
Future Perfect
RIO+20
United Nations Conference
on Sustainable Development

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Foreword

Sustainable development meets the needs of people and the planet today without compromising the ability of future generations to meet their own needs. Seen as the guiding principle for long-term global development, sustainable development consists of three pillars: economic development, social development and environmental protection.

At the United Nations Conference on Sustainable Development (Rio+20), world leaders, along with thousands of participants from governments, the private sector, non-governmental organizations and other groups, will come together to shape how we can reduce poverty, advance social equity and ensure environmental protection on an ever more crowded planet.

The Conference, which will take place in Brazil from 20-22 June 2012, marks the twentieth anniversary of the 1992 United Nations Conference on Environment and Development in Rio de Janeiro and the tenth anniversary of the 2002 World Summit on Sustainable Development in Johannesburg.

Rio+20 is envisaged as a Conference at the highest possible level, including heads of state and government or other representatives, and will result in a focused political document. It will focus on the two themes of a green economy in the context of sustainable development poverty eradication and the institutional framework for sustainable development. The preparations for Rio+20 have highlighted in particular seven areas that need priority attention: decent jobs, energy, sustainable cities, food security and sustainable agriculture, water, oceans and disaster readiness.

The publication of *Future Perfect* is intended to raise awareness about sustainable development and inspire all stakeholders committed to the success of and follow-up to Rio+20. The stories that comprise the publication come from governments, major groups of society and other stakeholders. The many contributions provide a mosaic of views about the future we want.

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Sustainability policies, programmes and their economic impact

Image: nrg4SD

Image: Kai Jensen/Scanpix

JOSÉ MANUEL BARROSO, PRESIDENT OF THE EUROPEAN COMMISSION

In June, leaders from all four corners of the globe must prove that we can provide future generations with a more equitable, more prosperous and greener world for all.

The recent economic downturn has left much of the world struggling to return to growth. We must seize this opportunity to forge a new path to better growth, since growth based on intense resource use and high consumption simply will not work any more.

The United Nations Conference on Sustainable Development (Rio+20) must be a turning point. In the twenty-first century, our common duty as leaders, businesses and citizens is to redefine growth in line with the needs of the world today, namely poverty eradication, food security, emissions reductions and using the planet's resources efficiently.

I am confident that Rio+20 will produce clear targets, tangible outcomes and effective actions that will demonstrate a common commitment to a new, sustainable economic model based on a balanced integration of economic, social and environmental objectives.

Rio+20 will be a once-in-a-generation opportunity to act to build a better future. The European Union will come to the conference with a level of ambition in line with scope of the challenges and a steadfast determination to make it a success.

José Manuel Barroso
President of the European Commission

YOSHIHIKO NODA, PRIME MINISTER OF JAPAN

I would like to express my sincere respect to the organizer, the United Nations and the chair, the Government of Brazil on the occasion of the United Nations Conference on Sustainable Development (Rio+20). We, the world leaders, bear responsibility for achieving positive results at this conference towards the realization of sustainable development.

Japan has been encouraged by warm support from all over the world in the aftermath of the Great East Japan Earthquake. The sound of hammers to reconstruct the affected areas strongly resonates with us. We are trying to transform this tough process of reconstruction into a great opportunity to foster innovation to build a sustainable and enriched society. Against this backdrop, I understand that the earthquake imposed on Japan a historic mission to tackle the most pressing tasks facing human beings.

As part of our reconstruction efforts, the Japanese Government designated six cities of the affected areas as 'future cities' — future-oriented eco-friendly cities. Renewable energy and new systems, including smart grid, will be introduced in these cities to achieve a frontier model for building a fulfilling society.

In order to realize a sustainable and prosperous society, the transition to a green economy is indispensable. Japan will contribute to creating a better world by taking advantage of the most advanced and top-notch technologies as well as expertise to satisfy both economic growth and environmental protection. Japan pursues a world guided by the principle of Human Security, where every human being plays a role and equally enjoys the benefits of growth and together realizes its rich potential.

With the expertise in energy conservation and green innovation, which has been cultivated nationwide and will be further enhanced through the reconstruction process, and with the people's resilience and the power of 'Kizuna' (the bonds of friendship), Japan is determined to revitalize the country. I firmly believe that a reconstructed Japan can further contribute to building a better world.

Yoshihiko Noda
Prime Minister of Japan

LEE MYUNG-BAK, PRESIDENT OF THE REPUBLIC OF KOREA

At the United Nations Conference on Environment and Development in 1992, the international community agreed on 'Sustainable Development' as a guiding principle for socioeconomic development.

Despite significant progress to this end, rapid world population growth and increasing resource scarcity pose unprecedented challenges to achieving sustainable development. The time has come again to assess what we have done so far and how we can move forward to address emerging challenges.

I welcome the theme of the United Nations Conference on Sustainable Development (Rio+20) in highlighting the concept of a green economy. I firmly believe that green, environment-friendly initiatives and economic growth can go together and that greening our economic growth is the only way forward for achieving sustainable development.

In a wish to contribute to Rio+20, Korea has developed and demonstrated its own successful national green growth strategy, which is an action-oriented strategy for facilitating the transition towards a green economy. This transition presents a big opportunity for all of us. It brings the opportunity to build more eco-friendly infrastructure and develop more climate-resilient livelihoods — with more jobs, of course. This is why Korea has made 'green growth' an international development priority.

As a country that was once on the receiving end of international aid but is now a significant donor, Korea wishes to facilitate cooperation among the international community, for both developed and developing countries, in the transition to a green economy. Korea also seeks to make the best use of the tremendous opportunities offered by green growth.

In this interconnected world, policy challenges for the transition to a green economy are global in nature and require transboundary action. Having a shared vision for a green economy, setting tangible goals, adopting an operational strategy and endorsing cooperative partnerships are essential parts of our mission at Rio+20. It is time to make the big shift to build a planet-responsible civilization, and this will happen only if we act together.

It is my sincere hope that Rio+20 will indeed serve to unite us in the spirit of sustainable development and lead us towards a green economy — the future we want.

Lee Myung-bak
President of the Republic of Korea

JENS STOLTENBERG, PRIME MINISTER OF NORWAY

Mankind has made tremendous progress since we met in Rio 20 years ago. Life expectancy has increased. Hundreds of millions have been lifted out of poverty. Communicable diseases are receding. Democracy is on the rise. And there are far fewer dictatorships.

Still, the challenges facing the planet are unprecedented and extraordinary: poverty, food insecurity, water shortages and climate change.

This time, Rio is about how we can ensure sustainable development for all, through a greener economy and an improved institutional framework.

Energy is key to sustainable development. If we want to lift millions of people out of poverty and secure economic growth, we need to ensure universal access to energy. But we cannot allow greenhouse gas emissions to increase. In Rio, we have to decide how to reconcile our growing numbers with the carrying capacity of our planet. None of this can be achieved without the empowerment of women.

As governments, we must provide frameworks that will move us in the right direction. We need to make bold decisions and take decisive actions. In short, we need to practise good governance in order to secure a sustainable future.

Jens Stoltenberg
Prime Minister of Norway

JACOB GEDLEYIHLEKISA ZUMA, PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA

The future we want can only be the future we make.

In Rio de Janeiro in 1992, at what was popularly called the Earth Summit, the countries of the United Nations agreed to Agenda 21, a programme of action for sustainable development and reaffirmed that sustainable development was delimited by the integration of economic, social and environmental pillars. The spirit of the conference was captured by the expression 'Harmony with Nature', exemplified by the first principle of the Rio Declaration.

State leaders expressly acknowledged the urgent need for deep change in consumption and production patterns, resulting in agreements being reached on the Convention on Biological Diversity and the Framework Convention on Climate Change.

When we convened for the ten year review of the Earth Summit, in South Africa at the World Summit on Sustainable Development in 2002 it was hardly a secret, or even in dispute, that progress in implementing sustainable development has been extremely disappointing since 1992.

With poverty deepening and environmental degradation worsening, what the world wanted was not a new debate but rather a summit of actions and results. And so the Johannesburg Plan of Implementation, encapsulated in its commitment to 'Making it Happen' became the new global deal from the Summit.

Rio+20 convenes in the context of emerging challenges such as the food security and price crisis, climate change and unstable international financial systems, which continue to reverse some of the gains made by developing countries in their efforts to achieve sustainable development.

Today, Africa lags behind in the implementation of the Millennium Development Goals, and Small Island States continue to be vulnerable to adverse weather conditions. Workers around the world continue to lose jobs, and children are still hungry and sick.

The future we want should be the future we make as governments and our partners. Rio+20 should build on the concrete experience of twenty years in implementation, reinvigorate political commitment and work towards assisting developing countries in their efforts to achieve agreed international developmental goals.

We can only build the future we want through transformation to a greener economy, promoting sustainable and inclusive growth and protecting vulnerable groups. In this way, we reduce carbon dependency, reverse ecosystem degradation and move closer to achieving the Millennium Development Goal of ending extreme world poverty.

Jacob Gedleyihlekisa Zuma
President of the Republic of South Africa

FREDRIK REINFELDT, PRIME MINISTER OF SWEDEN

In June, more than 50,000 people will meet in Rio de Janeiro with the shared purpose of putting sustainable development where it belongs, at the top of the global agenda.

Environmental awareness has long characterized Sweden's domestic policies and our priorities in various international forums. Forty years ago, in 1972, the first United Nations Conference on the Human Environment was held in Stockholm. With representatives from 113 countries and more than 400 organizations in attendance, the conference marked the beginning of political and public awareness in relation to global environmental and development issues.

Sweden has undergone a transformation from a poor agrarian country to today's industrialized and service-oriented society with high welfare ambitions, where economic, social and environmental policies are closely linked. These policies are based on the conviction that economic growth and prosperity can go hand in hand with social cohesion and care for the environment. Sweden's history also shows the importance of securing respect for the rights, freedoms and driving forces of the individual — men and women; young and old. A society that has space for all individuals has greater prospects of flourishing.

Development takes time and patience, and it takes trial and error. Every country faces different conditions and challenges and there are different ways to achieve sustainable development. On Sweden's part, we believe that we can contribute in particular through innovative solutions in the areas of water and sanitation, sustainable cities and the pricing of ecosystem services. That is also the focus of the Swedish chapter in this book.

But it is perhaps most important to look ahead of the present situation and into the future – the future of our children and grandchildren. If we live beyond our means today, future generations will pay the price for our folly. We will also do well to remember that inaction comes at a cost that is often too high. Now is the time to take responsibility and to act. The United Nations Conference on Sustainable Development (Rio+20) is an opportunity that we must seize.

Fredrik Reinfeldt
Prime Minister of Sweden

Ecuador: promoting the rights of nature

María Fernanda Espinosa, Coordination Minister of Heritage, Ecuador

Twenty years after the United Nations Conference on Sustainable Development in Rio in 1992, the world faces multiple crises in the realms of finance, economy, energy, food, climate and environment. These are symptoms of the crisis of the economic model and the conventional styles of development. The weak implementation of commitments to reach sustainable development shows the world that the structural causes of unsustainability of the current development model still remain.

It is important to recognize that the economic system is a subsystem of the global ecosystem. This implies that the ecological principles of the Earth's sustainability are superior to the principles of the traditional economic system. In consequence, the economic system's long-term development should follow the principles of evolution of the global ecosystem.[1]

In Ecuador, discussion of the development model and the biophysical limits of the planet became a key issue when the Government of President Rafael Correa took office in 2007, and especially during the drafting of the new Constitution in 2008, adopted through popular vote.

The Constitution framed the development model in the paradigm of Buen Vivir (life at its fullest). This concept is in itself an alternative to development, which seeks to replace a model based on economic growth that has led to poverty, inequity and exclusion. Buen Vivir is a process in construction, based on the traditional knowledge of indigenous peoples and nationalities.

Buen Vivir implies living in harmony with oneself, with nature and with others, while building democratic, inclusive, plurinational and intercultural states. It also requires full respect for the rights of individuals, communities, peoples and nationalities, while they exercise their responsibilities interculturally, with respect for diversity and in harmony with nature.[2]

Another main aspect of the Constitution is the recognition of the Rights of Nature, making this the first constitution in the world to recognize such rights. Nature or Mother Earth, where life is reproduced and carried out, is no longer considered an object but a subject, with a right to its own existence, maintenance and regeneration of its vital cycles, structure, functions and evolutionary processes.[3] Ecuador's Constitution is extremely progressive in relation to recognizing the limits of Nature.

With those two basic paradigm shifts, under Ecuador's Constitution, to reach Buen Vivir demands the integration of five pillars: economic, political, social, cultural and environmental.

The Buen Vivir paradigm implies work in the following areas: improve the quality of life; build a just, democratic, productive and sustainable economic model based on the equal distribution of the benefits of development, the means of production and the generation of stable and dignifying work; promote participation with equity and social control; recover and conserve nature and maintain a safe and sustainable environment; guarantee national sovereignty and promote Latin American integration; promote territorial development with equity; and protect and promote cultural diversity.

Image: Elder Bravo

Yasuni National Park

Image: Francisco Caizapanta

Ecuador highlands

Image: Francisco Caizapanta

Shuar child, Macuma Community in the province of Pastaza

National planning and institutional development

This comprehensive approach is further developed in the country's National Plan for Buen Vivir, which is the planning instrument that coherently develops the paradigms included in the Constitution and integrates the five pillars of sustainable development. It includes 12 national objectives, with goals and indicators, which are monitored, evaluated and reviewed on a yearly basis and adjusted every four years. The Plan itself has defined a twenty-year road map that will guide the country to a production reconversion whereby its main income will come from biotechnology, bioknowledge and conscious tourism services, moving away from extractive activities, such as oil and mining.

The Plan has been developed by Government institutions with the participation of civil society organizations and social movements. It guides the work of all public institutions and, as such, is mandatory. Planning is today a key issue assumed directly by the Government, whereas before, during the neoliberal years, planning almost disappeared, since privatization schemes required the State to pass on its responsibilities to the private sector.

Another important aspect of Ecuador's programme has been to restore the role of Government institutions. Along with the Ministries that execute policy, there are now Coordinating Ministries by area, for example: Natural and Cultural Heritage, Knowledge, Social Development, Strategic Sectors, Economic Policy and Production. Each integrates the planning process, including projects and budget definitions, of 6 to 10 Ministries. The Coordinating Ministry, together with the National Planning Secretariat and the Ministry of Finance, defines the budget allocation for the work to be carried out by the Ministries.

This approach has allowed an adequate integration of the sustainable development pillars in the planning process and enabled monitoring of public policy implementation. Every year, the Coordination Ministers present a consolidated report to citizens in relation to the work the ministries have carried out, as well as responding to any requests for further information and clarification. This is in line with the fifth branch implemented with the new Constitution, named Citizens Participation and Social Control (along with the executive, legislative, judicial and electoral branches).

Ecuador's innovative work and proposals

In this five-year period, Ecuador has also developed forward-looking proposals for sustainable development with strong political impact at a global level.

One of the most innovative proposals is the Yasuní-ITT Initiative. The main idea of this initiative is to leave unexploited 846 million barrels of oil in the Ishpingo-Tambococha-Tiputini camp, about twenty per cent of

the country's oil reserve, within the Yasuní National Park, in order to conserve biodiversity, protect the indigenous peoples that live in voluntary isolation, promote social development and combat climate change. This will also avoid the emission of 407 million tonnes of carbon dioxide. Under the principle of joint responsibility, Ecuador requests that the international community provide compensation equivalent to at least US$3.6 billion, which represents fifty per cent of the amount the country would receive if it were to exploit the oil.[4]

Image: Francisco Caizapanta

Napo Galeras Reserve

Such resources will be used to carry out the following activities:

- Change the energy matrix
- Effectively conserve protected areas
- Carry out reforestation
- Increase energy efficiency
- Improve social development in the area
- Foster research, science and technology.

This proposal is especially significant since Ecuador is an oil-exporting country that depends highly on such exports in its national budget.

There has also been a dramatic increase in the number of protected areas. In 1996 there were 16 protected areas; currently there are 46 (19.1 per cent of Ecuador's territory).[5] These areas are managed directly by local and national Government, while there are also forests managed by the private sector.

Within the protection of biodiversity and valuable ecosystems, it is important to highlight that the Ecuadorean Amazon region, 45 per cent of the country's territory, is managed under a specific constitutional mandate that considers it a special region due to its cultural and biological richness.

The Government has developed the Environmental and Social Reparation Program to assist communities affected by social and environmental damages, as well as the Socio Bosque Program, which provides economic incentives to 90,000 peasants and indigenous communities committed to the protection and conservation of native forests.[6]

Ecuador has also developed a National Climate Change Strategy, which includes projects to change the energy matrix, through hydroelectric plants that will reduce the generation of electricity based on oil fuel.

On the economic side, Ecuador has been able to reduce its foreign debt and manage its economy with sovereignty. After a foreign debt audit to determine illegitimate debt, as well as renegotiating its debt, Ecuador now has more resources for social development. In 2000, the relation of debt to GNP was 89 per cent, while in 2009 it dropped to 20 per cent.[7]

In relation to poverty eradication, Ecuador has developed programmes such as the Solidary Bonus, which provides monthly financial support to 1.8 million people. The Government has also developed special programmes for people of different capabilities, such as the Manuela Espejo and Joaquín Gallegos Lara programmes, whereby people are visited in their homes, while the relatives who take care of them receive Government financial support for the work they carry out.

Investment in education is a high priority for the Government, and currently 12 per cent of the state's budget is earmarked for education, which is free for all citizens, including university, as a Constitutional mandate.[8] The Government has given high priority to education through scholarships, more investment in public education and evaluation of colleges and univer-

Image: Francisco Caizapanta

Women in the town of Olmedo in the Ecuadorean Andes

sities, as well as building 'Millennium Schools' in impoverished neighbourhoods and rural areas, with the latest technology and quality. There is also a programme in place to develop Yachay, the city of knowledge, which is an innovation cluster for higher education.

In summary, the Government of the Citizens' Revolution has been the first one in Ecuador's history to assume the preservation, maintenance and dissemination of our cultural and natural heritage as an authentic State policy, developed by the Coordination Ministry of Heritage, in order to reach the society of Buen Vivir.

Ecuador towards Rio+20

After carrying out a participatory national evaluation process in relation to sustainable development in the country, Ecuador has developed four proposals for discussion at Rio+20, based on the principle of common but differentiated responsibilities, equity and ecological debt.

1. The paradigm of Buen Vivir as an alternative to development, recovering a life in harmony with nature, in recognition of the limits of Pacha Mama or Mother Earth
2. The promotion of a Universal Declaration of the Rights of Nature, to ensure that Mother Earth's cycles and evolutionary processes are respected
3. The establishment of a new international economic order and a new financial architecture. This implies we need to take action to face multiple crises, including the financial one, and to guarantee financing mechanisms for development. Ecuador presents the following proposals:
   - The Daly-Correa tax on oil imports by developed countries
   - A new emission of Special Drawing Rights, to make resources available for sustainable development
   - The Net Avoided Emissions mechanism, which implies compensation for developing countries that decide not to carry out an activity that causes greenhouse gas emissions; this mechanism currently forms part of the United Nations climate change negotiations
   - A tax on international financial transactions
   - The Yasuní-ITT Initiative.
4. Develop the fourth pillar of sustainable development, namely culture, which articulates and generates a balance among the other three pillars: economic, social and environmental. In capitalism, culture has been instrumental in favor of the economy, which has led to the promotion of homogeneity and thus the undervaluing of diversity. By considering culture as one of the main pillars of sustainable development, the idea is to recover diversity, respect different cultures as a key element to build sustainable societies, promote the popular and solidarity economy, promote respect for human rights and ancestral knowledge; and promote participation in conditions of equity, interculturality and respect for nature.

Rio+20 demands bold proposals and decisions, as the world is at risk. We consider that the proposals Ecuador presents can contribute to finding solutions, especially if we consider that they are being built right now, in order to create a world of social and environmental justice.

Establishing Earth-based governance for the rights of the environment

Linda Sheehan, Executive Director, Earth Law Center

People and the planet stand at a crossroads, with climate change forcing a definitive, immediate choice of paths. Scientists overwhelmingly agree that 'warming of the climate system is unequivocal'[1] and that human activities have been the driving force behind this increasingly dangerous trend.[2] Independent energy experts conclude that 'if stringent new action is not forthcoming… all the CO_2 emissions allowed in the 450 Scenario (2º C increase) up to 2035' will have been allocated by 2017.[3] In other words, without swift and decisive action, the world is heading for irreversible climate change.

This urgent call for action is being echoed around the globe. Depleted waterways, disappearing species and vanishing habitats bear witness to the relentless pressures of an overarching economic system that assumes the environment is property to be used for the benefit of humans. This premise misses the truth of our actual, inextricable interconnections with the natural world, and it underlies a governance system that will ultimately fail to ensure the well-being of either people or planet.

The escalating depletion of the natural world also puts at increasingly greater risk those growing human populations without clean water, safe shelter, healthy food or other basic necessities. Many of these become 'environmental refugees' and face similarly dire living situations in overcrowded cities far from their home communities. If this pattern continues, as a recent report commissioned by the United States Secretary of

Image: Linda Sheehan

Public march for 'water for life, not for sale', Marseille, France, March 2012

Image: Fundación Pachamama

Signs at perimeter of Vilcabamba River restoration site, Ecuador

Image: Patricia Siemen

World People's Conference on Climate Change and Mother Earth
Cochabamba, Bolivia April 2010

State concludes,[4] armed conflict will increasingly break out over water and other essential elements of life. The alternative is to decide now to choose a governance path that embraces our integration with the environment and each other.

The United Nations Conference on Sustainable Development (Rio+20) falls fortuitously, and gravely, at this critical juncture. The United Nations Environment Programme (UNEP) set the stage for Rio+20, with its Towards a Green Economy report, which prioritizes using economics to improve human well-being while reducing environmental damage and scarcities.[5] But will this vision of change — which is rooted in flawed, 'human over nature' governance structures — achieve the world we want?

The Rio+20 focus on sustainable development and green economies misses the point that development and the economy are not the end game, but are tools to achieve a larger vision of thriving human and environmental communities that represent the best of us and inspire us to evolve further. Thriving human communities include not just development and the economy, but also healthy food, clean drinking water, wide circles of family and friends, sanitation, housing, necessary medical care, democratic governance, education, meaningful and appropriately rewarded labour, spirituality, and civic duty, alongside healthy relationships with the natural world, on which we depend utterly. Thriving environmental communities similarly require healthy nutrients, clean water, biodiversity, restoration in the face of destruction, and connected habitats and migratory corridors, along with healthy relationships with humans, who have the power to destroy, as well as rejuvenate.

If constructed correctly, development and the economy will serve thriving, interconnected human and environmental communities that interplay to create a vibrant planet. Yet inexplicably, despite the fact that the existing economic system is fundamentally driving environmental destruction, it has remained relatively immune to much-needed public debate over alternative models. Instead, apparently convinced of their inevitability, the discourse has flipped the status of development and economy from their proper roles as servant, to master of people and planet. Protection of nature is regularly subsumed to the incessant driver of economic growth, rather than enhanced by evolved economic goals that incorporate the well-being of all the Earth's inhabitants.

As one example, in France, the 2012 World Water Forum in Marseille showcased the privatization of water — an essential element of life itself — as a 'solution' to the world's water challenges. Thousands of members representing global organizations that included conservation, human rights and labour met in a parallel forum to offer alternative, Earth-based solutions that recognize the inherent rights of people, ecosystems and species to water needed for survival. Their work illustrated the growing financialization of nature and showed how it leads to dangerously unbalanced relationships among humans and the rest of the community of life on Earth.

Unfortunately, this imbalance is being exacerbated by other, expanding proposals to 'save' the environment by sweeping it into destructive economic models. One example involves pricing out elements of the natural world and trading them to their allegedly 'highest' use. It should surprise no one that the result of this financial 'solution' will focus around money and markets, rather than the health of the environment. The cap-and-trade process is just one early example of the impacts of this strategy. Though the European Commission is calling for new emissions reductions,[6] states are resisting further tightening of carbon reduction targets and issuing of fewer trading permits in the face of a record

Image: Transition Network

Installation of solar systems, Transition Town Totnes, UK

Image: Eriberto Gualinga

Children of the Kichwa Nation of Sarayaku

slump in carbon prices, which itself is reducing much-needed investment in low-carbon technologies.[7]

The first principle of the 1992 Rio Declaration[8] states that 'human beings… are entitled to a healthy and productive life in harmony with nature'. This is true, but not the whole truth. Nature requires such rights as well. We cannot scientifically, ethically or practically treat the natural world as 'resources' and property to serve our self-selected, self-destructive economic model. The false dogma of humans over nature needs to shift to allow us to recognize our interconnectedness with the natural world, and acknowledge its inherent rights to exist and thrive, which in turn will protect our own.

An essential step in this direction is to establish a legal system that incorporates and respects the rights of ecosystems and species to live in harmony with all other Earth inhabitants. This legal system would be supported by an evolved economic system that maximizes social and biological well-being, rather than private wealth. Only a governance system based on a humble acknowledgment of our place within a web of inter-relationships — one that recognizes that a healthy Earth is fundamental to continued, flourishing human existence — can be deemed sustainable. By acknowledging in law the science of our integration with the environment, we will create governance structures that guide us toward sustainable lives and communities.

Such an Earth-based governance system would respect the planet's limits, continuously evolving to reflect new science on the workings and boundaries of Earth's systems. It would incorporate ongoing analysis of ethics for the purpose of developing decision-making criteria, such as use of the precautionary principle of care. Finally, Earth-based governance would recognize and implement in law the rights of ecosystems and species to exist, thrive and evolve, and it would protect the environment's right to restoration for human-caused destruction.

Nations and communities around the world are already beginning to adopt and implement such legal systems. Most notably, in 2008 Ecuador became the first country to adopt a constitutional provision endowing nature with inalienable, enforceable rights.[9] Its new Constitution states that the natural world has the right to exist, persist, maintain itself and regenerate its vital cycles, structure, functions and processes in evolution.[10] Further, the Constitution provides the natural world with a right to restoration that is independent of humans' right to compensation.[11] Finally, it endows every person, community or nationality, the right and responsibility to call for enforcement of these rights of nature before public bodies.[12]

These Constitutional provisions were first tested in a successful case in March 2011. In this legal matter, which was brought by attorneys acting on behalf of the Vilcabamba River, the court found that the river's constitutional right to flow had been violated by destructive road development practices and ordered that the river be fully restored to health.[13] Although restoration efforts started, they have since lagged, and citizens have stepped in to ensure judicial inspection of the site and reinvigorated enforcement of the court's orders.[14]

Indigenous peoples are also working to ensure that these Constitutional provisions become a reality. The Kichwa people of Sarayaku in Ecuador's Amazon region obtain 90 per cent of their food from their local territory, and so they are particularly vulnerable to damage to its health. The Sarayaku further espouse the world view of 'Kawsak Sacha cosmovisión,' which incorporates an understanding of direct contact with Mother Earth and sees the jungle as a living being, with spiritual representatives for each element. The Sarayaku have been taking action in the Inter-American Court of Human Rights to protect the jungle's physical and spiritual well-being from violently destructive projects such as mining and fossil fuel extraction.[15]

Image: Filipe Fortesk

Pittsburgh, PA adopted a 'rights of nature' ordinance, importantly giving clean water to the city

The precedent set by the Ecuadorian Constitution led to the adoption, spearheaded by Bolivia, of an international Universal Declaration of the Rights of Mother Earth in April 2010.[16] Following the failure of the United Nations Conference of the Parties in Copenhagen to gain meaningful progress in combating climate change, the Bolivian Government organized an alternative conference for communities, NGOs, lawyers, academics, scientists, the public and governments from around the world. Held in Cochabamba, Bolivia, the conference was attended by tens of thousands of people and concluded with the adoption of the Universal Declaration.

The Declaration recognizes that 'Mother Earth and all beings' have numerous rights including the right to exist, the right to water as a source of life, the right to integral health, and the right to full and prompt restoration for violations of these rights. Bolivian President Morales formally presented the Universal Declaration to the United Nations immediately after the conference.[17] Further, Member States and experts addressed the Universal Declaration at an April 2011 General Assembly Interactive Dialogue[18] on implementation of the Rio Principle of life in harmony with nature. The report of the Secretary-General that supported this Dialogue recommended a 'declaration recognizing nature's intrinsic value'[19] that is apart from its value to humans. The Universal Declaration provides an important structure for establishing governance systems that lead to healthy, sustainable communities, both human and environmental.

Recognition of the rights of nature increasingly occurs at community level as well, particularly in those communities threatened by outside attempts to injure local waterways and lands. Faced by corporate demands to drill locally for natural gas using a particularly destructive technique known as hydrofracking, the City of Pittsburgh in Pennsylvania took action to protect its drinking water and local rivers from the projected contamination that would have occurred. The city passed a local law not only prohibiting fracking, but also recognizing that 'natural communities and ecosystems… possess inalienable and fundamental rights to exist and flourish within the City of Pittsburgh' and granting City residents 'legal standing to enforce those rights on behalf of those natural communities and ecosystems.'[20] The actions undertaken by this major US city with over 305,000 inhabitants are a model for other communities around the globe.

The challenge now is to take up and expand these efforts, broadly working to create Earth-based governance that recognizes the inherent rights of the natural world, and are consistent with modern scientific awareness of our integrated relationships. New laws and economic systems are essential elements of this transformation and can be spearheaded by practical actions on the ground, particularly those at local level. One example of community-based action is the Transition Network,[21], which fosters worldwide 'transition towns'. Community members within these towns work to rebuild local resilience in key areas such as food, water, housing and energy, as well as regularly take direct action to reduce local greenhouse gas emissions. Community initiatives geared towards resiliency and biodiversity will build a culture of connectedness with the Earth, which in turn will advance the governance changes needed to establish a broader evolution of law and economic policy for the long term.

Our current governance systems arose from an era in which society mistakenly believed humans could, and therefore should, control the environment. The current path of endless growth and monetization of the Earth's systems will only repeat these past mistakes, to the detriment of all. Instead, modern science and ethics are calling out for an Earth-based governance system that will embed and guide the implementation of mutual, respectful rights of coexistence for all Earth's inhabitants, to our collective benefit. Our future depends on the path we choose now.

Approaching harmony with nature

Barbara Sundberg Baudot, President, Triglav Circle

Awareness of humankind's potential for destroying the natural environment existed in the dawning years of the industrial revolution. James Madison, the fourth President of the United States, anticipated today's major environmental challenges and general lack of concern for harmony with nature. He stands out as a visionary, witnessing the devastating consequences progressive and aggressive agricultural practices inflict on the natural environment, including erosion of the soil, deforestation and loss of biodiversity. He offered a prescient argument for an ecological method of agriculture. In 1818, he observed:

"On comparing this vast profusion and multiplicity of beings with the few grains and grasses, the few herbs and roots and the few fowls and quadrupeds, which make up the short list adapted to the wants of man, it is difficult to believe that it lies with him so to remodel the work of nature… by a destruction… of entire species, with the few exceptions which he might spare for his own accommodation."[1]

Image: Barbara Sundberg Baudot

Scientists are unable to predict more than a fraction of nature's behaviour

Madison challenged assumptions that natural resources were inexhaustible and foresaw vital ecosystems being reduced to vast wastelands by the relentless plundering of these reserves. He emphasized the interconnections between humans, plants, and animals and vehemently advocated protecting the earth's rich diversity of life. It was imperative that ecological balance be maintained between all forms of life even when the economic utility of some species was obscure.

Failing to heed Madison's forewarnings and those of subsequent advocates for the environment, humanity now encounters imminent ecological catastrophe. Currently, 7 billion people inhabit the Earth, seven times more than in 1818. People and domesticated animals make up about 90 per cent of the vertebrate mass and have modified nearly 80 per cent of the planet's land surface. Both clean air and safe drinking water are increasingly threatened, while thousands of species of flora and fauna are effectively extinct. According to the Stockholm Environment Institute,[2] the three gravest threats to nature today are climate change, nitrogen use and loss of biodiversity, which are attributed to human transgressions of planetary boundaries.

Such awareness has not been matched by sufficient corrective action by the world community despite the initiatives by a number of goverments and international institutions.

In 1980, an extensive report by the International Union for Conservation of Nature and the World Wildlife Fund, in conjunction with the United Nations Environment Programme and in collaboration with the United Nations Educational, Scientific and Cultural Organization and the Food and Agricultural Organization of the United Nations, prefaced the General Assembly (GA) debate and adoption of the World Charter for Nature in 1982.[3] The Charter affirmed that 'mankind is part of nature', that 'civilization is rooted in nature', and that 'living in harmony with nature gives man the best opportunities for the development of his creativity'.[4] It denounced 'excessive consumption and misuses of natural resources,' and formulated general principles, functions and methods of implementation to promote 'respect for nature and its essential processes'.[5] This Charter and with it, the concept of harmony with nature, largely disappeared from international discourse until 2005. Neither the United Nations Conference on Environment and Development and its follow-up in Johannesburg, nor the major policy-setting texts adopted by the United

Image: Barbara Sundberg Baudot

Honeybees are most threatened by loss of biodiversity

Nations on the eve of the twenty-first century, give much attention to the philosophical and spiritual roots of relations between humanity and nature.[6]

In 2005, however, the GA decided that 2008 will be the International Year of Planet Earth,[7] and, in 2009, it designated 22 April each year as International Mother Earth Day.[8] In 2009, the GA also adopted a resolution on harmony with nature,[9] in which Member States expressed concern over 'the documented environmental degradation and the negative impact on nature resulting from human activity', recalled the 1982 World Charter for Nature, and invited all actors 'to consider, as appropriate, the issue of promoting life in harmony with nature'.[10]

In preparation for the United Nations Conference on Sustainable Development (Rio+20), the GA adopted further resolutions on Harmony with Nature in December 2010 and December 2011.[11] In response to these resolutions, two extensive, thought-provoking reports were submitted to the GA by the Secretary General and two interactive dialogues took place, the first in April 2011, and the second in April 2012.[12]

The dialogues brought to light issues that have heretofore been inadequately addressed by the world community. It is sobering to consider our planet from the standpoint of the universe, to evoke the billions of years it took nature to evolve, and to realize humankind's present capacity to destroy it. It is critical to understand the need for ethics in Nano research, and the wisdom of traditional cultures in addressing today's ecological concerns.

Clearly, effectively achieving sustainable development, with advancement of technology and poverty eradication is hardly feasible if humanity does not take to heart, that attaining and maintaining harmony with nature is the sine quo non of a sustainable economy and ultimately of the survival of humanity. "Harmony with nature" is not a mere catchphrase: it is an imperative goal for society. To create more amenable conditions for an ecologically sustainable future demands considerably more thoughtful reflection, intellectual work and practical initiatives by governments and civil society.

In determining directions for this requisite and holistic work, it is important to acknowledge that the physical and social sciences cannot frame all the questions and provide all the answers in the quest for harmony with nature. It must be understood that Nature has both material and metaphysical dimensions, as well as intrinsic and instrumental value. Therefore, it is crucial that in both thinking and in practice a holistic and interdisciplinary approach be adopted. Protecting nature calls for philosophical thinking, poetic inspiration and spiritual reflection, in addition to scientific, economic and social considerations. Deeply disturbed by ongoing destruction of the environment, former Czech leader and author Václav Havel wrote:

"The only option is for something to change in the sphere of the spirit… in the… attitude of man towards the world and his understanding of… his place in the overall order of existence… Only a new understanding

Image: Kevin Sullivan

Community farms supply their inhabitants with local food

will allow the development of new models of behav- iour, scales of values, and objectives in life and, through these means, bind a new spirit and meaning to specific regulations, treaties, and institutions."[13]

This understanding can come from openness to philosophical and spiritual enlightenment, with new models of behaviour, and a sense of responsibility and accountability to nature.

Appreciation of nature's intrinsic value is enhanced by poetic thinking, or flights of fancy, inspiring sensitivity to the beauty and grandeur of nature's creations, according to Belgian playwright, poet and essayist Maurice Maeterlinck, who is known for his powerful, symbolic writing, presenting vital spiritual truths cloaked in rich imagery drawn from nature. His play, The Bluebird, uses imagery to convey the realities of celestial truth and absolute happiness. Such ideas are contagious, so it is no wonder people built the houses and recreated the habitat for the successful return of this bird to New England. Equally powerful is his discourse in The Life of the Bee, in which philosophy, science and fancy intermingle, generating for the swarm and the hive — as for the bluebird — great affection and admiration. He writes: "to him who has known them and loved them, a summer where there are no bees becomes as sad and empty as one without flowers or birds."[14]

Similarly, fairy tales possess the power to incline the affections of young and old to reverence for life and love of nature, as J.R. Tolkien explains.[15] The fairy tale helps humanity to see afresh things that familiarity and triteness have dulled. Good craftsmen of fantasy enchant nature, touching the reader with the beauty and complexity of its visible and invisible forms. Even the grass beneath one's feet is a wonder, the greensward that covers the earth making life possible.

A sense of the beauty of nature, promoted by poets and artists, is fundamental to the wellbeing of society, as John Stuart Mill notes: "Left alone to meditate among the trees and flowers, in meadows or beside placid lakes, humankind would restore its soul and spirit… Solitude in the presence of natural beauty and grandeur is the cradle of noble thoughts and aspirations which are not only good for the individual, but which society could ill do without."[16]

Scientists also acknowledge the sublimity of nature. Humbled by the uncertainties of existing scientific theories of nature and the universe, physicist Richard Feynman remarked:

"This universe has been described by many, but it just goes on, with its edge as unknown as the bottom of the bottomless sea of the other idea – just as mysterious, just as awe-inspiring, and just as incomplete as the poetic pictures (of the ancients) that came before. But they see that the imagination of nature is far greater than the imagination of man. No one who did not have some inkling of this through observations could ever have imagined such a marvel as nature is."[17]

Although scientists have greater knowledge of the mechanics of the universe than ordinary people, they

Image: Kevin Sullivan

Farming in harmony with nature is a craft

are unable to predict more than a fraction of nature's behaviour. Even awe-inspiring glimpses of reality are better than ignorance for the continuity of life and should give reason for living in conformity with the physical environment, according to the laws of nature from which it derives its life forces.

Turning now to practical actions, how might a holistic approach begin, for example, to address the loss of biodiversity and arrest the use of destructive pesticides and fertilizers? Actions must begin with grass-roots initiatives and creative individuals, as illustrated by examples from apiculture and community-supported agriculture (CSA).

One of the most serious threats to biodiversity is the loss of honeybees in many parts of the world. The decline of honeybee numbers and vitality has several causes. Bee populations that have been overexploited for commercial profit are severely stressed. Reduced to mobile pollinating factories that are trucked over great distances, thousands of hives have also collapsed. Flowers that provide bees with nectars and pollens have been either poisoned by pesticides or uprooted, to make place for monocultures or even pristine lawns. Without doubt, the moribund bees have unpredictable life prospects unless steps are taken to protect them. The loss of bees would have grave consequences for the world's supply of fruits, nuts and vegetables.

Because bees play a key role in the food chain and natural ecosystems, apiculturists have a responsibility to approach their profession in ways that are wholly consistent with nature. Kirk Webster described his method as:

"The model of a healthy, treatment-free northern apiary, based on the balanced production of queens, nucleus colonies and honey… Reverence for Nature and its restorative power were consulted and used at every possible opportunity. Economic success was assured only by the counter-intuitive process of ignoring economic concerns and focusing on the natural ability of bees and insects to be healthy, productive and responsive to changing conditions. Much of the stress and worry has been eliminated and beekeeping has become more interesting and enjoyable than ever before. This 'promise' is available to every beekeeper who can selflessly think and work at the same time and adapt Nature's methods to his or her own situation."[18]

In response to the environmental damage associated with industrial agricultural methods poisoning land and water, reducing biodiversity and eroding topsoil from fertile landscapes, community supported farms have come into existence to serve inhabitants by supplying them with foods that have been grown locally and often organically. On some of these farms, scientific methods have been enriched by philosophical and spiritual beliefs, as in the case of natural, permaculture and biodynamic farms. These holistic approaches work with nature, and require close observation and thoughtful labour, including attention to examples of sustainable land use.

Temple-Wilton Community Farm is a CSA prototype in New Hampshire in the United States. This four-acre vegetable farm — then one of only two of its kind — was established in 1985 by Anthony Graham, Lincoln Geiger and Trauger Groh, immigrants from Zimbabwe, Sweden and Germany, respectively. It is an association of 'active and passive' farmers who share the profits and losses of the land that provides vegetables for more than 100 families, all year round.

Work on this farm is grounded in moral principles and spiritual aims. The farmer's job is to produce life-enhancing foods for local families, in harmony with natural forces. Here, farming is labour, a craft and an art, where farmers create conditions that allow nature to fulfil its functions of growing crops and feeding livestock.[19] The farm is a biodiversified, closed organism, supplying its own biological fertilizers and seeds, while maintaining self-sufficiency in its productive processes. Thousands of CSA farms have burgeoned in the United States and around the world since 1986.

Madison's plea for harmony with nature remains urgent and auspicious. Addressing the World Economic Forum in Davos in January 2011, United Nations Secretary-General Ban Ki-moon emphasized the necessity for everyone to live in harmony with the natural world, as had the ancients. He declared: "In an odd way, what we are really talking about is going back to the future. The ancients saw no division between themselves and the natural world. They understood how to live in harmony with the world around them. It is time to recover that sense of living harmoniously for our economies and our societies." Hope rests in progress achieved caringly by creative and soulful individuals around the globe.[20]

Climate change mitigation through oriental wisdom and human development

Suthawan Sathirathai and Buntoon Sethasiroj,
Good Governance for Social Development and the Environment Institute

The Good Governance for Social Development and the Environment Institute (GSEI), which was founded in 2009, is a non-profit organization devoted to environmental and social policy research, as well as multi-disciplinary knowledge development and enhancement. The work of GSEI aims to encourage and support public policies based on knowledge and good governance.

Most of the current global environmental crises are the result of unsustainable development. Over the past five years, GSEI has conducted multidimensional research projects on related issues, for instance, the negotiation of the post-2012 climate change regime, development of environmental economics tools, environmental laws, climate change adaptation and a green economy for sustainable development. The findings of these projects provide recommendations for policy formulation and the drafting of regulations to solve environmental problems at domestic and international levels. The research, jointly conducted with academics from different universities functioning as a multidisciplinary network of researchers, centres around the concepts of sustainable development, human development, community strengthening and the application of oriental wisdom. Current GSEI research projects also focus on oriental wisdom including the development of indicators to apply Sufficiency Economy Philosophy (SEP) in mitigating global warming, using the oriental wisdom concept. Examples include the development of the Ban Pred Nai Community Learning Centre in Trat province, which aims to strengthen and apply local wisdom in combination with scientific knowledge for climate change mitigation. Research also focuses on climate change issues such as the Multilateral Environmental Agreements and Global Warming Strategies Platform, as well as a study on economic and legal mechanisms to solve and mitigate global warming problems, and to provide recommendations for Thailand.

Image: GSEI

Mangrove forests in Ban Pred Nai community in Trat province

As climate change poses an enormous threat to humanity, the global community has begun to adopt mitigation policies to reduce the cause of the problem, namely the emission of greenhouse gases. This mainstream approach tends to focus on technology fixes such as the biofuel solution, which seeks to resolve environmental problems, but at the same time continues to support industrial production. Nevertheless, a solution like biofuel has negative impacts, such as food insecurity and deforestation. The failures of mainstream solutions to curb the inevitable negative effects of industrial production of the past centuries have encouraged the search for possible alternative remedies. Indeed, solutions that emphasize only the production side without considering sustainable consumption will not be sufficient. With this in mind, GSEI has dedicated its research to finding alternative solutions to economic and environmental degradation, with the aim of proposing oriental wisdom as one alternative solution.

In its Thai manifestation, oriental wisdom is partly influenced by the tenets of Buddhist philosophy, which recommend harmonious coexistence with nature by emphasizing mindfulness and mental cultivation as a means of curbing destructive behaviour such as greed. Through the collaborative work of GSEI and local communities, Through the collaborative work of GSEI and local communities, we have shown that GHG emissions can be reduced by adopting a lifestyle that coexists harmoniously with nature through oriental wisdom.

Environmental economists often find that the problems of environmental conservation stem from the characteristics of common-pool resources (CPRs), which are defined in common property terms as non-excludable but at the same time subtractable. Yet most of the world's productivity relies on the exploitation of such resources, and as a result we have entered a state of 'tragedy of the commons', where the environment is destroyed because it is overused. This can be explained through the metaphor of the 'prisoner dilemma' game, where individuals do not optimize their long-term benefits because personal greed or interests outweigh collective efforts. However, in the end they all suffer the joint consequences of their behaviour. A good example of a CPR

Image: GSEI

Achieving climate change mitigation through combining local wisdom and scientific knowledge is key

is our global atmosphere. Climate change problems occur as a result of an accumulation of CO_2 that began in the middle of the nineteenth century. In terms of historical emission, as estimated by the World Resource Institute in 2005, the developed countries — mainly the United States and Europe – account for 76 per cent of accumulated CO_2; these nations have already utilized three-quarters of our atmospheric CPR. International agreements have pushed many developed nations into pursuing emission reduction goals. In reality, their emissions are partly reduced by offshoring or outsourcing their production elsewhere. For example, between 1990 and 2008, based on figures from the United Kingdom (UK) Department for Environment, Food and Rural Affairs, GHG emissions from UK production decreased by 14 per cent, whereas GHG emissions from UK consumption increased by almost 20 per cent. Unsustainable consumption is another problem. The Global Footprint Network found that between 1961 and 2007, the world consumption level would require 1.5 earths to sustain itself in terms of the use of natural resources. There is clearly an excess demand with respect to the limited supply available for humanity. The source of current global dilemmas can be traced to excess greed and heightened consumerism. In his book, The Price of Civilization, Jeffrey Sachs stated that given the neuroplasticity of the brain, constant stimulus through media and advertisements may lead to addiction to certain material objects. From an early age, our younger generations are bombarded by images and stimuli that induce an endless need to consume. This reflects what Mahatma Gandhi said: "The world has enough for everyone's need but not enough for everyone's greed."

Contemporary economics theory views greed as an inevitable trait of human nature that cannot be curbed. Therefore, the mainstream approach uses market and institutional mechanisms as well as technology to fix the problems. These conditions may be necessary but insufficient. In fact, the works of Venerable P.A. Payutto, based on Buddhism, explain how wisdom can be cultivated so that greed can be curbed. He pointed out that in Buddhism there are two types of consumption, consumption with greed and consumption with wisdom. Consumption with greed involves an excessive demand for materials such as food, which can lead to obesity. Consumption with wisdom, on the other hand, will reject the necessity of those needs. It will pose questions such as, what is enough? What are the qualities of the materials to be consumed? And most important of all, what is not necessary? In Pali this is called 'bhojane mattaññu (ta)' or 'knowing the proper consumption'. At the same time, he noted that human beings and society could attain happiness by training the mind. Coincidentally, this viewpoint has been supported by research work on neuroplasticity that was carried out at the University of Wisconsin. Brains from average people were scanned and compared to that of the highly trained Lama — the Venerable Matthieu Ricard — also known as the world's happiest man. The results revealed a highly balanced and happy brain, even though he lived simply and modestly. Therefore, the solution to environmental problems may not be dependent on technology and institutional re-arrangements alone, but also on training the mind. In addition, the United Nations Framework Convention on Climate Change has proposed lifestyle change as a solution to climate change. This can be achieved more easily if rich people stop acquiring more and believe they can attain happiness with less material accumulation.

GSEI has focused its efforts on pursuing good governance and environmental sustainability through the application of oriental wisdom. GSEI action research

Image: GSEI

Integrating the local community into business can lead to greater economic success

shows that two important conditions, namely trust and reciprocity, can easily be cultivated through such an approach. Both conditions, which enable the effective management of local CPR, were shown in research by Professor Elinor Ostrom, the first woman to receive the Nobel Prize for Economics. She conducted extensive studies throughout South and Southeast Asia into why and how self-organizing groups of local communities arise and successfully manage CPR. When communities work together and are extensively linked to one another, they can ultimately achieve a single long-term vision of sustainability. The conditions of trust and reciprocity produce a sense of communion within the village network and community. GSEI studies also showed that with shared values based on oriental wisdom, an ethical code would effectively ensure collective effort.

The best example can be seen in the Ban Pred Nai community in Trat Province. Led by Venerable Subin Pannito, a local monk who sought to encourage the rehabilitation of a local mangrove forest into a source of coexistence and income, the villagers followed Buddhist teachings together with SEP and created the Sacca Network, which targeted harmonious economic activities. SEP, a wisdom initiated by the King of Thailand, comprises important principles of moderation, reasonableness and self-immunity. Wisdom manifests itself in a balanced way of life. In addition, Venerable Subin's teaching of Buddhist concepts such as 'metta' (compassion) and 'sacca vacca' (right or honouring words), leads to trust being created amongst community members and has allowed micro-credit to circulate. To date, the community's working capital has amounted to US$46 million, with more than 2,000 hectares of community mangrove forest. Moreover, to the surprise of the GSEI research team, carbon emission measurements have revealed that CO_2 mitigation in the community is now much more effective. On average, Pred Nai village annually absorbs up to 2,100 tons of carbon, which is equal to 1.85 tons of carbon per person. The average forest carbon absorption rate is 0.91 tons per year, making the absorption rate twice as high as the baseline following the activities initiated by Venerable Subin.

According to the GSEI study, success is not limited to local communities alone, but could also be achieved by businesses. A case in point is the Chumporn Cabana Resort, which chose to operate through applying SEP concepts. The resort relies on local communities and supplies its own operational needs by cultivating and using natural products available in the area, such as the community forest. By encouraging good governance and integrating the local community into its business, the resort has managed not only to become environmentally friendly, but also to generate both savings and income.

Image: GSEI

Buddhist teachings and oriental wisdom lead to a more balanced way of life

Fundamental qualities such as honesty, moderation and compassion lie at the heart of oriental wisdom, as achieved through mental cultivation. It has proved successful in bringing about sustainable development. More importantly, a successful environmental endeavour such as GHG mitigation can be harnessed to happiness. However, it is essential to note that we would not want to neglect the need to pursue mainstream solutions such as technology and institutional re-arrangements; it is feasible and necessary for the human mind to simultaneously curb its greed and reinvestigate the concept of collective interests and morality.

Global environmental crises in the areas of food security, energy, finance and climate reflect the neo-liberal economic system and ensuing unsustainable development; a paradigm shift is therefore needed. The important proposal for a 'green economy' has become part of the world agenda for the United Nations Conference on Sustainable Development (Rio+20).

Given the different socioeconomic and environmental contexts worldwide, as well as differing levels of development, conceptually it is appropriate that each country determines its own definition, attributes and components of the green economy to be compatible with its own local context. However, in the globalized era, all countries are connected by a web of interactions, especially through international trade. Therefore, it is necessary to build a common understanding of the green economy as a new paradigm of development that rearranges economic growth as one of the key pillars in sustainable development and supports the social system. This model must be pursued along with human beings' spiritual development, as illustrated in the practical examples mentioned earlier. This is an approach to 'sustainable consumption' in both developed and developing countries, as requested and indicated in a document entitled The Future We Want for Rio+20.

With regard to building an institutional framework for sustainable development, it is important to take into account not only the international level under the United Nations structure, but also the interconnections between international, regional, national and sub-national levels, including local communities and local administrative organizations, which will lead to the establishment of a new institutional framework which is not state-centred. The objective that GSEI has emphasized in its research and experimentation is the building of collaboration in the form of a public-private-people partnership for social innovation. This includes oriental wisdom and working towards climate change mitigation and a green economy for sustainable development.

Non-regression in environmental protection: a new tool for implementing the Rio Principles

Michel Prieur and Geoff Garver, International Centre of Comparative Environmental Law

Hopes are high that the United Nations Conference on Sustainable Development (Rio+20) will be a major step forward in sustainable development and environmental protection. But, given the mounting evidence that the sustainable development agenda adopted at the United Nations Conference on Environment and Development (Earth Summit) in Rio in 1992 has not achieved its goals, forward progress is not enough. It is time for the international community to recognize a new tool for achieving environmental protection under the Rio Principles that emerged from that event: a commitment to environmental non-regression, as a way to prevent backsliding on the levels of environmental protection provided under national and international law. This is the story of how an international group of dedicated environmental lawyers is pushing the international community to make this commitment at Rio+20.

Twenty years ago, when the Earth Summit took place in Rio and the international community adopted the 1992 Rio Principles, sustainable development was an emerging concept and public awareness of climate change was still limited. Since then, we have learned a great deal about the increasingly precarious relationship between human society and our finite planet Earth. Important post-Rio tools like the ecological footprint tell us we are consuming the Earth's biocapacity faster than it is regenerated – a clear sign of unsustainability. The Intergovernmental Panel on Climate Change has issued four sweeping reports on the increasing danger of climate change. The Millennium Ecosystem Assessment reports, released in 2005, warn of the dire and declining state of biodiversity. In 2009, distinguished researchers identified nine planetary boundaries of safe operating space for humanity and they told us that we have already crossed at least three of them (climate change, biodiversity loss, and human-caused loading of nitrogen in ecosystems). This new information creates an entirely different, more urgent context for Rio+20 than existed in 1992.

Rio Principle 11 declares that: "States shall enact effective environmental legislation." International and national environmental laws and policies generally seek to reduce pollution and to protect and enhance biodiversity using the best pollution control technologies, and effective environmental law seeks continual improvement in environmental protection. Following the Earth Summit, environmental law has seen advances in many countries and at the international level, in the form of new domestic laws and multilateral environmental agreements. More and more countries and regions are also recognizing a human right to a healthy environment, which, as with all human rights, should be protected against any type of regression. However, the lesson from the two decades since the Earth Summit is that serious environmental problems have persisted despite the Rio Principles. The looming threats of climate change, loss of biodiversity, toxic pollution, nitrogen loading and more make clear that levels of environmental protection are not yet high enough, and the human right to a healthy environment is not yet adequately protected.

Paradoxically, these ecological threats can enhance economic or social pressures to decrease, not increase, environmental protections as a way to promote economic opportunities. For multiple reasons, legal reforms in economic or social arenas can arise, either explicitly or by stealth, leading to reduced protection of biodiversity and increased risks of pollution and ecological distress. Of course, as environmental degradation causes further economic and social problems in the long term, this creates a vicious cycle that runs counter to the Rio agenda for sustainable development. That is why a commitment to non-regression is needed to ensure well-being for present and future generations of people and other life, and to halt the environmental degradation enabled by rollbacks in environmental laws and regulations. International and national law and jurisprudence need to recognize, as a key tenet of environmental law, the principle of non-regression that prevents any rollback of existing levels of environmental protection.

The *Centre international de droit comparatif de l'environnement* (CIDCE — International Centre of Comparative Environmental Law) has been a leader in pushing the international community to adopt the principle of environmental non-regression. The president of the CIDCE, emeritus Professor Michel Prieur of the Université de Limoges, and others in the organization, realized that the idea of non-regression in protection of human rights should apply equally to environmental protection — whether in recognition of the right to a healthy environment or because of the enormous challenge that lies ahead to combat climate change, biodiversity loss and other environmental problems. In 2010, Michel Prieur and Professor Gonzalo Sozzo of the Universidad Nacional del Litoral in Argentina launched the Non-Regression Knowledge Forum. They sought authors for a book that would promote the principle of environmental non-regression in environmental law and present a comprehensive review of environmental

Image: Geoff Garver

Sugar maple trees are an important part of both the natural ecosystem and the economy in Quebec and nearby states and provinces in Canada and the United States. But climate change threatens the survival of sugar maples in this region. The non-regression principle would reinforce efforts to protect these regional treasures

non-regression in existing national, regional and international legal systems. This book, *The Principle of Non-regression in International and Comparative Law*, launched at Rio+20, shows that the non-regression principle has a firm, but still tenuous, foundation in environmental law, even in countries or regions like the United States that do not follow a rights-based approach. Some tribunals, particularly in Europe and in South America, expressly recognize the non-regression principle to guarantee people the right to a healthy, continually improving environment that promotes harmony between humans and nature. In addition, many countries in the Americas, including Canada, the United States, Mexico, the Central American countries, the Dominican Republican and several South American countries, have signed international agreements declaring that it is inappropriate to weaken environmental, health or safety laws in order to promote economic activities like trade and investment.

The book promises to increase the profile of the principle of environmental non-regression in environmental law, but it is only part of the story. The CIDCE has also promoted adoption of a commitment to environmental non-regression within the Rio+20 negotiations. In September 2011, it hosted the Third World Meeting of Environmental Lawyers and Environmental Law Associations in Limoges, France, to develop recommendations to submit formally to the Rio+20 process. Environmental lawyers from every continent participated in the conference. On the basis of presentations by jurists who had studied non-regression as part of the book project, the principle of environmental non-regression emerged as a leading recommendation, strongly supported by the conference delegates. The CIDCE submitted its recommendations to the United Nations in October 2011, highlighting environmental non-regression as a key desired outcome in Rio+20. As a result of this outreach, Brazil also supported the non-regression principle in its formal submission. In addition, the European Parliament adopted its Resolution of 20 September 2011 on a common European Union position for Rio+20, calling for "the recognition of the principle of non-regression in the context of environmental protection as well as fundamental rights." The CIDCE is continuing its outreach and garnering the support of other groups and associations.

Within the Rio+20 negotiations at the United Nations, the CIDCE is an officially recognized civil society organization, participating as a member of the Major Group for Non-Governmental Organizations (NGOs). In December 2011, Member States of the United Nations met to discuss the framework of the Rio+20 outcome document, kicking off the negotiation of the actual text to be adopted in June 2012. Each major group was asked to make a three-minute statement to the United Nations delegates. The CIDCE succeeded in convincing the other NGOs, each of them with their own sets of positions and interests, to call for recognition of the non-regression principle in this short statement. As negotiations have continued, and civil society participants have become increasingly concerned that some Member States may be calling into question long-standing international commitments to human rights and to the Rio Principles, support for clear recognition of the principle of environmental non-regression has grown — not only within the Major Group for NGOs, but within all of the Major Groups, representing Youth, Women, Workers and Trade Unions, Indigenous Peoples, Local Authorities, Business and Industry, Scientific and Technological Communities, and Farmers and Small Forest Landowners. It is increasingly clear that civil society wants to see a strong commitment to the principle that environmental protection, and sustainable development in general, should continually advance, and should not slide backwards. Adopting the principle of non-regression at Rio+20 will set the groundwork for further elaborating its application in environmental law and implementing it at the national, regional and international levels.

Convincing Member States to heed this call for a commitment to environmental non-regression at Rio+20 remains a challenge, although there have been some steps in the right direction in the past. During its 19th special session in 1997, the United Nations General Assembly called for a commitment "to continue the progressive development of international law related to sustainable development." As of this writing, the outcome of Rio+20 is uncertain. Will the Member States of the United Nations take stock of the urgent global ecological crisis that has become crystal clear in the past twenty years? Will they act on the need to make much better progress on implementing the Rio Principles with an ambitious set of commitments — including a commitment to environmental non-regression? If they are listening to civil society, they must.

Social equity, gender equality and environmental justice

Sascha Gabizon, Executive Director, Women in Europe for a Common Future

Throughout the world women are key actors in maintaining the livelihoods and welfare of their families and communities, and in making a transition to a more equitable and sustainable world. Our economy depends on a healthy planet. It also depends on women's economic contributions, both formal and informal.

Social equity, gender equality and environmental justice must form the heart of sustainable development and of the outcomes of the United Nations Conference on Sustainable Development (Rio+20) in 2012. Twenty years after the first Rio conference, great social and economic inequities still remain. These especially affect women and children, who make up the majority of those living in poverty.

On the positive side, all but six countries have ratified the Convention on Elimination of All Forms of Discrimination Against Women (CEDAW), and the last country not to allow women to vote has decided to do so in a few years' time. Much progress has been achieved across the world, as many countries have developed policies and laws that reduce discrimination against women.

Image: WECF

According to some estimates, women's unpaid labour is equivalent to at least half of a country's GDP

But great challenges remain in the implementation of these policies and in the behavioural changes required within households, communities and institutions to promote gender equality. Thus, in many countries, women's knowledge, skills and contributions remain largely unrecognized and undervalued.

Women living in poverty often have to devote many hours each day to providing basic services for survival: water, food and fuel. Lack of adequate sanitation is also a greater burden for girls and women. This leaves them little time for paid employment. In addition, in many countries women are not allowed to own property, have a bank account or hold a passport. It is estimated that women own less than two per cent of land worldwide.[1] In many countries, laws and tradition still forbid women from owning land and resources, thus limiting their access to finance.

Recent studies show that eliminating gender inequalities is good for societies and economies. The World Bank states that investing in women is the best way to invest in the development of their communities[1] and world gender inequality brings economic costs. The Food and Agriculture Organization concluded in its 2011 report that by eliminating gender discrimination in agriculture, food production could be increased by 20 per cent.[2]

According to some estimates, women's unpaid labour is equivalent to at least half of a country's Gross Domestic Product (GDP).[3] The unpaid labour performed by women is referred to as the 'care economy', signifying the work performed, usually in the domestic sphere (feeding, clothing, cleaning and caring for the ill, young and vulnerable), that enables others to take part in the economy and generate income. "If the care economy sputters, it will have serious consequences for both society and its productivity as it is losing its most important resource and value generator — people."[4]

Women's unpaid contributions to our economies are not valued nor measured, and the same is true for the unvalued contribution of nature and ecosystems. This has been shown in the study, The Economics of Ecosystems and Biodiversity (TEEB), which also demonstrates that intact ecosystems assure the survival of the poorest people, who depend for up to 80 per cent of their livelihoods on functioning ecosystems.[5] The majority of

Image: WECF

Governments at the Rio 1992 Earth Summit agreed on the need for full participation of women in sustainable development

the poor — some 70 per cent — are women who depend on a healthy planet and access to natural resources for their livelihoods.

The main economic indicator used for policy decision-making, the GDP, is 'gender blind'. It does not reflect the unpaid contribution of women or the unvalued contribution of nature to our economies. In the words of Robert Kennedy, the GDP "measures everything, except that which makes life worthwhile". GDP growth does not necessarily mean more jobs and wellbeing. There have been many cases of GDP growth which have lead to increasing inequity, depletion of the economy's natural resource base, growth which did not benefit women, and even unemployment growth.

The current economic system creates greater inequities

While the wealthy consume more and more natural resources and are responsible for increasing levels of environmental damage, the poor are suffering from degradation of their agricultural land, forests, water resources and biodiversity, and alteration of natural weather cycles due to climate change. Too much public funding goes to perverse subsidies for unsustainable and speculative activities.[6] Almost all countries are growing more unequal, and inequality is growing both in the North and the South. Too little funding goes to human capital development and social equity, and too little reaches women. In times of economic crisis, austerity measures are often a greater burden on women then on men.[7] The current prices of natural resources, energy and consumer products do not include externalities and future costs. Current economic decision-making is too short-term, and long-term benefits are not valued. Military budgets and tax spending for bailing out banks are taking away necessary funding for social development and environmental protection. The growing frustration of citizens with such inequities is taking the form of civil society resistance all over the world — such as the 'Occupy' movement.

Building on the Rio 1992 Earth Summit

In 1991, the global women's movements gathered in Miami, in advance of the 1992 Earth Summit, and developed the Women's Action Agenda for a Healthy Planet (WAA21).

WAA21 sounds as if it had been written today: "We, women of many nations, cultures and creeds, of different colours and classes, have come together to voice our concern for the health of our living planet and all its interdependent life forms. As long as nature and women are abused by a so-called 'free market' ideology and wrong concepts of 'economic growth', there can be no environmental security".[8]

WAA21 identified 11 urgent Action Areas and specific recommendations which were used to advocate with policymakers in the negotiations of the 1992 Earth Summit. Partly as a result of these preparations, governments in Rio agreed to Rio Principle 20 on the full participation of women in sustainable development. Furthermore, Rio Agenda 21 devotes an entire chapter to 'Global Action for Women towards Sustainable Development'[9] as well as 145 other references throughout the text, in 33 of its 40 chapters.

All the Rio Principles remain as valid today as they were 20 years ago, and we should focus on applying them to all policies, in particular the Precautionary Principle and the Polluter Pays Principle, as well as Principle 10 on access to information, justice and public participation on environmental matters.

Our organization, Women in Europe for a Common Future (WECF), was created as a result of the Miami and Rio women's engagement, to give a voice to women

Image: WECF

WECF works to give women a voice in policymaking on sustainable development

in policymaking on sustainable development (as women had become one of the nine Major Groups in Agenda 21[10]) and to practically implement sustainable development at the local and national levels. Through our practical activities we are keenly aware of some major implementation challenges that remain.

During its first 15 years, WECF's local implementation projects focused primarily on the former Soviet Union countries which had opened up after the fall of the Berlin Wall. Now, WECF implements women's sustainable development projects around the world.

WECF projects focus on four goals: safe, renewable energy for all; safe water and sustainable sanitation for all; safe food and rural development for all; and safe chemicals and health for all. With over 100 local partners in 40 countries, we have provided environmentally-friendly water systems, ecosan toilets, wetlands for waste water treatment, solar collectors, biogas plants, solar fruit driers, non-toxic building materials and natural pest-protection products. These local participatory projects have provided access to sustainable and affordable services for over 35,000 women, men and children. Among others, at least 50 schools and some 20,000 pupils have improved water and sanitation. Together with local women and men and according to their needs, we develop sustainable technologies which create local employment while ensuring energy and food security and sovereignty.

These results are good, but not enough. To achieve sustainable and large-scale improvements, we need to change our political and economic conditions. We need rule of law, good governance, and the elimination of current barriers to women's empowerment, poverty eradication and environmental protection.

Among the challenges our local partners face are lack of priority for women's participation, the lack of access to affordable finance, and the wrong political incentives from international finance institutions. But violence against women, intimidation, corruption, lack of press freedom, perverse subsidies, lack of a functioning legal system and lack of access to information all help to maintain these barriers.

WECF therefore empowers its partners politically, making sure that women are enabled to participate meaningfully in policymaking and promoting quotas where necessary. Through its EcoSoc observer status, WECF helps its partners to present their lessons learned and their successes to policymakers in relevant United Nations policy processes such as at the Rio+20 conference. Currently, WECF is co-chair of the Women's Major Group for the Rio+20 process and for the United Nations Environment Programme (UNEP), and is a core member of the Gender and Women's constituency at the United Nations Framework Convention on Climate Change.

WECF and the Women's Major Group are promoting the need to go beyond a green economy to a care economy which would value the contribution of women and nature to the well-being of our societies. This does not automatically mean that we need to monetize nature — but at least in our constitutions we should acknowledge its value and protect our natural resources from short-term exploitation. Governments must manage common natural resources in the sole interest of their citizens, including future generations. There is a concrete instrument for this, the Public Trust Doctrine, which allows the governance of global commons beyond national jurisdiction. The basic concept is that certain common natural resources cannot be subject to private ownership and instead are held within a Public Trust.

In a care economy, governments must also protect women from violence, exploitation and poverty. In practice, that means full implementation of CEDAW and its

optional protocol in all countries. Furthermore, we need a 'global social protection floor' – assuring women's access to health services, water, sanitation, food, energy, housing and employment and a basic income for women. In many countries, including developing countries, a social protection floor already exists. Brazil has made great advances in poverty reduction with social protection floor instruments such as its 'Bolsa Familia', where women in the households obtained a basic income and access to basic services. India has agreed on a 'human rights-based' approach in development policy, giving women and men in rural areas the 'right to employment' — at least 100 days of guaranteed employment. A social protection floor is not expensive, it costs one to two per cent of GDP. The time has come for a global social protection floor, financed through additional funding (in particular the Financial Transaction Tax), but also by global environmental protection levies such as the kerosene levy and the ocean levy.

Women are the 'first environment' for the developing child. Our grandparents still believed that the placenta protected the developing child from all unhealthy influences. After more then 50 years, in which our children have been the guinea-pigs for new technologies and harmful substances, we know this is not the case. The pollution the mother receives from food, air or in the workplace enters the placenta. Therefore, technology is among the key priority issues from a women's perspective. The draft outcome document for Rio+20 calls in many parts for 'technology transfer' and the development of 'green technologies'. But who decides what green technology is? Is it geo-engineering, which is already happing in large-scale experiments above the Pacific Ocean? It is sometimes suggested that women are the enemies of technology. Many polls show that women want responsible technologies and, worldwide, women have been the majority of those saying 'no' to nuclear energy and genetically modified organisms. Unfortunately, little has been learned from previous health disasters. Many governments still allow lead in petrol, which has led to generations of children with damaged health. Many countries continue to sell and use chrysotile asbestos, a recognized killer responsible for over 100,000 deaths each year, when asbestos can easily be substituted with safe alternatives.

Research shows that women and children are at great risk from nuclear radiation. A recent French study[11] suggests that children living near nuclear power plants have higher levels of leukaemia (blood cancer) — but no legal measures are being taken to protect them.

There are many indications from scientific research that children's health is being irreversibly impacted by harmful chemicals (Bisphenol-A, brominated flame retardants, phthalates) and new technologies such as nanotechnology. Our children are all involuntarily part of a global experiment by industry — and they are not sufficiently protected by law.

Women also suffer environmental health damage. In some countries in Africa, breast cancer has become the number one cancer among women, and kills women of reproductive age. This increase in breast cancer in Africa cannot be explained by the usual reproductive life risk factors, but is most probably linked to increased environmental pollution, possibly including pesticide use, electronic waste and others.

That is why WECF calls for the creation at Rio+20 of an independent technology assessment and monitoring organization. WECF calls for a global phase-out of nuclear energy, an immediate moratorium on nanotechnology in women's and children's products, and a moratorium on geo-engineering and synthetic biology.

WECF also demands that any new institutional framework decided on at Rio+20 should aim to achieve gender equality in its governing bodies, staffing and implementation mechanisms. An established organization with existing staff, such as EcoSoc, is unlikely to be able to give sufficient priority to the issue of gender and sustainable development. WECF therefore supports the creation of a new Council for Sustainable Development (CSD). WECF also supports the upgrading of UNEP to a specialized agency with predictable, increased funding and a strong gender programme. Both the CSD and the new UNEP must be given priority at the United Nations General Assembly.

Image: Katachel e.V.

Katachel e.V founder Sybille Schneehage with girls at a school in Afghanistan built by the organization

WECF supports the proposal by Colombia and Guatemala for Sustainable Development Goals (SDGs), especially because they will be universal goals — not just for developing countries, but for all countries worldwide. The goals are intended to ensure that everybody should benefit, rather than only seeking to reduce by half the population living in poverty as is currently the case with the Millennium Development Goals (MDGs). The SDGs should be grounded in human rights. It is important that gender equality and women's empowerment become part of the SDGs, and this can be ensured through gender indicators for each goal — for example, an indicator to measure how far women have equal access to renewable energy. Another option is to have specific gender equality and women's empowerment goals as part of the SDGs, building on the experience with MDG3 and MDG5. Such goals could include indicators that women should have access to land rights, basic services and finance.

I would like to end with the final words of the Women's Major Group submission paper to the United Nations.[12]

"The world stands at a cross-roads, and the future of our planet Earth and its human communities lies in our hands. United in our diversity we, women from all regions in the world, call on our governments and other stakeholders to renew the commitments on equitable and sustainable development made at the Earth Summit in Rio de Janeiro in 1992. We commit ourselves to contribute to a peaceful and healthy planet, in which human rights are well respected and women's voices are well represented. We request that you act in the spirit of global solidarity, trust, environmental and social care, and take our recommendations well to heart."

Sustainable development at the local level in Botswana

Sankuyo Tshwaraganang Management Trust

Botswana has long embraced issues of environmental management. This commitment has been further strengthened by the adoption of the concept of sustainable development. In addition, Botswana is party to various international agreements and has significantly contributed to capacity development and enhancement as well as financial assistance in terms of funding projects and programmes.

In terms of implementation of policies, programmes and projects geared towards sustainable development, Botswana has adopted an integrated approach that involves the engagement of all relevant stakeholders. This has considerably enhanced the achievement of project objectives and the level of project ownership has improved among stakeholders, especially communities. Of particular importance is the continued involvement of community-based organizations (CBOs) in all processes of national and local project development and implementation.

Because of their impact at grassroots level, CBOs have been identified as integral to the process of national development. This has seen the Government of Botswana investing in the establishment of these organizations and they have been established in all districts of the country.

In order to ensure assistance to CBOs as they implement their programmes, the Government of Botswana, through the Ministry of Environment, Wildlife and Tourism (MEWT), has established Technical Advisory Committees (TACs) in all districts. The committees are chaired by the District Commissioner's Office, while the Department of Wildlife and National Parks (DWNP) serves as the Secretariat. TACs comprise representatives of all Government departments in each district. It must be noted, however, that in addition to assisting CBOs, TACs also perform other duties in terms of advising on other district development issues.

In line with guiding the implementation of sustainable livelihood programmes at the community level, the Government of Botswana has established a Community-Based Natural Resource Management (CBNRM) policy, which focuses on improving the livelihoods of communities through the sustainable utilization of the natural resource base in their environs.

In the domain of CBO engagement, the Government of Botswana has provided the necessary institutional structures and policy instruments, as well as financial assistance. These elements have been critical in ensuring that communities are actively involved in projects that are mostly implemented at the grass-roots level.

CBOs in the environment domain largely focus on the management of national heritage sites, veldt products conservation, waste management, birdlife conservation, tourism development and wildlife management. In all of these, the underlying objective is to improve natural resources management and the socioeconomic status of the community. The Sankuyo Tshwaraganang Management Trust (STMT) is one of the CBOs taking part in natural resources management and community livelihood improvement.

Background of STMT

Seen as an opportunity to improve community livelihoods through sound natural resources management practices, STMT was established in 1995 after wider consultations among stakeholders. It was formed after Government and other stakeholders realized the importance of community organizations in the socioeconomic and environmental development process.

The village of Sankuyo is located in a Wildlife Management Area (WMA) in the environs of Moremi Game Reserve. Because this is an area in which wildlife species are dominant, its use is monitored and controlled through a management system. As such, Sankuyo is a biodiversity-rich area, which needs sound and effective management systems to maintain its integrity. It is also an area in which hunting is controlled. In Botswana, all land belongs to the State. However, after the formation of the STMT, the Government of Botswana, through the Tawana Land Board, leased it two controlled hunting areas, Ngamiland 33 (NG33) and Ngamiland 34 (NG34). These were to be used for purposes of photo safaris, hunting and tourism.

In addition, the Government further allocated the STMT a wildlife quota. This was then used to propel the income-generating aspect of the STMT. These wildlife quotas were used to extend hunting rights to some private companies in the form of Joint Venture Partnerships (JVPs), an arrangement in which the private company sub-leases the hunting area from the Trust and pays them quota fees for the game animals they hunt, and provides contributions to the community development fund.[1]

The STMT was also allocated NG33 for purposes of photographic safaris. The community has leased this land and NG34 (hunting) for purposes of tourism. Some of it has been sub-leased to private companies through JVPs. This arrangement has been beneficial as the community continues to learn the necessary skills of business operations and ensuring sustainability of natural resources.

Socioeconomic status of Sankuyo before the formation of the Trust

Before the formation of the STMT, the people of Sankuyo lived in extreme poverty. They had limited and financially risky sources of livelihood and depended on arable farming,

which was not viable because they lived in a wildlife-dominated area. Therefore, their crop fields were repeatedly destroyed by wildlife. They were also heavily dependent on Government social services in the form of monthly meal rations, subsistence allowance and old-age pensions. Illegal hunting of wildlife for subsistence purposes was high and the village experienced high levels of illiteracy among its youth.

Objectives and management of the STMT

The STMT's main objectives are to engage in conservation and management of area's Sankuyo and NG33 and NG34's natural resources and to realise economic benefits for livelihood improvement and poverty reduction. Therefore, the trust provides a balanced approach in terms of the environmental and socioeconomic status of its operations.

The STMT has a ten-member board of trustees that is elected for two years at a time. The Board meets once a month and holds an Annual General Meeting, at which all members of the community participate.[2] It makes decisions on behalf of the community and provides guidance on the overall management of the Trust.

Achievements

Since its formation, the STMT has ensured that the management of the natural resource base leased to it is undertaken in a sustainable manner that also contributes towards livelihood improvement. The approach that has been adopted to achieve this is through partnerships with experienced private companies in the form of JVPs. The following provides a brief overview of the JVPs that STMT has engaged in since 1995, and the benefits attained.

STMT partnered with Game Safari Company in 1997 for a period of twelve months for purposes of hunting. It generated P285,000 and 30 employment opportunities for the locals.

In 1998, the STMT partnered with Crocodile Camp for hunting and ecotourism projects. The partnership was for three years. In 1998, the partnership generated P285,000; in 1999 the figure was P462,850; and in 2000, P595,460. In this period, the partnership generated 50 jobs.

In 2001, the STMT engaged in a JVP with HCH. This was a five-year partnership that managed to generate P1,3 million and 56 jobs for the local community.

Land rentals, hunting quotas, community development levies and game birds yielded P1, 801,657 for STMT in 2003; P1,734,666 in 2004; and P1,630,400 in 2005. By 2005, a total of 103 locals were directly employed by the STMT through its operations and those of the JVPs.

The STMT also operates Santawani lodge, Sankuyo bush camp, Kaziikini camp site and Shandereka cultural village, which have collectively created 45 jobs and generated over P400,000 in revenue in 2010.

STMT partnered with Squacco Heron Pty (Ltd) in the operation of the Dibatana research camp and Moremi tented camp. These have managed to create 30 jobs for the locals.

In 2011, the STMT generated P2,277,100 from a partnership with Johan Calitz Safaris (JCS). These were generated from game quotas and land rentals as the JCS had leased the hunting camps of Mokolwane and New camp.

Socioeconomic benefits

The people of Sankuyo Village have benefited from the STMT in a number of ways. The employment of locals has provided a major economic boost to the livelihood of the community of Sankuyo. Also, the STMT assists households with cash payments of P550 per household per month. It also pays P1,100 to members of the community who are over 55 years and with no jobs.

The STMT, through revenues accrued from natural resource utili¬zation, has been offering assistance to community members in the form of scholarships, funeral cover, support for local sports activities, transport services, stand pipes for water, toilets and supporting the activities of the village primary school. This is a laud¬able effort of sustainable livelihood practices at the local level supported by all stakeholders.

Benefits to the environment

Since the formation of the STMT, natural resources management practices in Sankuyo have improved. The community has a greater appreciation of the importance of sustainable natural resources management. Incidences of poaching, which were on the rise, have also declined to zero. The enhanced relationship between people and natural resources/wildlife is in part a result of the fact that the local community enjoys socioeconomic benefits from these resources.

Through Community Escorts Guides, the STMT monitors the state of the environment within the area. It also engages in community awareness raising, thus ensuring that all community members know the value of natural resources management.

Success factors for local sustainable development

The STMT has shown the value of the engagement of the local community in sustainable development at the local level. The following elements were critical in their success:

Community involvement: wider consultations among members are important in ensuring that there is ownership of the Trust and its operations and that the community supports all efforts towards conservation and the challenging aspects of benefit distribution

Stakeholder engagement: the need to engage stakeholders cannot be over-emphasized. Stakeholders bring different expertise and the necessary advice, which is important to the sustainability of the community organization

Guidelines: a community organization needs to develop guidelines regarding all components of its operation. This should be endorsed by the community, as members of the organization. Guidelines will ensure that the organization operates through agreed processes and procedures

Government's role: the role of government is to ensure that its people are developed. Therefore, community organizations must constantly engage with government as a way of soliciting advice and more opportunities for development. With regard to STMT, the Government of Botswana leased to it an area rich in wildlife and other biological resources. This was a major boost, which the community utilized to improve natural resources management and the socioeconomic status of the community.

Botswana has measures and systems in place which support sustainable development, not only at the national but also at the local level. This was enabled through the CBNRM policy and the leasing out of state land to community organizations. Such an arrangement leads to improved natural resources management practices and enhanced rural livelihoods.

National development projects supporting sustainable human development in Azerbaijan

Huseingulu Bagirov, Minister of Ecology and Natural Resources and
Shahin Mustafayev, Minister of Economic Development, Azerbaijan

Ensuring sustainable development for the long term is a key objective for Azerbaijan following the adoption of a new approach involving a broad application of science. Intensive technologies are supported by intellectual resource and therefore, creation of a competitive, export-oriented and multi-branch economy in addressing challenges today. After recent dynamic growth, our nation's GDP exceeded US$63 billion and its per capita rate exceeded US$7,000 in 2011. As a result of social and economic policy, Azerbaijan experienced a three-fold increase in GDP from 2003-2011, while the per capita rate increased 2.7 times. In the same period, growth in wage earner income increased 5.3 times, while the national average monthly salary increased 4.6 times and individual savings 15.2 times.

One of the policy priority areas in human development is eliminating poverty. Having joined the Millennium Declaration to ensure action in the struggle against poverty in Azerbaijan, approval has been achieved for the State Programme for Reduction of Poverty and Economic Development in the Republic of Azerbaijan during 2003-2005, as well as the State Programme for Reduction of Poverty and Sustainable Development in the Republic of Azerbaijan during 2008-2015. Due to actions outlined in the latter, poverty fell from 46.7 per cent in 2002, to 7.6 per cent in 2011.

Image: Azerbaijan State Telegraph Agency

President Ilham Aliyev visits a secondary school in Khojaly city, Azerbaijan, February 2011

Sustainability in human development is included in a list of strategic development goals for any country. However, actions and measures of international organizations in relation to this issue should also be mentioned. Achievements in recent years have strengthened the economic foundations of Azerbaijan and widened opportunities for implementing more effective strategies, including accelerating the non-oil sector, infrastructure, regional social and economic development, poverty reduction and environmental safety.

Azerbaijan achieved the fastest growth in human development across 187 former Soviet Union countries in the last six years, based on average annual growth in the Human Development Index (HDI) contained in the United Nations Human Development Report. Progressing from 101st in 2005 to 76th in 2011 meant the country progressed from 'average human development' to a 'high level human development' classification.

The Azerbaijani state attaches particular importance to developing a new and creative young generation possessing a broad knowledge and world view, with the aim of turning 'black oil' into 'human gold.' The State Programme for Education Abroad of Azerbaijani Youth 2007-2015, which was adopted to promote youth education in teaching institutions across various foreign countries, is one of the important steps in this direction and continues its success with a year on year increase in the number of students — now about 10,000 — receiving education abroad through a variety of programmes. This new thinking in human potential remains an important part of Azerbaijani statehood.

Improving national education, building hundreds of new schools, applying up-to-date ICT training, and stimulating activity for education workers while strengthening their social protection and raising their status, are among state initiatives that directly impact on the development of education and ultimately are important for sustainable development of the Azerbaijani citizen. To improve the education infrastructure for current requirements, 40 per cent of general schools have been rebuilt, expanded or repaired. Reforms in schooling have seen the education level of people rising year on year so about 97 per cent of the population aged 15 and over now have higher, secondary special and general secondary

Image: Azerbaijan State Telegraph Agency

The opening ceremony of Shabran District Central Hospital, Azerbaijan, August 2011

education. Apart from reforms in science, the application of science in economy and efficiency improvements and the establishment of special state institutes for the funding of research projects are important components targeting sustainable human development.

Significant initiatives have been implemented in recent years in health service reforms, including delivery of a high quality medical service, rationalization of the network and bed capacity of health institutions, improvement of sanitary and epidemiological services, pharmaceuticals, medical training and the development of medical science.

To improve the welfare of people, an increasing number of new projects are being carried out to ensure management of the environment by modern methods, with a policy based on sustainable development principles and Millennium Development Goals.

Future challenges are recognized, such as attaching greater importance to environmental issues, the implementation of large-scale environmental projects and creating the circumstances to allow Azerbaijani citizens to live in a cleaner environment. In recent years, funding allocated to solving environmental problems originated from the rapid development of the country's economy, which allowed major environmental projects to be undertaken.

As early as 2003, Azerbaijan adopted a national programme for environmentally sustainable social and economic development. With environmental sustainability being one of the Goals, sustainable development principles were integrated into state policies, with the main aims identified. The key objective is systematic and efficient implementation of nationwide investment projects directed at developing the country's economy — particularly the non-oil sector — delivering greater satisfaction of people's economic and social needs, developing the regions and, maintaining economic security and environmental protection.

Opportunities exist to resolve past environmental problems by using green technologies. Transitioning to a 'green economy' meant many enterprises not complying with environmental and economic requirements were closed and others refurbished and modernized, while new low-waste and non-waste technologies were introduced.

The alternative energy sector was selected as a priority area for development and in order to put in place state policy, the State Agency for Alternative Energy was established for rolling out the national programme. Among other projects, a solar panel production plant became operational, with a view to growing the recyclable energy share by up to 20 per cent in 2020.

Although Azerbaijan didn't achieve the reduction obligation for gas-emission-created warming under the United Nations Framework Convention on Climate Change, after Kyoto action was taken to reduce waste. Despite intensive economic development, waste was reduced to 48 million tons from 70 million tons in the benchmark year 1990, with greater importance attached to sustainable development principles, including environmental protection and mitigation of the effect of climatic changes.

The volume of gases was reduced to 298.3 million m3 in 2010 from 578.6 million m^3 in 2006. The use of fuel oil in producing electric energy ceased in 2010 and full transition to natural gas was completed with the conditional fuel spend for production of one unit of electricity reduced by 30 per cent from 2000.

The outcome of this policy in recent years is that significant progress was made in all areas, including protection of biological diversity, development of forests, expansion of green space and sustainable management of water resources and waste.

In water management, the plan is not only to achieve the Millennium Development Goals — a two-fold reduction of the number of people not provided with safe drinking water and sanitary services — but to make these accessible to all citizens. Existing wastewater purifying plants are a mix of the refurbished, modernized and newly constructed, with some purifying 1 million m3 of waste-

Image: Azerbaijan State Telegraph Agency

President Ilham Aliyev meets the residents of Gasimbeyli village, Sabirabad city, Azerbaijan, May 2011

water each day. Sanitary systems have been built in all regions. To prevent even low-level pollution of the Caspian Sea, a protection system comprising module-type wastewater purifying plants was established, meaning shore-to-sea waste flow is prevented for a distance of 100 km.

Major projects are providing people with safe drinking water through water supply systems in all regions. The installation of module-type purifying plants began in 2007 — with 221 villages and 400,000 people provided with drinking water — allowing centralized access to clean drinking water for even the remotest settlements. At the same time, a high technology-based plant was built to desalinate seawater.

Annual increases in the intensification of both forest planting and rehabilitation within forested territories exceeded 1 million hectares and accounted for 11.8 per cent of land area in the country, up from 11.4 per cent previously. In order to expand green areas in Baku and the Absheron peninsula, and alongside main motor highways, 4 million trees and bushes of various kinds were planted.

Initiatives within protected natural areas and the creation of an environmental network means there are now eight national parks, 11 natural state reserves and 24 state wildlife sanctuaries functioning in Azerbaijan. From 2003 the protected natural spaces increased from 478,000 hectares to 882,000 hectares, accounting for 10.2 per cent of the country's land area. Rare species at risk of extinction in their traditional habitats are being reintroduced, with 100 head of antelope returned in 2011 and — due to the artificial increase of water-based biological resources over the past 10 years — over 5 billion fish of different species, including sturgeon, farmed and released into water reservoirs; a sizeable project also included establishing a twenty-first century zoology park.

To manage hazardous wastes, a dangerous wastes landfill was established where about 300,000 tons of mercury-containing toxic wastes were rendered harmless. Hundreds of hectares of oil-polluted soils were cleaned and rehabilitated, as were lakes.

As a result of initiatives in the past 10 years, Azerbaijan achieved second place across 132 countries, based on the Environmental Performance Index (EPI), an international league table of the environmental sustainability status of nations, produced from recent research at Yale and Columbia Universities in the USA.

The biggest obstacles in human development facing our nation include the occupation of 20 per cent of Azerbaijani lands following military aggression by the Republic of Armenia from 1988, the abandonment in occupied territories of more than 4,000 industrial and agricultural enterprises along with over 300,000 jobs, and deportation of over 1 million refugees and internally displaced people from their settlements. Aggression against Azerbaijan by Armenian nationalists has resulted in an extremely negative effect on the economic and social situation, which has put a strain on employment.

National data shows that internally displaced people prevail among the unemployed, so to resolve this, the 'State Programme for Improvement of Living Conditions and Expansion of Employment of Refugees and Internally Displaced People' was approved, creating the environment to aid internally displaced people wishing to engage in entrepreneurial activities and establish farm enterprises, who are eligible for assistance in mastering new professions and, to facilitate employment of internally displaced people, increase production output and reduce poverty.

In the past seven years over 1 million new jobs and over 40,000 new enterprises have been created under these wide-ranging initiatives, resulting in unemployment dropping from 9.7 per cent in 2003, to 5.4 per cent in 2011. Relevant policy continues to successfully ensure conditions and support are maintained within national development schemes, for ongoing sustainable human development in Azerbaijan.

Views from the ground: the role of subnational governments in sustainable development

Maruxa Cardama, Secretary General, Network of Regional Governments for Sustainable Development

Twenty years after the Rio Summit, the status quo is no longer an option. The time we have to provide our 'one planet and its peoples' with a comprehensive set of sustainable development policies and an institutional framework adapted to the needs of the twenty-first century is as limited as ever. The scale and urgency of the challenge requires action by all levels of government. It is time to improve our use of the principle of subsidiarity and acknowledge the importance of devolving governance, funding, implementation and accountability to appropriate levels of government, including at subnational and local level.

Since the Rio Summit in 1992, subnational governments — such as states, regions, provinces, counties, territories and other intermediate levels of government — all over the world have been fully involved in sustainable development processes. They have demonstrated in a number of ways that their contribution and leadership is essential to help achieve the objectives of sustainable development on the ground. Local Agenda 21 initiatives; subnational sustainable development strategies and councils; territorial thematic strategies in the environmental field; public-private partnerships; and decentralized cooperation projects carried out by subnational governments, have significantly evolved over the past years and shown that the efforts and actions of a country become stronger when transposed and complemented by governmental stakeholders such as federated states, regions, cities and other local authorities.

Many of those governmental stakeholders are the subnational governments that carry out sustainable development activities at international level, either individually or coming together in organizations such as the Network of Regional Governments for Sustainable Development (nrg4SD).[1] Formed by the subnational governments that attended the Johannesburg Summit in 2002, nrg4SD is a non-profit international organization representing subnational governments and associations of subnational governments at global level in the field of sustainable development. The network promotes sustain-

Image: nrg4SD

There is limited time to provide our planet and its peoples with sustainable development policies and an institutional framework for the twenty-first century

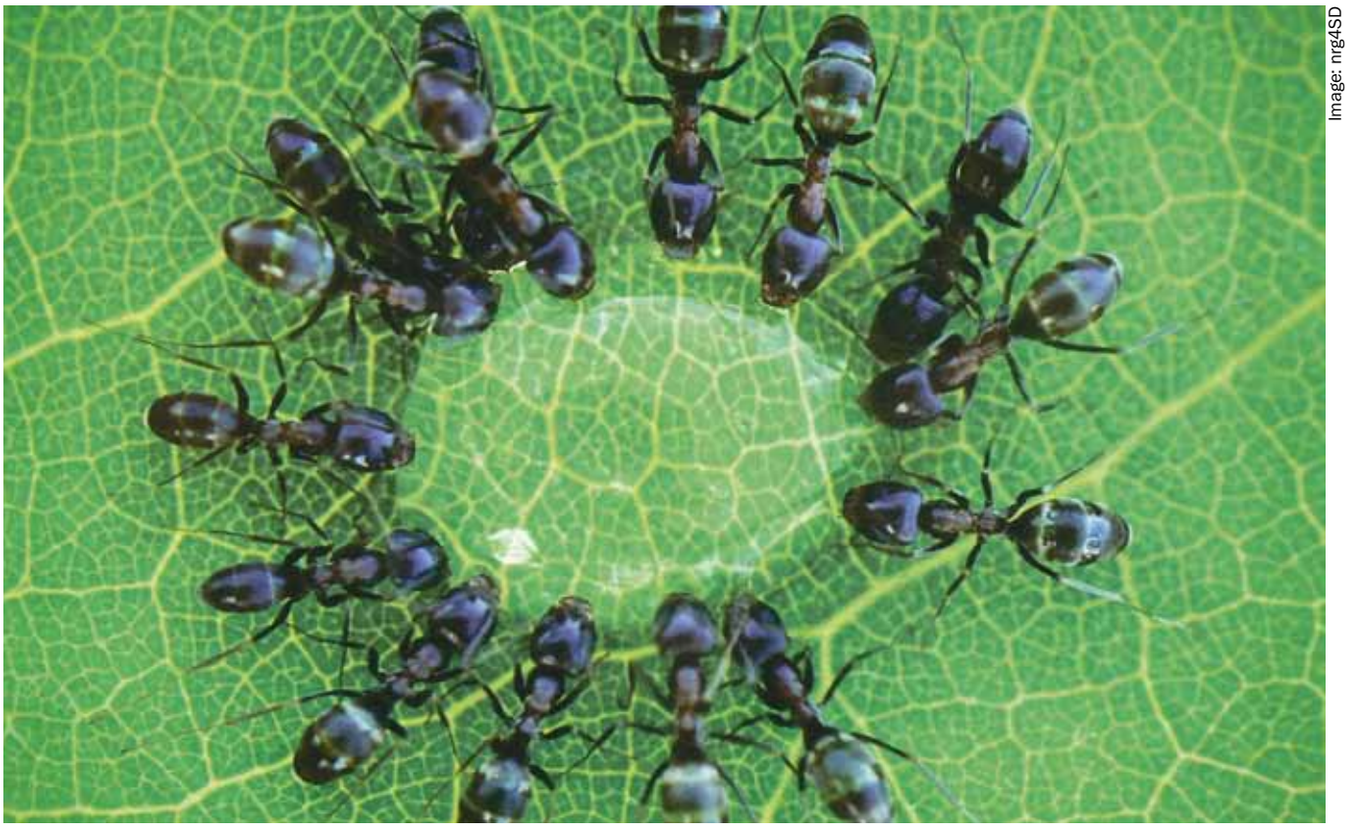


Image: nrg4SD

Water is essential to all life

able development across the world and is conceived as a platform for political dialogue and technical work between developing, emerging and developed federated states and regions. In this context, nrg4SD establishes collaboration and partnerships between subnational governments, academia, the private sector, international organizations and other levels of government. It also seeks greater international recognition of the important role of subnational governments in international decision-making on sustainable development matters.

A territorial approach

Fully aware of the cost of inaction around climate change and particularly well placed for identifying the needs and the strengths of their communities, subnational governments have taken up the climate challenge with substantial human and financial resources. Through power-sharing arrangements or constitutional attribution of powers, subnational governments are often responsible for the development and implementation of legislation, policy and financial mechanisms in areas such as energy, transport, buildings, public procurement, research and development or education – areas that directly influence the levels of greenhouse gas emissions and deal with the impacts of climate change. Indeed, according to the United Nations Development Programme (UNDP), between 50 per cent and 80 per cent of adaptation and mitigation actions necessary to tackle climate change are or will be implemented at the subnational or local level of governance.

With this in mind, UNDP and the United Nations Environment Programme (UNEP) have created the Down to Earth: Territorial Approach to Climate Change (TACC) programme[2] in response to an increasing number of requests from subnational governments in the developing world for assistance in assessing and managing the physical and socioeconomic impact of climate change. This initiative seeks to enhance the capacity of subnational governments from developing countries to develop low-emissions, climate-resilient development strategies. The TACC programme draws on political commitment towards interregional solidarity, on the experience, skills and institutional strengths of subnational governments in developed countries, and on their ability to induce the participation of private businesses that have developed expertise in green technologies, as well as the participation of non-governmental organizations and aid partners that are familiar with conditions on the ground. Since the TACC programme was established, it has been supported by nrg4SD and several of its member governments, which are currently engaged in ongoing projects across six countries in Latin America and Africa.

Protecting biodiversity

Scientists predict that at the current pace of urbanization, natural resources and ecosystems will be severely damaged by 2030 if no further action is taken to halt biodiversity loss and landscape fragmentation. The United Nations Convention on Biological Diversity (UN CBD) acknowledges that better decisions and actions for biodiversity need to be made at all levels of government, for the effective and efficient implementation of the convention and its 2011-2020 Strategic Plan on Biodiversity. The first of the so-called Aichi Targets for the new CBD Strategic Plan recognizes the

Image: nrg4SD

The TACC programme helps develop low-emissions climate-resilient strategies

need that "by 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies."

Subnational governments have a crucial role to play in biodiversity goals by translating international and national directives into subnational economic strategies and policies related to public investments, ecosystem services and green public procurement programmes; spatial planning and land use strategies; compensation measures for biodiversity protection; and education to inform citizens' and consumers' behaviours.

Decision X/22, adopted by the parties of the CBD at their tenth conference in October 2010 in Nagoya, endorsed the Plan of Action on Subnational Governments, Cities and other Local Authorities for Biodiversity 2011-2020.[3] The plan provides national governments with a set of guidelines to follow at their discretion in support of local and subregional implementation of the convention. It invites the CBD parties to involve subnational governments, cities and other local authorities when revising their national biodiversity strategies and action plans; and to encourage them to elaborate their respective subnational and local strategies and action plans. Additionally, the plan refers to the establishment of advisory committees in cities and on subnational governments, which will provide input and support to the plan of action.

Accredited to the UN CBD and a partner in the Global Partnership for Biodiversity, nrg4SD enjoys close collaboration with the Secretariat of the Convention. In fact, in adopting the plan of action, Decision X/22 identifies nrg4SD as a key partner for the set-up of an Advisory Committee of Subnational Governments. The Advisory Committee was launched in April 2011 in Curitiba, Brazil with the direct participation of subnational governments across the world — including members of nrg4SD. The Advisory Committee leads on developing subnational biodiversity strategies and action plans in support of, and in close collaboration with, national governments and local authorities. It also promotes collaboration between different levels of governments, and coordinates efforts by subnational governments in support of the CBD plan of action. Its ultimate objective is to advise parties in the implementation of that plan.

Consensus on water

The lack of drinking water and adequate sanitation is a serious threat to human health, affecting the most vulnerable sectors of both urban and rural communities. The World Water Council has acknowledged the major role of subnational and local governments in achieving water-related targets under the Millennium Development Goals and has developed a Local and Regional Authorities Process in the framework of the editions of the World Water Forum.

In collaboration with the Regions United/FOGAR, nrg4SD and several of its subnational governments participated intensively in the preparation of the 6th World Water Forum held on 12-17 March 2012 in Marseilles, France. Their efforts focused on the official session of the forum dedicated to the role of subnational governments, as well as on the Istanbul Water Consensus.[4] According to the World Water Council, at the end of the forum, local and regional authorities obtained a historical recognition. In addition, the Istanbul Water Consensus reached 1,070 signatories from local and subnational leaders committed to bringing concrete solutions for guaranteeing the recognition that access to good quality water and sanitation is a basic human right — one that plays an essential role in life and livelihoods, health and the fight against poverty.

In April 2010 nrg4SD adopted a memorandum of understanding spanning 2010-2014, for a cooperation framework on water issues in Latin America and the Caribbean (LAC). This framework includes a long list of governments from LAC and the Iberian Peninsula wishing to establish long-term collaboration on water issues related to sustainable development. The objectives of the memorandum are:

- education, training capacity and awareness on water issues, with emphasis on the participation of women
- exchange of advice on water planning
- collaboration for research, innovation and development related to hydrology
- monitoring of the ecological status of water bodies
- implementation of the International Decade of Water Life 2005-2015.

Activities carried out under this framework include meetings of experts, online courses and exchange programmes between water agencies.

Empowering coherent action

In conclusion, because sustainable development happens at the subnational and local levels, it is essential to fully ensure the territorial dimension of any international agreements and policies in this field. This territorial dimension acts as a reality check of what can actually work on the ground, and constitutes an essential driver for deploying action at the rapid pace required.

The goals of a multilateral agreement for sustainable development cannot be achieved without the contribution of all levels of government. In this context, in a post-Rio scenario the full potential of subnational and local governments as governmental stakeholders must be recognized and transposed into enhanced engagement within the United Nations decision-making processes. This is not about questioning the role of United Nations Member States as sovereign representatives in United Nations multilateralism. It is about empowering coherent, complementary and synergetic action from all tiers of government. In a nutshell, it is about multi-level governance and leadership in the interest of a much-needed realistic, courageous and results-oriented path towards sustainable development.

A sustainable, healthy, inclusive future — the ground rules must be different

Sharan Burrow, General Secretary, International Trade Union Confederation

By any indicator, the planet, our economies and most importantly, our communities are simply not sustainable if we continue with business as usual. Twentieth century models of capitalism are not serving and will not serve twenty-first century societies. Inequality is the legacy of decades of greed from individuals, corporations and nations mindlessly competing for wealth. The people and the planet have both been victims of this competition. Global Gross Domestic Product (GDP) reached US$65 trillion in 2011, but while it has been increasing over time, so have environmental degradation and social inequalities. The share of global wealth for the bottom 40 per cent of the population remains less than five per cent.

The now much talked-about global imbalances have always been obvious to the 1.4 billion people living on less than two dollars a day. However, the extent of inequality as a substantial risk is now recognized and is indeed growing both within and between nations, including in the developed and emerging economies. The United Nation's UNDP Human Development Report 2011 shows that despite efforts that have raised living standards, the projections are for a disturbing reversal of those trends in the future, if environmental deterioration and social inequalities continue to intensify. A substantial proportion of people living in poverty are in 'middle income' countries including India, China and Nigeria. As countries emerge from poverty, the dominant development models show increasing national and regional inequalities within them. These gaping inequalities will persist while wealth and power continue to remain in the hands of a small number of people.

This risk has also been substantiated by the OECD study 'Divided We Stand: Why Inequality Keeps Rising' (December 2011), which revealed that across the OECD the average income of the richest 10 per cent is about nine times that of the poorest 10 per cent. The income gap has risen even in traditionally more equal countries such as Denmark, Germany and Sweden, from a ratio of five to one in the 1980s to six to one today. The gap is ten to one in Italy, Japan, Korea and the United Kingdom, while it is

Image: ©Matilde Gattoni

Greening the construction sector offers significant potential globally

Image: ©www.alter-echos.org

Workers from across the globe support issues related to climate change and sustainability, as in this march for the COP17 meeting in Durban, South Africa, November 2011

Image: ©Gaetan Nerin

Nurses from many countries, supported by actor Bill Nighy, highlighted the need for a Financial Transactions Tax at the G20 meeting in Cannes, November 2011

higher in Israel, Turkey and the United States at fourteen to one. Chile and Mexico have the highest levels of income inequality in the OECD with the income of the richest being 25 times that of the poorest.

For working people and their unions, anger is growing at the current political and economic attacks on their job security, wages, pensions and services. These attacks are occurring despite OECD analysis finding that the 'regulatory reform' which has weakened labour market institutions has had a significant impact on wage inequality among fulltime workers, and that this in particular is due to the weakening of employment protection legislation governing the employment of temporary workers, as well as product market deregulation and lower unemployment benefit replacement rates. These policy trends continue.

The consequence of growing impoverishment and inequity for working people, the bitter crisis of unemployment and the dramatic marginalization of young people from productive employment are causing, and will continue to generate, social unrest. The International Labour Organization's annual 'World of Work' report in 2011 featured a new 'social unrest' index showing levels of discontent over the lack of jobs, and anger over perceptions that the burden of the crisis is not being shared fairly.

Indeed, as the economic recovery slowed or stopped over the last year, social exclusion and discontent became more widespread. In 40 per cent of the 119 countries for which estimates could be made, the risk of social unrest had increased significantly since 2010. Similarly, 58 per cent of countries showed an increase in the percentage of people who report worsening standards of living. Confidence in the ability of national governments to address the situation weakened in half the countries.

The ILO report showed that to date, social discontent had increased most in advanced economies, the Middle East, North Africa and to a lesser extent, in Asia. However, income disparities in Asia are now beginning to rise quickly.

There can be no doubt that leaders of the world must first and foremost address poverty and inequity.

Addressing risks to the planet and humanity

We urgently need to change the trends of global environmental destruction to ensure a safe space for human development. We are already trespassing on the planetary boundaries through the impacts of climate change and the rate of biodiversity loss. Governance of our 'global commons' is vital to achieve sustainable development for this and future generations. The risk to human survival arising from increasing levels of greenhouse gas emissions has been scientifically demonstrated, with the only possibility for risk mitigation being a reduction of emissions necessary to slow global warming to around 1.5ºc by the end of the century. Inaction is simply due to a lack of political will in the face of the same dominant interests largely responsible for the causes of inequity.

There are also serious questions about the survival of humanity if the risks of food, energy and water security are not addressed. With 50 per cent more food, 45 per cent more energy and 30 per cent more water needed by 2050, world leaders must act now.

Ensuring food security for nine billion people, while cutting 33 per cent of humanity's ecological footprint by 2050, requires an overhaul of the global food system. This means scaled-up investment in hundreds of millions of small-scale food producers including secure access to critical land and water resources, and action to prevent and reduce vulnerability to food price shocks. We need to get the world on the right path by putting in place a fair and sustainable food system as a key element for economic growth.

Image: ©Kristin Blom

Green and decent jobs go hand in hand. Workers at the rally in Durban, South Africa, during COP17, November 2011

Image: ©Kristin Blom

Climate Change is Union Business. As simple as that!

Providing clean and safe energy for all is fundamental for a sustainable planet. Access to sustainable forms of energy must be enshrined in the mandates of public authorities. We must not leave this as a responsibility of the private sector. We support universal access to a basic minimum level of modern, clean and safe energy services for both consumption and production uses by 2020 and targets for improving energy efficiency at all levels, with a view to achieving a 50 per cent decrease in energy intensity by 2020.

Access to water is fundamental to sustainable development and is a basic human right. The overuse or pollution of water and fragmentation of freshwater systems is contributing to reduced quality of life and increasing instability. Governments must ensure sustainable water resource management delivers for the protection and provision of water services vital for human well-being, biodiversity, economies and security. Both water and energy are essential rights and need to be provided as essential public services.

With our NGO allies, we support solutions to the challenges of food and energy security and demand both conservation and governance solutions to the challenges posed by the degradation of our oceans and the threat of water shortages throughout vast areas of the world.

The good news is that investment in these initiatives means new and additional jobs.

RIO+20 can make a difference

The world needs to reorient economic priorities towards a new prosperity for all that respects the human rights of all people and respects the planet's critical natural resource boundaries. This is the basis of the emerging discussion on Sustainable Development Goals (SDG). As part of the process of developing global goals, governments, international institutions, business and civil society need to commit together to a framework where democratic governance, labour and human rights are respected, and gender equality achieved. Goals focused on decent work, employment and social protection for all are fundamental to achieving sustainable development.

The world's leaders must accept the urgent need for transition to a sustainable and environmentally respectful and inclusive economy and direct the process of transition. Trade unions are working to ensure that these transformational changes in production and consumption systems are just and that decent work is safeguarded and promoted. The principles of the green economy must be vastly different from those governing the economies of today.

ITUC argues that the key principles at the heart of any discussion on a green economy must include equity between and within countries, opportunities for women and young workers, decent work for all people including formalizing the informal economy and a social protection floor for all. The 'Just Transition' approach which acknowledges and secures the livelihoods and jobs of those whose sectors might be affected is central to these principles.

ITUC, representing the world's working people and their unions, calls on leaders to invest in green jobs, to fund the implementation of a universal social protection floor and to raise global funding to support these ambitions, beginning with the introduction of a financial transactions tax. This tax would raise vital resources and contribute to a more just and equitable world.

Investment in green and decent jobs

In the face of the most bitter crisis in unemployment, investment in green jobs is urgent. ITUC's research, based on the analysis of 12 countries —

Image: ©Gaetan Nerin

Fundamental rights for all workers were promoted at the launch of the ITUC campaign for Domestic Workers, outside the European Parliament in December 2011

developed, emerging and developing in all regions of the world — demonstrates that an investment equivalent to two per cent of GDP at national level could potentially create 9.8 million jobs each year in the 12 countries and economic sectors analysed.[1] Countries studied include: Europe (Germany, Spain, Bulgaria); The Americas (Brazil, Dominican Republic, USA); Africa (South Africa, Ghana, Tunisia); and Asia and the Pacific (Indonesia, Nepal, Australia), in the energy, construction, transport, manufacturing, agriculture, forestry and water sectors.

The trade union movement has been clear that a green job should reduce environmental impacts of enterprises and economic sectors to sustainable levels, while providing decent working and living conditions to all those involved in production and ensuring workers' rights are respected.

A green job must provide adequate social security and decent wages and be covered by sufficient health and safety provisions. From this definition, several dimensions of green jobs must be taken into account: their ability to reduce the environmental impact in all sectors, their capacity to deliver decent work, their compliance with trade union rights and their ability to outperform traditional jobs when it comes to the inclusion of women and youth in the labour market.

The Social Protection Floor

The United Nations describes social protection as 'the missing piece in a fair and inclusive globalisation'. The Social Protection Floor is a set of basic social security rights, services and transfers to help promote human rights and support decent living standards worldwide. Basic income security and access to essential services through the various phases of life requires healthcare, child benefits, basic retirement pensions and income support for the working poor, the unemployed and pregnant women. In Rio, trade unions demand that heads of state implement the Universal Social Protection Floor initiative by 2020 and that funding is provided for its establishment in the poorest countries.

Financial Transactions Tax

Innovative approaches are needed to address both environmental concerns and social inequities exacerbated by speculative financial sector practices. A global Financial Transactions Tax (FTT) could fund programmes to alleviate global poverty and support sustainable development and climate action by taxing specific financial transactions from the very sector that created the global financial crisis.

Imagine a future where there is the dignity of decent work and secure incomes from the growth and development of a green economy. This future will be optimistic for all the world's people, as the Social Protection Floor will have ensured that the Millennium Development Goals are realized and the interdependence of people and nations will have generated a greater cooperation in the governance of the world's resources. All it takes is the political will of leaders in Rio de Janeiro in June 2012, to set the world on a sustainable path.

The world's unions know there are no jobs on a dead planet, no equity without rights to decent work and social protection, no social justice without a shift in governance and ambition and ultimately, no peace for the peoples of the world without the guarantees of sustainability.

The solutions are available to us. Rio and beyond provides the opportunity to address these complex and interrelated issues. The challenge is to secure committed and cooperative leadership.

Making a decent living while respecting the environment

Laura Martín Murillo, Director, Sustainlabour

At the 1992 United Nations Conference on Environment and Development in Rio, it was agreed that social progress for all could be achieved within the planet's environmental limits if we collectively took charge of the change. It was a triumph of the 'real economy', in all its complexity, over clearly self-serving, short-sighted or incomplete economic agendas. Yet twenty years later, governments must firmly seize the reins in order to stop the rampant destruction of the environment and the shameful rise of inequalities, and to create green and decent jobs.

For several years, the United Nations Conference on Sustainable Development (Rio+20) has been a topic of reflection and intense work for Sustainlabour, for various reasons. This symbolic date marks the 20-year anniversary of a summit in which, through abiding by the rules of multilateralism, the world's governments were able to achieve important advances. In particular, they recognized that great challenges lay before us and they realized the power of concerted global action.

Today more than yesterday

The current global context makes it all the more relevant to draw on the achievements of UNCED. Beyond the sense that today is a key opportunity which cannot be lost, known facts demonstrate that coming up with solutions to known problems cannot wait indefinitely. Our capacity to take charge and resolve known problems is time sensitive, so we have a window of opportunity to lay a new foundation. For example, climate change scientists have repeatedly warned that there are thresholds beyond which our capacity to manage the change is greatly reduced; scientists recommend that rises in temperatures should not exceed 2° C, yet if we continue along the current path the 2° C limit will be a reality within decades. It is estimated that the rate of extinction of species is between 1,000 and 10,000 times higher than it would be naturally and is exceeding the safe limits for a viable human society. Humanity is overstepping envi-

Image: Sustainlabour

Creating employment is not an excuse for destroying the environment

ronmental boundaries and in the process, failing to provide decent livelihoods to people.

Further, economic and environmental crises have occurred more rapidly in recent years, dominating news programmes and economists´ analyses, and bringing fear and confusion to millions of workers worldwide. The global economic crisis has increased poverty, exclusion and unemployment, with 30 million jobs lost since it erupted in 2008. Other crises are causing the loss of lives; it is estimated that 300,000 people lose their lives due to climate change each year. More than ever, the financial and environmental crises show how we collectivize risk and privatize benefits. The institutions responsible for the financial crisis — many having previously made inconceivable fortunes — were bailed out with taxpayer money. The costs of infrastructure or crop loss in relation to climate change effects are paid for with taxpayer money, or with scarce resources from the communities least responsible for the problem.

Rio+20 should mark the moment that governments become sufficiently realistic and practical to carry out the profound changes needed to ensure dignified survival for all. Changes should distribute the social and environmental costs of economic activities, efficiently regulate markets and natural wealth, and rebalance capital and labour. The economy has to be redirected democratically, social and environmental protection systems set into motion to build resilient societies, and to create decent jobs for all, while keeping in mind resource limitations.

Linking Environment and Labour

UNCED enabled us to understand that it is not possible to defend the planet without taking into account poverty eradication and that lasting social or economic development will not be possible if it is does not respect the environment.

From 2003, at Sustainlabour we have been working hard to overcome the false labour-environment dichotomy. How can we strengthen the labour dimension of change toward a more sustainable economy? How can we create an economic and development model that creates quality jobs and protects the environment? And how can we ensure that trade union organizations — fundamental actors in securing greater equity, equality, justice and democracy — could also play a role in defending the environment?

It is of extreme importance for us that decent work and social inclusion form a fundamental part of governments' agreements in Rio+20. Unemployment affects some 200 million people, but about 1.4 billion people are unemployed or live in poverty.

At the same time, creating employment should not be used as an alibi for destroying our natural heritage, stripping future generations of basic resources, clashing workers from polluting industries against polluted communities, and continuing to benefit only very few.

Making a decent living while respecting the environment

Our organization is the result of discussions between trade union participants at the United Nations World Summit on Sustainable Development 2002 in Johannesburg, to assist with this ethos. Since then, much has changed. Some so-called green sectors have grown sufficiently to demonstrate their potential for employment creation, including the renewable energy sector, organic agriculture, waste management and water treatment. For example, the European renewable energy industry now accounts for more than 1 million jobs, with the latest official figures showing employment in this sector has increased by a quarter in one year, the solar energy industry in the United States employs more workers than the country's steel industry and green manufacturing in Germany is expected to produce more jobs than the country's automotive industry, over the next 20 years. But we also know that green employment does not automatically create decent, good jobs for communities; of the 3.5 million key environment-related jobs created in Bangladesh, only 800,000 meet decent work standards.

The potential for job creation associated with the transition to a sustainable development model is undeniable; the Food and Agriculture Organization of the United Nations estimates that shifting to environmentally-friendly agriculture is projected to create over 200 million full-time jobs by 2050, resulting in more decent, green jobs across the entire food production system.

An important part of the global green jobs movement continues to be led by trade union organizations. Over the years, unions have achieved consensus on the green jobs proposal and have learned to take into consideration all of its variables, including respect for trade union rights, capacity to reduce environmental impacts in all sectors, generation of decent work and reversal of the current labour market marginalization of women and youth. This results in a proposal that integrates, like few others, simultaneous advancement on the economic, social and environmental fronts. Sustainlabour has been working to put this into practice and has trained unionists from 75 countries to help better understand the challenges by promoting dialogue with other social actors, seeking collective solutions, or supporting workers' occupational training on renewable energies.

But it is not just about creating new green jobs, it is also about greening existing ones. And it is encouraging to see how many workers are committed to this task. We have supported demands from agricultural workers in the cotton and sugar sectors in West Africa who wished to make more sound use of pesticides. Ugandan truck drivers are learning about mitigating climate change and saving money through more efficient driving, alongside learning and teaching their colleagues how to transport hazardous substances and improve waste management. In Uruguay, waste collectors are coming out of marginalization and asking for decent, green jobs while working hard to involve their fellow citizens in the reduction, separation and recovery of waste. In Nepal, timber workers are committed to fighting climate change by taking care of their forests. These examples are a few among many.

Sharing the commons to advance socio-environmental protection

In addition to the fundamental aspect of employment, Rio+20 should advance on agreements regarding social inclusion and equity. Unfortunately, the most alarming indicators from the previous 20 years, together with those showing rapid destruction of the environment,

Image: Sustainlabour

Unions leading by example

are the ones relating to the constant increase of inequality between the richest and poorest. The 50 richest individuals globally have a combined income greater than the poorest 416 million. The 2.5 billion people living on less than US$2 a day — 40 per cent of the world's population — receive only 5 per cent of global income, while 54 per cent goes to the richest 10 per cent of the world's population.

To reverse this dangerous trend, we must strengthen existing social protection systems and urgently establish social protection floors, as contributing to social cohesion is one of the main ways to distribute wealth. Only 20 per cent of the world's population has access to adequate social protection, with horrid consequences: 150 million people each year suffer from financial catastrophe and 100 million are pushed to the poverty line when compelled to pay for healthcare.

The social protection floor is a first step; a set of basic social security rights and transfers, to promote human rights and support decent living standards worldwide, extending basic support and protection for all those in need. Within this framework, the International Labour Organization promotes four essential guarantees: access to healthcare, child benefits, basic retirement pensions, and income support for the working poor, the unemployed and pregnant women. Statistics on inequality show us that policies for income redistribution are needed without delay and the social protection floor should be resolutely followed by initiatives to increase vertical coverage of social security.

In regard to the ecological crisis, social protection is needed more than ever. Increasingly, climate change, depletion of commons and collapse of biodiversity push more people to migrate. Again, social protection is a key element: the International Organization for Migration states that in communities where social protection was articulated, there has been less displacement and more effective reconstruction. Finally, by providing the poorest communities with protected income and the capacity to have more sustainable livelihoods, social protection systems could reduce the environmental pressure poor families place on natural resources.

Unions have the necessary will

The required changes are complex but possible if they are accompanied by sufficient determination to engage in social dialogue and democratic participation in decision-making. Although at times conflicts exist between labour and the environment, so do solutions. With the environmental crisis as a backdrop, to avoid the conflict today simply means aggravating it tomorrow.

Sustainable development is not achievable without democracy. To put policies into practice that seek to achieve the common good, greater participation in the decision-making process is needed. Governments must work to reverse the overwhelming influence of vested interests. This means more democratic institutions and a rights-based framework for information and participation across all levels from the national level to the workplace.

At Rio+20, unions expect these democratic principles to be a reality. They want their demands heard and governments to commit to concrete outcomes in decent and green job creation and social protection. But they also want to lead by example and renew their commitment to sustainability; they will be gathering prior to Rio+20 in a global trade unions assembly, to do just that.

Education as a driver for sustainable human development

Kartikeya V. Sarabhai, Director, Centre for Environmental Education (CEE), Nehru Foundation for Development, India

When the first major United Nations Conference on the Human Environment was held in Stockholm in 1972 — at a time when the word 'environment' meant mainly pollution and wildlife — invitations went out to all heads of government. Only one, the then Prime Minister of India, Mrs Indira Gandhi, accepted. In her plenary speech on the challenge facing developing countries, she stressed that:

> *On the one hand the rich look askance at our continuing poverty, on the other they warn us against their own methods. We do not wish to impoverish the environment any further and yet we cannot for a moment forget the grim poverty of large numbers of people. Are not poverty and need the greatest polluters?*[1]

Mrs Gandhi argued that early developing countries "got a head start through sheer ruthlessness, undisturbed by feelings of compassion or by abstract theories of freedom, equality or justice… Now, as we struggle to create a better life for our people, it is in vastly differing circumstances, for obviously in today's eagle-eyed watchfulness, we cannot indulge in such practices even for a worthwhile purpose. We are bound by our own ideals."[2] She spoke of development goals: "The rich countries may look upon development as the cause of environmental destruction, but to us it is one of the primary means of improving the environment for living, or providing food, water, sanitation and shelter; of making the deserts green and the mountains habitable."[3]

As the world met at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, two words — environment and development — were widely recognized as twin goals that needed to go together. Dominated by development continuing to be fossil fuel-based, with an unsustainable ecological and carbon footprint, it is difficult for countries to follow alternative paths. While writing the UNCED national report for India, we explained this dilemma as follows: "While the challenge of development might seem to be how to get there, the real challenge is how not to get there."[4]

Two decades from that first conference and as the world gathers again in Brazil, we are better equipped to meet the challenge. We have more options in terms of technologies

Image: Centre for Environmental Education, India

Livelihood option for women — making baskets and brooms

and more tested, innovative systems, and there is greater understanding of the policies and financial mechanisms that lead to more sustainable behavior. But the existence of options without the ability to evaluate these, along with the will and courage to do things more sustainably, will not be enough. If a new development strategy is to be realized, it requires people to think and act differently. Whether policymakers or the people on the street, young children or youth, everyone needs to make this transition. Education, communication and knowledge management are key to this change; we need critical thinking, outside the conventional box that has defined post-industrialization development. This is the role of education for sustainable development (ESD); a driver to the sustainable world, acknowledged at the United Nations Environment Programme (UNEP), which recognized the importance of environmental education and recommended its further development to the world so that actions needed for protecting and improving the environment would be better understood. This led to the first UNESCO Intergovernmental Conference on Environmental Education, which was held in Tbilisi, Georgia in 1977. The resulting report emphasized that: "Environmental education is a lifelong process and should not be confined to the formal system. Integrating environmental education in other forms of teaching — particularly within the working environment — the school pupil, factory or field worker, and economically-educated consumer, represents an urgent need."[5]

Agenda 21 was one of the important outcomes of UNCED in 1992. While education was dealt with in most sections, chapter 36 focused specifically on education, training and capacity-building, stressing that: "to improve sustainable development education, nations should make environment and education development available to people of all ages."[6]

In the early 1980s, India sought ways to develop institutions to bring environmental considerations into its development plans. Initially a Department — later a Ministry of Environment — was created within central Government. Education was recognized as crucial in a sustainable development strategy. In 1984, the Indian Government joined forces with the Nehru Foundation for Development to establish the Centre for Environment Education (CEE) as a Centre of Excellence in environmental education. CEE was formed primarily to improve public awareness about the environment, with a view to promoting conservation and the sustainable use of nature and its resources, for a better environment and quality of life. Today, through 40 offices across India and several hundred partners, programmes are offered in all major languages of the country. CEE develops innovative training material, building capacity in sustainable development and education across various development sectors. Having the lead role in the United Nations Decade of Education for Sustainable Development (DESD) the CEE is the central agency for implementing DESD programmes on behalf of the Ministry of Human Resource Development, India. CEE is also responsible for ESD at different levels, including educating key decision makers, running programmes within formal teaching systems, working with rural communities in assisting after natural disasters, capacity-building groups for taking up new livelihoods in the green economy, programmes in the informal sector in urban areas, and projects within small and medium enterprises, along with large corporations wanting to become more sustainable.

ESD for an aware generation

The Constitution of India requires every citizen to care for the environment and in a public interest litigation, the Supreme Court of India ruled that every formal course of study must have environmental education built into it. Over the years, the National Council of Educational Research and Training and CEE have worked closely with education boards across the country to 'green' their textbooks. The National Green Corps programme, offered by the Ministry of Environment — in partnership with NGOs, including

Image: Centre for Environmental Education, India

Rag pickers collecting plastic for recycling

Image: Centre for Environmental Education, India

System of Rice Intensification (SRI) planting

CEE — targets eco-clubs in schools. CEE has also launched a programme called Paryavaran Mitra — or Friends of the Environment — which is being implemented in over 100,000 schools across the nation to instil environmental leadership qualities into students through curriculum-linked and co-curricular projects, for positive change at individual, family, school and community levels. The slogan 'increase your handprint and decrease your footprint,' where 'footprint' represents the negative impact of our lifestyle on global resources and the CEE-introduced handprint concept represents positive environmental action, has become the symbol of positive action for a generation who will be tomorrow's decision makers.

Sustainable solutions and the decision makers

Ahmedabad, a city of about 7 million people in the western part of India, houses the main office of CEE. Over the past 40 years, while the city's population has grown by nearly 150 per cent, the number of vehicles has increased by over 4,000 per cent, amounting to about 2 million — mostly two-wheeled — vehicles. The proportion of the population using private vehicles went up from nearly 50 per cent to more than 75 per cent and the city's transport systems were under pressure, until in 1994, a student in the School of Planning and Architecture in Ahmedabad completed a dissertation project on bus travel in the city. By 2005, the concept of a Bus Rapid Transport System (BRTS) had been proposed. Developed in Bogota, Colombia, this system would not normally have been an option open to an Indian planner, but with the assistance of a knowledge partner and by raising awareness among policymakers — including a trip to Columbia — this was possible. The BRTS is 129 km long with more than 100 hundred buses now using the route.

Rebuilding after disasters

CEE was directly involved with helping 41 villages in 2001, after a major earthquake in Kachchh, Gujarat, saw more than 25,000 people lose their lives and about 7,900 villages destroyed. Having faced such calamity, people were questioning their own assumptions and thinking about their futures in new ways. As well as the construction of more than 1,000 homes — alongside many schools and other facilities — an intensive education and awareness programme was undertaken. New developments, apart from being earthquake proof, had better management of water and other natural resources through the direct involvement of local communities. Three years later in 2004, when a major tsunami hit southern India, CEE once again found that people were ready for rebuilding in a more sustainable way. Activities included planting in coastal areas, the creation of new green jobs and sustainable livelihood options. One of the most difficult, yet important, issues for ESD was helping people while maintaining their initiative. It is very easy to arrive intending to do good work but end up making an otherwise entrepreneurial and full-of-life community dependent on assistance. CEE's approach was to engage people in rebuilding their lives and livelihoods in ways they viewed as more appropriate, rather than having an external model of sustainability forced upon them.

Sustainable solutions through facilitating learning

Naroda, an industrial estate covering about 350 hectares on the outskirts of Ahmedabad, is the oldest estate in India. Of its 900 industries, about 600 were discharging toxic chemicals. An effluent treatment plant was established and with CEE facilitating, key ESD strategies were identified, including raising awareness among, and capacity-building of, management and workers within chemical factories. There was a large variation between best and worst practices on the estate, but if performance levels could be raised to emulate the best, it would lead to significant improvement. So CEE identified best practice engineers and encouraged them to communicate to others. Using ESD, horizontal communication proved an effective way of bringing about change. Working with industry groups, CEE is now helping set up a knowledge centre for hazardous waste at a landfill site. The idea is

Image: Centre for Environmental Education, India

Students quantifying their school's waste

not simply to reduce waste, but to explore how waste generated from one industry could be used as a resource for another.

In partnership with the waste management facility, a knowledge management centre with a museum for schools and the public — including a conference centre — is being established at the site.

Partnerships in managing urban waste

Bhopal, a city in central India, generates 14 per cent plastics in its solid waste so local NGO Sarthak, along with the municipal council and local rag pickers, is developing a sustainable model to reduce plastics disposal and improve conditions for rag pickers. CEE is the national host institution for the Small Grants Programme within the United Nations Development Programme. Through grant funding and co-financing by the local group, the project has expanded so that close to 900 rag pickers are now involved. Plastics smaller than 20-40 micrograms are recycled at 5,000 kg a day. Bundled plastics are then sent to four different cement plants, where they are burned at 1200° C and used as replacement fuel for coal, with no fluoride or dioxins produced. The waste reprocessing units have enhanced the rag pickers' skills, knowledge and practice, while ESD has connected them with social security initiatives, allowing them dignity and respect.

Remodelling projects

In the south Indian state of Tamil Nadu, a major poverty reduction project is underway across 25 districts, with support from the World Bank. Its key objective is generating employment to improve livelihoods for the poorest sections of the population — women, the vulnerable, the disabled and tribal people — using a participatory, community-driven process. To ensure the environment is not compromised, an Environment Management Framework (EMF) has been integrated into the project, with CEE appointed as the State Environmental Resource Agency (SERA).

ESD is involved with capacity-building, material development and environmental supervision and monitoring. This means managing natural resources in efficient ways so livelihoods are sustainable by suggesting cost-effective, environmentally-friendly practices. This in turn provides a platform for creating community awareness, building skills, addressing issues linked with commons — water bodies and pasture lands — by using eco-friendly technologies, and enhancing local environment and ecosystem services.

Agricultural practices in Thiruvallar, Tamil Nadu, where both jasmine and vegetable cultivation are the main livelihoods, involved using restricted chemical pesticides. Coordinating with the District Project Management Unit and environmental appraisers, SERA taught members about organic farming techniques and provided training in using organic extract.

Embedding work in rural communities

The Hingolgadh Sanctuary in Rajkot district of Western India is a fragile, semi-arid rural area that is environmentally vulnerable, drought-prone and with limited natural resources. Nearby village communities are dependent on the natural resources of this region. The shift in livelihoods from agricultural biodiversity to the monoculture of cash crops such as cotton led to soil degradation and over-extraction of ground water. ESD tackled these issues by forming a local natural resource management group comprising local women and youth, to develop village-level institutions and provide community funding for eco-enterprises. Criteria are in place to ensure the proposed enterprises are environmentally sound, economically viable and socially beneficial. CEE is also supporting activities related to agriculture and animal husbandry, with objectives set up for an institutional framework that influences practices and helps strengthen the local economy through more sustainable approaches, which support the community and therefore reduce stress on the fragile ecosystem.

Education is the key to change

These examples illustrate not only the diverse sectors and environmental issues needing ESD, but the various approaches required to suit local situations, alongside reflecting CEE's philosophy and highlighting the essential role education plays in moving towards sustainability. Raising awareness among policymakers about sustainable alternatives, as in the case of the BRTS — sharing best practice, using disaster situations as opportunities to rebuild not just infrastructure, but also livelihoods, trust and hope, while building capacity in communities to exploit the power of education to influence policymakers — are all educational components for creating a development path that is sustainable. The focus has been not only on natural resource management itself, but the way to sustainable livelihoods, including identifying suitable options — alongside building skills and capacity — for effective adoption. ESD is also concerned with offering dignity and respect to communities by expanding knowledge and providing better social security. CEE, through its long and varied experience, has sought to demonstrate that education can be a key driver for change; one that is environmentally sound, economically viable and socially beneficial. This is the essence of education for sustainable development.

How organizations can manage social responsibility for sustainability

Christian Brodhag, Professor, National School of Mines, Saint-Etienne

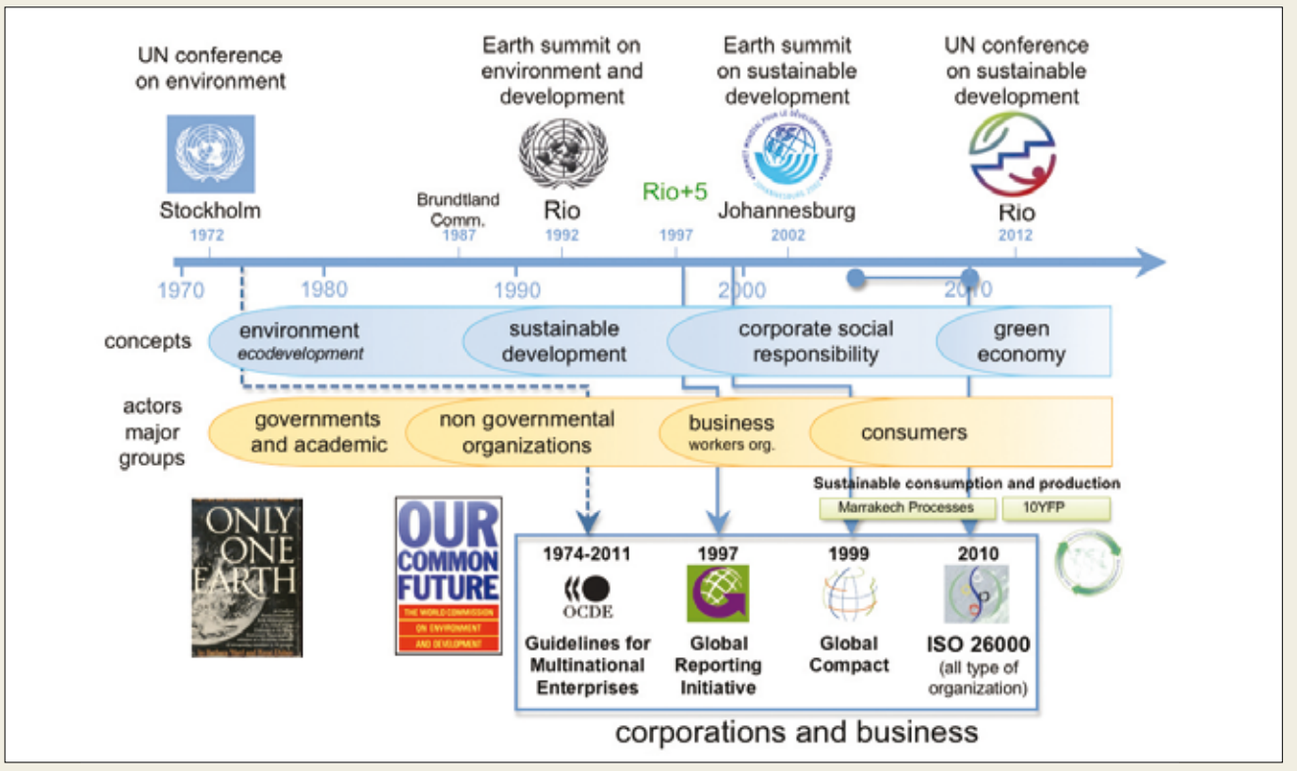
A concept with multifaceted origins, social responsibility should be seen as an essential element of implementing sustainable development as well as being part of governance.

Based on theoretical considerations, four different approaches to social responsibility can be considered, including instrumental, political, integrative and ethical.[1] Instrumental theories, which focus on the economic objectives of social activities seek competitive advantages through cause-related marketing. Political theories promote responsible business power relations within the political arena based on a social contract between business and society. Integrative theory concentrates on global performance, integrating social demand through stakeholder management. Finally, the ethical approach aims for a contribution to sustainable development through private enterprise investment in universal human rights and common production.

Referring to implementation and political considerations, we can consider two main visions of Corporate Social Responsibility (CSR). The first, historically known as 'contractualist,' relies on taking account of shareholder interests. The second, described as 'institutionalist', favours performance and advocates enterprises reaching goals beyond meeting legal compliance, seeking universal rights. These are two opposing visions of collective action.

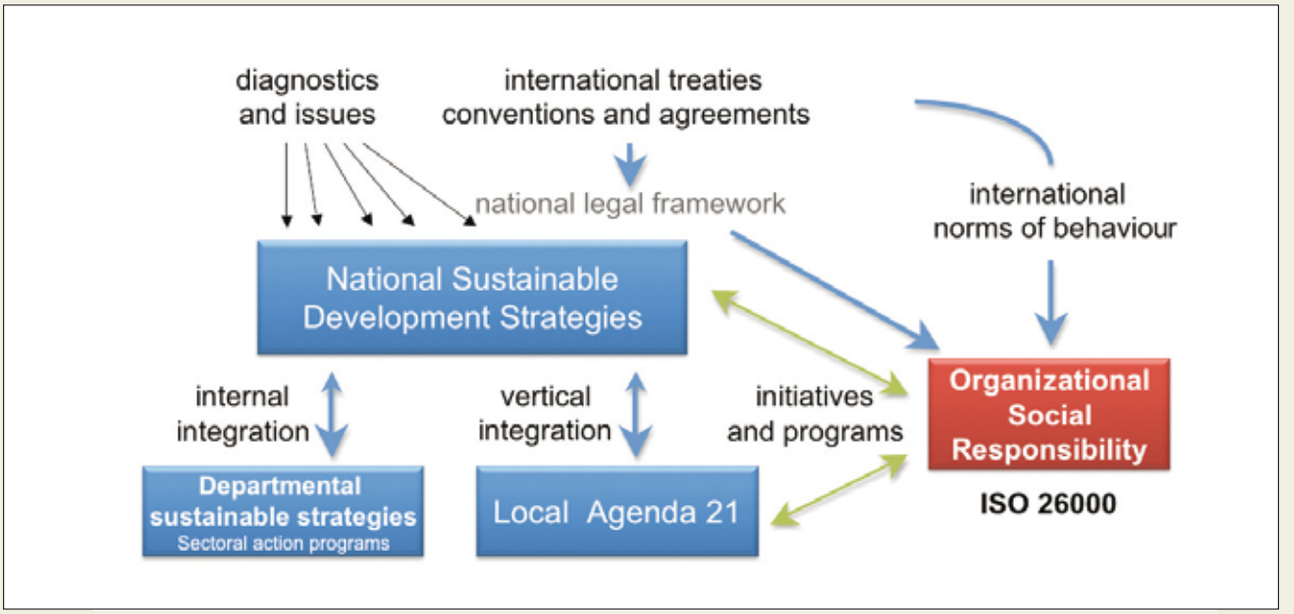
The contractualist vision is upward-oriented, focusing on the nature of the social contract between the actors in society. Beyond their basic duty to shareholders, companies assume responsibility to a broader constituency that includes various stakeholders. This approach places great importance on the managerial process and on how

Key milestones in sustainable development



Source: ©brodhag.org

Architecture of governance in sustainable development



Source: ©brodhag.org

a company identifies and engages with its stakeholders. Based on this logic, public goods are produced through the free interaction of moral actors, who are engaged in ethical behaviour.

The second is the more recent institutional approach. It is downward-oriented as incorporates awareness of the limits of governance — including international governance — and of regulation within environmental and social domains. Companies are asked to voluntarily commit themselves to achieving compliance over and above regulatory requirements. Public goals are defined and implemented within the framework of public institutions.

The emergence of CSR in international institutions began five years after the United Nations Conference on Environment and Development (UNCED) in 1992. The conclusions of UNCED focused on public policies and the commitment of developed countries to devote 0.7 per cent of Gross National Product (GNP) to development aid, in exchange for environmental commitments from developing countries. But the early 1990s marked the beginning of globalization and an understanding that private investment has a greater impact on development than Official Development Assistance and that across the 100 largest economies, there were 50 countries counting their GNP and 50 multinationals counting their turnover.

Therefore, in 1997 the Global Reporting Initiative, driven by the United Nations Environment Programme (UNEP), businesses and NGOs, developed a reporting framework, guidelines and indicators for companies. Two years later, launched by then United Nations Secretary-General Kofi Annan at the Davos World Economic Forum in January 1999, the United Nations Global Compact encouraged participating companies to respect nine principles in relation to human rights, including freedom of association, working conditions and environmental protection. This was followed in 2005 by a tenth principle on corruption and a requirement that participating nations publish their improvements by area, once a year.

The history of sustainable development is marked not only by the successive emergence of different concepts integrating the previous ones (environment, sustainable development, social responsibility and green economy) but also by the influence of stakeholders who contribute to these concepts.

The relationships between these networks of influence and governments negotiating in the multilateral system are essential to global governance for sustainable development. Agenda 21 devoted its third part to 'Strengthening the Role of Major Groups,' acknowledging that nine sectors of civil society have a key role in sustainable development and are granted consultative status. These include women, children, the young, indigenous peoples, non-governmental organizations (NGOs), local authorities, employees and unions, business, scientific and technical communities and farmers. The influence of these actors has varied over time in parallel with the issues they face. Social responsibility, in particular the green economy, provides an important role for business.

It is within this international context that the International Organization for Standardization (ISO) published ISO 26000:2010(E) to update its 2005 guidance document for social responsibility, ISO26000. ISO is a network of the national standards institutes of 163 countries. Traditionally dominated by business, it has implemented a new process for the development of ISO 26000, which involves 450 participating experts, 210 observers from 99 ISO member countries and 42 liaison organizations. Each ISO member country was invited to nominate experts from six main stakeholder groups, including industry, government, labour, consumers,

NGOs, service, support and research. Following five drafts and eight international meetings, the final document received only five negative votes in summer 2010.

Components of ISO 26000

The content of ISO 26000 is a hybrid of both institutionalist and contractualist models, which provide globally relevant guidance on social responsibility for private and public sector organizations of all types and sizes. It strengthens the legitimacy and efficiency of law, as respect for the rule of law — and therefore the institutions that are in charge of it — is identified as mandatory. Use of the contractualist model's approach of leveraging voluntary engagement with stakeholders allows for processes of creating shared value. Applicable to any type of organization, ISO 26000 encourages dialogue between public and private actors in relation to civil society and the business world. Based on common principles, it creates the trust necessary for cooperation and targets specific areas of action, for example, reducing transaction by organizing dialogue on common issues.

ISO 26000 defines social responsibility as the 'responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour that:

- Contributes to sustainable development, including health and the welfare of society
- Takes into account the expectations of stakeholders
- Is in compliance with applicable law and consistent with international norms of behaviour
- Is integrated throughout the organization and practised in its relationships.[2]

This definition illustrates the hybridization of the two models above, with the first and third belonging to an institutionalist vision, while the second and fourth relate to a contractualist vision.

When an organization assumes social responsibility, its primary objective is to maximize its contribution to sustainable development.

It is recommended that organizations take into account social, environmental, legal, cultural and political diversity, consistent with international standards of behaviour derived from customary international law or intergovernmental agreements, and are encouraged to exceed the minimum requirements of legal compliance.

The identification of social responsibility involves highlighting areas that are directly affected by the impact of the organization's decisions and activities, along with the impact of other organizations in its sphere of influence, before deciding how to address these effects and contribute to sustainable development. Social responsibility for an organization also means recognizing its stakeholders, as well as having respect and consideration for their interests.

Organizations should base their behaviour on standards, guidelines or rules of conduct in accordance with the following principles of right or good conduct:

- Accountability — relating to an organization's impacts on society, the economy and the environment, accepting and responding to appropriate scrutiny
- Transparency — disclosing policies, decisions and activities for which the organization is responsible, including known and likely impacts on society and the environment
- Ethical behaviour — based on the values of honesty, equity and integrity, alongside concern for people and the environment
- Recognition of stakeholder interests — respecting, considering and responding to not only its owners, members, customers or constituents, but also other individuals or groups who may have rights, claims or specific interests that should be taken into account
- Respect for the rule of law — accepting that respect for the rule of law is mandatory and organizations should comply with all applicable laws and regulations, while ensuring those within the organization observe and implement those measures
- Taking account of international norms of behaviour — adopting generally accepted principles of international law and not being complicit in activities of another organization whose behaviour is inconsistent with these norms, particularly in countries where legislation or its implementation does not include adequate environmental or social safeguards
- Respect for human rights — recognizing both their importance and their universality and their application in all countries, cultures and situations, to avoid taking advantage of the situations where human rights are not protected.

Here again, note the hybridization of the two models, with the first four principles contractualist in nature and the final three, institutionalist.

ISO 26000 details seven core subjects and associated issues relating to social responsibility for which information is provided on the perimeter of each core subject, together with considerations, principles, detailed specific actions and associated expectations.

The first concerns the governance of the organization itself, based on incorporating the principles of social responsibility in decision-making and implementation, focusing on all core subjects, and viewing their interdependence in an integrated and holistic manner. This governance includes both formal mechanisms based on defined structures and processes and informal mechanisms that emerge from the organization's culture and values:

- Human rights — organizations have a responsibility to exercise due diligence to identify, prevent and address actual or potential human rights impacts resulting from their activities, or the activities of those within their sphere of influence. It covers two categories of human rights, civil and political rights, including the right to life and liberty, equality before the law and freedom of expression, along with economic, social and cultural rights, including the right to work, food, the highest attainable standard of health, education and social security

- Labour practices — encompasses all policies and practices relating to work performed within, by or on behalf of the organization, including subcontracted work, employment, social dialogue, conditions of work, health and safety, social protection, human development and training in the workplace
- Environment — includes pollution prevention and sustainable resource use (energy, water and materials) with both themes including climate change mitigation, adaptation and environment protection, biodiversity and the restoration of natural habitats
- Fair operating practices — covers prevention of corruption, responsible political involvement, promotion of fair competition, social responsibility in the value chain and respect for property rights
- Consumer issue — includes fair marketing, factual and unbiased information, fair contractual practices, protection of consumers' health and safety, promotion of sustainable consumption, education and awareness, consumer service, support, complaint and dispute resolution, consumer data protection and privacy and access to essential services
- Community involvement and development — through education and culture, employment creation and skills development, technology development and access, wealth and income creation, health and social investment.

Approaches to corporate social responsibility

ISO 26000 guidance is oriented toward mastering impacts and performance. It is not a management system that establishes requirements, which is why it is not intended or appropriate for certification, regulatory or contractual use. The important thing is what the organization really does and not how it does it. It can profit from concrete actions it undertakes. Even if an organization meets the expectations of society, social responsibility should not be seen as a constraint or obligation, but as a strategy that allows it to create shared value for itself and for the various components of society and the environment. It is not just a question of communication for the organization, or a superficial 'green washing' practice but an integral part of core organizational strategy, which allows for the renewal of the business design, activities and market. It can be a way of finding opportunities for cooperation with stakeholders. In this respect the organization should:

- Consider the integration of the seven general principles and those associated with core subjects
- Identify its impacts on society, economy, environment, community and stakeholders as well as associated expectations
- Prioritize domains of action that are relevant and important in terms of risk and opportunity for the organization, society, environment and stakeholders
- Estimate the level of organizational performance in different policy areas and the degree of maturity of managerial practices
- Identify relevant initiatives on the themes of social responsibility led by sectors, governments and territories, from which to draw information, resources, capabilities and cooperation
- Develop an action plan for the short, medium and long term for continuous improvement, eliminating the risk factors (such as regulatory non-compliance) and addressing differentiation in incremental terms, for example, continuous improvement or breakthrough innovation
- Engage in dialogue with stakeholders, both internally and externally.

Social responsibility in governance

ISO 26000 is not intended to replace, alter, or in any way change the duty of the State to act in the public interest. But governments at all levels can assist organizations to operate in a socially responsible manner, which includes the recognition and promotion of social responsibility.

As governance is multilevel, sustainable development must be designed and implemented at all levels including global, regional, national and local.

We propose a connection of social responsibility, as defined by ISO26000, with reflection on governance at the United Nations Conference on Sustainable Development (Rio+20).

At the international level, institutional issues concern both the process of coordinating various international policies and organizations through the United Nations Commission on Sustainable Development or specialized agencies, and strengthening UNEP and its transformation into an international organization. At the national level, the issues include the development of strategies on sustainable development and turning international agreements into national law. At the local level, development of local strategies for sustainable development are covered by the so-called 'Local Agenda 21'. ISO 26000 can provide the final element of this multilevel governance through integration in each organization. It recognizes the legitimacy of international law and intergovernmental agreements through the notion of an international standard of behaviour, national recognition of national laws, the identification of relevant policy areas, and initiatives and actions relevant to sustainable development.

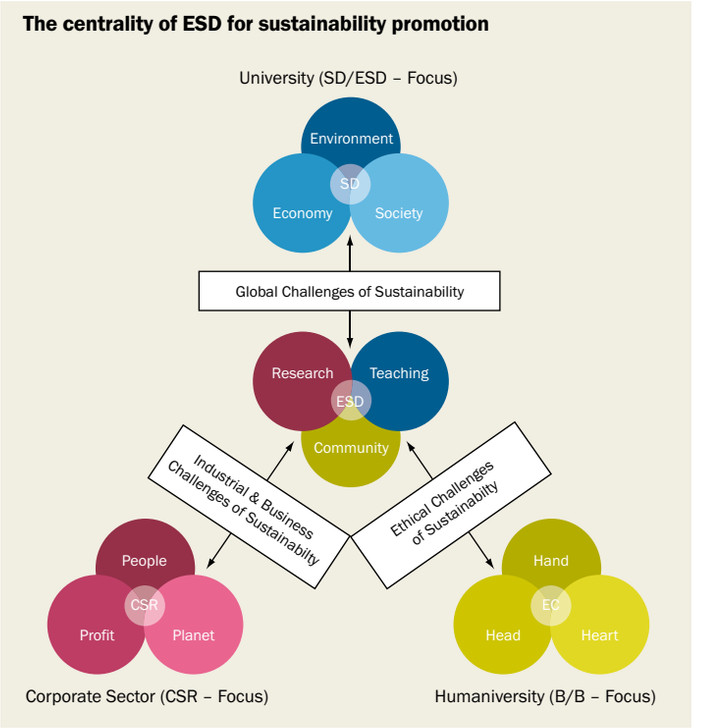
It is necessary that institutions recognize social responsibility as a lever for implementing the law, as well as their strategies and actions. This could facilitate the implementation of social responsibility, support the organizations involved and assist in the implementation of initiatives and processes that advance the practice of social responsibility.

This bridge between institutions and voluntary commitments, along with contracts between private actors and the merging of institutionalist and contractualist visions of social responsibility, has been established by the diversity of stakeholders who participated in writing ISO 26000. But the ISO system does not offer an implementation mechanism that leaves the market to act. It established a monitoring process in preparation for the revision. It is necessary to organize a global partnership on implementation that has a similar composition in its development. This is the mission of the United Nations Partnership for Sustainable Development that is envisaged by the International Organization of La Francophonie and proposed for discussion in Rio+20.

A vision for sustainability transformation at a knowledge base institution

Omar Osman, Vice-Chancellor, Universiti Sains Malaysia; Norizan Md Nor, Director; and Kanayathu Koshy, Professor of Sustainability; Centre for Global Sustainability Studies, Universiti Sains Malaysia

As Dato' Mustapa Mohamed, Malaysia's then Minister of Higher Education, said in his foreword to the book *Constructing future higher education scenarios: insights from Universiti Sains Malaysia*[1], regarding the conclusions of the Future Higher Education project, a key part of the process: "Clearly, universities must be attuned to the ever changing needs of society and industry if they are to remain relevant and contribute towards human capital development. Strategic plans of action should also mirror Malaysian values and ethics, and embody our aspirations, particularly those for the younger generation." Taking its cue from the Minister's speech and as part of its long-term commitment to academic excellence, Universiti Sains Malaysia (USM) has been sensitive to the needs of the society it serves. As a re-commitment to the sustainability cause, USM stated in the publication *Tomorrow Today*: "In the life of a university… there comes a point after which there is no turning back. In our sustainability journey, USM has reached that point."[2] In other words, USM recognizes that now is the time to redeem its sustainability pledge. It is striving to do so by implementing the vision that emerged from its Scenario Planning Process.[1]



Source: Universiti Sains Malaysia

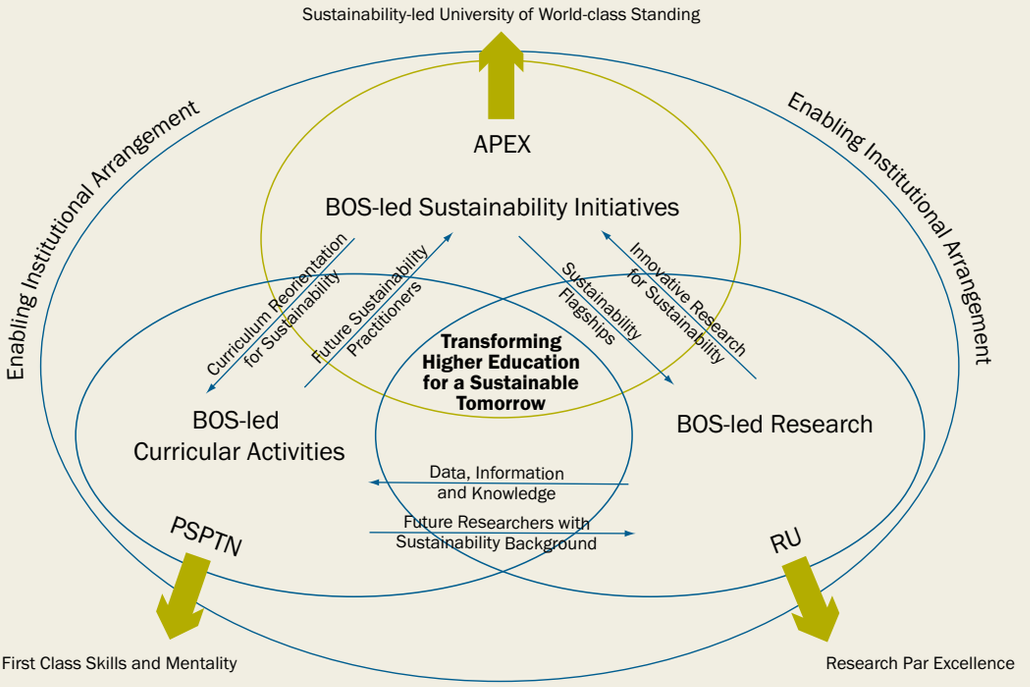
The scenario planning process

USM's teaching curriculum, research agenda, co-curricular and student-led activities have always put its graduates at the forefront of Malaysia's major development initiatives. However, early in the new millennium, it became evident that to remain competitive with other higher educational institutions and stay abreast of the changing demands of the communities it serves, the university needed to create a proactive scenario for its future. The USM Scenario Planning Process was born with this goal in mind.[1]

It considered various future scenarios in order to identify one allowing USM to respond best to the rapid democratization of knowledge and transition to knowledge-based economies.[3] The process took into account both the worldwide trend towards globalization and the need to address national aspirations for holistic and people-focused development that would be environmentally sustainable and socially inclusive. Following a university-wide consultation, the 'University in a Garden' scenario was adopted and became USM's tagline. This scenario emphasizes the close affinity between the university's role as an institution of higher learning and its setting in nature, as part of the global ecosystem.[4] A learning environment is envisioned that enriches each individual's intellectual, spiritual and humanistic faculties and promotes academic leadership and encourages individuals to think innovatively, fostering entrepreneurial development, knowledge creation and the germination of ideas. In the new millennium, USM expressed commitment to sustainability through a number of focused initiatives, four of which can now embody this emphasis in the university's life:

- The Kampus Sejahtera (Campus Well-being) Programme
- USM as a United Nations University Institute of Advanced Studies Regional Centre of Expertise for education for sustainable development
- The 'University in a Garden' scenario
- Malaysia's Accelerated Programme for Excellence (APEX) award, created to help USM pursue its vision of 'transforming higher education for a sustainable tomorrow'.[5, 6, 7, 8]

Transforming higher education for a sustainable tomorrow



Source: Universiti Sains Malaysia

USM delivering as one: Satu USM or 1 USM

In his speech to the university community in January 2012, the new Vice-Chancellor, Professor Dato' Omar Osman, reinforced the university's determination to stay the sustainability course and deliver on all its promises. Emphasizing USM's triple status as one of 20 government universities guided by the National Higher Education Strategic Plan (Pelan Strategik Pengajian Tinggi Negara, PSPTN),[9] one of four recognized Research Universities (RUs) within the plan, and the sole university recipient of an APEX award, he said a unified approach would have a much better chance of success than anything that could be achieved by a single person or within a single discipline.[10] Institutions must become more interdisciplinary to remain relevant in a world where globalization and internationalization are speedily changing the higher educational landscape. USM must remain traditional enough to compete in the 'red ocean' environment of the present, while also becoming innovative enough to sail into the 'blue ocean' space of tomorrow.[5, 11]

The concept of USM delivering as one or '1 USM' parallels the national slogan of '1 Malaysia,' designed to inspire the nation to unite in achieving its Vision 2020, which can be seen on the Office of the Prime Minister's official website. 1 USM is a vital unifying concept because it will help us reach the goals relating to each aspect of our identity as a PSPTN, RU and APEX university and, as a result, will enable us to realize our new vision under APEX of 'transforming higher education for a sustainable tomorrow.'

The three facets operating interactively, represent the higher educational transformation achieved through outstanding teaching under PSPTN, state of the art research under RU and holistic sustainability within the APEX focus, alongside each sector providing mutual reinforcement to the others. Relationships

Image: Universiti Sains Malaysia

Cooperation and Working Together. Vice-Chancellor Prof. Dato' Omar Osman's annual address to the USM Community, 5 January 2012

Image: Universiti Sains Malaysia

Promoting community based adaptation approaches using life jackets, boats and emergency kits provided by the project

between the three are cyclical and quality of output improves with iteration. This results in graduates with first class skills and thinking, excellent research products and services, and best practices in sustainability that will make USM a university of world class standing.

Community, industry and policy engagements

For more than a decade, the key thrust in promoting sustainability has been to work closely with industry, community and policymakers through various knowledge transfer programmes. USM will act both as a knowledge base by enhancing the knowledge of society through knowledge generation — dissemination and transfer, with knowledge a major output and service — and as a knowledge-based institution, making use of specific knowledge as an important input, tool or feedstock, to generate desired outcomes and products. Operating in these capacities requires USM to deliver as one, focusing not just on knowledge and skills, but intangibles such as values, ethics and morals. Graduates entering our industries will have both planet and people in focus as they seek to make profits, providing the fundamental basis for a 'green economy' and 'green growth' which is becoming the metric of sustainable development. An inclusive community commitment with a 'bottom billion' focus is essential and needs a 'head, heart and hand' approach, the hallmark of graduates from a 'humaniversity' — a university valuing human well-being, not just material prosperity.

A core commitment to education for sustainable development (ESD) is developed through three branches of activity: teaching on sustainable development, research related to the corporate sector and community initiatives addressing ethical challenges of sustainability.[12] By implementing this model using best ESD practices, initiatives addressing the overall global challenges of sustainability can be integrated with efforts to meet industrial, business and ethical challenges. A holistic approach includes faculties involved in industry, business and the economy, as well as faculties relating to the human community and its culture, ethics and spirituality. This expanded sustainability implementation model shows the centrality of ESD in promoting education in its broadest form to build capacity for overcoming major ecological, economic and social challenges in a coherent and interdisciplinary way.

Some examples help illustrate how the university is pursuing its mandate to work with community, industry and policymakers. In community engagement, for example, a number of projects are ongoing, including one focused on people suffering from cleft

Image: Universiti Sains Malaysia

Hands-on training for composting and recycling

lip and palate (in developing countries, millions of children and adults suffering with unrepaired clefts are subjected to social stigma). USM medical staff, collaborating with Mercy Malaysia, have worked with healthcare partners in Indonesia, Malaysia and Bangladesh to conduct free reconstructive surgery. Six missions to Dhaka Community Hospital from 2008-2011 resulted in the successful treatment of 338 children and adults.

Focused on one rural and one urban community, a project by CGSS@USM entitled 'Delivering Sustainability Excellence' incorporated two components. The first, aimed at reducing climate change and flood-related food security challenges in Kuala Nerang, used the Vulnerability and Adaptation Assessment methodology to identify groups most in danger of food insecurity and empowered them through adaptation measures. The second, Enhancing Sustainable Living within Universiti Sains Malaysia and its Neighbouring Communities, promoted collaboration on integrated waste management, recycling and awareness-building by working with USM staff and students on campus, as well as students at six local schools, customers of a hypermarket, those living in nearby residential areas and industries located within 8 km of the Minden campus. The third, Balik Pulau, is an ongoing project focused on developing a model sustainable village close to the university. It aims to help communities reconnect to their resources to promote human well-being by enhancing social and political empowerment, community self-reliance and self-determination. Under the heading of industry engagement there are a number of other project examples. One is an interactive, multi-faceted collaboration between university academics, students, industry management and personnel at USM. The Centre for Education and Training on Renewable Energy and Energy Efficiency (CETREE, USM) conducted a nationwide project in collaboration with Philips Malaysia, the Philips-CETREE energy-efficient mobile show home. The home's diesel-powered engine was adapted to accept used cooking oil as a fuel substitute and electricity was supplied through fully solar power. Its five knowledge kiosks — general knowledge on renewable energy, energy-efficient electrical equipment, solar heating, solar electricity and biomass fuel generation — were used for demonstration projects and community education. The collaboration with Philips included a Simple Switch campaign designed to highlight the economic savings of switching to energy-efficient lighting. A pledge wall gave students and others the opportunity to commit to an energy-efficient lifestyle. The ENDEAVOR-Mobile project is an Android-based teleradiology platform for image analysis and visualizisation that brings the power of computing into the healthcare field. A team of USM

Image: Universiti Sains Malaysia

Cleft lip and palate project (CLIPP). Among others, this initiative has included six missions to Dhaka Community Hospital from October 2008 to October 2011

scientists launched a mobile version of ENDEAVOR in 2011 to give medical professionals remote access to CT, MRI and X-ray reports, allowing them to collaborate on diagnosis and treatment.[8]

Networking and policy interaction projects include the Asia-Pacific University Community Network (APUCEN), launched in 2011 by USM, includes 44 higher educational institutions in 10 countries. It aims to be a formal platform for the University Community Engagement Conference first held in Penang in 2009 and next scheduled in Thailand for 2012. The Global Higher Education Network is another sustainability education network that USM launched in 2011. Organized over the past six years by the university and the Ministry of Higher Education Malaysia, it is the cornerstone of the Global Higher Education Forum.

The Centre for Global Sustainability Studies (CGSS) at USM spearheaded the development of the USM Sustainability Roadmap and Action Plan with a full set of indicators for sustainability assessment and for monitoring and evaluating sustainability projects. CGSS is also responsible for the development of the Framework and Roadmap for Sustainability Education for the Association of South East Asian Nations (ASEAN 2012).

Finally under this heading comes the Knowledge Transfer Programme (KTP): Launched in 2010 by the Ministry of Higher Education under its Critical Agenda Programme, KTP supported a total of 44 projects worth about US$6 million in 2011 under its two focal areas, industry and community. Overall funding for the four-year programme is US$40 million with a 30 per cent co-financing requirement for industry projects. The main feature of this programme is the transfer of ready-to-use knowledge and skills from public universities of Malaysia to partner industries and communities, for improving industry performance and community well-being and providing feedback to the university through graduate interns, to continually improve the knowledge transfer process. USM plays a key role in the overall administration and implementation of this programme.

Projects and plans

USM has several new and ongoing initiatives to help achieve its sustainability goals in the short to medium term. Although there have been no major setbacks in the implementation of sustainability so far, many issues require continuous attention and monitoring. The following are worth noting:

- Having secured autonomous governance, USM adopted a new constitution in July 2011 to create a better environment for promoting sustainability. This constitution created new structures for USM's Board of Governors, Senate, Ombudsman and Student Consultative Assembly
- Major research projects will be initiated by CGSS to achieve USM's sustainability goals. In addition, a Masters Programme in Development Practice will be offered jointly by CGSS and the Graduate School of Business as part of an international network coordinated by the Earth Institute at Columbia University
- USM will work with the Malaysian Technology Development Corporation and the Northern Corridor Implementation Agency to promote halal vaccines and diagnostic kits, providing matching grants where appropriate
- A new Science and Engineering Research Centre is being launched in the engineering campus for multi-disciplinary research
- Green procurement will be mandated and promoted in all possible areas
- Strategic amalgamation of internal entities for cost-effectiveness and efficiency will be pursued where appropriate
- The campus Sustainability Office at CGSS will be strengthened so that all USM centres and schools can be audited for sustainability outcomes.

Acknowledgement

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The impact of climate change on sustainable development in Latin America and the Caribbean

Walter Vergara, Division Chief, Climate Change and Sustainability, Inter-American Development Bank

Climate change has significant impacts on development.[1] These impacts are of such magnitude that the economic consequences of efforts to adapt to the new climate conditions while reducing the global carbon footprint to prevent further damages are likely to be among the main driving forces for the global economy this century.

Given the current pace of greenhouse gas (GHG) emissions and the poor prospects for immediate and drastic reductions, a rise of at least 2ºC in the course of this century is now expected. Further, there is an expectation that some adverse climate feedback effects that are not yet properly foreseen[1,2] will develop during the century. These may include tipping points for forest stability, marine ecosystem integrity and water regulation. Climate change of this magnitude will have significant negative effects on economic activities, social conditions, ecosystems and individual species.[1] The quest for sustainability in the face of these changes is likely to become ever more challenging.

Image: Catiamme Tijerina

Crops are affected by warming and reduced soil humidity

In particular, the effects of climate change[3] are likely to impact heavily on Latin America and the Caribbean, where there remains a substantial, but intrinsically fragile, natural capital and where there are a number of climate-sensitive eco-regions. These areas are being characterized to reflect the relative vulnerability of dependent populations (not only humans) to climate impacts.[4]

Although there are uncertainties with regard to exact physical impacts, there is widespread agreement[5] that impacts from climate change, even under significantly more modest emission scenarios, will affect the functioning and integrity of key ecosystems worldwide. This will add to the stress already resulting from local anthropogenic effects, according to the 2007 Millennium Ecosystem Assessment. The combined effects represent an unprecedented challenge to the global biosphere and while these impacts are being felt globally, some regions will be more affected than others.

Some of the key problems facing the region include:

- Impacts on agriculture caused by warming and by reduction of relative humidity of soils, as well as by changes in intensity of rainfall
- Accelerated sea level rise and increased sea surface temperature
- Increased frequency and intensity of extreme weather events in coastal zones
- Additional exposure to tropical vector diseases caused by increases in temperatures and changing climate conditions
- Glacier retreat due to a significant temperature anomaly in the Andes
- Potential rainforest dieback.

These physical impacts have substantial economic and social consequences. The long-term consequences of these changes may limit development options in the future and affect the prospects for sustainable development.

Many of these impacts can be monetized, or quantified in economic terms. However, a significant share of the impacts is felt by ecosystems and the damage inflicted is more difficult to evaluate. Although the economic services provided by these systems can be quantified, many effects are borne by numerous other species with little or no chance to adapt unaided to rapidly changing environmental conditions.

Image: Willie Heinz

Rising sea levels affect coastal areas

Image: Willie Heinz

Coastal zones are affected by increases in extreme weather events

We require the methodologies and tools to estimate such costs, but these need to be acknowledged upfront and efforts should be undertaken to develop policies and instruments that would allow us to properly consider the costs of adaptation for natural capital.

On the other hand, with about 5 per cent of the global share, the Latin America and Caribbean region is a modest emitter of fossil CO_2 emissions, reflecting an overall low energy-intensive regional economy. But if one counts all GHG emissions, including those from land-use change, the regional share increases to about 11 per cent of the global count. This is due to the comparatively large share of global deforestation and large emissions of CH_4 and N_2O associated with agricultural activities.

However, the regional carbon footprint can be misleading. While most countries in Latin America are indeed low-carbon economies (as their emissions are well below 1 per cent of global emissions), the region has some very large carbon emitters: countries with high rates of deforestation, non-intensive carbon economies and countries that are in the process of transition induced by structural changes.

Also, most countries in the region (20 out of 32) are low-carbon economies — defined as those with a carbon footprint of less than 45 million tons of carbon dioxide equivalent (CO_2e) per year (less than 0.1 per cent of global emissions) — most of which also have low carbon intensities. Small economies with negative rates of deforestation (Uruguay, Panama, Costa Rica and most Caribbean nations) are mainly in this category. Together, these countries have a total CO_2 budget of less than one-quarter billion tons of CO_2e (about 0.5 per cent of global emissions).

Coincidentally, many of these low emitters are among the most vulnerable countries, including islands and some Andean nations, which are affected by some of the most intractable climate impacts (sea level rise, intensification of extreme weather events, impacts from glacier retreat and rapid warming of high mountain habitats).

Further, either because of their limited populations or as a consequence of the carbon structure — typically consisting of low-carbon power and transport sectors and modest rates of land-use change — it is highly unlikely that the carbon budgets of these nations will show significant changes in the future and even if they do, the net global impact will be negligible. Therefore, whatever occurs in these countries has limited global relevance, even if drastic improvements in energy efficiency and land-use change are achieved. Setting apart countries with low emissions is important because this is a global problem caused by absolute increases in GHG concentrations.

To address the threat of climate change to sustainable development prospects, a significant adaptation effort is required. Such an effort will not only minimize net impacts but will, at the same time, adjust the level of services required from nature, at a level consistent with the effects of climate on the regional natural capital.

Addressing the challenge at a policy level requires efforts to enact and promote policies that will lead to the development of mechanisms and tools for better accounting of future adaptation and estimating costs and the benefits of adaptation measures. Policies should encourage the valuation of natural capital assets in any development project that has potential impacts on the natural resource base. Fiscal policies should be adopted to encourage advance and contingency planning to minimize adaptation costs through investment in early response measures, including those needed to provide for the future costs associated with sea level rises. Finally, it is necessary to enact national development policies that prioritize adaptation to climate impacts as an instrument to strengthen sustainability.

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its board of directors, or the technical advisors.

Sustainability research using spatially explicit land-use change scenarios

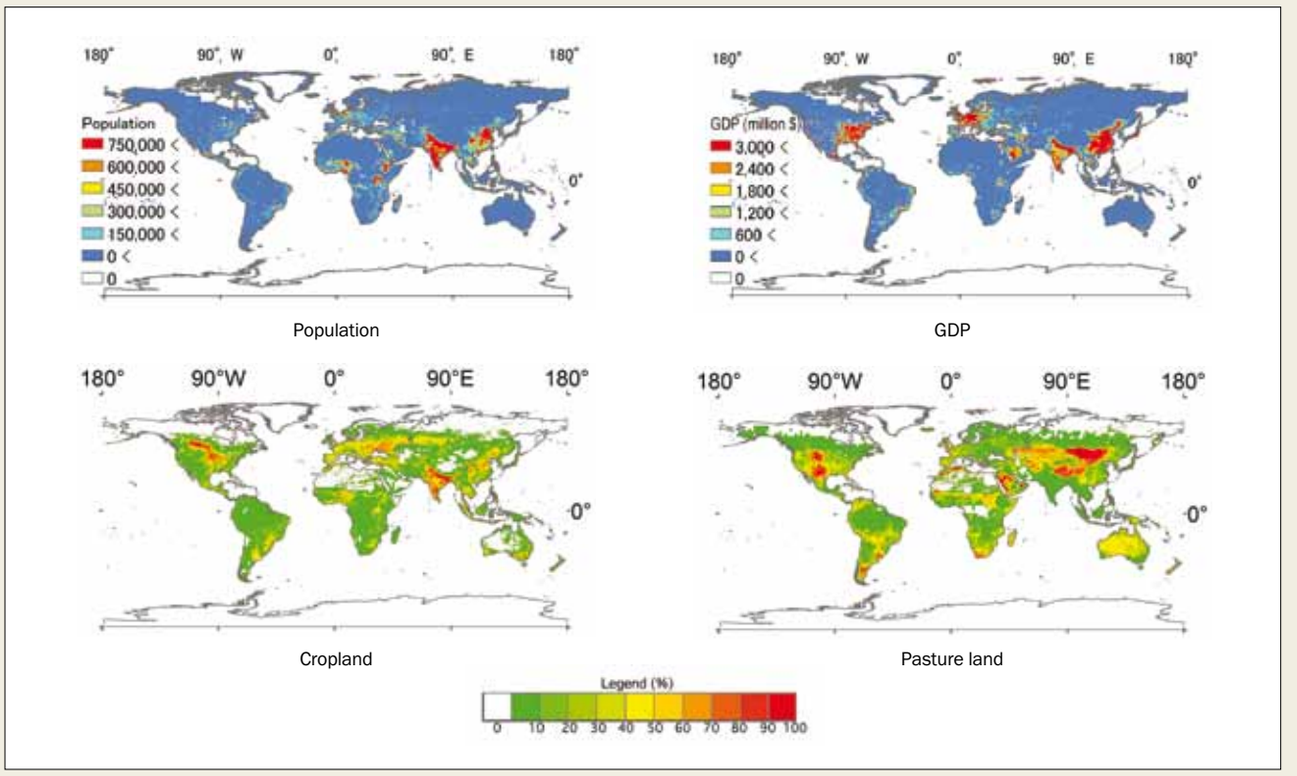
Yoshiki Yamagata, Centre for Global Environmental Research, National Institute for Environmental Studies, Tsukuba, Japan

Climate change prediction scenarios form the scientific foundation when considering global warming countermeasures. Detailed spatial interactions between climate change predictions and socioeconomic changes have yet to be analysed in Intergovernmental Panel on Climate Change (IPCC) assessment reports. Socioeconomic scenarios dividing the world into different political units such as the USA and the EU (using a different integrated assessment model than that used in this study) have been used for prediction. However, future consideration of a sustainable low-carbon society will require the use of climate prediction models of greater spatial resolution to analyse global warming mitigation and adaptation for specific land uses. In our research, we have sought to develop geographical land use, land-use change and forestry (LULUCF) scenarios on a scale of 50 km suitable for the IPCC Fifth Assessment Report.

Global warming impact assessment

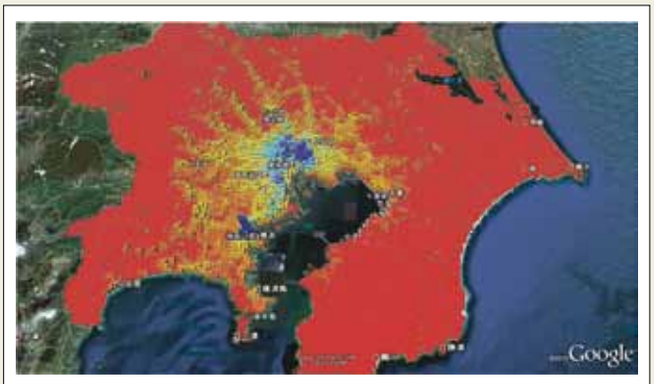
We have developed a new method for downscaling the population, GDP, changes in land use (e.g. pasture land, cropland and cities) and other data generated by country-specific socioeconomic models, to a 0.5° mesh (approx. 50 km spatial grid data). As a means of allocating land use to each cell of the mesh within a country, we used land cover classification maps created from 1 km mesh satellite images to estimate urban growth, then a crop and forest productivity model which estimated changes in cropland and other land uses accompanying urban growth, and allocated those changes to the mesh as land use required for agriculture and forestry production in each country, up to the year 2050. Our results

Distribution of population, GDP, cropland, and pasture land in 2050

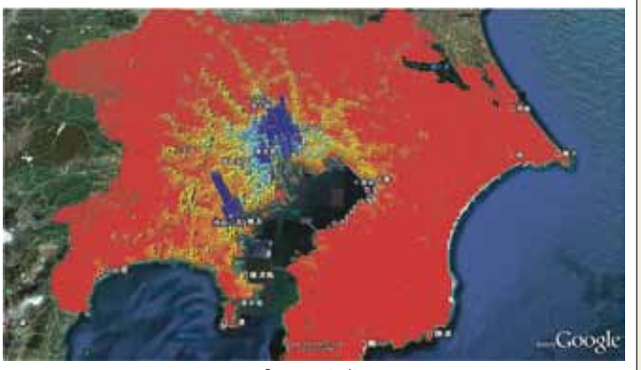


Source: NIES

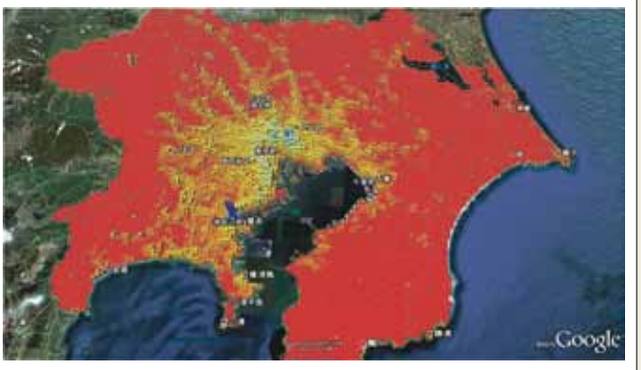
Distribution of population in the Tokyo Metropolitan Area



BAU scenario



Compact city



Dispersed city

Source: NIES

showed that the population and GDP of Asian cities would grow markedly and this would, in turn, change the global distribution of cropland and pasture land. As one of the Representative Concentration Pathways (RCPs) being covered in the IPCC Fifth Assessment Report, our findings are being used to predict worldwide climate change. Along with downscaling global scale scenarios in this way, we developed spatially explicit land-use change scenarios specific to certain localities. A newly developed urban economic model was used to construct a scenario for land and building markets in the Tokyo Metropolitan Area. Depicting socioeconomic changes in terms of either population centralization (compact city) or dispersion (sprawl), we predicted differences in anthropogenic heat emissions from housing, offices, transport and other human activities, as well as changes in green space ratio, building density, and other land-use attributes. We are using these scenarios in urban climate model research to analyse heat island effects caused by future changes in land use.

The use of these spatially explicit land-use scenarios not only enables us to make more precise predictions of both global and regional climate change, but to facilitate assessment of climate change impacts at the regional level and consideration of adaptation measures.

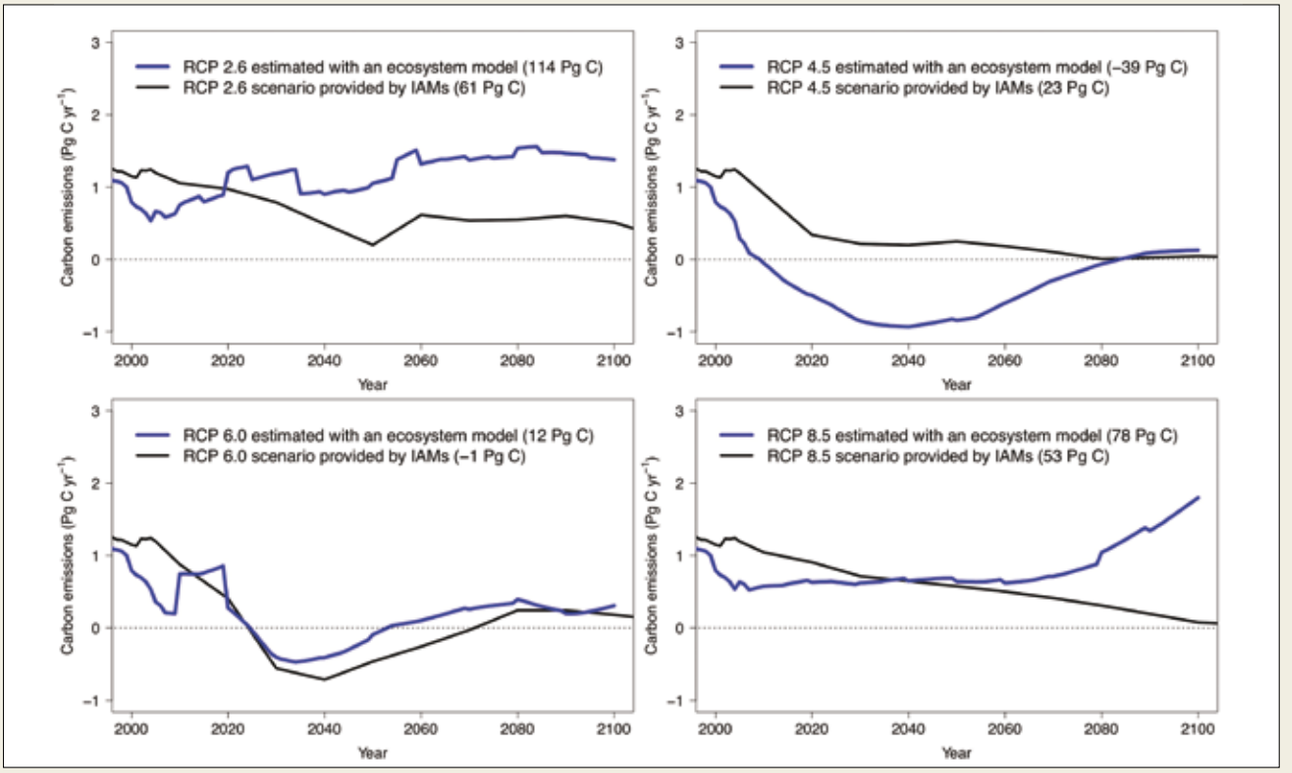
Carbon cycle feedback

Changes in land use are second only to the use of fossil fuels as a source of human-induced CO_2 emissions. We now realize that converting natural vegetation into cropland or pasture land causes changes in the physical environment of the surface layer, which affects climate. We used a land-use change scenario prepared for the IPCC Fifth Assessment Report to analyse alterations to CO_2 emissions caused by future changes in land use (such as reductions in forest cover). Using a terrestrial ecosystem model that simulates the movement of carbon through processes such as photosynthesis and transpiration of plants and decomposition by soil microorganisms, we have assessed CO_2 emissions resulting from deforestation and logging, and CO_2 absorption by resurgent growth of vegetation on abandoned arable land. This showed that the impact of increases or decreases on forest vegetation (different for each scenario) in the global carbon cycle is larger than we had estimated.

Land-use scenarios were analysed to estimate the cumulative carbon emissions derived from changes in land use relating to scenarios being considered under IPCC RCPs to stabilize the concentration of CO_2 in the atmosphere by the end of the twenty-first century. Our findings revealed a marked difference between integrated assessment model emission scenarios and two RCP scenarios in particular from 2006-2100 — RCP 2.6 (CO_2 concentration of approx. 450 ppm) and RCP 4.5 (CO_2 concentration of approx. 550 ppm). RCP 2.6 shows an increase in the area of agricultural land to realize low-carbon scenarios through large-scale biomass energy use, while RCP 4.5 predicts CO_2 absorption through large-scale reforestation and reduction of the cropland and pasture land area by introducing a price for global greenhouse gas emissions. The large impact of increases and decreases in forest cover on the carbon cycle brought about by these scenarios is responsible for the discrepancies from the integrated assessment model emissions scenarios.

Since global low-carbon scenarios being used by the IPCC and elsewhere, do not consider carbon cycle feedback related to changes in land use, our results pinpoint the need to combine land-use change scenarios with terrestrial ecosystems and climate

Net carbon emissions from land-use change for each RCP scenario. Values in parentheses of the legends indicate the cumulative carbon emissions for 2006-2100



Source: NIES

models while considering mitigation and adaptation scenarios that allow for carbon cycle feedbacks, including global warming.

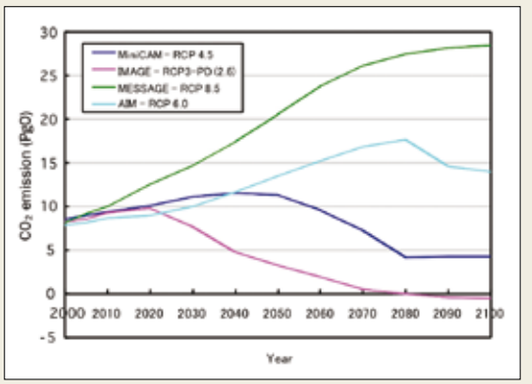
Building an international research network

We are implementing an international 'Urban and Regional Carbon Management (URCM)' project relating to the development and application of spatially explicit land-use change scenarios with particular reference to Asian megacities. Specifically, we are collecting geographically delineated data on socioeconomic activity related to energy demand, population, economy and public infrastructure, carrying out bottom-up analyses (totalling estimates for different localities) of urban GHG emissions, developing methods for estimating urban growth and population density through using remote sensing images, and analysing the relationship between urban morphology (compactness) and CO_2 emissions. In relation to this, we are building an international network of researchers in our capacity as the international secretariat for the Global Carbon Project, an Earth System Science Partnership project being carried out under the auspices of the International Council for Science.

Future challenges

We are conducting research on land-use change scenarios that include a geographical distribution perspective and are making our findings available to researchers involved in global and regional climate change prediction and impact assessment. From these initiatives, to the building of a global sustainable society — the main theme of The United Nations Conference on Sustainable Development (Rio+20) — we feel it is important to create a research platform offering information that considers climate change mitigation and adaptation measures, analyses the compound impacts of climate change arising from interactions between land use, water resources and ecosystems, and provides policymakers with information on the implications of different land-use scenarios based on various sustainability indicators.

Carbon emission projections of the IPCC AR5 RCP scenarios. Three scenarios stabilize atmospheric CO_2 by the end of 21st century at different levels



Source: NIES

Save the Earth: sharing Japan's experience with the world

Shinya Ejima, Director General, Global Environment Department,
Japan International Cooperation Agency

The Japan International Cooperation Agency (JICA) has as its corporate vision the pursuit of inclusive and dynamic development in order to achieve human security for all people in the world. 'Inclusive development' represents an approach that encourages all people to recognize the development issues they themselves face, participate in addressing them, and enjoy the fruits of such endeavours.

JICA's goal is to provide effective backing for this process. 'Dynamic development' refers to the creation of self-reinforcing virtuous cycles of mid- to long-term economic growth and poverty reduction in a constantly changing environment of developing countries where a variety of issues arise simultaneously and become entangled with one other. JICA will provide creative, highly effective support towards this end, at times moving swiftly and at times acting from the longer-term perspective as the situation demands. In accordance with its vision, JICA supports the resolution of the issues facing developing countries by using the most suitable tools and assistance methods, along with a combined regional-, country- and issue-oriented approach.

JICA assists and supports developing countries as the executing agency of Japanese Official Development Assistance (ODA). Since joining the Colombo Plan in 1954, Japan has been providing financial and technical assistance to developing countries through ODA, aiming to contribute to peace and development in the international community and thereby help ensure Japan's own security and prosperity. JICA is in charge of administering most of ODA, such as technical cooperation, ODA loans and grant aid, in an integrated manner, with the exception of contributions to international organizations. As one of the world's largest bilateral aid agencies, JICA works in more than 150 countries and regions through some 100 overseas offices, and has helped foster human resources, technology transfer and infrastructure development in various countries through technical cooperation. JICA has also forged close relationships with the governments of industrialized countries and international aid organizations aimed at achieving the Millennium Development Goals (MDGs) and resolving global issues such as climate change.

There are many issues in the world that must be addressed not by individual countries but by the international community. In dealing with such issues, JICA's Mission Statement has defined four priorities for its cooperative operations:

- Addressing the global agenda
- Reducing poverty through equitable growth
- Improving governance
- Achieving human security.

JICA implements effective and efficient support for the termination of the vicious cycle of poverty and environmental destruction. In developing countries, a vicious circle has occurred as the destruction of the environment, which is a basis for human life, causes the further escalation of poverty. Each passing moment brings the further destruction of the irreplaceable natural environment on which humanity depends, driving the need for the creation of a sustainable society based on the concept of harmony with the environment. JICA is implementing cooperation widely for the conservation of the global environment. Key initiatives focus on nature conservation, environmental management, water resources, disaster prevention and management, and climate change. This paper focuses on nature conservation, environmental management, and disaster prevention.

Nature conservation

JICA has carried out afforestation activities for forest restoration in many countries in addition to collecting forest data, formulating management plans and improving the lives of local residents. In order to eliminate the vicious cycle of environmental deterioration and poverty, and to promote the formulation of a society in harmony with the environment, JICA provides cooperation on nature conservation in the following three areas, with the aim of facilitating harmony between the maintenance of the natural environment and human activities.

Sustainable use of natural resources by local residents

In developing countries, many people use a variety of natural resources in their daily lives. A steep rise in population, however, has meant that the use of those resources exceeds nature's ability to recover, causing the deterioration of the environment that supports human life. Aiming to conserve nature and improve living standards, JICA has provided assistance based on local requirements, including those for sustainable production, environmental restoration and conservation activities, and worked to improve community services through administration.

Conservation of biodiversity

Biodiversity sustains daily life in forms such as food, clothing, medicine and wood products. However,

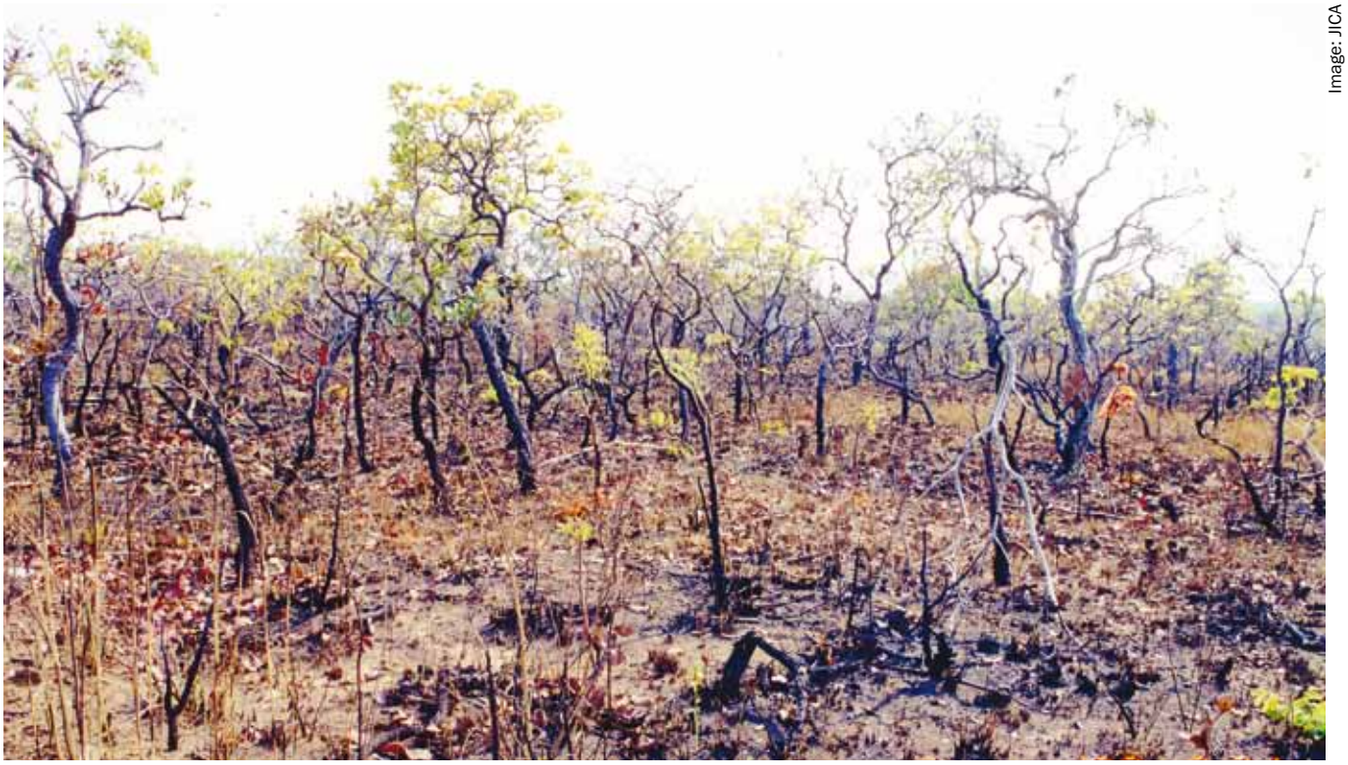


Image: JICA

JICA's role in nature conservation facilitates harmony between maintenance of the natural environment and human activities

because of such factors as the excessive utilization of natural resources due to deforestation, overgrazing and the harvesting of firewood and charcoal materials, as well as overhunting of wildlife, introduction of alien species and the threat of climate change, it is considered that as many as 40,000 wildlife species, including unknown species that remain undiscovered, are becoming extinct every year, and the functions of the ecosystem are deteriorating all over the world. With the aim of establishing a sustainable society in which human activities coexist in harmony with the natural environment, JICA has provided various forms of support such as providing technical cooperation for improving the capabilities of administrative officers and researchers, raising awareness through environmental education for local residents, introducing eco-tourism, and developing and disseminating agricultural technologies that can help strike a balance between improved productivity and environmental conservation. In particular, JICA carries out activities for the conservation of biodiversity hotspots such as mangrove forests and coral reefs in regions that are rich in biodiversity.

In October 2010, the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP10) was held in Nagoya, Japan. In keeping with the adoption at COP10 of the Nagoya Protocol on Access and Benefit Sharing (ABS), or the fair and equitable sharing of benefits arising from the utilization of genetic resources, JICA has supported the efforts of developing countries in protecting their biodiversity-related resources and also in connection with ABS, which plays an important role in the promotion of sustainable utilization.

Malaysia: Forest conservation together with communities

As set forth in the MDGs, securing environmental sustainability is a common global agenda to protect the present and future Earth. JICA has expanded cooperation in conservation of the natural environment all over the world, aiming at balancing the resolution of global issues with the growth of developing countries.

The Bornean Biodiversity and Ecosystem Conservation Programme has been implemented in Malaysia since 2002. This region, which contains the world's greatest biodiversity, is popular among tourists, who are fascinated by its apparently vast tropical rainforests. However, the reality is that wildlife species are disappearing and the forest area is rapidly declining. Therefore, JICA is promoting the conservation of the natural environment by the whole community, as has been practised in various regions of Japan, involving all stakeholders that enjoy benefits from Bornean forests, including the provincial government, developers and local communities. Activities include a survey, which was set up to collect data on ecosystems, and instruction of field researchers by the JICA expert on monitoring methodology, as well as a workshop held with local inhabitants on park management.

Ecotourism, including homestay, is another opportunity for environmental education in which people experience living closely associated with nature in this area. It also plays a significant role in improving the livelihoods of local people, who in the past might have sold their own land to a plantation company when requiring cash. Following such a sale, their traditional life was in many cases no longer feasible, because of new problems such as wastewater from the plantation

Image: JICA

Workshop on state park management with local residents, Malaysia

site polluting spawning areas for shrimps. Nowadays they can gain cash income by introducing ecotourism and are free from the need to sell their land, which translates into ensuring the sustainable coexistence of nature and human beings.

Sustainable forest management

Forests are not only valuable natural resources; they also have the function of retaining water resources and conserving soil while absorbing CO_2 to mitigate climate change. Although it is critical to replace forests by planting trees, it is more important to ensure, via adequate maintenance and management, that existing forests are not depleted above current levels. JICA conducts surveys on the state of forests, develops reforestation technology to regenerate wooded areas, and works to raise awareness of the importance of forests and their maintenance and management. In addition, JICA has extended cooperation on the conservation of forests, with a view to contributing to the establishment of the Reducing Emissions from Deforestation and Forest Degradation in Developing countries (REDD+) programme, which has been advanced by the international community in recent years as part of the measures against climate change.

Lao PDR, Indonesia and Brazil: Promoting REDD+ as an Approach to Mitigating Climate Change

REDD+ is a concept to reduce greenhouse gases emissions or to maintain or enhance forest carbon stocks by curbing deforestation/forest degradation or through forest conservation in developing countries. JICA is conducting REDD+ projects around the world. From Policy to Action JICA provides cooperation to promote REDD+ from three aspects: 1) development of policies, institutions, and capacities; 2) improvement of technologies for measuring forest area and forest carbon emissions; and 3) promotion of demonstration activities to reduce deforestation and forest degradation. Through each of these approaches, JICA encourages stronger partnership among stakeholders in developing countries. In Lao PDR, which is aiming to restore forest coverage ratios that have been declining rapidly in recent years, JICA has dispatched experts in the forest policy field who are providing guidance and training to forest administrators in order to develop their capabilities in policy formulation and institutional planning in the forest sector, including REDD+. In Indonesia, which is faced with the problem of forest fires caused by drying peatlands and slash-and-burn cultivation, JICA is involved in a science and technology research partnership for sustainable development (SATREPS) in collaboration with related institutions in Indonesia and Hokkaido University. This cooperation involves detecting forest fires using satellite images, developing a prediction model, and establishing a system for evaluating forest carbon stock for a REDD+ framework. Moreover, in Brazil, JICA is providing cooperation to reinforce controls on illegal logging, which occurs frequently in the vast Amazon rain forests. JICA is working to build a monitoring system and strengthen the capabilities of counterpart personnel so that the Brazilian Federal Police and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) can monitor illegal logging through satellite images. JICA will provide comprehensive cooperation in this field to Cambodia and Viet Nam as well.

Image: JICA

A tree planting activity being conducted by local residents, Lao PDR

Environmental management

Environmental issues such as water and air pollution and untreated solid waste, once considered the problems of developed countries, now extend to developing countries as well. This threatens the health and life of humans and other life, and inhibits the sound development of economic activities. It will be too late to address environmental issues once our ecosystems and human health are tangibly damaged. What is needed is an effort emphasizing prevention, and to this end it is important to strengthen the capacity to respond to environmental issues.

Waste management

JICA supports measures for improving waste management, such as increasing the administrative service capabilities for the collection, transportation, intermediate treatment and final disposal of waste, and improving capacity for drafting management plans and making policy proposals. Recently, JICA is increasing its support to create a sound material-cycle society by promoting the 3Rs (Reduce, Reuse, Recycle) of waste.

Pacific Region: Project for promotion of regional initiative on solid waste management to reduce the environmental impact in Island countries

The island nations of the Oceania region, where land areas are small and traditional land ownership systems remain intact, share the common issue of how to ensure the adequate treatment of solid waste. In order to disseminate the outcomes of the efforts on solid waste management that JICA has obtained through cooperation with the region's countries, JICA commenced region-wide Technical Cooperation in February 2011 in collaboration with the Secretariat of the Pacific Regional Environment Programme (SPREP), with which JICA had previously established the Pacific Regional Solid Waste Management Strategy 2010–2015.

Disaster prevention and management

The prevalence and damage of disasters has increased sharply in the past 30 years or so, as storm and flood damage, earthquakes, volcanic activities and other disasters occur across the globe almost daily. People in developing countries are particularly vulnerable due to urbanization, which accelerates the concentration of people in cities and delays the provision of social infrastructure. Natural disasters do more than claim life; they directly impact people's livelihood and aggravate the poverty cycle. Whereas the previous mainstreams of disaster assistance were centered more on structural measures such as construction of dams and levees, there is also a need for compound measures that emphasize non-structural assistance such as installation.

Indonesia: Project for safe school reconstruction in devastated areas of earthquake in offshore of Padang in West Sumatra region

On 30 September and 1 October, 2010, a year after a major earthquake struck West Sumatra Province, a memorial ceremony marking the one-year anniversary of the earthquake was held with the attendance of the governor of the province as well as representatives from the governments of Indonesia and Japan. At the ceremony, the disaster prevention efforts and the reconstruction plans made with the cooperation of JICA were introduced, and the concerned parties reconfirmed the importance of disaster prevention. In addition, the Declaration Marking the One-Year Anniversary of the Earthquake — for the Sharing of Lessons Learned from Reconstruction was adopted.

Success with sustainable development in the Dominican Republic

Ernesto Reyna Alcántara, Minister for Environment & Natural Resources, Dominican Republic

The Dominican Republic is located in the Caribbean, occupying the eastern two-thirds (48,442 km^2) of Hispaniola Island, and is bordered on the western third of the island by Haiti. The country's complex and diverse array of habitats supports a high degree of unique and globally significant biodiversity, in recognition of which it has been identified as a "Caribbean Hotspot"[1].

The National Plan Quisqueya Verde is a direct action of the Dominican Republic that aims to restore degraded ecosystems through reforestation and other instruments. It is an example of how a forest restoration programme has become a state policy, which has helped to increase forest coverage to 39.6 per cent of its territory.

For decades, deforestation was perceived as the most serious environmental problem in the country and was one of the main causes of land degradation and biodiversity loss. The plan was conceived as a response of the Dominican Government to the process of natural resource degradation and high poverty rates in the upper and middle watersheds, home to the poorest of the poor.

On World Forestry Day in 1997, the Dominican Government ordered the creation of the National Plan Quisqueya Verde, with the aim of "improving the living conditions of people in the rural areas through the promotion of natural resources, employment generation, environmental protection and strengthen-

Image: Min for Env & Nat Resources, Dominican Republic

The National Plan Quisqueya Verde aims to restore degraded ecosystems through reforestation and other interventions

Image: Min for Env & Nat Resources, Dominican Republic

Many communities in the Dominican Republic depend on generation of income through forestry

ing coordination among state institutions, local small businesses and civil society organizations working on behalf of sustainable development."

In its first three years of operation, the initiative became a major achievement. Its most important embodiment, the execution of a massive reforestation plan that would be implemented nationwide, was marked by the following characteristics:

- Incorporation of local organizations working in the environmental sector
- Training of brigades or squads of local people for reforestation in the major river basins
- Massive participation of the general population in reforestation field days
- Institution of the month of October as the Month of Reforestation
- Generation of income for families in extreme poverty and community development support of these families
- Contribution to the creation of a forest subculture with the establishment of thousands of forest plots provided with their respective certification
- The promotion of gender equality by incorporating women in rural areas as managers of reforestation crews.

The quantifiable results of this period included reforestation of 14,000 hectares, planting of 26.5 million trees, incorporation of 2,108 landowners in forest plantations, delivery of 582 certificates of entitlement to cut and plant, creation of 2,850 jobs, repair of 806 houses, construction of 235 houses, construction of 11 schools, and repair of 6 schools, 46 roads and 3 aqueducts. With the establishment of the Ministry of Environment and Natural Resources in August 2000, the Plan became the Department of Reforestation of the Ministry, continuing its active dynamic reforestation in the most degraded and poorest areas in the country. In 2007 the Ministry decided to deepen the implementation of the Plan, allocating more specialized resources to actions and specific areas in the border zone with the Republic of Haiti.

The relevance of the implementation of National Plan Quisqueya Verde was confirmed by storms Noel and Olga, which occurred shortly afterwards, leaving a legacy of serious damage, much of which was caused by the deterioration of our natural resources. A positive consequence of such phenomena is the increased sensitivity of people to the protection of rivers and forests. Under these conditions, the National Plan Quisqueya Verde is revealed as a natural infrastructure to reduce vulnerability to extreme weather events promoted by climate change.

The emphasis at this stage has been on the reforestation of watersheds and natural recovery. Since late 2007, National Plan Quisqueya Verde has had a subprogramme, Frontera Verde, operating on the border with Haiti and aimed at alleviating extreme poverty and

Image: Min for Env & Nat Resources, Dominican Republic

The Dominican Republic has launched a reforestation project focused on planting two million trees across the country

natural resource degradation in the five provinces bordering Haiti (Montecristi, Dajabón, Elías Piña, Independencia and Pedernales) and along the Haitian counterpart. This sub-programme includes the planting of wood and fruit trees by the brigades working on both sides of the border, creating green jobs for the future, for both Dominicans and Haitians. During the period 2008-2011, it resulted in the reforestation of 28,400 hectares the planting of 34 million trees and the creation of more than 5,000 green jobs, through which these people have overcome extreme poverty.

Overall planting carried out under the National Plan Quisqueya Verde from 1997 to 2011 involved the introduction of 108 million seedlings over 88,000 hectares. All this has been implemented with the National Budget funds.

As part of the strategy in the implementation of the Plan, we have developed a Pilot Payments for Environmental Services (PES) Project addressing Payment for Environmental Water Basin Services in the largest water basin in the country, the 7,000 km^2 Yaque del Norte River.

The objective of PES is to contribute to the conservation of the Yaque del Norte River through environmental payment services, in order to maintain the sustainability of the quality and quantity of the water resources, while collaborating in the improvement of the living conditions of forest owners who intend to apply conservation practices.

To ensure these services, we have implemented three target areas: rates of compensation or payments, change in land use (reforestation) and management to address the issue of pollution.

This initiative has allowed the application of an agency management model involving the Ministry of Environment and Natural Resources, the hydroelectric power company and the Santiago Water and Sewerage Corporation. The second major province in the country provides financial resources on a voluntary basis, up to an annual amount of 10 million pesos in total for the project.

So far the PES benefits 22 owners and holders of forested land, under the terms of protection of forests and agroforestry (coffee), located in the communities of La Pelada, Los Dajaos and Arroyo El Dulce of the city Jarabacoa, in the Province of La Vega in the northern region of the country.

The experience of this project is evidence of the unity of three public institutions driven by a common cause in welfare of citizens. It has generated technical knowledge and skills adapted to the Dominican reality, allowing for the establishment of a management model that can be replicated in other areas of the country and help establish a national PES for the Dominican Republic.

Quisqueya Verde provides a framework for the implementation of national forest policy, in order to increase and preserve forest resources and promote sustainable management of natural forests and forest plantations according to a management plan. The Forest

Image: Min for Env & Nat Resources, Dominican Republic

The Yaque del Norte PES project has generated technical knowledge and skills adapted to local conditions

Management Plan is an instrument required by law to authorize the appropriate actions.

During the 1970s, the residents of rural areas had become the enemies of trees and natural forests, as farmers and farm owners did not allow the growth of pine (*Pinus occidentalis*) on their properties. However, the option of managing the natural forests in a sustainable way has changed this attitude. Today, forest landowners preserve this resource, as it represents a source of income.

In June 1997, the first forest management plan was started in the municipality of Restauracion, Dajabón Province, on the border with Haiti, in the project of the conservation and management of the Sabana Clara forest. In subsequent years, the first forest inventories and private forest management plans were produced and harvests began in 2001. From 2003, a boom in forestry activities was seen in the municipality. At the moment, the area under forest management in the municipality is 5,797 hectares, distributed across 193 management plans, making this activity an important source of income for the 6,938 urban residents and the 8,333 rural residents of this town.

According to a 2010 study of use and land cover in the Artibonite River Basin (DIARENA 2011), which analysed satellite images from 2003 and 2010, the area of forest cover in this county experienced an increase of 12.76 per cent for the period analysed.

Forest management in the area has significantly helped to reverse the exodus of the rural population to urban centres, as some owners who had left have returned to carry out forestry activities on their properties. It should be mentioned that the forestry sector in the municipality of Restauración generates 1,140 direct jobs, 900 at the farm (harvesting, reforestation and other activities) and around 230 in the small industries that process local timber production.

Also in the study, it was considered important to know the identity of those who manage their forests, how and why they take decisions and what ecological, social and economic aspects of sustainable forest management affect individual cases. For this reason, seven case studies were conducted at forest plantations located in the municipality.

The surface area of the cases under study varied between 44 and 315 hectares. All farms under evaluation had managers with at least six years' experience in management of their forests. By analysing each case, it was revealed that farmers and producers had substantially improved their income, earning on average RD$5,596.62 (US$144.00)/ha/year net income, depending on the quality of the forest. They were optimistic about the forest's potential and aware of its importance in the production of goods and services for present and future generations.

Sustainable forest management in forests and the equitable distribution of the benefits have become important tools to fight poverty and create opportunities for the local communities in the Dominican Republic in their efforts to achieve sustainable development.

Sustainable development in Kuwait

Salah Mudhhi Al-Mudhhi, Environment Public Authority, Kuwait

The twenty-first century is a time of unprecedented change, with global pressures impacting society and the natural environment. Challenges include rapid economic development and population growth, increasing demand for food, water and energy, scarcity of water resources, particularly in the Arabian Gulf region, degradation of land and water quality, and global and regional climate changes impacting water availability, soil quality and marine productivity.

In addition, there is increasing risk from the impacts of major natural and man-induced disasters and hazards such as floods, earthquakes, storms, droughts, sea-level rise, greenhouse gas (GHG) emissions, endangered plant and animal species, degradation of land areas and ecosystems caused by wars, and accidental spillage and discharge of crude oil, untreated industrial waste and sewage water into the marine environment. Sustainable development has become the first priority of governments in most countries as they seek to conserve the Earth's resources for future generations.

At the Earth Summit Conference in Rio de Janiero in 1992, the late Amir of Kuwait His Highness Sheikh Jaber Al-Ahmed Al-Jaber Al-Sabah expressed the keen interest of the Kuwaiti Government and people in developing a society that enjoys well-being, safety and security while conforming to local, regional and international agreements, laws and regulations on the protection of the environment.

Kuwait's policy for the sustainable development of society and protection of its environment has manifested itself in several ways. Funds have been allocated for future generations and in 1995, the Kuwait Environment Public Authority (KEPA) was established[1] to:

- Set and implement strategies, policies and plans to safeguard Kuwait's environment
- Combat and control environmental pollution
- Cooperate and coordinate with all relevant organizations to draft laws, prepare legislation and promulgate regulations to ensure environmental safety, protection and development
- Ensure sustainable development of the environment and society.

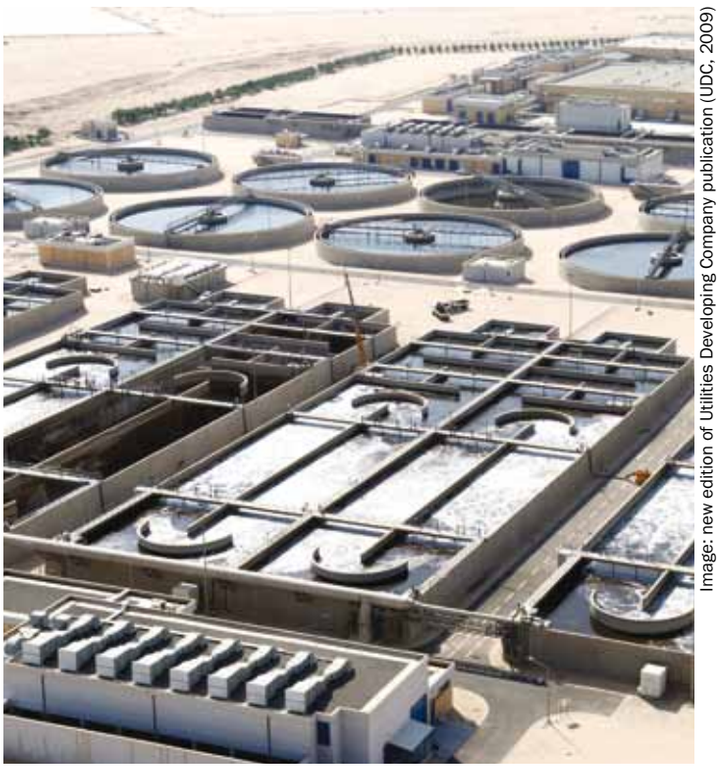


Image: new edition of Utilities Developing Company publication (UDC, 2009)

Aeration tanks and secondary clarifiers

Image: new edition of Utilities Developing Company publication (UDC, 2009)

Aerial view for Sulaibiya Plant

An Executive Bylaw (known as Decision 210/2001) was issued including environmental regulations and standards,[2] and the new Environmental Law of Kuwait was submitted for approval to the Kuwaiti Parliament. The Agenda 21 Programme has been implemented, covering Kuwait's most important achievements in sustainable development.[3] In addition, the Environmental Strategy of the State of Kuwait[4] was established, and 14 major international agreements were ratified between 1992 and 2006. Almost 80 per cent of these agreements have been implemented through KEPA environmental laws, regulations and standards and through national action plans and programmes.

KEPA has collaborated with relevant Kuwaiti governmental organizations and academic and research institutes to set new strategies and policies with the aim of achieving the following national goals:

- Reducing and, where feasible, eliminating atmospheric emissions and release of pollutants to water and land through environmental compliance of all industries. This is backed by online monitoring programmes linked to a GIS-based Environmental Monitoring Centre in KEPA, and enhanced by action plans to establish a National Emission Inventory and build emergency and central industrial wastewater (IWW) treatment plants
- Transferring knowledge to remediate soils and land areas heavily contaminated with crude oil, and rehabilitate marine areas heavily impacted with large untreated industrial and sewage water discharges
- Encouraging private sector investment in areas related to environment protection, such as the rehabilitation of old landfills and contaminated soils
- Encouraging public and private sector research and investment in areas related to renewable energy source development, water conservation and efficiency, water recycling and treatment and recharging groundwater aquifers
- Establishing the Green Buildings concept and technology in Kuwait
- Reducing GHG emissions in accordance with the Copenhagen Accord evolved from the United Nations Framework Convention on Climate Change.

Examples of national goals recently achieved or expected to be accomplished in the near future are summarized below.

Zero discharge of industrial wastewater

Between 2003 and 2008, around 1,200 million gallons a year of IWW were dumped illegally by factories from several industrial areas in four operating municipal solid waste (MSW) landfill sites and one closed landfill (Al-Wafra in the south-west). Around 4 million tons of MSW are received annually.[5] To address this, the following measures were taken in 2007-2011.[6]

Treating all IWW illegally dumped in landfills

In 2009 the National TRIO Committee rehabilitated Al-Wafra Road Landfill to receive all IWW illegally dumped in landfills for treatment. In 2010, the committee commissioned Al-Wafra Emergency Treatment Plant to treat large quantities of IWW dumped in landfills; the plant is designed to receive 15,000 cubic metres of IWW a day.

Treating IWW in industrial installations

Between 2006 and 2009, the Kuwait Public Authority for Industry (KPAI) issued three directives urging all factories

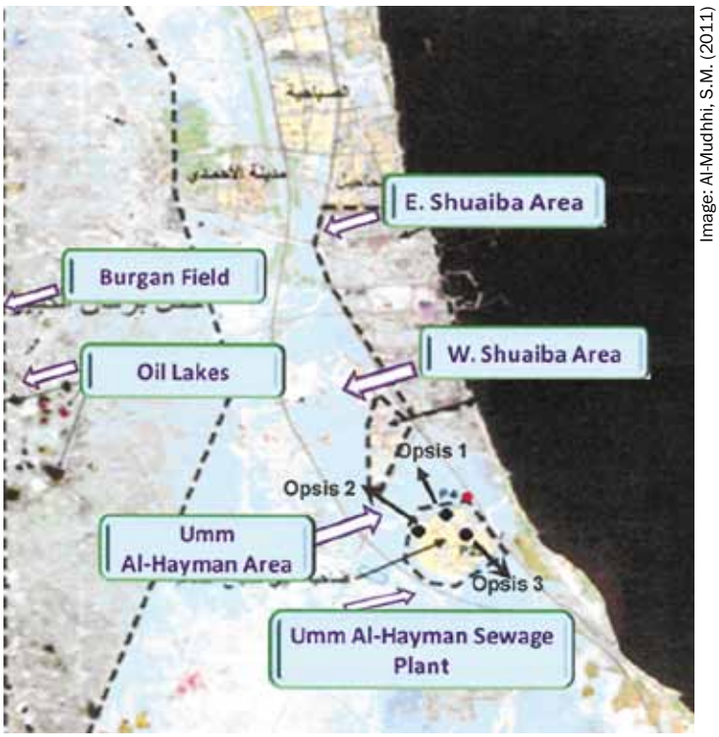


Image: Al-Mudhhi, S.M. (2011)

Possible sources of air pollution to Umm Al-Hayman residential area (Opsis 1-3: KEPA air monitoring stations)

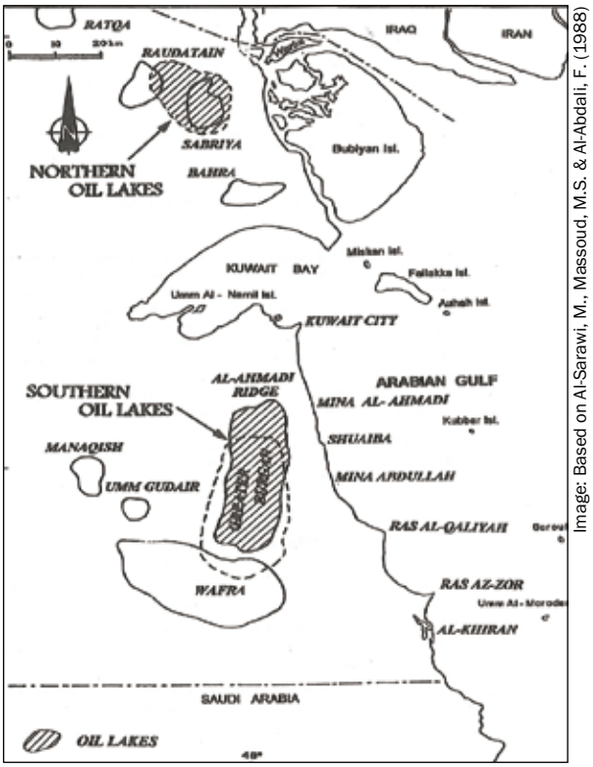


Image: Based on Al-Sarawi, M., Massoud, M.S. & Al-Abdali, F. (1988)

Map showing oil fields and areas contaminated with oil lakes in Kuwait

Image: Al-Yousifi, A.G. (1998)

Dead vegetation floating on the surface of oil lakes

Image: Al-Yousifi, A.G. (1998)

Dead palm trees and black soils heavily impacted by oil puddles in a desert oasis

to collect sewage and IWW into two separate pits, and to install onsite IWW treatment plants.

During 2009-2010, KEPA inspected 125 factories in the W. Shuaiba industrial area, a suspected source of pollution to the nearby Umm Al-Hayman residential area. It imposed heavy penalties on 80 factories violating KEPA environmental laws, regulations and standards. In order to reach settlement with KEPA, these factories must ban the discharge of IWW in the national sewage network and rain outfalls, install onsite IWW treatment units or closed loop systems, and reuse treated IWW to irrigate aesthetic plants within the factory premises.

KEPA also set a detailed three-phase plan to improve environmental conditions in the southern region of Kuwait, including:

- Relocating factories with heavy and medium impacts on pollution to new remote industrial areas
- Installing central IWW treatment plants in these new areas
- Establishing a National Fund for Environmental Compliance
- Evaluating existing environmental conditions and preparing online monitoring programmes for all factories.

In 2009-2010 the Ministry of Public Works (MPW) upgraded the Umm Al-Hayman wastewater tertiary treatment plant to treat the IWW generated from factories.

Remediation of areas damaged by oil burning

Over 600 oil wells in Kuwait's northern and southern oil fields were set on fire by retreating Iraqi troops in 1991, and wells that were not set alight gushed oil over a seven-month period. Around 60 million barrels (mmbbls)[7] of oil were spilled over topsoils in the oil fields, forming 200-300 oil lakes.[8] Severe weathering and evaporation caused an increase in the viscosity and density of the crude oil in these lakes, which led to compositional stratification[9] and an increase in persistent carcinogenic high-ring polyaromatic hydrocarbon (PAH) content.[10]

The latest estimates by the Public Authority for Assessment of Compensation for Damages (PAAC) show that the oil lakes cover about 114 square kilometres, and a total 100 million cubic metres of soils are contaminated by a heavy oil sludge layer known as tarcrete, under which a thick layer of crude oil exists.[11] The soils also became saline due to their flooding with around 1.5 billion gallons of seawater used in extinguishing oil fires, and suffered from severe compaction by military machinery.[12]

Oil lakes had lethal toxic effects on many species of flora and fauna. The vegetation cover was completely destroyed in areas inundated by the lakes, while 25-100 per cent of plants and animals were killed in areas covered by oil mist.[13]

In addition to the oil lakes, over 4 million tons (about 25 mmbbls) of oil fallout from the smoke plumes of oil-well blowouts and fires were deposited over approximately 1,000 square kilometres of soil, mainly along the coastline between Kuwait and Bahrain. The smoke plumes and soot fallout coated vegetation, reduced the yield of Kuwait's main crops, increased acid deposition and contamination with chemical pollutants such as PAHs and trace metals, and reduced solar radiation.[14] Groundwater pollution was recorded recently in the northern deeper water level aquifer (20-30 metres) in areas contaminated with oil lakes.[15]

Cost-effective technologies for treating oil-contaminated soil

In July 1994 and November 2004 the Kuwait Institute for Scientific Research (KISR), Japan Petroleum Energy Center and Kuwait Oil Company (KOC) carried out pilot studies on two sites of oil-contaminated soils and wet tarcrete sludge contamination in the Burgan oil field. The sites were successfully treated with four different biore-

Major international environmental agreements ratified by the State of Kuwait 1992-2006

1.	Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985
2.	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987
3.	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990
4.	Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Copenhagen, 1992
5.	Amendment to the Montreal Protocol on substances that Deplete the Ozone Layer, Montreal, 1997
6.	Amendment to Montreal Protocol on Substances that Deplete the Ozone Layer, Beijing, 1999
7.	Basel Convention on Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Basel, 1989
8.	Stockholm Convention on Persistence of Organic Pollutants, Stockholm, 2001
9.	Rotterdam Convention for the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam, 1998
10.	UN Framework Convention on Climate Change, New York, 1992
11.	Kyoto Protocol to the United Nations, Framework Convention on Climate Change, Kyoto, 1997
12.	UN Convention on Biological Diversity, Rio de Janeiro, 1992
13.	The Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973
14.	UN Convention to Combat Desertification in Those Countries Experiencing Drought and Redesertification, particularly in Africa, Paris, 1994

Source: KEPA, Kuwait (2009)

mediation methods and a mixture of indigenous microbial strains and nutrients.[16]

Soil washing technology, high temperature thermal dispersion and landfilling are among the other remedial technologies and methods that have been thoroughly bench-scale tested and evaluated.[17]

The Kuwait Environmental Remediation Programme

In May 1991, PAAC was established to assess the losses and damages resulting from the Iraqi invasion and occupation and assist claimants in preparing their claims before submitting them to the United Nations Compensation Commission (UNCC).[18]

On 8 December 2005 the UNCC Governing Council issued Decision No. 258, with around US$3 billion of funds awarded to a group of remediation/restoration projects for the environmental damages caused in Kuwait by the 1990-1991 Gulf War.[19]

Established in 2006, the Kuwait National Focal Point (KNFP) provides a point of contact between UNCC and the main stakeholders in Kuwait (Ministry of Defence, KEPA, Public Authority for Agriculture and Fish Resources, and KOC). It is mainly responsible for planning and supervising the implementation of the Kuwait Environmental Remediation Programmes (KERPs) by developing phasing plans and terms of reference for remediation/restoration contracts, setting terms for the organizations engaging field contractors, prioritizing implementation of projects and managing financial resources.

On request from KNFP, the Office of Consultation and Career Development in the Kuwait University College of Engineering recently set a Programmatic Management Plan to guide the implementation of KERPs.[20]

Al-Sulaibiya Wastewater Treatment and Reclamation Plant

Following a massive fish kill event (around 150 tons) in the northern coastal waters of Kuwait Bay in mid 1999, KEPA formed a permanent National Emergency Committee to study and follow up the fish kill and red tide (algal bloom) phenomena.

The committee implemented an action plan to minimize the discharge of nutrient-rich raw sewage water into sea waters by reducing the number of existing sewage pumping stations to two new stations, upgrading the existing three wastewater secondary treatment plants to tertiary treatment plants, and encouraging the private sector to invest in building a modern, large-capacity wastewater treatment plant in Al-Sulaibiya area.[21]

Accordingly, in 2002 the Utilities Developing Company (UDC) built Al-Sulaibiya Wastewater Quaternary Treatment and Reclamation Plant, one of the largest of its kind in the world. The plant initially treats up to 375,000 cubic metres of raw domestic wastewater per day — almost 60 per cent of Kuwait's total. Over the next 30 years, it is gradually expected to reach a capacity of 600,000 cubic metres a day using reverse osmosis (RO) technology.[22]

A detailed research project, funded by the Kuwait Foundation for the Advancement of Sciences and KEPA, has been implemented by a team of researchers in the KISR to study in depth the effect of using RO-treated wastewater on soil and groundwater at Al-Abdally farms in northern Kuwait.[23]

Al-Abdally is the second-largest area of agricultural land in Kuwait. Farmers have used brackish groundwater for irrigation for 50 years and, over the past 21 years, the overpumping of groundwater for agricultural use has lowered the water table by between 1.6 and 6.0 metres (about 3.8 metres on average). Continuous pumping of groundwater since 1963 has also significantly increased groundwater salinity, leading in turn to an increase in soil salinity.

Al-Qallaf and others[24] have drawn the following conclusions from their detailed field investigations and laboratory analyses:

- RO-treated wastewater is good for irrigation in Al-Abdally farms due to its low salinity, but fertilizers should be used to compensate for the water's low nutrient content
- The use of RO-treated wastewater in irrigation leached out the salts and lowered soil salinity

Image: new edition of Utilities Developing Company publication (UDC, 2009)

Preliminary treatment and pumping station

- The organic contents of soil in the areas irrigated with RO-treated wastewater are higher than those from areas irrigated with groundwater, indicating derivation of additional organic matter from the treated wastewater.

The authors strongly recommend the use of RO-treated wastewater in agricultural activities due to its ability to reduce and prevent the deterioration of soil and groundwater. They also recommend that the results of their study are used as baseline information for a comprehensive scheme to conserve water resources, recharge groundwater aquifers and sustain agricultural activities in Kuwait.

Renewable energy for power generation

The Ministry of Electricity and Water (MEW) provides Kuwait with electrical power and fresh (distilled) water supplies through five power and desalination plants (PDPs) built along the Kuwaiti coastline. The plants are fuelled mainly by gas oil which is heavy and high in sulphur content, thus providing a source of air pollutant emissions, particularly sulphur dioxide.[25]

Kuwait has one of the world's highest per capita power and freshwater consumption rates, with growing demand for both. The estimated total additional power load and amount of water required for State projects up to 2020 are 10,000 MG and 250 million imperial gallons per day (MIGD), respectively.[26] Consequently, the Kuwaiti Government plans to double the installed capacity to 26,000 MG of electricity and 1,000 MIGD of water by upgrading and building new PDPs.

MEW is also keen to develop alternative clean energy applications to address the energy shortage, reduce the emission of harmful gases and conserve energy. It has implemented and/or funded projects[27] including:

- Applying rooftop polyvinyls (PVs) to MEW and MPW buildings (project tendered March 2011), and to old government and school buildings (project tendered in March 2012)
- A feasibility study by Toyota Tsusho Corporation to build a Solar Combined Power Station with a total capacity of 280 megawatts — including 60 megawatts from solar source. The project was tendered in March 2012
- A pilot study by KISR researchers, in collaboration with consultant Lahmeyer International, to select the best solar systems for Kuwait conditions. Based on the study recommendations, MEW will build the first power generation plant, with Phase 1 producing 10 megawatts of wind, 10 megawatts of photovoltaic (PV) and 50 megawatts of concentrated solar power.[28]

Green Buildings

In November 2010, KEPA formed the National Committee of Green Buildings, which gathers together all governmental ministries and organizations, academic and research institutes, and private companies and consultancy/engineering offices dealing with the Green Buildings (GBs) concept.

The committee aims to lay the foundation for an applicable scope concept for GBs in Kuwait, to establish a local movement for GBs that are friendly to the environment, save energy and water and reduce GHG emissions reducing, and to set a local code compatible with international standards and backed by incentives to encourage investment from individuals and the private sector.[29]

As a member of the National Committee, the Kuwait Municipality formed a committee in July 2011 to review current construction codes and introduce a new code for GBs. The National Committee has also formed working groups to set and implement action plans and programmes with specific time schedules and establish GB culture and technology in Kuwait.[30]

Goals for sustainability

In addition to the national goals and achievements described above, a wide range of goals is planned to be accomplished over the next five to ten years, including:

- Rehabilitating heavily impacted marine areas and ecosystems
- Developing integrated management programmes/systems for air quality, coastlines and chemicals
- Developing national schemes/programmes to reduce GHG emissions
- Rehabilitating 17 closed landfills using modern methods such as waste-energy technologies
- Ensuring environmental compliance of oil companies through carefully planned programmes
- Enhancing proven oil and natural gas reserves
- Wide use of renewable energy as the main source of power generation
- Establishing GB technology.

These goals provide compelling evidence of the commitment of the State of Kuwait to the sustainable development of its society and the protection of its environment. Indeed, sustainable development has become a way of life in Kuwait.

A regional initiative within the Pacific Oceanscape Framework

Kevin Arthur Saimasina Thomsen, Director, Strategic Partnership and Coordination Programme, Pacific Islands Forum Secretariat

The Pacific Oceanscape Framework (POF) was first proposed by the Government of Kiribati in 2009 and later endorsed by leaders at the Pacific Islands Forum meeting in 2010. The POF is considered the catalyst for implementation of our Pacific Islands Regional Oceans Policy, which aims to protect, manage and sustain the cultural and natural integrity of the ocean for present and future generations and for the broader global community. The overall intent of the POF is to foster stewardship at all levels "to ensure in perpetuity the health and wellbeing of our oceans and ourselves."[1]

The POF seeks to address six strategic priorities identified for immediate implementation, namely:

- Establishing 'jurisdictional rights and responsibilities'
- Fostering 'good ocean governance'
- Supporting 'sustainable development, management and conservation'
- Promoting 'listening, learning, liaising and leading'
- Sustaining action and facilitating adaptation to a rapidly changing environment.

Economic rationale

Pacific Island nations depend on the ocean and its resources for daily sustenance and livelihoods, alongside its role as the mainstay of their national economies. Strategies for enhancing macroeconomic stability and future growth prospects include effective management of coastal and oceanic fisheries and maximizing of sustainable economic returns from fisheries resources.[1] These strategies are central to the sustainable development aspirations of Pacific Island economies and community well-being. For some, aquatic resources within their 200 nautical mile exclusive economic zones represent the only significant renewable resource and the best opportunity for economic development.[2] The region hosts the world's largest remaining tuna stocks and provides around half the global catch of tuna.[3] The 2010 catch was estimated at 2,421,113 tons[4] with a landed value of about $4.5 billion.[3] Offshore foreign-based fishing is responsible for around half the value of fisheries in the region, with locally based offshore operations accounting for about one-quarter of the value (mostly due

Image: PIFS – Kiribati

Threatened reefs within the Pacific Islands are among the most pristine in the world

Image: PIFS – Nauru

Reclaiming ocean stewardships is important for livelihoods

Image: PIFS – Kiribati

Pacific Islanders depend on the ocean for daily food

to the growing Papua New Guinea fleet).[3] Aquaculture, coastal commercial fishing and subsistence fishing make up the remaining quarter.[5] Of the multibillion dollar tuna fishing revenues, the Pacific Islands' capture contributes only six per cent, with fishing contributing $550 million each year to Pacific Island economies and coastal fishing — subsistence and commercial — that account for half this total.[2]

Why the region is a priority

In addition to the unparalleled importance of marine resources for the economic growth and sustainability of the Pacific Island nations along with global fish provision, the region boasts much of the world's remaining healthy reefs and associated biodiversity, but it is also recognized as a unique and threatened ocean and island ecosystem. Overall, the area's marine biodiversity is thought to be among the most intact, robust and pristine in the world, with almost half the world's hard coral reefs located in this region.

Threats

With fish stocks declining due to overfishing and illegal, unreported and unregulated fishing, ocean acidification, rising sea levels, warming ocean temperatures as a result of climate change and pollution, the oceans are now changing rapidly in ways that degrade the islanders' lives and threaten their very existence. This series of threats to ocean health and its resources results from a piecemeal approach to ocean management, which is largely driven by economic sectors such as fisheries or mining.

Opportunities

Addressing these threats requires taking concerted action on an ocean-wide scale, which the Pacific Islands region is uniquely prepared to do by using its unparalleled cooperative and collaborative mechanisms, most notably the Pacific Island Leaders Forum, which in 2011 unanimously endorsed the Pacific Oceanscape Framework as the mechanism for "securing the future for Pacific island countries and territories based on sustainable development, management and conservation of our Ocean." The Framework identifies the following strategic priorities for the region:[6]

- Establishing jurisdictional rights and responsibilities over maritime zones
- Setting policies and plans of action for promoting sustainable management and developing our ocean and its resources
- Putting policy into action in reclaiming stewardship of the ocean as core to our island livelihoods in a rapidly changing world
- Seeking ocean leadership based on further enriching our culture and reinforcing our identities while sharing and learning with others
- Building self-reliance through nationally cost-effective solutions, while realizing the value of regional and international partnership
- Seeking opportunities for adapting to and mitigating the impacts of climate change, climate variability, sea level rise, extreme events, and environmental and economic change.

Leveraging potential

Working in cooperation to design and implement this important initiative are 16 sovereign island governments, six territories, all regional intergovernmental agencies and the conservation community. In addition to fostering bold and innovative action — such as the Cook Islands' declaration of more than half the nation's EEZ as a marine park — the Pacific Oceanscape provides a consolidating framework for a number of ongoing regional and sub-regional initiatives and agreements. These include the Micronesia Challenge and Nauru Agreement to close encompassed high seas to fishing, piloting Kiribati's Phoenix Islands Protected Area 'reverse fishing license' mechanism for creating large fish reserves without losing fishing access revenues of critical importance to national economies, and efforts towards improving fisheries management through Marine Stewardship Council certification and International Seafood Sustainability Foundation engagement.

The promise of the ocean

Ms. Svandís Svavarsdóttir, Minister for the Environment and
Mr. Steingrímur J. Sigfússon, Minister of Fisheries and Agriculture, Iceland

The ocean is in many ways the last frontier on Earth, a vast part of our home planet still harbouring mysteries even as we are exploring the farthest reaches of our solar system. We are aware of 200,000 marine species, but there may be more than 10 times that, as yet undiscovered. But we have long since crossed this frontier and are affecting the marine environment in countless ways. Although the impact is less visible than that on dry land, pollution, acidification and over-exploitation of living marine resources mean that the effect is often much worse. However, the ocean is also a place to look for solutions to many of humankind's problems, from food security to energy. We must get to know the oceans better, not only the vulnerabilities of their ecosystems, but also the opportunities they present.

More than a billion people rely primarily on protein from the sea for nutrition. Seafood is important not only for basic sustenance, but also as an excellent source of quality nutrients such as minerals, vitamins and fatty acids. We have millennia of experience in agriculture, but only a relatively brief history of large-scale utilization of fishery resources. With a growing population and mankind struggling to reduce hunger and meet the Millenium Development Goals, a sensible way of managing fisheries is to make ocean affairs a clear priority. Aquaculture is a promising way to boost food supply in many regions, but needs to be developed without degrading the environment. We must also pay heed to the underlying health of marine ecosystems as providers of countless benefits we take for granted, from carbon sequestration to human recreation.

Image: Hugi Ólafsson

Vestmannaeyjar harbour. Sustainable fisheries are a key to long-term prosperity and well-being in Iceland

In Iceland, marine conservation and sustainable use of ocean resources is not only a matter of good policy and respect for the environment, it is an essential cornerstone of the nation's livelihood and welfare. The country's transition from poor nation to modern welfare society in the twentieth century is attributed to the rich fishing grounds surrounding the island, meaning that collapse of the fisheries would have a catastrophic impact on the nation's economy and society.

Iceland has put in place a system of sustainable fishing where individual vessels are allocated a strictly-enforced quota from the total catch — based on scientific advice — an approach designed to ensure the long-term health of fish stocks and to encourage maximum economic yield. This model requires state-of-the-art scientific monitoring and a robust enforcement mechanism, along with continued general consensus among stakeholders and decision makers that long-term sustainability of fisheries matters more than the short-term profits achieved through overexploitation. Although this is not a perfect system and the subject of constant debate in Iceland, the vast majority of the population want to adhere to the basic principles of sustainable use, scientific underpinning and economic viability of the fishing industry.

Iceland believes that as a fisheries-based economy aiming for sustainable management of living marine resources, its experience is relevant to others. Coastal developing countries in particular face the problem of managing their fish stocks with inadequate infrastructure and resources, easily leading to valuable resources being diminished by local or foreign fleets. In this respect research and development is imperative, as is effective capacity-building and training.

The United Nations University Fisheries Training Programme was established in Iceland in 1998, to help interested countries achieve their fisheries development goals by training professionals from developing countries in various fields of fisheries and aquaculture management. About 260 fellows have so far completed this postgraduate training in Iceland.

Numerous encouraging examples of well-managed fisheries employing various systems and methods exist

Image: Hugi Ólafsson

Fishermen in Cape Coast in Ghana. Fisheries are a source of employment, sustenance and quality nutrition to hundreds of millions of people

in all parts of the world. They are, however, too few. It has been estimated that the economic cost of fisheries mismanagement globally amounts to more than US$50 billion a year. Yet this does not reflect the human cost, as well-managed fisheries could massively boost food security, nutrition and coastal societies in many parts of the world.

The sea is not only a source of fish for consumption. It is the cradle of life on Earth, supporting a vast and complex ecosystem which we know less about than terrestrial life. We need to ensure its future by putting a stop to pollution and other destructive human practices. Although significant progress has been made on many fronts which can be built upon, we face immense challenges. The time when the ocean was seen as a vast garbage can has long passed. We have taken many important steps to reduce pollution from ships and to stop dumping waste into the sea. Chemical pollution of the ocean has also been reduced under the auspices of the Stockholm Convention on Persistent Organic Pollutants and other multilateral instruments. Yet we cannot maintain we have turned the corner on marine pollution, most of which comes from the land, where sewage treatment struggles to keep up with a growing population in coastal areas. The richest ecosystems and fisheries are more commonly found along coasts and in shallow waters, where human impact is more keenly felt.

Important for protecting oceans from land-based activities and tackling upstream sources of pollution, The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities of the United Nations Environment Programme recently launched a partnership to combat marine litter — a growing concern among scientists and policymakers — and should be strengthened in its efforts.

But the most pressing problem facing the oceans now may be climate change and the increasing carbon concentration in the atmosphere and hydrosphere. The retreat of Arctic sea ice is more rapid than previously predicted and is likely to have a profound impact on ecosystems and human activity in the northernmost part of the world. Ocean acidification is of growing concern and we still have poor understanding of how it could affect marine organisms and ecosystems. What we do know is that acidification will steadily increase in tandem with the runaway increase in carbon emissions, which will have an enormous impact on marine life, so combating greenhouse gas emissions (GHGs) is one of the key actions to keep our oceans healthy. One way to curb GHGs is to use the power of wind and ocean waves, a vast but almost untapped source of energy in currents and tidal flows, which awaits our ingenuity to mitigate climate change.

Acidification is a particularly severe threat to organisms with shells and exoskeletons made of calcium carbonate, including shellfish, many plankton species and corals. Tropical coral reefs are often called the rainforests of the oceans due to the wealth and variety of life they support, but corals are also found in cold waters, including those around Iceland. Ten coral areas in Icelandic waters are now protected, along with two undersea hydrothermal vents. These areas are being designated Marine Protected Areas (MPAs), but many more are protected from fisheries on a temporary or

Image: Hugi Ólafsson

Seas – the future

near-permanent basis, so the number of permanently designated MPAs gives a limited picture of the extent of conservation in Icelandic waters.

Efforts in preventing pollution and conserving biodiversity in the ocean need to be expanded, while sustainable development requires us to look further at the opportunities offered by huge expanses of sea. Well over a third of the ice-free part of dry land is used for agriculture, but a growing human population, with an increased appetite for meat and other animal protein, demands increased food production. In 2050 there will be more than 9 billion people inhabiting Earth and we need about 70 per cent more food than we currently produce to feed them and eliminate hunger. This intensifies pressure on rainforests and wetlands, along with other important and productive land-based ecosystems.

Capture fisheries now provide a little over 80 million tons of fish from the sea, the importance of which should not be overlooked. To produce meat for replacing annual fish landings would require almost 140 million km^2 of grazing land, which is more than 20 times all the rainforests on the planet.

Improvements in the way fisheries are managed might increase this yield, but it seems unlikely they can expand significantly, so it is worth ensuring poor management does not cause them to shrink further. We have learned that fisheries must take account of the biosphere as a whole to avoid disrupting food chains and vulnerable ecosystems, or overexploiting resources. We must use the right tools in creating the right incentives for long-term stewardship of resources. Lifecycle assessments show that capturing wild fish is highly energy-efficient in comparison to raising land animals and produces only a fraction of the GHGs generated by animal husbandry.

In contrast to the reduction in landing captured fish, the rise in aquaculture has been remarkable and now constitutes almost 50 per cent of all fish intended for human consumption. There is no reason to believe aquaculture cannot continue its growth, relieving pressure on both capture fisheries and land use for food production. While fish farming has occurred for millennia, large-scale aquaculture is a recent phenomenon with concerns that need addressing, from pollution to sustainable feeding of farmed fish. Despite these challenges, it is likely the oceans hold the greatest promise in achieving sufficient and sustainable food production.

Portuguese-Spanish transboundary water management cooperation

Rui Rodrigues, Head, Water Resources Planning and Monitoring and Information Systems Joint Departments, Portuguese Institute for Water

The Iberian Peninsula in South-Western Europe separates the Atlantic Ocean from the Mediterranean Sea. About 44 per cent of its almost 600,000 km^2 area corresponds to river basins shared between Portugal and Spain. Due to prevailing westerly winds throughout the year, the incoming moisture induces both a decreasing gradient in specific flows from north to south and an increasing Mediterranean torrential component to the flow regimes.

In comparison with other European river basins further north, the annual average specific flows in the Iberian shared rivers are lower, although its specific flood flows are much higher. For instance: the 100-year flood flow in the Tagus downstream of the international reach is about 16,400 m^3 for an area of 60,000 km^2; the 100-year flood flow for the Rhine at the border between Germany and the Netherlands is less than 50 per cent of the former while its drainage area is 2.75 times larger; and for the Elbe at Dresden, the 100-year flood flow is almost 25 per cent of that of the Tagus with similar drainage areas involved.

During the twentieth century, several agreements were signed by both countries to allocate equitable amounts of water to each country's water projects. In the early decades of the century, the main objective determining the sharing of waters was power generation, focused only on stretches of river delimiting the border. However, eventually a more transboundary hydrographic scope was adopted and water transfer impacts were also considered.

At the end of the twentieth century, a more holistic approach was developed, in keeping with the Water Framework Directive that was then being negotiated between the European Union Member States and the European Commission. This meant the consideration of ecological status preservation as well as the restoration of shared waters.

The Water Convention signed in 1998 assigned for the first time minimum requirements, not only for the upstream country but also for the downstream country, in order to secure fresh water inflows to estuary ecosystems at river mouths.

Figure 1: The Iberian Peninsula and its river basins shared between Portugal and Spain

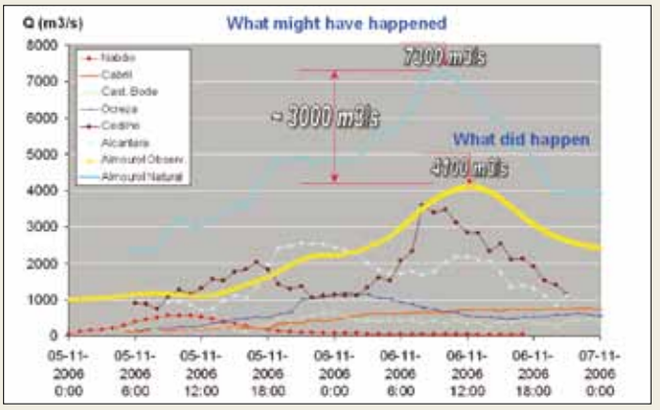
Source: National System of Information Resources

Example of verification of dry conditions in current hydrological year (2011/2012) for the Guadiana river basin

Final date of rainfall accounting procedure for hydrological year: 1 March
Weighted amount of rainfall collected in reference rain gauges within the basin: 142 mm
Minimum rainfall threshold (65 per cent of mean value from October to February): 182 mm
Total volume stored in upstream dams: 5574 hm^3 (= 5.57 cu. km)
Stored water thresholds (for total exemption:< 2650 hm^3; for partial exemption: >2650 ; <3150 hm^3)
Annual amount of flow due to downstream country in current year: 400 hm^3;

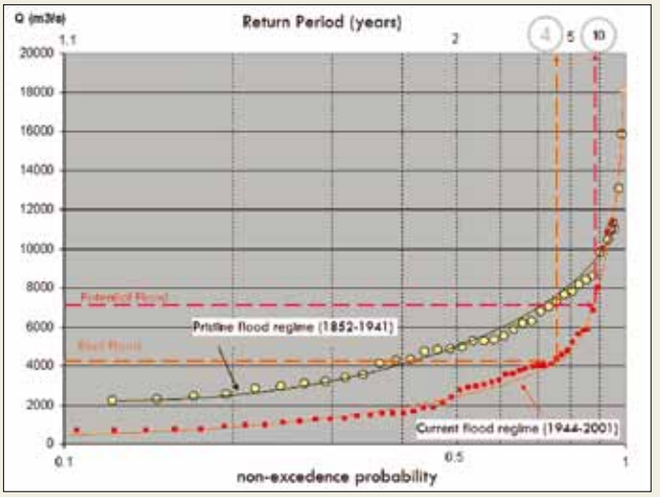
Source: National System of Information Resources

Figure 2: Peak flood attenuation of 3000 m^3/s occurred in November 2006 in the Tagus river basin due to the cooperation between upstream (Spain) and downstream (Portugal) countries



Source: National System of Information Resources

Figure 3: Statistical plot of flood regimes (pristine regime prior to upstream dam construction, and man-made altered since 1940s) and severity change in the November 2006 flood in terms of return period



Source: National System of Information Resources

For each of the four major river basins shared between Portugal and Spain, minimum assured flows were defined, at annual and three-month period scales, and for two of them, the flow regime was downscaled on a weekly basis.

All these minimum flows (annual, seasonal and weekly) might not be maintained in very dry years and exemption procedures were built for each river basin in order to define its applicability. In general terms, this is an accounting procedure based on rainfall in five- to eight-month periods within each hydrological year and its degree of compliance with minimum thresholds defined on certain percentages of the mean values. Since the torrential character of the flow regimes increases towards the southern basins, the exemption verifications in these situations are anticipated in time and become more complex, adding thresholds also to the previous year's rainfall or to the amounts of water stored in the upstream country in previous years. In practice, the flow continuum is taken into account in areas where man-made changes to the natural river regimes are substantial.

On top of these verifications there is a strong interchange of information coming from 13 rain gauges, 10 flow gauges and six reservoirs (with joint capacity of 7.25 km^3, that is, billions of cubic metres), mentioned in the text of the Convention and implemented de facto in the management routines of each country's water services.

This exchange of information is of vital importance in the verification of the Convention, especially for dry conditions. During the management of other extreme hydrological conditions, such as floods, the amount of information exchanged is substantially enlarged, due not only to hourly interchange timespans but also to the increasing number of rain gauges, flow gauges and reservoir inflows and outflows considered. All the information is made available through web server protocols.

In the management of floods in the Tagus river basin, cooperation is more developed than in other areas for historical reasons. Not only is there an exchange of data relevant for each country's flood management (flow data for the downstream country and rainfall data for the upstream country, since storm paths move inland from the ocean) but also, importantly, there is an exchange of the reservoir management strategy for a period of time. Due to this capability of cooperation, it is possible to lag and route flood components in such a way that peak flows are significantly attenuated, either by avoiding overlapping of flood components from tributaries or by adjusting downstream flow releases from reservoirs.

Figure 2 shows how a potential peak flow of 7300 m^3/s (light blue graph component) was attenuated to 4100 m^3/s (yellow graph component), reducing by more than 3000 m^3/s its severity.

Through this cooperation a ten-year return period flood was shortened to a four-year return period flood, carrying less damage downstream to the Tagus floodplain.

These examples of management cooperation during extreme weather conditions have become quite common since 1995. The good cooperative relationship built up around technical aspects was eventually transmitted to the political level and the partnership, which began informally in the technical field, was identified as an example of good practice and incorporated in the text of the Convention. A process that started with technical harmonization concerns as its driving force reached its conclusion in the political field with the achievement of a 'goodwill' text, leaving the fine-tuning of some technical details for further development during the implementation phase. The Water Framework Directive text was also an inspiring source during the discussion of the bilateral Convention.

Advancing environmental sustainability and sustainable ecological agriculture through community empowerment

Sarojeni V. Rengam, Executive Director, Pesticide Action Network Asia and the Pacific

Pesticides continue to negatively impact the health and lives of millions of agricultural workers, their communities and consumers worldwide as well as causing great damage to biodiversity and the environment. Farmers and agricultural workers are heavily exposed to pesticides and suffer a range of acute and chronic health effects while remaining tragically ignorant of their source. Pesticide impacts compromise people's ability to work, earn a living and conduct community and livelihood functions. Long-term chronic effects — including systemic damage and diseases, cancer, reproductive health problems and hormonal disruption — seriously threaten the long-term survival of rural communities. Impacts on women's health (and that of their children) are critical as the pesticides women farmers and workers spray are potentially toxic to the foetus. Endocrine disruption is particularly dangerous for unborn babies, affecting growth and formation and causing systemic and functional deficiencies and effects on future fertility.

Image: PAN AP

Pesticides have a variety of long-term chronic effects on the body

Pesticides, poverty, food and health are inextricably linked in a vicious cycle. With poverty, there is less ability to take action – for example, to seek treatment for health effects or switch to safer methods. Most workers are reluctant to report pesticide poisoning for fear of losing their jobs or experiencing retaliation, or because they cannot afford time off or medical costs. With farmers, the problems of pest resistance and resurgence intensify a heavy reliance on pesticides: resorting to more poisonous pesticides, increasing the amounts sprayed or using dangerous cocktails, all of which intensify health impacts. Many fall into severe debt and poverty to keep up with this increasing chemical use and crop loss. Highly hazardous pesticides also cause losses in the biodiversity which provides sources of food, health and livelihoods for many rural communities. Pesticide production is a multinational industry whose priorities are profits rather than the health of communities and the environment.

Pesticide Action Network Asia and the Pacific

Pesticide Action Network Asia and the Pacific (PAN AP) is the regional centre for PAN International, working with partners to tackle pesticide problems and advocate for alternatives. Over the years, PAN AP has evolved its own regional priorities, which include advancing food sovereignty for the people, particularly the marginalized sections of society, and promoting gender justice and environmental sustainability in the region. PAN AP has been supporting small farmers, agricultural workers, rural women and indigenous peoples in their struggles against pesticides that impact their health and the environment, against unsustainable agriculture and aggressive development, and against displacement and loss of livelihood. It seeks to strengthen people's movements for environmental protection, biodiversity-based ecological agriculture (BEA), food sovereignty, land rights and rural women's empowerment.

Towards these ends, PAN AP has built strong partnerships with peasants, agricultural workers and rural women's movements in the Asia Pacific region. PAN AP now comprises 108 network partners in the region and has links with about 400 other civil society and grassroots organizations, regional and global.

Image: PAN AP

Indigenous farmers preparing a hill rice plot for sowing during the BEA training in Sabah

PAN AP's strong pesticides programme challenges the power of the agrochemical companies and small farmers' dependency on pesticides, while empowering communities to work towards the reduction and elimination of pesticide use. The programme rests on four complementary strategies:

- Community empowerment through Community-based Pesticide Action Monitoring (CPAM)
- Policy research and advocacy
- Campaigns addressed at targeted pesticides and companies
- Institution-building and alliance-building towards these ends.

CPAM, a self-surveillance monitoring and recording methodology developed by PAN AP and its partners, enables communities to measure the effects of pesticides on their health and the environment and take actions to reduce or eliminate pesticide use. Based on participatory action research, this comprehensive programme helps communities to document the adverse impacts of pesticides, raising awareness and motivating them to adopt ecologically sound and sustainable agricultural practices. Further, it prompts them to pressure governments and campaign for better pesticide regulation and implementation of international conventions on pesticides.

In the past 10 years, learning exchanges and capacity-building workshops have been organized and CPAM surveys carried out in several countries including Cambodia, China, India, Indonesia, Korea, Malaysia, Mongolia, Philippines, Pakistan, Sri Lanka and Vietnam. The results were compiled and discussed at national and international meetings, stressing the need for national and global action.

The year 2010 saw the release of the landmark Asian Regional Report (produced by 12 organizations from 8 Asian countries), followed by the Communities in Peril: Global Report on Health Impacts of Pesticide Use in Agriculture. A significant outcome of these reports and the folow-up media reports made the United Plantations, a Danish plantation company operating in Malaysia and Indonesia, phase out the use of two HHPs, paraquat and monocrotophos, from their plantations. In India, PAN AP partner Thanal and the local community in Kasargod were successful in their actions to stop the health and environmental devastation caused by the HHP endosulfan after more than 10 years.

PAN AP provided extensive documentation on the severe health and environmental impairments caused by endosulfan, which was widely used in Asian and other developing countries, to the Conference of the Parties (CoP) to the Stockholm Convention on Persistent Organic Pollutants (PoPs). Following strong worldwide campaigns by PAN and various groups, in 2011 CoP finally recognized endosulfan as a PoP, leading to a ban on its manufacture and the phasing out of its use worldwide. Further, in 2011, paraquat was recommended for inclusion in the Rotterdam Convention, which requires prior informed consent for trade in certain hazardous chemicals. The Governments of Sri Lanka, Malaysia and China have been reviewing the impact on health of certain HHPs, particularly endosulfan and paraquat.

Promoting ecological agriculture

With CPAM creating strong awareness among farming communities, many of them not only pledged to reduce pesticide use, but also wanted to move towards farming without chemicals — that is, towards organic or ecological agriculture. After the CPAM process, PAN AP's partner Vikalpani, the Sri Lankan Women's Federation, was motivated to work with PAN AP to organize a series of training workshops on organic farming for its

Image: PAN AP

Indigenous women preparing a nursery bed as part of the BEA training in Sarawak

members, many of whom are now practising organic agriculture in their home gardens and in their rice fields.

PAN AP has been a strong advocate for small-farm BEA as a sustainable alternative to the toxic model of modern agriculture. BEA is also a fundamental component of food sovereignty. It provides sustainable livelihoods for small farming communities and strengthens community resilience in coping with climate change. It is one of the Five Pillars of Rice Wisdom that form the foundation of PAN AP's Save Our Rice campaign, launched in 2003. With the global food, financial and climate crises which emerged in 2008, the importance of BEA in sustaining the food security and food sovereignty of small, vulnerable rice communities all over Asia took on greater urgency. Thus, capacity-building has featured largely in our activities in recent years.

We identified the System of Rice Intensification (SRI) as an important BEA technology for sustainable livelihoods. This was because SRI had proven to reduce production costs while increasing yields and net incomes significantly in several Asian countries over the past three decades. Two regional workshops for network partners and farmers from eight Asian countries were organized in Cambodia and India, with partner organizations *Centre d'Etude et de Développement Agricole Cambodgien* (CEDAC) and Kudumbam respectively acting as trainers due to their expertise in SRI. Another regional training programme on farmer empowerment, seed breeding and climate change adaptation using diversified integrated farming systems was organized for partners and farmers from 11 countries to meet the need for rice communities to learn to organize themselves, save seeds and adapt to climate change. This training was conducted by MASIPAG, a farmer-scientist partnership for development in the Philippines, due to its expertise in the areas of focus. These were fundamental areas for the sustainable development of poor rural communities.

Having close network partners with BEA expertise has been very significant and a major strength for our network. With these partners, we have managed more effectively to meet the needs of our other network partners and the sectors both we and they serve. Other than training, such partners have also helped us to develop important factsheets on BEA and farmer empowerment, which have been translated by network partners into local languages to strengthen their BEA sustainability initiatives.

We also responded to local needs for capacity-building in BEA where local communities were found to be struggling with low yields and incomes. Local indigenous communities in East Malaysia and small rice farmers in Andhra Pradesh and Uttarakhand, India, received special hands-on training in BEA and SRI skills.

All the BEA projects were very much appreciated by the participants, who said they had gained a lot from the training and who continue to practise and benefit from their new skills. Trainees have reported gains such as minimizing pest attacks by using organic pesticides they have learned to make. They have also achieved improved yields, better incomes and a more diversified diet (for example from kitchen gardens), and have even increased their adaptive capacity to climate change. Seed breeding techniques learned from MASIPAG have been upscaled at the local level in several countries, including Indonesia, Nepal, Cambodia and India. One

Image: PAN AP

PAN AP works with marginalized groups to ensure food security and a healthy environment

farmer said of the MASIPAG training: "It widened my vision and knowledge in terms of the role of local rice seeds for farmers." Meanwhile, network partners have shared how these initiatives have helped them build capacity to upscale BEA initiatives at the local level and empowered local communities to do better.

The capacity-building activities have facilitated the upscaling of BEA practices; built BEA skills among farmers, non-governmental organization (NGO) staff, agricultural extension workers and others; and supported local action and network building. Collectively, the activities have significantly contributed to the sustainable human development of small rice farming communities in various countries in Asia.

In 2009, the rice fields of Yunnan, China, were destroyed by the rice plant hopper and we collaborated with our network partner in Yunnan, the Pesticide Eco-Alternatives Center (PEAC), to address the situation. A short study was carried out, followed by a cross-country workshop on the results, involving NGOs, academics, scientists and policymakers from China, Vietnam, Lao PDR and Burma. In addition, we produced factsheets on the rice plant hopper and Integrated Pest Management. All these efforts were timely responses by PAN AP and PEAC to the crisis, to convince agriculturalists and policymakers that the use of pesticides actually exacerbates rice plant hopper attacks and is unsustainable, whereas BEA methods are effective and sustainable in dealing with pests.

Fact-finding missions on displacement and land-grabbing

As part of its continued support of small producers in their struggle for livelihoods and sustainability, including rights over land and other productive resources, PAN AP has been organizing international fact-finding missions (FFMs) to some countries where communities were being forcibly displaced from productive land to enable the building of power plants or industrial and mining projects.

In a successful intervention, PAN AP organized an international FFM to Sompeta in Andhra Pradesh, India in September 2010. Local communities were resisting a planned coal-based power project which was to be built on 779 hectares of lush farmland that the Government had declared 'wasteland'. The FFM documented the plight of the farming communities and the problems of displacement and loss of livelihood for about 20,000 small farmers. The likely impact of the project and the paradox of unsustainable development could be best summed up in the words of Sheshamma, an elderly local woman: "Who will enjoy electricity in our villages when we will be begging on the streets in big cities?"

Based on the FFM report, PAN AP mounted an international online campaign and also sought interventions from United Nations Special Rapporteurs. With strong local protests and international pressure building up, India's National Environmental Appellate Authority denied environmental clearance to the project, which was then scrapped in June 2011, saving the land and livelihood of the communities.

PAN AP also supported communities fighting displacement from land acquisition for mining in the Philippines when, in November 2008, it exposed the destructive oil and gas exploration projects in Tañon Strait on the island of Cebu. The project was spearheaded by Japan Petroleum Exploration Co. with support from the local government. Tañon Strait was declared a protected seascape by the Philippines as early as 1998, and is a migration route of whale sharks. In addition, the exploration project prevented the local communities from having access to the sea, thus violating their rights to decent livelihoods. As a result of the FFM and the campaigns that followed, the company withdrew the project and the exploration was stopped.

Making a difference

PAN AP has been working with organizations and groups of small farmers, agricultural workers, rural women, indigenous peoples and other marginalized groups to take up the challenge to ensure a healthy environment, safe food, and food security and sovereignty. We have realized that we cannot work in isolation and that we must see this struggle within the framework of human rights and environmental sustainability. This has meant that PAN AP not only confronts dependency on pesticides and chemical agriculture, but also supports people's rights to produce food ecologically and to have access to productive resources such as land, water, biodiversity and seeds. There is a need to organize and mobilize support from a wide range of people to champion food sovereignty and ecological agriculture and to show that alternatives to pesticides exist. Our greatest strength and most powerful resource is the network of people's organizations, particularly of marginalized communities that also represent diverse movements and organizations. Together we can make a difference.

Rwanda's firm steps on the road to Rio+20

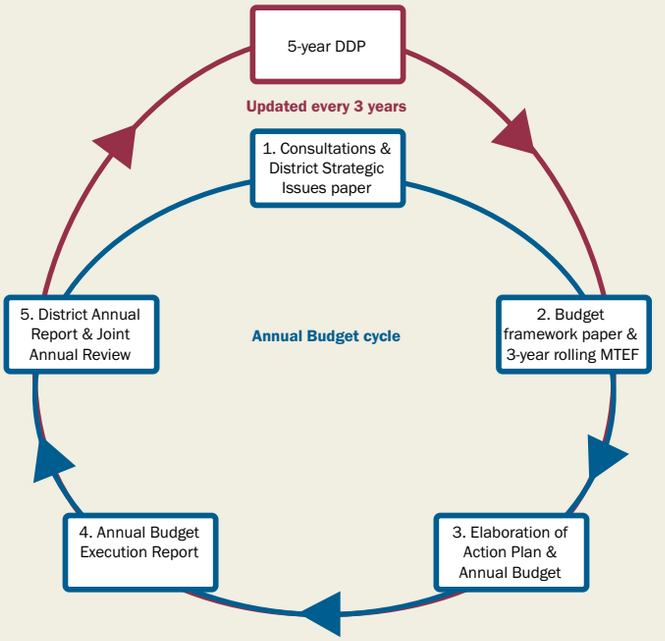
Alex Mulisa, Rwanda Environment Management (REMA), Denis Rugege, Environmental Advisor to REMA, Rose Mukankomeje, Director General, REMA, Ms Caroline Kayonga, Permanent Secretary, Ministry of Natural Resources, Republic of Rwanda

As the global community convenes for the United Nations Conference on Sustainable Development (Rio+20), Rwanda has registered significant strides on the sustainable development front despite the challenges it faces. The country has worked to drive the sustainable development agenda and invested great efforts to benefit from green growth in line with the Rio vision of globalized sustainable development objectives. This article provides a summary of Rwanda's areas of focus for sustainable development.

Vision 2020

In 1992, when the world convened in Rio for a historic accord on the multilateral environmental agreements (the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity and the United Nations Convention to Combat Desertification), Rwanda was in the throes of war and conflict that later culminated in genocide, destroying the lives of over a million people as well as property and institutions.[1] In July 1994, the genocide ended and efforts were rapidly directed to reconstruction, including institutional building through an emergency period that lasted until 1998. In the aftermath of the emergency period, Rwanda set its focus on policy and institutional set-up and reorganization.

Sector policies, legislations, strategies, programmes and plans: the subnational planning and budgeting cycle to implement EDPRS



Source: Rwanda Environment Management Authority/District Environment Management Project (REMA/DEMP), 2007

In 2000, the country developed a new vision for a post-war Rwanda and called it Vision 2020. The vision captured the nation's aspirations for what the Rwandan people would accomplish by the year 2020. Vision 2020 is the overarching policy prescription which sets out the key areas of focus that must guide Rwanda's progress towards sustainable development. It envisages "a population that is healthier, educated and generally more prosperous" and its key targets include:

- Achieving annual per capita income of US$900 in 2020 (from US$220 in 2000)
- A poverty rate of under 30 per cent in 2020 (from the rate of 60.4 per cent in 2000)
- An increase in average life expectancy to 55 years (from 49 years in 2000).[2]

The nationally-driven Vision 2020 targets were aligned to the Millennium Development Goals (MDGs), an indication of Rwanda's national commitment to the sustainable development target of reducing poverty by half by 2015.

To implement the vision, a Poverty Reduction Strategy Paper (PRSP 1) was designed by the Government of Rwanda in 2001 and implemented over a five-year period. As part of the national focus on sustainable development, implementation of PRSP 1 took into account the integration of the environment as a cross-cutting issue to ensure environmental sustainability in social and economic sectors. Periodic reviews have since led to the consideration of the environment and climate change in the light of emerging knowledge on their role in fostering sustainable development.

Following a recent review of current sustainable development trends, Vision 2020 indicators and targets have been revised to focus national development efforts on responding to the rapid pace of Rwanda's development and the changing global environment. This focus has substantively incorporated environmental sustainability and climate change as key components in the pursuit of national sustainable development. It serves as

Image: REMA 2012

Sabyinyo mountain gorilla natural habitat

a key message for Rio+20 as the world reviews the path of sustainable development from 1992 to today.

Follow-up on national sustainable development is conducted at the highest level of Government, and results shared at the 2012 Government of Rwanda Leadership Retreat highlighted the progress made.[3] Of the original 47 indicators and targets:

- 12 (26 per cent) were already achieved
- 16 (34 per cent) were well on track to be achieved
- 8 (17 per cent) showed good progress (achievable)
- 11 (23 per cent) needed significant efforts given the trend of progress.

Notably, Rwanda plans to redouble its efforts towards accelerating the pace of development beyond what was originally envisioned in the recent Seven-Year Government Programme, which periodically reviews and redirects national development targets. This lends credence and support to Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS).

The Economic Development and Poverty Reduction Strategy

The EDPRS is Rwanda's second-generation national medium-term strategy, developed in the aftermath of PRSP 1 to implement the Vision 2020. The EDPRS development process was highly participatory, bringing together all national and subnational stakeholders in a consultative process that culminated in a nationally owned strategy. Since Rwanda was committed to achieving sustainable development goals, the medium-term strategy sought to integrate the environment and climate change as a cross-cutting issue. The integration of environment and climate change from 2008-2012 was clearly intentional in ensuring that the links between poverty and environment were implemented and monitored to maintain a focus on sustainable development.

The implementation of the strategy was carried out through a decentralized process with District Development Plans focusing on implementation modalities that are results-based and monitored through a home-grown approach known as 'Imihigo'. The key EDPRS flagship, which primarily focuses on reducing predominantly rural poverty, relies on improving the management of environment and natural resources as an important input towards sustainable development. Progress monitoring is conducted through this approach, using indicators and targets that are aligned to localized MDGs.

The policymaking processes were initiated in the aftermath of the reconstruction phase around 2003, during which the environmental policy was first formulated. The policy informed the formulation of the Organic Law on Environment in 2005. This was a significant milestone in the pursuit of national sustainable development.

Environment was considered a cross-cutting issue among other issues such as gender, youth and social inclusion in the EDPRS. To this end the Ministry of Finance and Economic Planning, which is responsible for sector coordination at the national level, played a critical role in integrating environment and climate change in other sectors, particularly economic sectors such as energy and agriculture. Cross-cutting aspects such as the environment and climate change, gender promotion and participation in development, youth

employment and social protection measures, have all evidently accelerated the pace of Rwanda's progress towards inclusivity and sustainable development. Rwanda leads the world in women's representation in parliament, with a current level of 56 per cent.

As a result, national policies, legislations and strategic plans in economic and social sectors as well as planning and implementation processes are aligned to overarching policy prescriptions such as Vision 2020, MDGs and EDPRS, which are driven by sustainable development objectives.

Climate change and low carbon development strategy

The Government of Rwanda has developed a renewed commitment to address climate change following data and information that was gleaned from the first and second communications in the UNFCCC. It became apparent that climate change had far-reaching implications in influencing national economic development. In an effort to develop a clear country position on climate change, a study sponsored by the UK Department for International Development (DFID) was conducted and concluded in 2009. The study highlighted that climate change costs Rwanda about 1 per cent of gross domestic product.[4]

Among other highlights from the DFID sponsored study, it became apparent that a cross-sectoral strategy on climate change in Rwanda was crucial. Thus, a national strategy on climate change was formulated to address climate resilience and green growth with a focus on promoting low-carbon options. A significant achievement of the strategy was its focus on a range of sectors that contribute to national sustainable development. This has informed the revision of Vision 2020 to incorporate climate change targets as a key input towards national sustainable development goals.

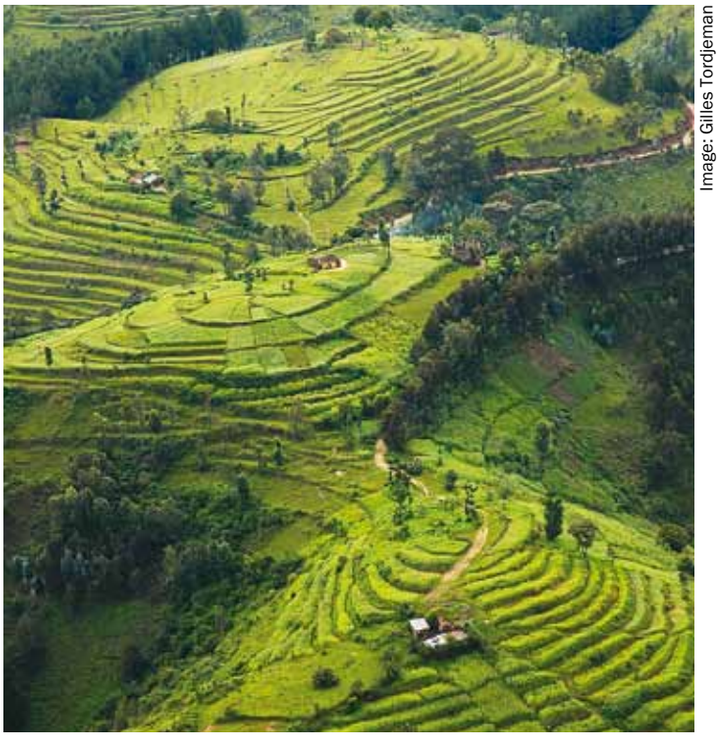


Image: Gilles Tordjeman

Land husbandry is crucial in Rwanda, Africa's most populous country. Agroforestry and terracing make good use of available land

Embedded within the strategy is a fund to foster the harmonization and sustainability of environment financing in Rwanda (FONERWA). This is a multisectoral sustainable financing mechanism that provides an opportunity for sectors to climate-proof development and open up sector-specific green jobs. Rwanda has experienced remarkable growth in tourism, which is currently among its top four sources of national revenue. This serves as an entry point towards the diversification of revenue sources, positioning Rwanda for green jobs and investments as well as for overall economic growth that will reduce dependence on fossil fuels and other high-carbon options.

In 2011, Rwanda hosted a regional workshop as an input towards institutionalizing green growth through the policy, legislative and regulatory frameworks, and towards institutional mechanisms to reinforce green growth and opportunities at both national and regional levels. The consensus generated from the regional workshop is poised to augment the national efforts that will move Rwanda towards consistent green economic growth.

Challenges

Rwanda is a developing country, and it faces sustainable development challenges that are typical to other developing countries. Rwanda suffers from the impacts of globalization, including trade imbalances, greenhouse gas accumulation in the atmosphere leading to climate change impacts, and transboundary environmental impacts such as pollution and other forms of atmospheric deposition that cross boundaries between and among nations. These issues increase the cost of regulation on the part of Rwanda.

The country faces extreme challenges in terms of energy availability, access and cost, which is increasingly imposing a burden on sustainable development. The Rwandan population is primarily dependent on biomass as a source of energy and this has multiple implications, including increasing deforestation rates and exacerbating soil erosion and the siltation of national water resources. These issues pose challenges to Rwanda's efforts towards poverty reduction goals and make it more costly to achieve sustainable development. Rwanda's private sector is still young, and is yet to develop the capacity (human and technical/technology transfer) required to provide alternative off-farm employment that may reduce pressure on the environment and natural resources.

Rwanda has the highest population density in Africa. Thus, population pressure is increasingly constraining natural resource use and there is a need for creative ways to manage the environment and natural resources — especially in a situation of climate change from global impacts. Whereas policies and government are key ingredients in improving management, there are intractable problems that require cooperation and support from the international community. The FONERWA fund for the environment and climate change, an innovative solution for sustainable financing, serves as an example of the innovations the country has undertaken.

Advancing the green economy in solid waste management across the Middle East and North Africa

Joy Jadam, Technical coordinator and Sherif Arif, Consultant, SWEEP-Net

Waste management is one of the main sectors considered in a green economy, where 'greening the waste sector' means shifting from conventional to solid waste management (SWM) methods of collection, treatment and disposal, towards achieving the 4Rs (reduce, reuse, recycle and recover) so that waste is transformed from a liability to an asset, generating both economic and environmental benefits.[1]

Despite worldwide advances in SWM during past decades, the Middle East and North Africa (MENA) region still suffers unsustainable waste management practices, including open dumping, waste burning and mixing hazardous waste with municipal waste. Economically, this is exacerbated by low levels of waste reduction, recycling and material recovery that includes separation at the source and composting.

Given these circumstances and a crucial need to improve the sector, in 2009 the Regional Solid Waste Exchange of Information and Expertise Network (SWEEP-Net) was established. Its general objective is to advance sustainable SWM in the political agenda of partner countries and to set up a common regional platform for technical assistance, capacity-building and exchange of best practices, expertise and experiences in the field of SWM. The current partners include Algeria, Egypt, Jordan, Lebanon, Mauritania, Morocco, Palestinian Territory, Syria, Tunisia and Yemen.

Image: GIZ – Egypt

The cash value of waste is mostly appreciated by the informal sector, who collect, recover, reuse and sell waste materials

How far from changing to a greener waste sector are the SWEEP-Net partner countries?

Challenges

Greening the municipal waste sector in MENA is still in its early years, as governments pay little attention to the 4Rs, lack the political will to change and are without the proper institutional, legal, financial and technical structures for effective SWM, let alone greening the waste sector. If not adequately addressed, these factors put SWEEP-Net partner countries at a competitive and technical disadvantage to other MENA nations. With the expected population growth, partners will be faced with a number of challenges, including an increased impact on public health due to unsanitary waste disposal, increased pressure on natural resources, contribution to climate change and more complex SWM requirements, along with costs due to waste composition changes, such as e-waste. The World Bank's Mediterranean Environmental Technical Assistance programme has estimated that the cost of environmental degradation due to poor municipal SWM ranges from 0.2 per cent to 0.5 per cent per capita Gross Domestic Product (GDP).[2]

This situation worsened in the aftermath of the Arab Spring, when many regional investments were discontinued or suspended, including those in SWM. The revolutions in Tunisia, Egypt and Yemen, although laudable for seeking democracy, social equity, freedom and employment, contributed to the downturn of economic growth, from about 3.2 per cent of GDP in 2010 to 2.1 per cent in 2011, leading to higher unemployment in many sectors.[3] During and after the revolution, municipal waste was left to accumulate on the streets and waste workers went on strike in many countries, demanding formal recognition of their status and improved economic and social benefits, issues being addressed by many governments.

Image: SWEEP-Net – Morocco

High potential to compost organic waste is undermined by lack of awareness and incentives to separate at the source

Opportunities

Steps have been taken to green the waste sector, with most partner countries developing their own strategies and national programmes for improving waste collections, promoting closure of open dumps and disposal in sanitary landfills, recycling and material recovery, applying the polluter-pays principle and raising public awareness. But despite the establishment of laws and regulations, enforcement is largely absent and much waste continues to be disposed of in open dumps.[4] Sanitary landfilling is not only environmentally sound but economically viable, through the Clean Development Mechanism (CDM) to reduce greenhouse gas (GHG) emissions. Some countries have started to benefit from CDM, including Morocco, Tunisia, Egypt, and Syria (through methane gas capture) as well as Jordan (through energy recovery from waste).[5] These nations have registered 10 CDM projects in total, which are designed to avoid 1.87 million tons of CO_2 emission annually, equivalent to about €18.7 million certified emission reductions each year.

According to the Intergovernmental Panel on Climate Change model of 2006, it is estimated that the amount of CO_2 equivalent being emitted from present landfills in SWEEP-Net's partner countries will be 8.16 million tons by 2025.[6] Assuming the amount of waste dumped in these landfills remains the same, the generated amount of CO_2 equivalent will be about 130 million tons by 2025, clearly on the conservative side. This could generate between US$0.9 billion and US$1.2 billion in the region by 2025, at a unit price for CO_2 in CDM projects of US$ 7-10 per ton, excluding the market price of recyclables. The latter are estimated to be in the range of US$2.2 billion to US$7.0 billion.

On the other hand, waste produced in the MENA region is more than 50 per cent organic, which has potential for composting and a further reduction in GHG emissions through landfilling.[7] However, composting is practically nonexistent due to lack of both awareness and incentives to separate waste at the source. This results in cross-contamination of the organic component and, where practised, a degraded compost quality.[8] A number of promising initiatives to divert more of the waste stream to composting is underway in Egypt and Lebanon. The Cairo southern zone composting project began in 2008 with the aim of treating about 1,100 tons a day of domestic waste through recovering recyclables and composting, reducing landfill-produced GHG to an equivalent estimated CO_2 reduction of 55,656 tons/year.[9,10] As an alternative to incineration, a technological breakthrough in the use of waste-to-energy is being considered in Lebanon and Egypt, alongside the use of biomethanation as well as mechanical and biological treatment to produce high-grade compost.

Material recovery and recycling — including plastics, glass and paper — is also very low at less than six per cent on average. In 2009, the German International Cooperation (Deutschen Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) estimated that Egypt was losing an average of US$500 million each year by not recycling all its potential

Image: GIZ — Nour El Refai — Egypt

Recovery and recycling is less than six per cent of total waste

waste. The market share for recyclables will reach a minimum of 7-9 million tons each year by 2025, for an estimated 75 million tons of municipal waste generated in SWEEP-Net's partner countries.[11] Provided proper awareness is in place, this should trigger the proliferation of recycling industries and the establishment of new professional consulting services.

Finally, the role of the informal sector cannot be overlooked, where often the cash value of waste is appreciated only by waste pickers and scavengers, who collect, recover, reuse and sell waste materials. They have developed an internal economy from waste disposal sites, such as those in Cairo, where at least 200,000 waste pickers — the Zabbaleen – have created one of the city's largest informal settlements, which is home to between 800,000 and 1 million people. Initiatives are now underway to organize and formally integrate this informal sector in Morocco, Egypt and Tunisia. Indeed, partner countries can build on the much-needed expansion of social programmes to create regional jobs and establish a formal labour force from waste recycling and recovery, especially in a region where cheap labour costs could offset expensive technology options. Institutional arrangements between formal and informal sectors could also be improved, such as those for marketing recycled waste products, or providing raw material to manufacturers.

How is SWEEP-Net contributing to greening the waste sector?

As the only regional platform for exchanging best practices and experiences in MENA, SWEEP-Net plays an exclusive and critical role in strengthening regional cooperation and enabling its partner countries in moving towards greener SWM.[12] This issue is being addressed by SWEEP-Net, through four regional work axes:

- Public awareness and community participation, including induced behavioral changes
- Financial and cost recovery aspects, including market incentives and environmental tax
- Public-private partnership and cooperation
- Strengthening local authorities to improve SWM (SWEEP-Net is the subregional secretariat for the United Nations' IPLA / International Partnership for Expanding Waste Management Services of Local Authorities).

The regional platform is being developed with key stakeholders and direct support from the waste management authority in each partner country; this allows policymakers to learn from the experiences and success stories of similar countries, exchange ideas on the best ways to develop and implement new policy frameworks for waste reduction, reuse and recycling, and to promote green technologies in the sector.

SWEEP-Net's second regional forum, held in May 2012, focused on the economic and ecological potential for 'greening' the waste sector in the MENA region. Attended by international professionals and experts from the public and private sectors, the forum addressed environmental and economic challenges as well as national initiatives in a green economy, including the role of the banking and investment sector. SWEEP-Net was also launched as a regional organization during this event, which is a further confirmation of SWEEP-Net's ongoing commitment to developing effective SWM solutions.

Agricultural sustainability research and development projects

Warren Page, Manager, Communications and Public Affairs,
Australian Centre for International Agricultural Research

The Pacific Islands cast an alluring image of white sands and tranquil sunsets. While tourism remains an important industry, trading on the promise of these images to travellers, the future may be less idyllic.

Apart from tourism, the natural resource base of many Pacific Islands is the main source of income for residents. Fisheries and forests account for the livelihoods of more than 70 per cent of people in the Melanesian countries of the Pacific, who derive their basic needs from subsistence fishing and agriculture. In the Solomon Islands 75 per cent of the population are smallholder farmers and fishers.

In a 1999 census, 50 per cent of women and 91 per cent of men were engaged in fishing activities. Fish is a staple food, with this source accounting for 73 per cent of all expenditure on animal protein. Such a high level of dependence on the natural resource base, particularly the rich fisheries of the region, provides a real challenge for long-term management. Telling fishers that catches must be limited today to ensure their viability tomorrow is difficult, particularly when fish are an important part of diets. The task becomes harder the farther into the future that timeline extends.

Yet sustainable resource management of fisheries is vital to both the current and future blue economies (sustainable economies driven by nature-inspired technologies) of the small islands of the Pacific. Coastal fisheries are the most important source of fish across several island states and are those under the most stress.

Image: ACIAR

Supporting blue economies means developing alternative livelihoods in other agricultural fields

Alleviating these stresses is an important priority for the Australian Government's aid programme. The work of the Australian Centre for International Agricultural Research (ACIAR) is contributing to understanding the factors at play in managing these resources, by encouraging promising opportunities for alternative agricultural livelihoods and strengthening governance arrangements.

Inshore fisheries and marine resources are central to many facets of life in the Solomon Islands, Vanuatu and Kiribati. The fisheries supply daily protein and a potential cash resource. These resources also have cultural value for fishing communities, so sustaining them is central to their life.

Growing populations, the impacts of climate change and the threat of overfishing are combining to threaten the long-term viability of fisheries. The prospect of diminishing returns from inshore fisheries will place greater pressure on food security. This situation has the potential to threaten political stability in individual countries and to reduce the impact of governance structures. Once this cycle has started it is difficult to break. However, with practical solutions the difficulties can be overcome.

ACIAR is focusing on the Solomon Islands as a pilot for linking and aligning the multiple strands involved in managing inshore fisheries to form a cohesive thread running from local communities to national scale interventions, and extending these approaches to other island states.

In 2010, the Solomon Islands developed a National Strategy for the Management of Fisheries and Marine Resources. The Strategy articulates the steps needed to achieve a series of national goals relating to managing inshore fisheries to 2020.

Community-based co-management of marine resources is central to the successful implementation of the Strategy and in providing a platform for the implementation of sound environmental practices, along with sustainable development of blue economies.

ACIAR's role is to support the development of structures, processes and capacity, to implement and sustain the national programme of community-based marine resource management. This builds on past ACIAR work in developing community-based fisheries management plans.

Image: ACIAR

Rich forest resources offer job opportunities if sustainably managed

From 2005 to 2008, ACIAR and the WorldFish Center worked with communities in Kia District (Santa Isabel Island and Isabel Province) and Jorio (Vella Lavella Island and Western Province) to establish community-based management plans for the sea cucumber. At community level, the project involved a participatory process of household interviews and focal group discussions to facilitate the development of a management plan. At the request of the community, plans were broadened to cover all marine resources. From the Kia community, the project expanded in 2007 to include all of Kia district and led to the establishment of a marine managed area covering approximately 450 km2.

Through a similar participatory process, a management plan covering 170 km2 of the Jorio region was implemented in September 2008. Responsibilities for administration, enforcement and penalties now rest with communities through their own governance structures. Community technical teams have been trained in simple methods for conducting reef surveys of benthic invertebrates, such as the sea cucumber.

In mid-2008, representatives from both Kia and Jorio (along with representatives from related projects in other parts of the country) attended the first community workshop for coastal fisheries, held by the Solomon Islands Ministry of Fisheries and Marine Resources. The goal was to tap into community knowledge to ensure better coastal community participation within the Solomon Islands inshore and coastal fisheries management.

Governance of marine resources is central to success beyond the community level. ACIAR's support of the Strategy will also focus on strengthening the capacity of the Ministry of Fisheries and Marine Resources and the development of an impact assessment programme for the Ministry will be central to this work. The framework that is being developed through this research will also be transferred to Vanuatu and Kiribati, using the lessons learned in the Solomon Islands to identify approaches for other island nations.

ACIAR is also supporting other aspects of the blue economies of the Pacific region, by examining returns from sustainable management of deep-sea fisheries. With the Forum Fisheries Agency, a bioeconomic model used in determining harvest levels and rents payable for the South Pacific tuna fishery was updated with biological, catch, price and cost parameters. Two potential charging systems for obtaining access fees from distant-water fleet nations fishing in the exclusive economic zones of the Pacific Island nations were examined. The project identified that 'charge-on-effort' schemes should be considered, using a formula based on catch limits and fishing days.

A sustainable management plan for the live reef fish trade in the Solomon Islands was developed, with the plan presented at a final seminar attended by policymakers, local communities, fishery managers and researchers in Honiara. The seminar covered potentially controversial aspects, such as seasonal closures.

A second support component for blue economies is developing aquaculture capacity in the region. Farming freshwater fish and marine species can be a sustainable alternative to fishing, while reducing pressure on wild capture fisheries.

Numerous communities in Papua New Guinea (PNG) are dependent on coastline marine resources for the livelihoods of their families. Whilst coastal waters, reefs and fish stocks are comparatively healthy, communities are failing to capitalize on the potential economic and job opportunities this environment provides.

The development of mariculture in PNG can now be supported by the recently completed National Fisheries Authority Nago Island marine hatchery and training facility. The role of the facility is to develop marine aquaculture opportunities for PNG and to become a training centre for students from the National Fishing Centre. However, for the facility to achieve its goals, there is an immediate need for capacity-building from both technical and mariculture perspectives. This ACIAR project will develop Nago Island's capacity relating to the management of the facility and the husbandry of cultured marine organisms and will involve training facility staff at established research institutions that have similar roles, expectations and support needs. It includes basic production trials using coral and spiny lobsters, which will generate baseline information relating to their potential as food or income sources. Another part of this research is the restocking of depleted fisheries, with particular attention to sea cucumbers, which have been chronically overexploited throughout the Asia-Pacific region.

ACIAR-funded studies of the sandfish (Holothuria scabra) — a high-value sea cucumber harvested easily from inshore habitats — have led to technologies for breeding these in hatcheries and releasing them into the wild. The research concludes a significant, long-term research investment into sandfish culture in the Asia-Pacific. Three large projects have covered the hatchery culture of sandfish, techniques for releasing them into the wild, and aquaculture practices of sea ranching and pond culture. The research results were disseminated in a symposium — supported by the Secretariat of the Pacific Community — on recent advances in hatchery production technology, release strategies, farming techniques, management practices and supply chains, and marketing. The symposium led to informed recommendations being developed for guiding strategic research into sea cucumber aquaculture for the next decade.

Inland aquaculture is an important component of ACIAR's fisheries strategy. Fish demand and supply scenarios indicate that the supply of fish through aquaculture will be essential in supporting future food security and nutritional requirements. For example, in the Solomon Islands — under current scenarios — there is predicted to be a shortfall of between 6,000 tons and 20,000 tons each year, by 2030.

ACIAR-funded research is assessing the feasibility of inland culturing of two further species. Initially, the focus will be on researching the feasibility of milkfish farming, followed by farm trials of husbandry and management systems for milkfish and/or Nile tilapia.

Increased capacity for aquaculture management within households, schools and business enterprises can reduce pressure on inshore fisheries. The research will link to investments that support the sustainable growth of aquaculture and help strengthen Government institutions at both national (Ministry of Fisheries and Marine Resources) and provincial levels.

Lessons will have been widely shared within Pacific nations facing future fish supply shortfalls, with the goal of developing an inland aquaculture industry that makes a significant contribution to food and nutritional security in the Solomon Islands.

Image: ACIAR

Sustainable fisheries management is vital to blue economies of the Pacific

The final component of supporting the blue economies is to develop alternative livelihoods in other agricultural fields. The rich forest resources of the Pacific, like the fisheries sector, offers job opportunities if sustainably managed.

Vanuatu, which comprises about 80 islands with a population of 220,000, has about 35 per cent of its land area covered by primary forests and another 35 per cent by dense thickets of low trees. Forests provide wood and non-timber products for customary landowners, while forestry activities include small-scale logging, agroforestry and conservation programmes.

ACIAR research is introducing improvements in silvicultural management of whitewood (Endospermum medulosum) for plantations in Vanuatu. This helps custom landowners achieve good returns from growing high-quality native timbers. The project has established 15 hectares of trials — located on six sites in East Santo — covering site preparation, fertilization, weeding, spacing, thinning and pruning operations, in both pure whitewood and mixed species plantings.

The silvicultural trials have indicated that there is little or no benefit from using sophisticated site preparation techniques or fertilizer, but that the key issue for seedling survival is good weed control, particularly in relation to controlling the aggressive Merrimia vine.

In many Pacific countries, there are large areas of senile coconut palm (Cocos nucifera) plantations that are no longer producing commercial returns. While coconut palms have been used to produce furniture and handicrafts in the Pacific, there has not yet been a viable enterprise using this resource on a sustained basis.

Value-added products from coconut stems could assist with clearing of the old plantations, while generating income for landowners. ACIAR's project on improving the value and marketability of coconut wood included research on the most appropriate processing techniques for producing both sawn timber and engineered flooring, suitable for international markets. Coconut palms have higher-density fibre near the outside of the stem, with the lowest density in centre of the stem. The lower sections of senile stems can produce high-quality cocowood which is suitable for either tongue and groove or laminated flooring, if the back-sawn material is carefully graded and appropriately dried. The project determined the physical and mechanical properties of the material and published a best practice manual for producing high-value cocowood flooring products.

Creating sustainable approaches for enhancing management of the natural resource base within the Pacific region is central to ensuring that possibilities in the blue economies of small island states are inclusive and provide opportunities for all, including smallholders who depend on agriculture and the fisheries. ACIAR's research is a modest component of an Australia-wide approach for ensuring a future for the region.

Food, nutrition and sustainable agriculture within a green economy

Hans Rudolf Herren, Biovision

In order to sustainably secure food and nutrition for all human beings, a profound transformation of our global agricultural and food system is required — a shift towards ecological agriculture, which primarily relies on smallholder and family farms. The international community will have to develop and implement a set of actions to inform and design new agricultural policies to achieve this.

"By selling my vegetables on the market I used to earn ETB160 (around US$10) in two months on average," says Haraba Abdulamahid, a smallholder farmer in Assosa, Ethiopia. Farming is a challenge in this region as the soils are threatened by erosion, and many farmers lack the means and knowledge to adopt sustainable farming practices such as organic agriculture. Faced with this challenge, Haraba signed up for a training course at a biofarm — a model farm where feasible, low-cost, but highly effective farming methods are demonstrated to farmers. The farm, which is run by the Ethiopian non-governmental organization BioEconomy Africa and supported by Biovision, has a very hands-on approach. After the course Haraba went back to her own farm and started to apply what she had learned. She explains that she was able to get a better price for her organic products as they are now of better quality: "I am very successful on the market — I have earned ETB700 (US$40) in only two months." The Swiss and Kenyan-based Biovision Foundation is now supporting efforts to further disseminate this approach to giving farmers access to information and hands-on knowledge in sustainable agriculture.

Everyone should be able to have enough healthy food and enjoy a decent livelihood, as Haraba Abdulamahid does in Assosa. It is not acceptable that every fifth child born today will grow up hungry. But progress is very slow. Since the mid-1990s, the number of malnourished people has increased by more than 100 million, despite the fact that the world's farmers have been producing a daily average of 4,600 calories per person — about twice as much as needed. Calculated

Image: Biovision/Flurina Wartmann

Biofarms provide training in low-cost, highly effective farming methods

Image: Biovision/Peter Luethi

Regeneration of depleted soil can reverse the loss of farmland caused by erosion

in calories, losses between harvest and consumption today amount to about 50 per cent.

Meanwhile, agricultural resources are shrinking. Almost 40 per cent of the soil used by agriculture is already degraded. In many places, water supplies are running low; species diversity, the very basis of plant breeding, is declining; and in regions such as the tropics and subtropics, climate change will further severely impact both the profitability of agricultural production and food security in rural and urban Africa. Moreover, with a major share in global greenhouse gas emissions, agriculture is a major contributor to climate change.

In view of these challenges, global consensus is growing that 'business as usual' is no longer an option if we want to nourish a growing population while maintaining and protecting natural resources. As United Nations Secretary-General Ban Ki-moon states: "We need to transform the way we approach food security, in particular by unleashing the potential of millions of small farmers and food producers."[1] A widespread paradigm shift is needed in our agriculture and food system; a global transformation towards an agriculture based on ecological principles, which strengthens small and family farms. Although challenges exist, there are already many proven solutions available that can more than double present productivity in developing countries. Biovision, together with international partners, is implementing a global initiative to highlight the alternatives available and reshape global policy and governance.

When considering the issue of sustainable development and a green economy, we need to recognize that in some cases agriculture is a source of environmental problems, but also a major part of the solution to address urgent issues including climate change, land degradation and desertification, or scarcity of natural resources such as fossil fuels and water.

Climate change

Intensive industrial farming is one of the causes of climate change, and we need to switch to ecological methods to provide relief. Agriculture accounts for 30-50 per cent of man-made greenhouse gas emissions — more than the total for global transport.[2] Agriculture accounts for 50-60 per cent of emissions of nitrous oxide (N_2O) and methane (CH_4),[3] which are both potent greenhouse gases: 1 kilogram of methane has the same impact as 21 kilograms of carbon dioxide (CO_2), and nitrous oxide has 310 times the impact. Animal factory farms have the highest greenhouse gas emissions in the agriculture sector.[4] Moreover, the potential impact of climate change on agricultural production is huge.

On the other hand, some methods of sustainable and organic farming can reduce climate change impact while increasing resilience.[5] One example is the sequestration of CO_2 in fertile soils where the humus content is higher. CO_2 from the atmosphere ends up in dead plant materials in the soil, where it is mineralized before being released again as CO_2, but some of it is also stored in the humus for a long time. If the humus content increases, more CO_2 will be stored in the soil than will escape. Studies have shown that soils on organic farms are richer in humus than soils on conventional farms. Furthermore, ploughless farming techniques can further increase CO_2 capture in soils, because ploughs promote the breakdown of humus.

Sustainable use of natural resources

Not only are fertile soils crucial to mitigating climate change and building resilience for adaption to its

Image: Biovision/Peter Luethi

Drip irrigation improves efficiency of water use, significantly reducing consumption

impact; they are also the key resource for agricultural production. However, land is becoming scarce, with increasing degradation due to unsustainable practices and growing global competition for productive agricultural land. Land degradation, and poor soil fertility in particular, is widely accepted as the most critical limiting factor in constraining agricultural production in sub-Saharan Africa.[6] There are some 5 billion hectares of land presently available for the global food supply: 1.5 billion hectares of farmland and permanent crops and 3.5 billion hectares of grassland, grazing land and extensively used steppe.[7] Of this land, 1.9 billion hectares have already been degraded to a greater or lesser extent due to intensive and improper use.[8] Additionally, 10 million hectares are lost to erosion every year. The need to stop the loss of farmland is urgent, and this includes regenerating depleted soils so they can be uses in the future with sustainable production methods.

Sustainable use of natural resources is also especially relevant when we look at the use of water in agriculture. Agriculture accounts for 70 per cent of global freshwater consumption today — yet it is possible to limit water use while still meeting global food and nutritional needs. In various regions such as India, China, North Africa and the Middle East, depletion of water resources is already a serious problem. Groundwater levels are falling rapidly. Further, groundwater resources are only renewable over the very long term, if at all. Climate change will exacerbate water shortages in drier parts of the world. Sustainable small-scale farming exhibits a great deal of potential with regard to reducing water consumption. Efficient irrigation systems — such as drip irrigation — could reduce consumption by several degrees of magnitude. Case studies in developing countries have demonstrated that water consumption can be reduced by 40-80 per cent,[9] and in 2011 the United Nations Environment Programme (UNEP) Green Economy report confirmed that production with sustainable methods, which is adequate to cover humanity's food needs in the year 2050 with limited use of water, is now feasible.[10]

Biological diversity is crucial for sustainable food production, but it is currently shrinking. Over centuries, humanity has used over 10,000 edible plants: today we use only 150 and just 12 species make up 80 per cent of plant-based food production.[11] The edible plants being grown are becoming increasingly similar to one another. The enormous wealth of cultivars that the world's farmers have created through cultivation under a variety of conditions has shrunk in parallel with the rapid rise to dominance of a few globally grown high-yield cultivars. An estimated 75 per cent of all economically useful plant cultivars has vanished from the world's farms.[12] With every species that disappears, valuable genes are lost. Considering that 90 per cent of pest species have natural antagonists — predatory or parasitic insects —and over 100,000 species of pollinating insects provide their services to the agriculture sector, this matters a great deal. This is why diversity in the animal kingdom and plant species is an insurance against pest problems, and key to ensuring food and nutrition for all.

A healthy environment, resilience to climate change, fertile soils, sustainable use of scarce natural resources including water, and rich biodiversity are the foundation for a secure food supply in the long term. Farms do produce a number of key ecosystem services that benefit society, the environment and the economy as well as agriculture itself, for example with pollination and natural pest control. Farmers can and should be supported as needed to assure that these ecosystem

Image: Biovision/Peter Luethi

The 'push-pull' system helps farmers control pests and improve soil quality and increase their yields

services are maintained into the future, as our civilization depends on them. One way is to create incentives for farmers, and remunerate their efforts in maintaining ecosystem services.

Transforming policies, governance and investments

One example of an agricultural method meeting these challenges is the 'push-pull' system for maize cultivation, developed by the International Centre of Insect Physiology and Ecology (ICIPE) in Kenya. The system is widely accepted and adopted by smallholder farmers because it addresses their major production constraints. The key drivers of its adoption are the control of striga, stemborer and soil erosion, and the increase of soil fertility and fodder production. These combined benefits, together with the low cost, make it highly attractive to farmers. An impact assessment concluded that push-pull contributes significantly to reducing the vulnerability of farm families by ensuring higher yields. Of the assessed farmers, 75 per cent indicated threefold to fourfold maize yield increases and, more importantly, better yield stability.[13] Furthermore, as push-pull does not depend on external inputs such as synthetic pesticides and fertilizer, it is an environmentally friendly method that is likely to increase agro-biodiversity and contribute to provisioning of ecosystem services. With push-pull, ICIPE has developed the most successful and widely used intercropping system in East Africa and beyond, with current adaptations underway for more arid climates, focusing on millet and sorghum as the main crops.

The agricultural sector represents countless interests; yet given its essential role in reducing poverty and achieving economic growth in developing countries, and in ensuring sustainable development, there is broad agreement among diverse stakeholders to transform our agriculture and food system. Efforts to upscale successful agricultural applications from the ground need to be combined with four efforts outlined below to transform global policies, governance and investments.

First, to reach a breakthrough, the international community must take on the responsibility of working to strengthen these methods and develop an agricultural and food system that manages natural resources sustainably, advances resilience to climate change, improves food and nutrition security and benefits the livelihood of millions of small-scale and family farmers around the world. Seventy per cent of global food production is produced by 525 million small farms and there is significant potential to increase their yields and revenues using solely ecological methods. Numerous projects in the tropics and subtropics have shown that organic agriculture can generate 50-150 per cent more income.[14] Small-scale farmers are actually able to nourish people in developing countries — without expensive inputs, forest clearing or destruction of valuable ecosystems. However, they need to be supported and sustained by the appropriate agriculture and trade policies and research, development and education institutions.

Second, investment flows need to be redirected. In view of the United Nations Conference on Sustainable Development, the UNEP Green Economy report calls for a sustained investment of 2 per cent of our global economic power to begin the transition to a low-carbon, resource-efficient world economy. Of this, US$198 billion — or 0.16 per cent of the global GNP — should flow into agriculture. The funds should be used to regenerate degraded soils, promote diversified farms integrated with crops and livestock, fight erosion, establish efficient

Image: Biovision/Peter Luethi

It is possible to nourish our people and nurture our planet, if we shift towards ecological agriculture and primarily smallholder farms

irrigation systems, support biological pest control, facilitate access to the market for small-scale farmers, and reduce losses between harvest and consumption.

Third, to arrive at a truly sustainable agriculture and food system, it is essential to look at the entire food value chain — from production to consumption. There are enormous inefficiencies in food use as post-harvest food losses and waste along the entire food chain account for at least one-third of all the food produced in the world. Moreover, the trend to eat more meat and other animal products will need adjusting, to improve both health and the global food consumption footprint. To produce a single calorie of meat, two to seven equivalent crop calories are needed as livestock feed.

Finally, in view of the complexity of these issues, it is clear that coherent policies need reliable information support systems. The science-policy-knowledge link in agriculture and food needs to be strengthened. We need a mechanism that can deal with the changing needs in agriculture – one similar to the Intergovernmental Panel on Climate Change in climate policy, that will regularly inform governments, United Nations agencies and the global public on the situation and development of agriculture. An example of this is the International Assessment of Agricultural Knowledge, Science and Technology for Development, commissioned in 2002 by the Sustainable Development Summit and sponsored by six United Nations agencies and the World Bank. The multi-stakeholder process was a great example of how to bring all interested parties together to analyse the status of food and agriculture and present a series of options for action to transition towards agroecological principles. For a follow-up of the assessments, mechanisms must be set in place and monitoring of progress and impact assured. A permanent assessment platform would be a one-stop shop where a broad range of stakeholders could discuss sustainable agriculture and food and nutrition security policies. The United Nations Committee on World Food Security has the potential to serve as such a platform. However, its mandate should be extended beyond food security policy, to include working towards the implementation of sustainable agriculture and considering sustainability issues in the realm of food security and agriculture.

Setting the course

The feasibility of such a paradigm shift and transformation of agriculture and food and nutrition systems was clearly demonstrated by the authors of the chapter on agriculture in the UNEP report. It visualizes the agricultural developments to be expected until 2050, given the prerequisites of a sustainable agricultural model and the investment suggestions from the Stern report, and contrasts it with the 'business as usual' scenario in which the current agricultural policy would continue unchanged. The superiority of the sustainability scenario is impressive, allowing for an increase in food availability from its current 2,800 calories per person per day to 3,380 calories. This should create an additional 47 million jobs in rural areas and thus effectively help alleviate poverty. It uses less water than today, whereas the baseline scenario would lead to a 40 per cent higher demand. It would also lead to a situation in which agriculture would no longer be an emitter of greenhouse gases by 2050.

We now need to make the paradigm shift a reality to ensure a food and agriculture system that is resilient to climate change, restores soil fertility, reduces desertification and contributes to locally available sustainable diets for all. It is possible to nourish our people and nurture our planet, but we have to set the new course now!

The Farmer Communication Programme in East Africa

David Amudavi and Hudson Wereh, Biovision Farmer Communication Programme

John Cheburet, a radio producer in Nairobi, receives and responds to various questions after his radio broadcast show; questions like: "What can I do to get rid of pests in my maize field?" or "What can I do during the current drought?" John has a particular focus on producing a farmers' radio show where he shares hands-on knowledge about ecological agriculture.

Given the urgency of the farmers' need to do something about the pests in their maize fields or the encroaching drought, short message service (SMS) texts are used to respond immediately. "This has become feasible due to the spread of mobile phones in Africa," says John. Moreover, using new media such as Facebook and other social media tools brings dynamism into farming, making it attractive to younger generations.

The radio programme is part of the Biovision Farmer Communication Programme (FCP)[1] which supports national extension service systems to allow small-scale farmers to reap the benefits of accessing good quality information at the right time.

The East African agricultural sector faces various challenges, the main one being farmers' lack of access to reliable agricultural information. As such, low and declining agricultural productivity has continued to affect household incomes and worsen the food and nutrition security of most rural farm families, particularly in East Africa but also in Africa as a whole.[2] Farmers are increasingly expressing demand for information throughout the agricultural value chain, from production to processing, value addition and marketing. Such information is considered essential for agricultural and rural development. Also, in response to existing and emerging challenges such as poverty and the impacts of climate change, the need exists to increase the farmers' knowledge base through an integrated approach utilizing relevant information and communication technologies (ICT).[3] The focus is well placed, as evidence by a United Nations report has demonstrated

Image: ©Peter Luethi

Farmers' radio shows enable sharing of knowledge about ecological agriculture

Image: ©Peter Luethi

The web-based platform Infonet-Biovision keeps trainers, extension workers and farmers informed

that smallholder farmers can double food production within 3 to 10 years while mitigating climate change and alleviating rural poverty if ecological methods are sufficiently supported and applied.[4]

New approaches to information

Improving access to quality information and developing capacities, as well as networking and sharing knowledge, are necessary conditions for achieving the targets set by international proclamations such as Agenda 21 and the Millennium Development Goals. The Biovision FCP, supported by the Biovision Foundation for ecological development, the International Centre of Insect Physiology and Ecology, the Biovision Africa Trust and partners, is striving towards bridging the digital divide and removing the information barriers facing smallholder farmers in East Africa. The programme supports the dissemination of information based on four health dimensions:

- Plant health
- Animal health
- Environment health
- Human health.

Traditional pathways for accessing and exchanging relevant information and knowledge in a timely and effective manner are currently inadequate. Consequently, greater investments are needed in knowledge creation and management, information dissemination and enabling the wider use of ICT through space and time. Databases are needed to store and retrieve the much-needed information. Broadcast and print media are needed to unlock the power of organized, accurate and up-to-date information on demand. The Biovision FCP has been able to make a useful contribution in responding to these requirements. Its mission is, therefore, to advance and improve access to information on sustainable agriculture through practices and innovations that contribute to improved profitability, stewardship and quality of people's life by investing in carefully validated research and education

The Biovision FCP is based on the assumption that African farm households are capable of sustainably increasing food security and enhancing livelihoods while maintaining and protecting their natural environment. The programme is also based on lessons learned from experience: that strengthening and enhancing farmers' access to information and knowledge on relevant technologies can lead to healthy and increased agricultural productivity, thereby ensuring improved food security, better nutrition and higher incomes in a stable environment. A key message, then, is that individual nations can realize the full potential of agricultural development and enhanced food security by communicating farming knowledge and technologies effectively — given that other enabling policy conditions are put in place.

Using multiple channels

Being aware of the differences in farmers' agroecological conditions, their farming capabilities and needs, the FCP has initiated various projects through which authentic, scientifically proven farming information and technologies are disseminated to farmers — thus responding to their both expressed and latent demands. The FCP aims at scaling up and impacting the agricultural knowledge of rural communities by working together with a network of agricultural extension officers. These officers are considered an important

Image: ©Verena Albertin

The Organic Farmer magazine is distributed to farmers' groups in Kenya, Uganda and Tanzania

link between information sources and end users. Therefore, the programme combines investment in content development, technology dissemination and human resource development aimed at the training of farming communities.

To allow trainers, extension workers and farmers quick access to up-to-date, user-friendly, locally relevant and practical information, the web-based platform Infonet-Biovision was developed.[5] The platform already provides information on more than 45 major crops, vegetables and fruits grown in Africa, as well as on cultural methods of controlling more than 685 pests. It also provides information on various medicinal plants; value addition and preservation of fruits; sustainable soil, water and land management; animal husbandry and the control of various plant and animal diseases. This wealth of information is easily available for farmers practicing ecological organic agriculture, at no cost through the FCP dissemination channels or at a little cost by accessing it through the internet.

The Organic Farmer magazine is a monthly publication featuring articles on ecological organic agriculture, with 21,000 copies mainly distributed to farmers' groups and institutions. The publication currently reaches about 180,000 farmers in Kenya, Uganda and Tanzania. Due to the immense success of this magazine in the English language and growing demand for such information in neighbouring countries, a Kiswahili language edition was launched with 8,000 copies in Tanzania. The demand for this magazine, called Mkulima Mbunifu (or The Creative Farmer) has grown rapidly and its circulation is likely to increase as more resources become available.

To further improve outreach to farmers, information on ecological organic agricultural practices and innovations has also been broadcast on the radio. Through a partnership with the Farmers' Radio Programme (Kilimo Hai), broadcasts on hands-on agricultural practices and innovations reach farmers once a week via the popular national station of the Kenya Broadcasting Company and the local radio station Milele FM. Many more radio stations — in particular local stations — will join the FCP programme in the future.

Outreach and partnerships

In addition to radio, print and online dissemination channels, the FCP also strives to be present on the ground in farmers' and teachers' interactions. To this end, the field outreach programme employs tools to promote ecological organic farming methods among farmers through community managed resource centres and information hubs. The programme largely uses trained extension staff as well as a network of community information workers (CIWs), who are paraprofessionals linked to these facilities. The field officers use a small laptop in order to create a bridge between the information provided by the FCP and the farmers. The CIWs assist the communities to improve organizational matters, visit farmer groups to create awareness about ecological organic farming, and document information needs to enhance programme responsiveness. Moreover, there is also a side benefit of the way FCP works: since access to knowledge can be a powerful service to attract members to a farmers' association, it can also contribute to strengthening farmers' organizations.

Working together to build partnerships is crucial for an effort such as the Biovision FCP. As such, the programme also includes advocacy to promote a suitable policy environment for ecological organic farming. For example, the FCP programme has a partnership with the Kenya Agriculture Research Institute (KARI) and community-based organizations (CBOs). Under this arrangement, the research institute provides space and some facilities, while the FCP assists with management of the resource centres and equips the network of CIWs with small laptops and training. The programme also works with other partners, including the Ministry of Agriculture, non-governmental organizations and communities. For example, in 2011, access to Infonet-

Image: ©Peter Luethi

The programme supports small-scale farmers and their families to grow enough healthy food

Biovision was declared by the Agricultural Information Resource Centre of Kenya's Ministry of Agriculture to be one of the 'must haves' in an essential information kit for extension officers. This approach helps improve extension service delivery by equipping farmers with competencies to demonstrate and teach other farmers. We can only arrive at a truly integrated sustainable agricultural development if we share knowledge and experiences, and encourage the formation of measures and policies supplemented by international policies to promote ecological organic agriculture.

A two-way communication

Throughout its implementation, the FCP has ensured that there is an interactive two-way communication mechanism to capture end-user feedback. The Farmer Communication Programme is now being optimized by using an integrated User Response System (URS). The URS will further contribute to refining existing content as well as developing new content on sustainable agriculture. It will focus on the communication activities with SMS and applications for smartphones to complement other channels. To make use of new opportunities arising with the spreading of smartphones, an Android application is currently being developed. The application will allow users to browse information on ecological organic agriculture, based on Infonet-Biovision. Moreover, a survey function will be created to enable the FCP to collect data, manage, and publish findings as needed.

Benefits in the field

The benefits of the programme to people in the field are well known. Various stories from the field show that access to information can actually improve livelihoods. For example, Ibrahim Wakayula of Kimilili region in Western Kenya read about opportunities for sustainable chicken breeding in an article in The Organic Farmer magazine in 2007. Convinced of this idea, he started breeding chickens, a practice that is less common in his area. Thanks to complementary information he retrieved in the magazine, his endeavours met with great success. Ibrahim was able to earn a better living, which he used in turn to plant another field of Maniok. This allowed him and his family to earn a decent living and have access to enough healthy food.

Another success story is from the Kimutwa area in Machakos where women, who initially did not practise farming due to lack of relevant information, joined together to form a group — a precondition for getting trainings from FCP information officer, Ruth. A recent visit to the group by a Biovision delegate was filled with testimonies from the women on how well their farming is doing, thanks to the training programme conducted by Ruth. They engaged in different activities such as chicken rearing, vegetable growing and tree nursery cultivation, among others. Armed with information from Infonet-Biovision, Ruth is able to meet all their information needs.

These and other experiences show that by using state-of-the-art ICT and tested community learning structures, the Biovision FCP provides a great opportunity for national development. Its efforts can be scaled up and replicated to cover East Africa and beyond.

The Biovision FCP aims to strengthen farmers' access to information on sustainable, eco-friendly agricultural practices through multimedia. This will enhance innovation uptake and consequently contribute to improved food security, reduced poverty, better quality food, a stable environment and national development. With a rigorous monitoring and feedback system, the programme will enhance the relevance of agricultural research, increase its own responsiveness to farmers' informational needs and create synergies with other partners to scale up programme activities.

Voices of the forest: a community reclaims its livelihood

Prabha Chandran, Strategic Communications Manager, RECOFTC — The Center for People and Forests

"**It's our forest, it's our lives, the place we depend on… we have to protect it. It's as if we are taking care of our elders. We must help each other to conserve it." — Manot Peungrang, Headman, Prednai village, Trat, Thailand**

Summed up in these stirring words is a 20-year struggle by villagers in Prednai, on the east coast of Thailand, to reclaim not just their livelihoods but their identity. The villagers say the forest is "like a mother and father", providing succour, shelter, healing and a cultural and spiritual heritage that informs their world view. In the 1990s, that mother was dying. Decades of logging and intensive shrimp farming had decimated the country's rich mangrove forests; from 1979-1993, Thailand lost 75 per cent of its mangrove cover, of which up to one third was due to invasive shrimp aquaculture. In Trat, about 50 per cent of the mangroves had been cut down by 1987 and the giant shrimp beds were dying and leaching salt into once fertile croplands. Large scale commercial exploitation had enriched the companies — Thailand was the world's leading producer and exporter of shrimp in the 1990s — but beggared the local community that had thrived there for over a century. In destitution, the villagers of Prednai turned to the Government.

'We fought for our lives'

"Why are you complaining? Do you want to die?" said a senior Government official when villagers went to petition him. With powerful interests against them, the villagers began an existential fight, "since the existence of the forest ensures our own survival," says Amporn Phetsart, now a renowned community leader from Prednai. "It was dangerous," he recalls, "the loggers had money, power and connections, but we fought for our lives." His friend, Sa-Nga Peungrang, remembering those fearful days and said: "They hired a gunman from the next village to threaten me. We agreed that if a single shot was fired we would block the road… I was scared every night; sometimes I hid behind my rice shelter." Tragically, conflicts like this continue to

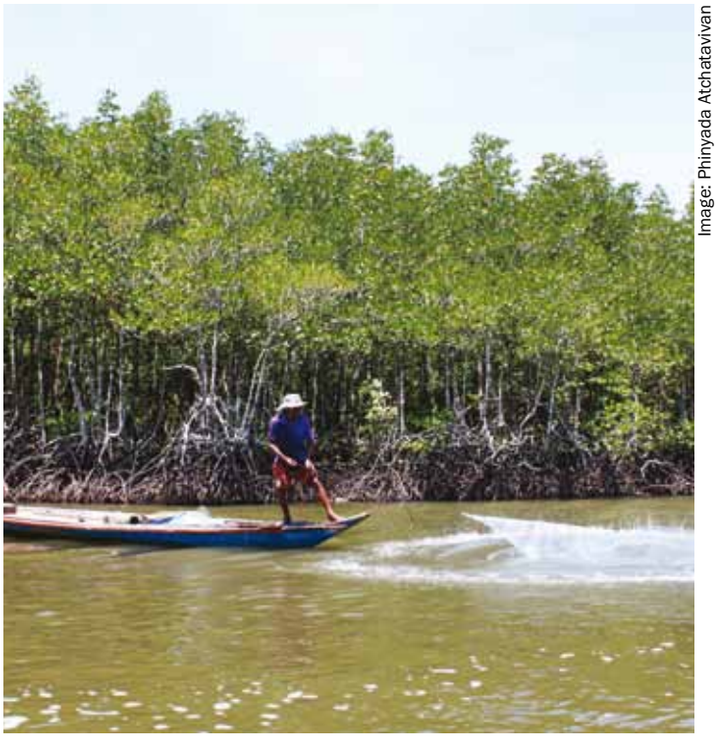


Image: Phinyada Atchatavivan

Waterways offer rich marine harvests and mangroves protect the village from wind and tidal surges

Image: Jaturong Hirankarn

Restrictions on crab fishing during the breeding season has doubled harvests

affect at least three quarters of Asian forests, the majority of these escalating into violence year after year, with little resolution in sight.

Luckily, the grit and guile of Prednai villagers eventually helped bring their case to the attention of higher authorities, resulting in a dramatic helicopter visit by a senior official and the end of the concession. The Government was also under increasing pressure to curtail logging which was blamed for the massive landslide in 1988, which resulted in the deaths of over 200 villagers. Devastated but not disheartened, the community of Prednai began the painful journey of rebuilding their lives. Using traditional knowledge and age-old principles of sustainability and universal participation, they began replanting the mangroves and regenerating marine life in the 12 major and six minor waterways intersecting Prednai, rejuvenating the land and its flora and fauna. Today, about 1,920 hectares of mangrove have been restored; the reefs are teeming with crabs, shrimp, molluscs and fish, while the orchards are laden with lush tropical fruit that proves irresistible to returning monkeys and birds. A locally preserved whale skeleton in the community centre is a formidable attraction for visiting city dwellers. In 2009, more than 1,000 visitors brought ecotourism income into the community. Prednai is now a celebrated case study, its inhabitants featuring in prize-winning films and international forums, while study tours are an annual event. Awards such as the Green Globe in 1999 and recognition as a finalist for the United Nations Development Programme Equator Prize in 2004 have celebrated its success. But how did they do it?

Universal participation is a basic conservation principle

"We worked to unite the community in dealing with officials," says Manot, who took over this crucial role from his father some years ago. He remembers the years after the concession when villagers put their traditional knowledge to work regenerating the land. "I always tell people we can disagree and have different attitudes, but we must remain together. The mangrove forest is our legacy, to be treasured by future generations." With this attitude, the villagers set up the first Community Forestry Group with some assistance from the Royal Thai Forest Department.

RECOFTC — The Center for People and Forests became involved in Prednai at the end of logging concessions. It found immediate resonance with villagers on the core principle of advocating participatory management of natural resources. Empowering the community to be stewards of their own land is the first tenet of successful community forestry. Set up in 1998, the Prednai Mangrove Forest Conservation and Development Group divided the forest into six zones. RECOFTC provided the training, specialized knowledge and resources needed to carry out intensive mapping of forest inventory. Over the past 15 years, training programmes and research work have reached hundreds of stakeholders at all levels, from grassroots to government, and remained a continuous feature of RECOFTC's involvement in Prednai. These days, training is about climate change adaptation and carbon sequestration, while in the early days it was about conflict management and livelihoods.

By 2000, a forest management plan was created, prescribing how each area of the forest should be used to promote sustainability and rebuild incomes. The mangrove restoration and zoning plan came out of collaborative fieldwork and long discussions with the community. "It was difficult to see the mangroves we grew up in being destroyed and to lose the common land that previous generations had used," recalls Nopparat Siraroy, who was a 17-year-old student when she bravely joined the protests. She is now

Image: Phinyada Atchatavivan

Sharing tropical orchard fruit with Norwegian ambassador Katya Nordegaard

Image: Phinyada Atchatavivan

Students benefit from strong school and community partnerships at the Mangrove Learning Center

Image: Jaturong Hirankarn

Nopparat Siraroy is now a businesswoman, a plantation manager and a community forester

Image: Jaturong Hirankarn

Villagers believe annual reforesting of dead trees is vital for biodiversity

President of the Tambon Administration Organization in Hong Nam Khao village and a successful businesswoman with fruit orchards and a rubber plantation. She credits the transformation to regulations that were introduced to manage natural resource harvesting, facilitate institutional strengthening and create community-based knowledge and livelihood networks. This led to the creation of the Forest Management Fund in 2003, along with a five-year plan to boost resources. Innovative techniques were used, such as placing old rubber tyres and rubber cubes along the embankments for aquaculture.

Recycled reefs

The tyres stopped erosion around young mangroves, while the cubes became artificial reefs for marine life and also prevented the passage of fishing trawlers through the nurseries. Along with the spawning of new fisheries and sedimentation of shrimp ponds, the community introduced a regulation that was to transform its economy. Like many far-reaching ideas, it was simple: "Yoot jab roy, khoy jab laan" which literally translated means: 'Don't catch a hundred, wait for one million.' What the community is referring to is the ban it observed on catching crabs during the breeding month and the creation of a crab bank. These restrictions resulted in a bumper crab harvest within a few years, becoming a major income generator for Prednai. Crab catches increased from 7-8 kg per person per night in 1998, to 15-20 kg per person per night by 2004-2005, despite the fact that the number of people catching crabs had also increased from six to 40. Crabs were bringing in an income of US$25-30 per person per night in 2005 and by 2009 the harvest had reached 95 tons — worth a substantial US$1.5 million. In 2008, news of the village's economic and ecological miracle resulted in a visit from HRH Princess Maha Chakri Sirindhorn, which remains a milestone in village lore. Today, high-value produce includes tropical orchard fruits, sea bass, oysters, crabs and shrimps, which are sustainably harvested and carefully adapted to maintain yield within changing seasonal patterns, rising humidity and sea water levels. "I never imagined that we would have all this," said Renu Kongpil, when she was interviewed for a film on Prednai, 'Voices of the Forest — Thailand', a few years ago. "We used to have no security. We had nothing; we started slowly and built it up bit by bit."

There are now 19 groups actively managing the use of forest and marine resources in Prednai: the aquaculture group monitors the release of wastewater, the traders' group ensures only sustainably harvested produce is sold, the ecotourism group provides hospitality year round, the youth group manages public relations, while the savings group provides support when required for poorer community members and is ambitiously planning the purchase of about 5,000 hectares of degraded forest. These groups are supported by a network of 25 external agencies, all contributing in their own way to village progress. A 2009 study by RECOFTC found the community spends about US$7,500 each year on forest management, including money for the annual mangrove plantings, investment in livelihood resources and human resource development through learning. The villagers place high value on learning and from the start, research and knowledge activities have been an integral part of their success. The learning network is now expanding from 19 villages to six sub-districts, through a US$168,000 project which is supported by the Norwegian Government through Mangroves for the Future.

Supporting climate change work and mangrove restoration

"We have received a lot of training and support in developing our knowledge centre, mangrove management

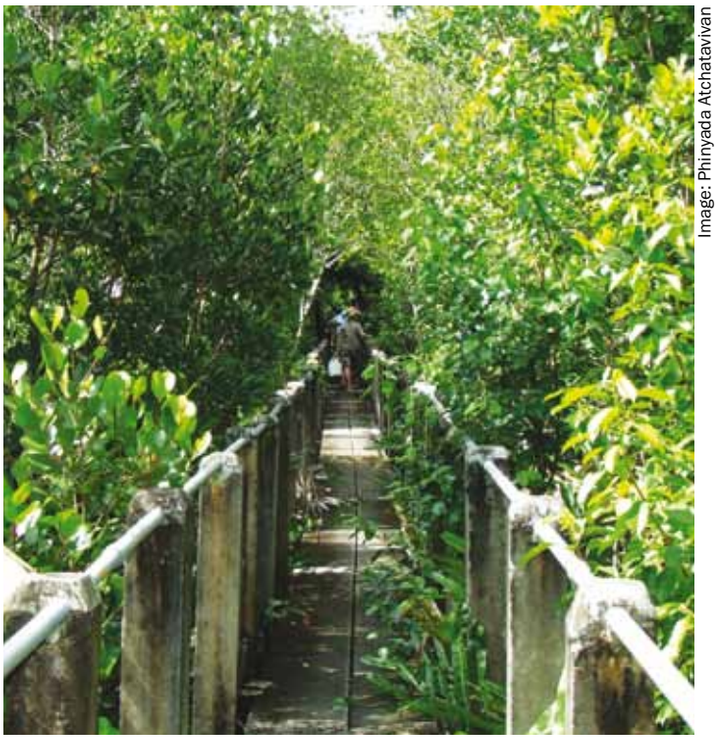


Image: Phinyada Atchatavivan

Mangrove walkway built by villagers attracts 1,000 tourists each year

Image: Phinyada Atchatavivan

Nearly 2,000 hectares of mangroves were restored through community efforts

systems and creating the sub-district network through RECOFTC and other organizations," says Amporn Phetsart, President of the Prednai Mangrove Conservation and Development Group, "but we are facing new challenges now from climate change and need technical and institutional support." In the past two years, RECOFTC has run more than 50 workshops to help villagers handle conflict and climate change impacts through adaptation techniques. Field studies have corroborated the enormous climate change mitigation resulting from mangrove regeneration. In 2010, the Good Governance for Society and Environment Institute found that mangroves help absorb 1,205 tons of carbon dioxide each year. They act as a powerful wind shield, while their massive root systems help protect the village against extreme weather events like hurricanes and tsunamis; according to a study by the Food and Agriculture Organization of the United Nations, "mangroves can absorb 70-90 per cent of the energy of a normal wave."

In April last year, the Norwegian ambassador to Thailand, H.E. Ms Katja Nordgaard, visited Prenai with RECOFTC and Mangroves for the Future, to launch the first phase of coastal resource management through the Community-based Learning Centers project. A green economy is a knowledge economy and the project will research the restoration of about 5,150 hectares of mangrove forest, to serve as a greenbelt, carbon sink and income source from seafood. Two other innovative pilots include the adoption of a low-carbon lifestyle in one community and the leveraging of the Prednai Community Mangrove Forest Management Fund, which could provide a prototype for a future village climate change fund. Recently, the Fund supported the purchase of seven hectares of land for mangrove expansion. The six Learning Centers will be teaching the skills and knowledge for sustainable mangrove practices to locals, who will return as teachers and mentors for their communities. RECOFTC has been collecting information from the 19 villages from June 2011, to study differences in how these communities use natural resources and how this impacts their livelihoods and surroundings. This research will result in an action plan for sustainable coastal resource management along the entire eastern seaboard of Thailand, once the most degraded along the Andaman Sea. The learning network will provide economic, environmental and climate change solutions to communities within this coastal province, while at the same time engaging the younger generation in the challenges of future sustainability.

None is more pressing than the legal passage of the Bill for Community Forestry, which would greatly enhance the tenure rights of marginalized forest communities and give them access to development funds. For two decades, RECOFTC has been working with civil society and the Royal Forest Department in helping 10,000 community forests get legal recognition and take on the challenge of sustainable development. Forests are the last frontier for development in the world's fastest urbanizing continent, inviting us to find green solutions to the looming food, water and energy crises threatening to undermine our future prosperity. The people of Prednai have found a green growth solution that has helped them flourish in what was once an inhospitable swamp.

RECOFTC's Vision:

Local communities can actively manage forests in Asia and the Pacific to ensure optimum social, economic, and environmental benefits.

A fishing guide to sustainability: local sustainable development in Serbia

Nebojša Pokimica, Assistant Minister; Srdan Sušić, Team Leader, Project: 'Support to Implementation of the NSDS of the Republic of Serbia'; Prof. Andelka Mihajlov, National Expert and Team Leader on Rio +20; Miroslav Tadić, Head of the Department; Ministry of Environment, Mining and Spatial Planning, Republic of Serbia

An international commitment to environmental sustainability generates and catalyses national commitments and ratified international policy tools, such as the multilateral environmental agreement (MEA) challenge to 'keep families together'.

While MEAs would usually be considered as an international means of enhancing sustainability in general, their implementation catalyses certain processes at the local level of governance. When efficiently implemented at sub-regional level, the basic concepts of the MEAs help to shape the common future, security, peace and sustainable development of the country. An example of this can be found in Serbia.

So far, Serbia has ratified 75 international agreements in the field of environment. Among them are some sub-regional agreements, such as the Convention on Cooperation for the Protection and Sustainable Use of the River Danube, the Framework Agreement on the Sava River Basin and the Carpathian Convention.

All Serbian national strategies — and particularly those related to sustainable development and environmental protection — are based on the implementation of ratified MEAs and the outcomes of major international processes. This helps us to transpose internationally set targets and goals in the field of environment and sustainable development into national and local

Image: Pavle Pavlovic, Serbia

Serbian national strategies are based on multilateral environmental agreements

Traditional environmental planning methods provide an important information base

governance systems. It also provides a way to put into practice elements of numerous important international documents such as the Rio Declaration, Agenda 21 and the Johannesburg Plan of Implementation.

A fishing guide to sustainability

Let's set the scene for this story. Firstly, there is the concept of a sea, described by American author Walt Whitman as "boundless blue on every side expanding". Secondly, there are many creatures roaming in that sea. Thirdly, there is James Lovelock, who expressed the 'Gaia' theory of Earth as a super-organism. The drama is ready to unfold now.

Like fishermen, local communities in Serbia are casting about for a means of development. Some try to catch a big fat fish that everyone can feed on. Others look for a small golden one that will grant their wish for a better life. In Serbia and its neighbouring region, the story goes, when they catch such a fish they often don't know what to do with it. They can eat it right away or they can pack it and save it for later. Or maybe they'll ask it to grant three wishes. But the fish — or the natural resources that a community relies on — cannot last forever, regardless of its size or wish-fulfilling ability. Attempts by local communities to feed their citizens with a single fish are just not sustainable. When local communities go fishing, maybe they should look for a golden fish that can grant more than three wishes. Maybe they should go fishing more often, or maybe they should try to catch a bigger fish.

Among the most effective tools to help local communities through these dilemmas in Serbia are local sustainability-related planning documents (LSDPDs) such as environmental action plans, local sustainable development strategies and local environmental security initiatives.

Considering the myriad development alternatives, why should local communities cast their nets for any LSDPD? These are singled out in this context because they aim to balance the demands of sustaining local economies, communities and ecosystems. LSDPDs factor in local impacts and balance development choices

Image: Pavle Pavlovic, Serbia

to equitably serve the local population. Stefan Buzarovski from Oxford, UK, is one of the leading experts in South-Eastern Europe on local environmental action planning. He believes that developing LSDPDs is in line with the idea of reconciling environmental protection and social justice with economic development. Thus, local communities simply need to make peace between the environment, their social goals (or aspirations) and economic growth.

Some, who we will dare to be called optimists, will nod their heads, roll up their sleeves and get to work. The Government of Serbia sees itself as a member of this camp. The Serbian Government decided after the 2002 World Summit on Sustainable Development (WSSD) to initiate the development of the National Sustainable Development Strategy (NSDS), which was adopted in 2008. The NSDS was built on a number of broad working groups. One of these dealt with the institutional framework for NSDS implementation, thus deliberating on local-level actions for sustainability.

The Government has been assisting local administrations in enhancing their capacities to manage their environment and, ultimately, to embark on a path towards sustainable development. Apart from being keen to teach people how to fish instead of giving them fish, the NSDS follows the idea that local governance is the closest to the people, and that it plays a vital role in educating, mobilizing and responding to the public to promote sustainable development. The Government has done this by working on local development or, more concretely, assisting local communities to develop LSDPDs. In addition to working towards sustainability, LSDPDs also work towards decentralization. To accomplish this, local governments need to have a certain security in their existence, sufficient resources and autonomy. LSDPDs aim to help authorities make their actions more credible and transparent, and to cultivate equitable relationships with higher authorities.

Good catch or red herring?

LSDPDs seem to be a good catch in Serbia. They incorporate public participation in environmental decision-making, take local circumstances into account and provide a planning framework for potential investments. But even though they do all these things, do they actually promote the larger aim of sustainable development? In other words, are LSDPDs just a red herring?

'Traditional' environmental planning methods, including those for public participation, provide an information base to support stakeholder decision-making. But these methods often prove inadequate for the long-term task of sustainable development planning. LSDPDs go a step further toward incorporating the development agenda of societies and, therefore, of local communities into the planning process. Other methods and tools based on the traditional concepts of environmental planning have also been redefined and adapted in LSDPDs. This is especially true in the areas of creating a common picture of current development conditions and assessing systemic problems and requirements.

A good example of how LSDPDs can improve the overall planning process is Serbia — a country where almost 25 per cent of municipalities have developed LSDPDs. The Serbian Ministry of Environment, Mining and Spatial Planning and other institutions started working towards introducing new practices in local planning in 2001. So LSDPDs cannot be so easily dismissed as a red herring.

But can anything else be done to make local development planned through LSDPDs in Serbia more sustainable? Ensuring functional vertical integration and revisiting methodologies for LSDPDs are some of the items on the top of this list.

Ways forward

Serbia's NSDS relies on the principles of inclusiveness of all interested parties in the process of bringing about sustainable development; intensity of decision-making for sustainable development; and integration of not only three pillars of sustainable development,

Image: Pavle Pavlovic, Serbia

Local sustainability–related planning documents are very helpful to communities

but three tiers of governance: local, regional and national. This ensures an opportunity for local communities to harmonize their development plans with larger-scale planning tools of national importance and effectively align their priorities and goals in a top-down fashion.

The NSDS framework also facilitates a bottom-up flow of information into the planning process through its monitoring activities. Information on how local communities are progressing towards sustainability is collected and used for fine-tuning future goals and actions. More concretely, there is the potential to use national-level sustainable development indicators at the local level, helping the Government to monitor the progress of each region separately and investigate their coherence. Such detailed monitoring can be scaled down to even lower levels in order to measure sustainable development and quality of life in local communities.

There are at least three ways forward concerning the methodology for developing LSDPDs. The first way is to incorporate a clear definition of sustainable development into LSDPDs. This definition then practically becomes the vision of sustainability for the local community, and the planning process will consequently assume social and economic community goals and/or targets derived from such a vision. The second way deals with the assessment practices in LSDPDs. Such practices should ensure that principles of sustainable development are met. Criterion-based assessment for sustainability might prove to be an appropriate tool, as it is not complex and easily distinguishes sustainable development from more 'traditional' development patterns. The third way forward is to examine the sustainability of actions proposed by LSDPDs against a set of criteria. This does not mean that replacing or working on those criteria that are missing or exhibit a poor record will ensure sustainability, as the mere fulfilment of requirements does not ensure that planning systems will deliver sustainable outcomes.

Finally, the fish that more than 50 local communities in Serbia and over 300 communities in Central and Eastern Europe have caught during the last decade seem to have had an effect. Most of those communities have continued working for the well-being of their citizens. They have chosen their development paths and LSDPDs have helped them to acknowledge what a community has and needs, and what will be the long-term consequences of short-term choices identified in environmental planning processes.

A nice end to the story — but what about James Lovelock, one might ask. To paraphrase from Lovelock's book, *The Revenge of Gaia*, instead of running for the hills 'in need of a sustainable retreat, as it is much too late for sustainable development', one might be better advised to run for a Local Energy Action Plan. Or forget about the fish and start a cattle farm. The choice is really ours.

Changing unsustainable consumption and production patterns

Nadine Gouzee, Member of the Belgian Federal Planning Bureau

Consumption and production are central to global economic activity. Their patterns change in time according to living conditions and lifestyles. While they are sustainable if they contribute to the present and future well-being of people and society, they can also be unsustainable when they generate social and environmental costs. "Changing unsustainable production and consumption patterns" is an overarching objective of sustainable development (SD) adopted by the international community at the World Summit on Sustainable Development (WSSD) in 2002 and can be considered as the central goal of a sustainable economy.

Three Belgian public and civil society institutions (a public agency providing SD studies and expertise, a public planning service for SD and a non-governmental organization undertaking development cooperation activities) report here their conceptual and practical experience concerning sustainable consumption and production (SCP) at global and national levels. They highlight the need of robust sustainable development policies and frameworks for domestic development as well as the importance of close partnerships with development partners abroad to achieve this overarching goal.

The three dimensions of sustainable consumption and production

The main commitment on the shift from unsustainable patterns towards SCP was reaffirmed ten years after Rio in Johannesburg as follows: to "encourage and promote the development of a 10-year framework of programmes in support of regional and national initiatives to accelerate the shift towards sustainable consumption and production to promote social and economic development within the carrying capacity of ecosystems (...)". This language shows the tension existing today between the three dimensions of sustainable development: social development, economic development and matters related to the carrying capacity of ecosystems.

SCP is a three-dimensional concept: it is central for the economy but must also improve social progress, hand in hand with protecting the environment. SCP cannot be reduced to green consumption and production (GCP), which is central to a green economy. GCP can, but does not necessarily, improve human well-being or social equity, while "...SCP seeks to identify and strengthen synergies between sound stewardship of the Earth's resources and improvements in the well-being of all humanity, especially of the poor".[1]

Since the United Nations Conference on Environment and Development, the work on sustainable production patterns has mainly striven to better identify, recognize and improve the environmental impacts of these patterns. But SCP policies are too often reduced to GCP policies. Beside pressures on the environment, production patterns also have a host of impacts on human resources. They can in particular have effects "on workers, ranging from the lack of freedom of association, to child or forced labour", "on gender discrimination, on occupational health and safety hazards" as well as "on poverty and insecurity".[2] The social impacts are often deeply interwoven with the environmental ones. They are generally poorly reported when dealing with sustainable production and therefore do not receive the attention required in SCP policies.

As it is the case for the environmental impacts, the social impacts are diffused along supply chains. These chains became more global with the growth of world trade and they affect consumers and producers, including workers, in developed and developing countries. In the developing and transition economies, the globalization of some supply chains had positive impacts on economic development. However, some of these chains also had severe negative environmental and social impacts through the promotion of unsustainable lifestyles on a larger scale, as recognized during the review year at the 18th session of the high-level Commission on Sustainable Development (CSD18): "(...) the lifestyles to which many aspire, and which globalization has enabled increasing numbers around the world to enjoy, are not sustainable on a business-as-usual basis".[3]

This evolution was reviewed at CSD18 and the environmental implementation gap was described as follows: "Despite some progress towards improved materials and energy efficiency in production processes, the global economy is still producing more and more products with shorter lives, using more physical resources."[4] The report also underlined social impacts:

"(...) globalization has also magnified gaps between rich and poor, within and between countries and regions, with consequent social and political impacts and tensions, for example, related to migration".[5]

This concern over social impacts linked to global production supply chains is also expressed by ILO in its report on Fair Globalization: "Global production systems are now a significant source of employment growth for those developing countries that have managed to become part of them. (...) Regulation is weak in these new production systems, and there is widespread debate about whether there is a 'race to the bottom' in labour and other standards."

Image: ©Autre Terre

Production patterns have a host of impacts, both on the environment and on human resources

To address such problems, there is obviously a need for global solutions. "Because significant impacts arise along supply chains through globalized production systems, national actions need to be supplemented by global solutions".[6] The adoption of a 10-year framework of programmes on sustainable consumption and production patterns, responding to the commitment of the WSSD, offers a way to integrate this issue in a context of sustainable development at the global level in cooperation with all relevant United Nations institutions.

But there is also a need for national responses. Several institutions develop life cycle assessment tools of the social and environmental impacts of products throughout their whole life cycle. The Belgian Government took the opportunity of its Presidency of the Council of the European Union in 2010 to promote such tools and in particular the social ones that are less developed than the environmental ones, during a high-level EU event. A recent publication of the United Nations Environment Programme, Guidelines for Social Life Cycle Assessment of Products addresses the various social aspects that need to be taken into account along the value chain.

Practical experience of sustainable public procurement

It its fourth chapter, which focuses on sustainable consumption and production, Agenda 21 (1992) stipulates "governments themselves also play a role in consumption, particularly in countries where the public sector plays a large role in the economy, and can have considerable influence on both corporate decisions and public perceptions. They should therefore review the purchasing policies of their agencies and departments so that they may improve, where possible, the environmental content of government procurement policies, without prejudice to international trade principles.[7] The Johannesburg Plan of Implementation (2002; §19(c)), in turn, calls to "promote public procurement policies that encourage development and diffusion of environmentally sound goods and services".

Public procurement has long been considered as one of the key policies through which governments — as major consumers — can demonstrate leadership and make a major contribution to sustainable development by using their purchasing power to drive markets towards the supply of more environmentally and socially sustainable products and services as well as to influence behaviour of other socioeconomic actors by setting the example.

The European Commission, as well, has called on the Member States to draw up publicly available action plans for greening their public procurement[8] and proposed that, by the year 2010, 50 per cent of all tendering procedures should be green, whereby 'green' means compliant with endorsed common 'core' GPP criteria.[9]

Sustainable public procurement has been taken up in the context of the two Sustainable Development Plans that the Belgian Federal Government has endorsed to date. In addition, a specific Federal Action Plan for Sustainable Public Procurement (2009-2011), with a wide focus on 'sustainable' (rather than on 'green') public procurement, entails an integrated approach of the three dimensions of sustainable development.

This approach reflects the idea that public procurement can also be used to encourage a variety of social improvements: whether by guaranteeing good working conditions for publicly contracted construction workers, ensuring disabled access in public buildings, provid-

Image: ©Nicolas Van Nuffel, CNCD-11 Nov 2011

A food production model should not only feed the world, but also the producers of the food

ing new employment opportunities for marginalized groups, or working against child labour and inhumane working conditions. More economically sound aspects are also taken into account, such as creating a level playing field for enterprises dealing with public procurement, providing opportunities for small and medium-sized enterprises or promoting life cycle costing as a means of integrating (environmental) externalities into the prices of products and services.

The site[10] is a work in progress and is updated on a continuous basis, taking into account approaches taken in the context of similar initiatives by European institutions and regional ministries, as well developments in research and consultations with interest groups. The quality of the information and its usability within the context of public procurement therefore differs from product to product and service to service.

To monitor the actual integration of sustainability criteria into tender documents, Belgium has set up a national coordination committee with representatives of all Government levels (federal, regions, provinces and local communities). The group has collaborated with the European Commission project to monitor the 50 per cent target for 10 product groups.

Cooperation activities on SCP

In 1992, the United Nations Conference on Environment and Development intended to reconcile environment and development. Twenty years later, we must acknowledge that, while most of the ecological limits have been exceeded, the development gap is still a reality: over a billion people on this planet are still starving and around another billion are living in extreme poverty. Moreover, the economic, social and environmental externalities of the Western way of life have negative impacts on the inhabitants of Southern countries.

Throughout the world, Belgian NGOs and their local partners are working to promote more sustainable patterns of production, but this would not make sense if they did not question the Western consumption model. This is the reason that their work in the South is intrinsically linked to their education and advocacy activities in Europe, with the overall objective to reconcile environment and development.

Over the last 20 years, many initiatives were taken, both by States and civil society organizations, to tackle the challenge of reconciling the three dimensions of sustainable development. More specifically, Belgian NGOs have been supporting projects in Africa, Asia and Latin America, aiming at eradicating poverty and inequalities through economically and environmentally sustainable patterns.

Protos and Water Committees

In Ecuador, Ghent-based NGO Protos, which specializes in providing sustainable solutions to water supply issues, supported the action of local-based actor CEDIR to provide water in the Canton of Cañar. In the last 13 years, the percentage of the population having access to drinking water was raised from 40 per cent to 70 per cent. But Protos did not only provide the means to rehabilitate and develop infrastructures. The whole project was based on the empowerment of local communities, through the introduction of 'Water Committees', which participated directly in the rehabilitation and were trained to progressively take over the management. Moreover, the ownership of every single family has been guaranteed through a monthly participation of US$0,10. However, as noble as the goal of providing safe drinking water to all is, it cannot be really sustain-

Image: ©Protos

Community management of water resources has been successfully implemented in Ecuador

able without a strong economic model. This is why Protos opted to fund rehabilitation, but to progressively withdraw from funding daily activities. Since 2006, all costs have been borne by local actors: 30 per cent by Water Committees, 70 per cent through local authorities. A total of 33,000 people have benefited from the project, which turned into a model in Ecuador, as community management of water was recognized by the 2008 Constitution.

Autre Terre and Coopcarmo

Meanwhile, Liege-based NGO Autre Terre ('Another Earth') has specialized in waste management in developing countries, through solidarity economy patterns. In Rio de Janeiro, Brazil, for instance, Autre Terre supports the activities of locally based cooperative Coopcarmo. In a country where systematic waste recuperation and recycling did not exist, the project has been supporting the organization of waste collectors to transform their environmentally useful activity into an economic success and a great social victory. By sensitizing the local population to waste sorting, Coopcarmo progressively turned into a legitimate partner to the surrounding municipalities. The cooperative contributes to limit local pollution and gas emissions, but also reinserts resources into the local economy. The support of Autre Terre allowed the worker-owned Coopcarmo to invest in compactors, which helped it to move up the value chain and increased its revenues. There are now 800 collecting points in two municipalities and a decent wage is guaranteed to all workers of the cooperative. As their slogan says: 'Waste is Life!'

Oxfam Solidarity and food sovereignty

For decades, many NGOs have worked in the agriculture sector, supporting small farmers in the commercialization of their products. But as the 'green revolution' shows its social and environmental limits, the results of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), issued in 2008 and sponsored by many international organizations, was considered an important victory for those fighting for a more sustainable food production pattern. Indeed, this report shows how agroecology, supported by many NGOs, is able to feed the world without depleting natural resources and worsening global warming consequences.

The IAASTD has turned into a stepping stone for those trying to re-establish a food production model that not only feeds the world, but also the producers, as two-thirds of people suffering from hunger are peasants and their families. But for NGOs such as Oxfam Solidarity, it was only a confirmation of the sustainability of their working model. Oxfam has supported farmers' organizations in developing countries for decades, towards food sovereignty. In Mali, Palestine, Vietnam and many other regions, it helps farmers rehabilitate heritage seeds, which are more adapted to local conditions. The consequences for environment and health are immediate, as those seeds require much less pesticides and fertilizers. But they are also important in terms of revenue, as local, richer seeds yield final products that can be sold at a higher price on local markets.

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Qatar's commitment to sustainable development: a forward-looking vision

Department of Social Development, General Secretariat for Development Planning, Qatar

Qatar's abundant hydrocarbon resources are being leveraged to make sustainable development a reality for all its people. Converting these natural assets into financial wealth provides a means to invest in world-class infrastructure; build efficient delivery mechanisms for public services; create a highly skilled and productive labour force; and support the development of entrepreneurship and innovation capabilities.

The Qatar National Vision (QNV) 2030 is beginning to transform Qatar into an advanced country, capable of sustaining its own development and providing a high standard of living for all. To help make that vision a reality, in 2011 Qatar launched its first National Development Strategy, NDS 2011-2016 – a far-sighted framework built on the principles of sustainable development and intergenerational equity.

Appeal to long-held values

Qatar's Government has anchored its plans for environmental preservation and protection in the core value of intergenerational justice, recognizing that depleting finite resources without creating new resources of renewable wealth jeopardizes the rights of future generations.

Image: GSDP (2011)

His Highness the Heir Apparent Sheikh Tamim bin Hamad Al Thani with Qatari children, the beneficiaries and a critical force in shaping national development, at the launch of Qatar National Development Strategy 2011-2016

Among Qataris, respect for the needs of future generations is a basic religious and moral value. In the same spirit as equipping the next generation with skills for future prosperity through education, Qatar's environmental management strategy seeks to preserve the quality of life for future generations and will put the country on a path of environmentally sustainable development.

Growth with balance and sustainability

In 2008, His Highness Sheikh Tamim bin Hamad Al Thani, Heir Apparent launched QNV 2030, which articulates the nation's long-term development goals and objectives. QNV 2030 is underpinned by four interrelated pillars: human, social, economic, and environmental development. It foresees a vibrant and prosperous future with economic and social justice for all, and where nature and humanity are in harmony with the principles of sustainable development.

The environmental pillar of QNV 2030 seeks to strike a balance between the needs of development and protecting the environment. It provides the principles for managing the negative externalities of Qatar's rapid economic growth, which saw real Gross Domestic Product (GDP) rise at an annual average of 13 per cent between 2000 and 2010.

The environmental challenges facing Qatar include the impact of diminishing natural water resources, extremely rapid urbanization and population growth as a consequence of rapid economic development, the effects of air pollution and environmental degradation, and the potential impact of global warming on Qatar's water levels and thereby on coastal urban development. Assessing the severity of risks and dealing with anticipated changes require mobilizing capacities and coordinating efforts to tackle the problems.

NDS 2011-2016 was launched in March 2011. It explicitly aligns the growth of national prosperity to the realities of environmental constraints. The strategy incorporates initiatives that support the foundations of sustainable prosperity.

Sustainable prosperity can be achieved only if the value of the nation's productive base expands – its constructed capital assets, infrastructure, human and social capital, natural endowments, technology and institutions. Growth of Qatar's productive base will lead

Image: Qatar Petroleum/Maersk Oil (2012)

Al Shaheen Oil Field, Qatar is committed to reducing CO_2 emissions from gas flaring through investment in innovative, cleaner technologies and improvements in industrial processes

to rising living standards for a growing population and for future generations.

Prioritizing sustainable development in industry

While investing in sources of future prosperity, the Government is adopting and adapting the most effective policies and technologies for protecting environmental assets and reducing pollution. The Government also recognizes the imperative of cultivating a sense of environmental responsibility within industry while building a legal system, effective institutions and partnerships that support environmental protection over time.

In recent years Qatar has made efforts to prioritize sustainable development at all levels of economic activity and development, most notably in the oil and gas industry. Qatar has taken major steps to reduce carbon emissions – especially from gas flaring, which accounts for about 12 per cent of total emissions. These steps include legislation to limit emissions, investment in cleaner technologies and improvements to industrial processes. Innovative research is underway at Qatar's Science and Technology Park on new carbon capture technology and on sequestration in carbonate reservoirs for storing carbon dioxide from the oil and gas industries.

In 2007 Qatar introduced its first United Nations Framework Convention on Climate Change Clean Development Mechanism, the Al Shaheen Oil Field Gas Recovery and Utilization Project, which reduced flaring by about 80 per cent. The Al Shaheen Oil Field is a production oil and gas field off the north-east coast of Qatar in the Persian Gulf, 180 kilometres north of Doha. The oil field lies over the North Gas Field, the largest gas field in the world. Currently there are seven offshore fields, which are under various stages of development in the North Gas Field. Facilities completed at the Al Karkara field in 2011 are designed to achieve zero gas flaring by injecting excess sour gas back into the reservoir.

Shipping is a critical link in the liquefied natural gas (LNG) value chain that extends from Qatar's North Gas Field to markets throughout the world. In 2008, research by Exxon Mobil Corporation in partnership with Qatar Petroleum resulted in an industry breakthrough in LNG carrier design and size, enabling transport technology that can carry 80 per cent more liquefied natural gas than current carriers and substantially reducing the energy used per delivered unit.

In 2009 Qatar Petroleum established a partnership with the World Bank's Global Gas Flaring Reduction Partnership (GGFR) programme. This has resulted in significant changes in gas flaring, despite the increase in production and expansion of oil and gas facilities. The joint effort by the GGFR partnership and the US National Oceanic and Atmospheric Administration highlighted a 14 per cent reduction of Qatar's flare volumes, from 2.2 billion cubic metres in 2009 to 1.9 billion cubic metres in 2010.[1]

The National Flaring and Venting Reduction Project will further reduce emissions from gas flaring, initially targeting the largest companies responsible for the bulk of flaring-related emissions. By 2016 the Government is committed to halving the volume of gas flaring to 0.0115 billion cubic metres per million tons of energy produced.

As part of its broader economic strategy, Qatar will continue to exploit its rich hydrocarbon endowment and further develop its energy-intensive petrochemical and metallurgy sectors, consolidating its position as a major force in world energy markets. At the same time, the country will look for opportunities to diversify its

Image: GSDP (2012)

Plans for a greener Doha will support other environmental priorities to improve air quality, use solid waste for composting and treat sewerage water to maintain green spaces

productive base into new areas that add to resilience and provide sustainable avenues of wealth creation.

Investing in creating the knowledge base

The Government is actively addressing knowledge and capacity deficits that can impede development of environmentally sustainable management systems and a knowledge-based economy. In 1995 the Qatar Foundation began investing in education, research and capacity development at all levels, with US$2 billion in resources. It supports a variety of programmes based at world-renowned international universities operating in Education City.

In 2006 the Government committed to spending 2.8 per cent of total government revenues on research, bringing the level of Government research support up to that of the world's major industrialized economies. The Qatar Science and Technology Park, established in 2009, promotes corporate research, technological

development and commercialization through engagement with international industry leaders and research institutions including Chevron Energy Solutions, Siemens, ExxonMobil, Shell Qatar and General Electric. This has helped Qatar to develop, promote and attract technology production, innovation and investment in cutting-edge research and development for more sustainable industries.

Towards environmentally sustainable development

The Government's ambitious environmental agenda requires organizational changes and substantial capacity strengthening within institutions responsible for the environment. Many parts of Government and the private sector are involved and the Ministry of Environment has assumed the lead.

Qatar's strategy for environmental management calls for 11 interrelated actions that cut across all areas of environmental management. These interventions, part of NDS 2011-2016, will put Qatar on a path of environmentally sustainable development. The changes call for new patterns in consumption and production, complemented by lasting improvements in environmental governance and performance. The environmental management strategy requires a broad shift in laws, regulation, management systems, technologies and attitudes.

The strategy for improved environmental management involves working towards seven outcomes with related time-bound targets.

Cleaner water and sustainable use

Among the various environmental concerns facing Qatar, the most pressing is linked to the country's most acute scarcity – water. With one of the world's lowest levels of rainfall, Qatar relies on water from desalination, groundwater and recycled water, and all three face stresses. Aside from these pressures, Qatar's consumption and network leakage rates are high. Per capita water use is one of the world's highest.

Qatar will enact a comprehensive National Water Act, establishing an integrated system of quality requirements, discharge controls and incentives for conservation in place of today's fragmented system of laws and regulations. The goal is a set of policies and regulations for the Government to align consumption and supply over time while protecting water quality.

Cleaner air

Qatar has two categories of air quality challenges. First, various local pollutants mix with particulates in the air – including chronically high levels of dust – which cause air quality problems that contribute to respiratory illnesses. Second, carbon dioxide emissions, mostly from energy production, add to greenhouse gases and contribute to global climate change. Qatar is developing a national policy to manage air pollution, greenhouse gas emissions and the broader challenges of climate change. All sectors of society – especially the private sector – have a role.

Improved waste management

Affluent societies tend to produce large quantities of waste, and Qatar is no exception. With an active construction business, an extensive hydrocarbon sector and a growing number of high-income households, Qatar creates more than 7,000 tons of solid waste each day.

Qatar has adopted a multifaceted strategy to contain the levels of waste generated by households, commercial sites and industry and to recycle much more waste. In approaching the challenge of improved waste management, the Government recognizes a hierarchy of actions to alleviate pressures on the environment, with the most preferable goal being the avoidance of waste. Where waste cannot be avoided, the goals are to reduce it, reuse it and recycle it.

Sustainably managed nature and natural heritage

In Qatar, as in many countries, biodiversity is facing threats from a range of human activities. Population growth and rapid urbanization have put pressure on the delicate balance of natural endowments, crowding out some elements in the biodiversity mix. Construction and industrialization are impinging on fragile coastal habitats and disrupting marine life. International shipping and trade have introduced invasive species that pose threats to indigenous species. Overfishing has emerged as both an ecological concern and a threat to future food supply.

To support the required analysis and eventual protection of the country's biodiversity, the Government will back detailed surveys that establish biodiversity baselines to enable decision makers to build new protections based on solid evidence. NDS 2011-2016 envisions a series of practical steps, beginning with the establishment of a central database by 2016 to inform decision-making, improve management plans and support regional activities. The database will draw on international best practice in design and could eventually be extended to cover all Gulf Cooperation Council countries.

A healthier urban living environment

Doha has grown exponentially, supported by a construction boom of striking contemporary buildings. Bringing a green dimension to urban planning will strengthen sustainability and make the city more liveable. Significant shifts in the make-up of Doha are being implemented. The Government's strategy for improved environmental management calls for an urban environment that effectively balances the natural and built environments by incorporating more green spaces. To make Doha a greener city, the Government is implementing a network of green spaces as ribbons of tree-lined areas rather than large, open parks which support other environmental priorities. These green areas will help to improve air quality and recycle waste by using organic solid waste for composting and treated sewerage water for maintenance.

An increasingly environmentally aware population

Successful environmental management will require active engagement throughout society. Large commercial corporations and policymakers have important roles, and so does every individual. There is also evidence that a deeper environmental awareness is growing. For example, schools have added environmental studies to the curriculum.


Image: GSDP (2012)

Increasing environmental awareness, especially in the young, will support and sustain improved environmental management

The Government will enlist the population in supporting and sustaining improved environmental management. The campaign to protect Qatar's environmental endowment draws on values embedded in the country's religious and cultural heritage. The notion of protecting the environment for the benefit of future generations has broad appeal.

Strategic partnerships

Addressing environmental concerns is a cross-generational, cross-border exercise. One key function of Government in the environment sector is to forge strategic partnerships with neighbouring countries as well as private firms and international organizations such as the United Nations Educational, Scientific and Cultural Organization, the United Nations Environment Programme and the World Health Organization, which can provide key knowledge, human resources and technology. Qatar's environmental challenges are shared to some degree by countries in every region of the world. Qatar has adopted an outward-looking, internationalist view to build partnerships that maximize the chance of successfully adapting both policies and technologies.

Within the Gulf region, countries share the challenges of hydrocarbon-driven growth and desert conditions, including water scarcity. Moreover, because pollutants do not stop at national borders, environmental problems spill over, requiring regional rather than national solutions. Just as the national Government will require national databases to support environmental regulation and policies, the Gulf region will need regional databases to support regional initiatives.

Strong regional cooperation will require continuous diplomacy and cooperation at all levels. Qatar is becoming more actively involved in regional and international platforms for sustainable development, including hosting the 18th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in December 2012.

Improved governance and outcomes

A culture of evidence-based policy-making will be needed, backed by information systems that ensure both informed decisions at the outset and continuous monitoring to guarantee compliance and, over time, measure impact. To make concrete the principles of gathering and sharing better information, the Ministry of Environment will mandate new reporting requirements, with all major industrial companies submitting quarterly environmental performance reports covering their emissions, water discharge and hazardous waste treatment. It will also provide a template for all companies to use for these reports.

Qatar's emerging commitment to environmental protection will require a virtual revolution in information and data-gathering systems. In mandating new standards for water, solid waste, airborne pollutants and biodiversity, the Government is taking stock of present conditions while defining realistic improvements for the next six years. However, decision makers need more information on groundwater levels, biodiversity and the health effects of air pollution – to cite just three areas where information gaps pose a challenge to assessing present and future risks and designing solutions.

A sustainable course

QNV 2030 established a framework of aspirations, calling for programmes and projects that ensure sustainable prosperity for future generations. Qatar's NDS 2011-2016 for the first time explicitly aligns the growth of national prosperity to the realities of environmental constraints. The programme of strengthened environmental management across economic and natural resource sectors sets out a framework for continuing economic growth that adheres to the foundational concept of intergenerational justice.

Interventions being initiated as part of NDS 2011-2016 will set Qatar on a course of environmentally sustainable development. Many of the changes call for new patterns in consumption and production, complemented by lasting improvements in environmental governance and performance.

Building the pillars of life on the road to Rio

Janez Potočnik, European Commissioner for the Environment

The European Union (EU) is playing an active and constructive role in ongoing negotiations regarding the United Nations Conference on Sustainable Development (Rio+20) and is determined to help make it a success. We would measure success in terms of concrete outcomes guaranteeing long-term sustainable development — delivering global job creation and eradication of poverty while safeguarding the natural resource base that the world economy depends on. Our view is that this would be best achieved by a global roadmap to an inclusive green economy. We believe this is closely linked to the emerging discussions on a set of global goals for sustainable development. At Rio+20, the EU is fully open to discussing universal goals and to working with everyone to achieve solid, measurable goals and milestones that will help us meet the enormous challenges we face together.

Sustainable development means meeting the needs of present generations without jeopardizing the ability of future generations to meet their own needs — in other words, a better quality of life for everyone, now and for generations to come.

Sustainable development will not be brought about by policies only: it must be taken up by society at large as a principle guiding the many choices each citizen makes every day, as well as the big political and economic decisions. This requires profound changes in thinking, in economic and social structures and in consumption and production patterns.

Creating opportunities for all

Each one of us will share our small planet with 9 billion people by 2050. It is predicted that there will already be 3 billion more middle-class consumers by 2030. We should rejoice at this prospect of prosperity for so many. But more middle-class consumers means more demand, and if this demand is met by the 'brown' economy, it will put immense strain on many resources. The world will need three times more resources — 140 billion tons annually — by 2050. That pressure will be the most significant limiting factor on our ability to grow and provide higher living standards. The planet's limits are

Image: Mauritania Delegation

Irrigation system at the region of Ardar in Sahara

Image: EU-China Biodiversity Programme (ECBP)

Sustainable protection of mountainous and peat area ecosystems

undeniable. The world should be looking at how to create prosperity, not misery, for all.

In order to guide the direction and pace of transition to an inclusive green economy, we need to build on the five pillars of life: water, sustainable energy, oceans, land and ecosystems, and resource efficiency, with a particular focus on waste. More specifically, we need to address the following areas:

- Water efficiency — access to clean water for all is essential
- Sustainable energy — we need to increase energy security and accessibility, and promote renewable energy and energy efficiency
- Oceans — we need to ensure the preservation and sustainable use of our oceans' resources
- Land and ecosystems — we must halt the degradation of land (soil) and ecosystems, and strengthen existing initiatives on sustainable agriculture
- Resource efficiency — we need to move to a more resource-efficient and zero-waste economy, as sustainable management of materials and waste is expected to generate substantial economic, environmental and social benefits.

An inclusive green economy based on global direction and global and national action on the pillars of life will be essential for growth and poverty eradication, offering opportunities for all countries around the world and in all stages of development.

The green economy can work...

In recent years the EU has implemented sustainable development through a broad range of its policies. In particular, it has taken the lead in the fight against climate change and the promotion of a low-carbon economy. The EU has adopted binding climate targets together with the EU Emissions Trading Scheme and a range of legislative instruments on biodiversity, waste management, water and air quality. This has encouraged the growth of EU eco-industries, which now correspond to over 2.5 per cent of EU gross domestic product and provide jobs for more than 3.4 million people. A key policy development has been the adoption of the Europe 2020 Strategy in 2010. This aims to transform the EU into a knowledge-based, resource-efficient and low-carbon economy and provide a sustainable response to the challenges facing the EU up to 2050.

...for everybody

The catalytic effect that proper incentives and framework conditions have on private investment is clear — and this is key to delivering on the promise of sustainable development. But at the same time we continue to acknowledge that official development assistance has a role to play. With €53 billion of development aid in 2011, the EU, with its 27 Member States, remains the world's biggest donor, providing more than half of global official aid. EU official development aid reached 0.42 per cent of EU gross national income, which exceeds the efforts of other major donors. EU aid has pulled millions of people out of poverty and saved countless lives over the past 10 years.

For example, take the efforts to provide sustainable energy for all. The European Commission alone has spent more than €2 billion over the past five years on energy projects and around €1 billion on improving the state of the energy sector in developing countries.

Image: EC Delegation in Sri Lanka

Waste management quick recovery project in north-east Sri Lanka

Building on our experience and expertise, we have focused on all elements of energy — from electricity, to governance, to technology, to clean cooking facilities. And we are ensuring that investments and growth are inclusive, benefiting all citizens while concentrating on the poorest and most vulnerable.

In order to scale up energy access projects, we have developed leading innovative financial instruments to pool the EU's grant resources with lending from European development finance institutions. Overall, this instrument already has a potential outreach of many millions in developing countries. And that's not all: the European Investment Bank has been prioritising energy, resulting in billions of Euros being granted in preferential loans in recent years.

Recently, the European Commission's Joint Research Centre published a very interesting report on 'Renewable Energies in Africa'. This study provides an analysis and a mapping of the potential and available resources for solar, wind, biomass and hydropower across the African continent. Such an overarching approach allows for each region of Africa to estimate the best choice or mix of renewable resources, taking fully into account sustainability and environmental criteria. The data available could serve to set up national renewable energy action plans.

And we are seeking to do more in the coming years. Our 2011 blueprint for higher-impact EU development policy — what we have called our Agenda for Change — will focus our cooperation on the most effective drivers of inclusive and sustainable growth. Using local people and local resources, it is central to providing opportunities for equitable and environmentally friendly economic growth, education and health, and to helping eradicate poverty.

Around 1.4 billion people, mostly in South Asia and sub-Saharan Africa, still live in extreme poverty and one-sixth of the world's population is undernourished. Unsustainable economic growth has increased the stress on the Earth's limited natural resources and on the carrying capacity of ecosystems, with 60 per cent of the world's natural resources already being used unsustainably or at their limit. Many environmental problems have not been solved and have become more acute; and economic, social and environmental problems are closely linked.

If we do not manage our natural assets and resources in a more sustainable manner, our economies and environment will suffer and we cannot alleviate poverty or achieve more equity. The poorest in our societies will suffer most if we use our resources unsustainably, as their lives and livelihoods depend very directly on water, land, seas, forests and soil.

There is a particular opportunity for those whose production systems are not yet 'locked in' to leapfrog to efficient technologies and systems that will permit them to exploit their resources — from forests and biodiversity to land and minerals — in ways that are sustainable and capable of supporting future increases in consumption, as the world's population rises. These could include anything from local renewable energy generation to water metering, and from satellite monitoring of forests and land use to development of farmers' skills in soil maintenance. However, new technologies alone are not enough. They must be combined with a drastic change in our consumption patterns, as without rendering these sustainable, there would be nothing left for us to buy, use and eat.

Working together for Rio+20

The EU is committed to delivering in Rio, but this cannot be done alone. We fully believe in multilateralism and hope others will help us to prove we are right. We hope the outcome of Rio+20 will be an ambitious plan for the future with concrete, timely and effective follow-up actions, which can have real impact across the world.

Sustainability programmes recognized by Zayed International Prize for the Environment

Meshgan Al Awar, Secretary General, Zayed International Prize for the Environment

Little effort or resource was spared in the quest for sustainable development under the late Sheikh Zayed Bin Sultan Al Nahyan, father and former President of the United Arab Emirates (UAE). To preserve and develop the environment for future generations of his country and worldwide, he adopted the concept of what has become known over the past 50 years as sustainable development.

In line with this vision and philosophy and to recognize and promote major pioneering contributions in the field of the environment and sustainable development, His Highness Sheikh Mohammad bin Rashid Al Maktoum, UAE Vice-President, Prime Minister and Ruler of Dubai, established the biennial US$1 million Zayed International Prize for the Environment (Zayed Prize) in 1999.

Global initiatives such as Agenda 21, the Millennium Development Goals (MDGs) and the Johannesburg Plan of Implementation for Sustainable Development are supported by the Zayed Prize, which, through the United Nations Economic and Social Council (UNESCO), has consultative status with the United Nations.[1]

Sustainable development drives prizewinner selection

Award winners are chosen by two international selection committees (Technical Advisory Committee and International Jury), based on three categories:

- World leadership in the environment and sustainable development
- Scientific/technological achievements in the environment
- Environmental action leading to positive change in society

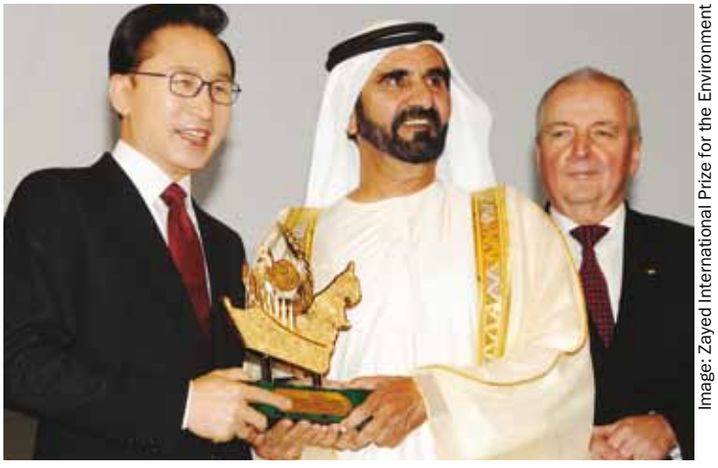


Image: Zayed International Prize for the Environment

H.H. Sheikh Mohammad bin Rashid Al Maktoum, UAE Vice-President, Prime Minister and Ruler of Dubai, awarding President Lee Myung-bak of the Republic of Korea

Stringent selection criteria means recipients must have advanced the cause of the environment and its contribution to sustained development, mobilized both regional and global efforts towards addressing sustainable development issues, successfully solved a major environmental problem, or accomplished sustained environmental improvement for a period of time.

Global leadership in Environment and Sustainable Development

Former United States of America President Jimmy Carter was recognized for his futuristic vision and concern for humanity, both as president and statesman. The Global 2000 initiative during his presidency indicates his concern for globalization, particularly in developing countries. His peace initiatives and work to improve conditions in human settlements, as well as his campaigns against poverty and the eradication of the Guinea worm in Africa, have gained the respect and admiration of the world community. The Jury considered that these achievements had made a major contribution to environmental protection in developing countries and also felt that President Carter upheld human dignity and the right to a decent livelihood, good health and development in peace, and that his concern for humanity and his vision met the objectives of the Zayed International Prize for the Environment.

The British Broadcasting Corporation (BBC) was awarded the Zayed Prize in 2004 in recognition of the fact that, in a media-dominated world, it is not just statesmen and women who drive awareness and change, but also the world's broadcasters and newspapers.

The media organization stands apart for its commitment, range of coverage, and dedication to addressing global, regional and national environmental concerns, with coverage cutting across all networks and programmes. Its commitment to environmental issues has been demonstrated at home through the organization's own sustainable development strategy, which is aimed at reducing energy consumption and waste in its day-to-day operations. The BBC not only broadcast and reported in depth on the 2002 World Summit on Sustainable Development (UNWSSD) but was applauded for its United Nations Conference on Environment and Development (UNCED) debate, which was co-produced with United States and South African television partners. A key commitment was the five-times-a-week broadcast of the Earth Report series, which has

Image: Zayed International Prize for the Environment

The international Million Tree Initiative launched in the Dubai Police Academy has been honoured by the Zayed Prize

been shown on the BBC since 1997. The series reaches nearly 300 million homes worldwide and around one million hotel rooms across 200 countries. The BBC broadcast its 300th Earth Report in December 2003, with a programme covering the devastating impact of industrial soy cultivation in the Brazilian Amazon. The series and its monthly interactive reports brought about real change by inspiring businesses, non-governmental organizations and governments to adopt more environmentally friendly technologies, lifestyles and policies.

Former United Nations Secretary-General Kofi Annan received his award in 2006, after doing more than most to catalyse political and public opinion to make environmental understanding a fundamental pillar of sustainable development. In this context, important reports in the run-up to the 2005 World Summit in New York included A More Secure World: Our Shared Responsibility and In Larger Freedom. The Jury also noted his personal leadership at UNWSSD, where water, energy, health, agriculture and biodiversity themes were addressed. Recognizing the potential threat that environmental degradation posed for people around the world, Annan called for the first international scientific assessment of the health of the world's ecosystems. The Millennium Ecosystem Assessment reported in 2005 and again prior to September's World Summit in 2005. Convinced that global environmental challenges require global cooperation, Annan has emphasized the importance of the multilateral system in all facets of his work,

Norwegian politician, diplomat, physician and international leader in sustainable development and public health, the former Prime Minister of Norway, Dr Gro Harlem Brundtland, received her award in 2008. She served as the Director-General of the World Health Organization and now serves as Special Envoy on Climate Change for United Nations Secretary-General Ban Ki-moon. Brundtland was Chair of the World Commission on Environment and Development, widely known as the Brundtland Commission. This group developed the broad political concept of sustainable development during a course of extensive public hearings, which were distinguished by their inclusiveness, and published its report, 'Our Common Future', in April 1987. The Brundtland Commission provided the momentum for UNCED and for Agenda 21. Brundtland was elected Director-General of the World Health Organization (WHO) in May 1998, and in this capacity adopted a far-reaching approach to public health by establishing the Commission on Macroeconomics and Health, and addressing violence as a major public health issue. Under her leadership, WHO was one of the first major employers to make freedom from tobacco addiction a condition for employment. In May 2007, Ban Ki-moon named Brundtland, along with Ricardo Lagos (the former president of Chile) and Han Seung-soo (the former Prime Minister of South Korea), as United Nations Special Envoys for Climate Change.

In 2011 President Lee Myung-bak of the Republic of Korea (ROK) was awarded the Zayed Prize for contributing to climate change adaptation and creating jobs through green growth policies. The Selection Committee recognized that President Lee's vision and leadership had created the opportunity for the ROK to become a green economy through low-carbon high efficiency. It added that in 2008, with the announcement of green growth policies aimed at achieving long-term sustainable development, Korea had taken the lead in green strategy. In the midst of the recent economic and financial crisis, the President committed his country to 'green growth,' a new paradigm for economic development that binds together environment protection and economic prosperity, by creating new

Image: Zayed International Prize for the Environment

Former United Nations Secretary-General Kofi Annan received an award in 2006 from H.H. Sheikh Mohammad bin Rashid Al Maktoum, for making environmental understanding central to sustainable development

growth engines and jobs through green technology and clean energy. His vision and leadership was a central driver in transforming the ROK development path into a low-carbon, resource-efficient and green economy. By extending the country's 'Green New Deal' into a five-year development road map, President Lee signalled that green growth is a strategy well beyond current economic recovery efforts and is intended to fashion a green economic future. This has the potential of starting a domino effect on the major Asian economies.

Scientific/Technological Achievements in Environment

The Zayed Prize was awarded to the Millennium Ecosystem Assessment (MA) in 2006, for the work undertaken by 1,360 experts across 95 countries involved in a landmark study on the condition of the world's ecosystem services, from fisheries and freshwater systems to the carbon capture of the global forests. The MA underlines the economic importance of nature's capital and demonstrates that the degradation of ecosystems is progressing at an alarming and unsustainable rate. Indeed, it estimates that 60 per cent of the ecosystem that supports all life on Earth is being degraded or used unsustainably. The MA concludes that these declines are fast becoming barriers to fighting poverty and meeting the MDGs, while triggering worrying new threats including the spread of old diseases such as malaria and cholera, as well as increasing the risk of emerging new diseases. Numerous spin-off reports from the MA published throughout 2005 are not only a wake-up call to world leaders, but offer forward-looking proposals on how to reverse the degradation of ecosystems and the services they provide.

In a statement released in March 2005, Living Beyond Our Means: Natural Assets and Human Well-being, the MA's 45-person board said: "The overriding conclusion… is that it lies within the power of human societies to ease the strains we are putting on the nature services of the planet", adding: "Achieving this however, will require radical changes in the way nature is treated at every level of decision-making and new ways of cooperation between government, business and civil society." In the opinion of the Jury, the MA is a remarkable scientific achievement. It is also one that is commanding political attention while shaping the environmental agenda of the twenty-first century, particularly in the challenging area of ensuring nature's capital is valued alongside financial and human capital.

In 2011, this prize was awarded to Sir Partha Dasgupta, the Frank Ramsey Professor of Economics at Cambridge University in the United Kingdom. One of the most outstanding environmental economists of his generation, he was among the leading economists making the link between sustainability and economics well before such work was fashionable or fully understood. Professor Dasgupta coined the term 'inclusive wealth' to spotlight the way conventional measures of wealth — primarily GDP – fail to capture natural capital or environmental assets.

Environmental action leading to positive change in society

Dr Badria Al Awadhi, an outstanding lawyer dealing with environmental issues, was awarded the Zayed Prize in 2004. As well as being a member of a number of international organizations such as the International Federation of

Women Lawyers, the International Law Association, the International Commission of Jurists and the International Council of Environmental Law established at Kuwait University in 2001, Dr Badria served as General Coordinator for Regional Organization for the Protection of the Marine Environment for more than 10 years. She is a founding member of the Kuwait Environment Protection Society and served as Secretary General for the Society for over 10 years. Dr Badria is also a Global 500 Laureate. She has published several books and articles on various issues including the environment, human rights, women's and children's rights and environmental awareness for children.

Beyond the Award

- In his acceptance speech during the award ceremony in Dubai in 2006, former United Nations Secretary-General Kofi Annan stated that the prize money would go to charity, promoting agriculture and girls' education in Africa[2]
- With the cash money received from the Zayed Prize, the Millennium Ecosystem Assessment Board developed and published Ecosystems and Human Well-Being: A Manual for Assessment Practitioners, launched in May 2010 at the Convention on Biological Diversity, Subsidiary Body on Scientific, Technical and Technological Advice, in Nairobi, Kenya[3]
- The Under-Secretary of Commerce for Oceans and Atmosphere and the National Oceanic Atmospheric Administration in the United States, and a world leader in environmental sciences, Professor Jane Lubchenco received her award in 2008. Professor Lubchenco discovered fundamental ecological and evolutionary relationships among animals and plants within complex coastal systems. She also studied the effect of aquaculture on world fish supplies, and how biotic and abiotic local interactions can have a strong influence on the large-scale properties of ecosystems. Her recent work has shown how coastal oceanographic features can affect local community structure and dynamics. These studies have led to a general understanding of factors affecting the distribution, abundance and biodiversity of species
- In his acceptance speech, President Lee Myung-bak of the ROK suggested the world share the vision of green growth to adapt to climate change and build a planet-responsible civilization. In particular, with the establishment of a regional office of the Global Green Growth Institute in the UAE, ROK and UAE can jointly work towards sustainable development.[4]

Image: Zayed International Prize for the Environment

The Zayed Prize has long worked in partnership with various United Nations bodies

International, regional and local sustainable development

Sustainable development is being promoted through various environmental initiatives and activities alongside the Zayed Prize, which has a long partnership with various United Nations bodies, such as UNESCO, United Nations Environment Programme (UNEP), United Nations Industrial Development Organization, United Nations Development Programme and the Economic and Social Commission for Western Asia.

In collaboration with UNEP and the United Nations Convention to Combat Desertification, in February 2000, the Dubai International Conference on Desertification was attended by several ministers and more than 200 scientists and practitioners. Several related activities ran in tandem, including workshops, seminars and an exhibition on environmentally sustainable technology, resulting in the Dubai Declaration on Combating Desertification. The Dubai Declaration on Integrated Water Resources Management in Arid Regions was established following the Dubai International Conference on Integrated Management of Water Resources in the third Millennium, in February 2002, in partnership with UNEP and the Arab Water Council.

In April 2005, the Second Festival of the Civilizations and Cultures of World Deserts took place in Dubai, alongside the World Deserts Foundation and UNEP. A ministerial conference was organized during the event for the Ministers of Environment, Culture and Tourism on the topic of Integrating Efforts towards Sustainable Development in Desert Regions, followed by the Dubai Charter for Sustainable Development in Desert Regions.

The International Conference on Sustainable Construction took place along with UNEP in June 2008. More than 500 delegates attended, including ministers, officials from environment ministries and scientists, as well as public and private sector representatives from around the world.

In February 2005, regional initiatives included hosting the Arab Region Roundtable on Harnessing Science, Technology, and Innovation for Sustainability in Dubai and establishing a partnership with the Academy of Science for the Developing Countries. The Dubai Appeal for Science and Technology was established, allowing scientists to appeal to Arab Governments and international organization, thus strengthening the role of science and technology in implanting sustainable development plans both regionally and nationally.

New local award launched

In 2011, Sheikh Mohammed integrated local and global efforts in his role as patron of the Zayed prize by founding a new award, The Emirates Appreciation Award for the Environment. This award aims to recognize and promote pioneering contributions from both individuals and organizations within the UAE in the field of environmental and sustainable development.[5]

International cooperation for global green growth

Sang In Kang, Jun Hyun Park and Emily Park, Global Strategy Center, Korea Environment Institute

The Korea Environment Institute (KEI) is the country's leading think tank on environmental policies and environmental impact assessment. Established in 1993 by the Korean Government as a public research institute, it has been at the centre of environmental development in Korea ever since. As part of the Korea Council of Economic and Social Research Institutes under the Prime Minister's Office, KEI works closely with line ministries of the Korean Government and provides policy recommendations and guidance to inform the decision-making process.

Bridging science and policy, KEI aims to set out a policy direction to a sustainable future for humanity. KEI delivers this vision by advancing quality research and development, promoting knowledge networks on the environment, building a collaborative research protocol, and creating a vibrant and transparent organizational culture. Through cutting-edge research and rigorous analysis, KEI has positioned itself as a leading national institution in responding to growing demand for knowledge and insight on sustainable development.

Dedicated to mainstreaming the environment for sustainable development, KEI's research and analysis is based on an interdisciplinary approach, which combines environmental, economic, and social pillars of sustainable development. KEI also strives to improve Korea's environmental policies and practices by ensuring interlinking between policy and implementation, comprehensive understanding of socioeconomic perspectives, and active communication and engagement with stakeholders. Common to all priority areas, KEI works in partnership with a wide range of stakeholders including line ministries, academia, international organizations, civil society and the private sector. With more than 240 research staff and 90 PhD

Organigram of Korea Environment Institute

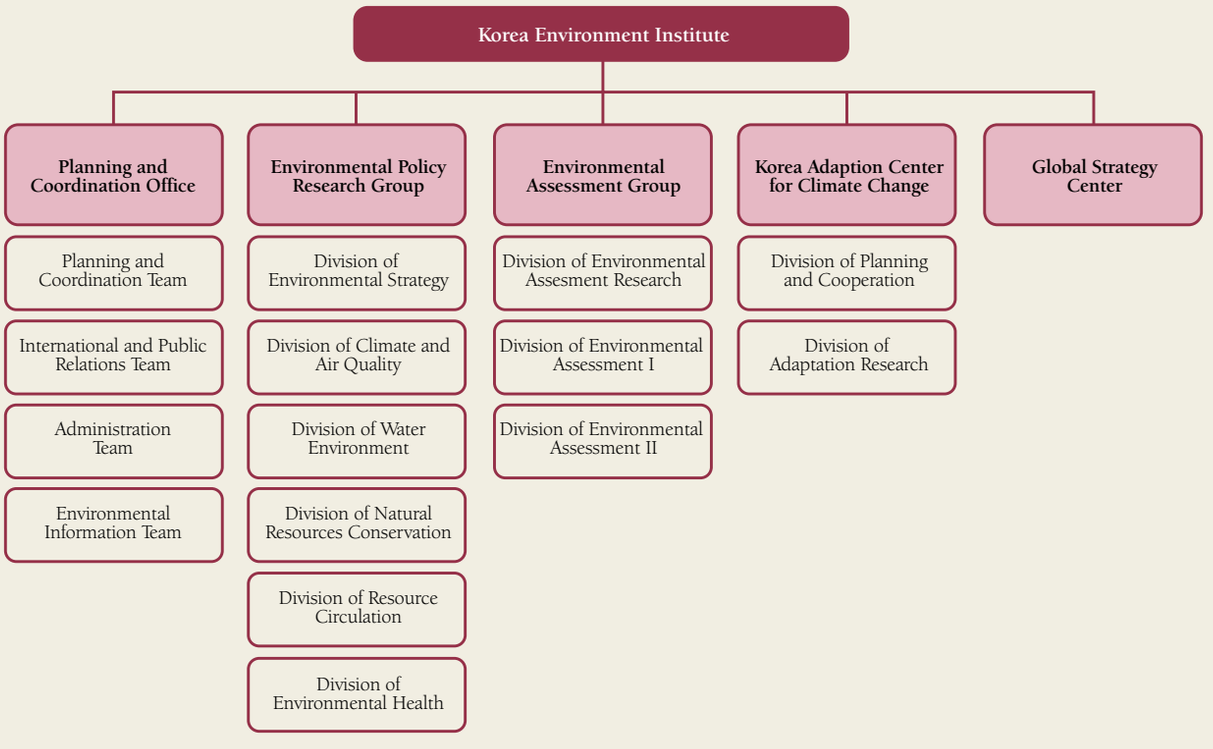


Image: Korea Environment Institute

KEI International Conference 2011 on 'Global Green Growth Partnership', 17-18 November 2011 in Seoul, Korea

experts in various disciplines, KEI's current work is organized around four priority areas:

- The Environmental Policy Research Group leads extensive research and analysis of KEI on a wide range of topics, including air quality, water, resource conservation and circulation, and environmental health. In particular, the Group is dedicated to developing an integrated approach to environmental strategy by implementing green growth for sustainable development.
- KEI is mandated to review major development projects in Korea and conduct environmental impact assessments. The Environmental Assessment Group is mainly responsible for this area of work within KEI. Sound environmental assessment is critical in minimizing environmental pressure and avoiding potential adverse impacts from development projects, in either planning or implementation. KEI plays an important role in implementing the country's Environmental Impact Assessment Act by carrying out a prior environmental review and assessment. Alongside the Ministry of Environment, it operates an online database designed to enhance knowledge management in this area. The database was upgraded to the Environmental Impact Assessment Support System (EIASS) in 2009.
- Although the Korean Government is strongly committed to taking robust action against climate change, the fight remains a formidable challenge. From 1912-2008, average temperatures across six of the nation's major cities increased by 1.7° C, which is more than double the global average. In an effort to support the national Government's strategy in proactively adapting to climate change, KEI has hosted the Korea Adaptation Centre for Climate Change (KACCC) since July 2009. KACCC seeks to maximize national adaptation capacity and ensure successful implementation of appropriate strategies by developing tools and methodologies on climate change adaptation.
- With a growing recognition of the need for enhanced collaboration and coordination beyond national level, KEI launched the Global Strategy Center in June 2010, to extend its body of work towards regional and global levels. The centre operates as the main implementing arm of KEI's global partnership and outreach activities, particularly on technical cooperation and knowledge sharing with developing countries. It also leads KEI's research on the green growth strategy for developing countries and reviews Korea's Official Development Assistance (ODA) on the environment.

Building on its 20-year experience at national level, KEI has taken its work to a new level through regional and global partnerships, and now collaborates with 23 research institutes from 12 countries and four international organizations, including the United Nations Environment Programme (UNEP) and the Organisation for Economic Co-operation and Development. KEI

Image: Korea Environment Institute

Field visit for 'Integrated Water Management Model on the Selenge River Basin in Mongolia and Russia (2007-2010)', in collaboration with Institute of Geoecology of Mongolian Academy of Science (IGMAS), Baikal Institute of Nature Management, and Siberian Branch of the Russian Academy of Sciences (BIN SB RAS)

facilitates policy dialogue and technical discussion by regularly hosting international conferences and seminars. The most recent KEI International Conference was held in November 2011, focusing on Global Green Growth partnerships. The conference provided an open forum for discussion on green growth in developing countries and strategies for green ODA.

KEI has led the way in developing an international research network known as the Network of Institutions for Sustainable Development (NISD) in collaboration with UNEP's Economics and Trade Branch (ETB). The network was launched in March 2004, at the 8th Special Session of the UNEP Governing Council/Global Ministerial Environment Forum (GC/GMEF) and consists of 49 membership organizations from 33 countries. NISD is a platform for enhancing information exchange, capacity-building and outreach activities and promoting regional cooperation. Its objectives are to foster participation in policy research, expand environmental knowledge, enhance programmes for sustainable development in developing countries and advance discussion on international environmental issues.

KEI also offers its expertise and knowledge through joint research and partnership projects. Key areas include the Integrated Water Management Model on the Selenge River Basin in Mongolia and Russia (2007-2010), in collaboration with the Institute of Geoecology of the Mongolian Academy of Science, Baikal Institute of Nature Management and Siberian Branch of the Russian Academy of Sciences. The objectives of the project were to build an integrated water management model that will serve as an important policy tool for sustainable management of the Selenge River Basin and to analyse the growing problems of managing water resources with a view to fostering the peaceful settlement of water-related disputes at local, regional and international levels.

Another key project, Sustainable Development in the Context of Regional Economic Integration: Strategies for Environmental Sustainability and Poverty Reduction (2005-2008), was designed to provide policymakers with ways of promoting sustainable development in regional economic integration, while identifying strategies for environmental sustainability and poverty reduction. Project participants included KEI, the Institute of Global Environmental Strategies in Japan, McGill University in Canada, the National Institute for Environmental Strategies in Japan and UNEP-ETB. Other institutions within Asia involved in national activities included the Policy Research Centre for Environment and Economy of the State Environment Protection Administration of China, Indonesian Institute of Sciences, Thailand Environment Institute, and the Institute of Environmental Science and Technology at the University of Hanoi in Vietnam.

KEI is also committed to sharing knowledge and best environmental practices for sustainable development to support capacity-building in developing countries. The organization develops and delivers bilateral programmes such as the Mongolian Capacity-Building Programme on EIA in mining development, Sri Lankan Waste Policy Education Programme and

Image: Korea Environment Institute

Capacity building programmes of Korea Environment Institute

Training Programme on Sustainable Development for Countries. These schemes draw upon environmental management practices in Korea, along with its experience in capacity-building, while inspiring forward-looking, viable policy measures in partnering countries.

Recognizing the pivotal role of capacity-building and public awareness in implementing environmental policy for sustainable development, KEI launched an online education programme through the Cyber Environmental Education Institute. This project offers a wide range of environmental training tailored to both beginners and practitioners. The topics include environmental impact assessment, sustainable management of resources, urban development programmes, conflict resolution and social impact assessment. In cooperation with the Korean National Commission for the United Nations Educational, Scientific and Cultural Organization, KEI also published a study on strengthening education for sustainable development (ESD) with recommendations on improving ESD for students and also introductory guidelines for educators in the field.

Progressing global sustainable development requires a solid and innovative approach. Climate change demands undivided attention and political commitment to achieve a sustainable society. In 2008, Korea adopted 'low-carbon, green growth' as a new development concept for the next 60 years. KEI is actively involved in spearheading the strategy and drawing up a road map for low-carbon, green growth, making recommendations for sectoral frameworks on the National Green Growth Strategy and five-year plan milestones. In addition, KEI is active in driving the transformation strategy as a resource for alternative policies, analytical capacity and relevant methodologies.

Korea holds a unique position due to its 60-year development experience. The Korean Government is ready to play a bridging role by sharing its knowledge to support the international effort on green growth for sustainable development. This means KEI remains firmly committed to the nationwide effort on low-carbon, green growth by capitalizing on its national expertise and international partnerships and ultimately, translating the vision of green growth into a practical term for all.

Image: Korea Environment Institute

Network of Institutions for Sustainable Development (NISD) (For more information on NISD and its research activities, http://nisd.kei.re.kr)

Green growth: necessity or opportunity for Africa?

Frank Sperling, Chief Climate Change Specialist, Department of Energy, Environment and Climate Change
and Alexis Rwabizambuga, Chief Climate Change Officer,
Compliance and Safeguards Division, the African Development Bank

In June 2012, the world's spotlight will again shine on the city of Rio de Janeiro. Twenty years after the United Nations Conference on Environment and Development — also known as the Earth Summit — representatives from government, private and civil sectors will once more converge in the city to take stock of the state of the world and try to chart a course for human development. They will seek to address pressing socioeconomic and environmental issues for current and future generations — a daunting task.

The problems are manifold and complex, as short-term and long-term socioeconomic and environmental issues vie for urgent attention. Decision makers are confronted with the immediate need to address the international financial crisis, while also having to respond to broader shifts in the political and economic landscape.

Image: AfDB

This fisheries project in Madagascar increased shellfish yields sustainably

Meanwhile, an ever-growing body of scientific evidence shows that the current economic model is unsustainable, as environmental changes driven by human activities are straining the Earth's life support system.[1, 2] A rapidly growing world population is confronted with declining land productivity, environmental degradation, air and water pollution and the looming threat of climate change. In fact, humans are now considered the dominating force shaping the face of the Earth by altering key physical and environmental processes on a local and global scale.[3, 4]

Building on the concept of sustainable development, green growth has been portrayed as the necessary model for humankind to master these challenges. Like sustainable development, green growth takes a more comprehensive approach to development, capturing its economic, environmental and social dimensions, while adding an emphasis on growth of a 'green' nature. Then there is the concept of a green economy, which is described by the United Nations Environment Programme (UNEP) as a mechanism for sustainable development. But what does the term 'green' mean? Are there shades of green? Will there be green development projects versus non-green projects? How green should a developing country's development be? And can developing countries afford to be green?

Africa's changing development context

Over the past decade, the African continent has seen rapid economic growth, with six of the world's ten fastest growing economies. However, while this is promising, it is also important to recognize that growth has been uneven across countries and economic sectors. There have been important advances in macroeconomic policies, but often growth is driven largely by a single sector. Despite some progress towards the Millennium Development Goals, African countries will fall short in achieving many of the targets.

Furthermore, the positive impact on sub-Saharan Africans has been limited. The number of people living on a daily income of less than US$1.25 has decreased by only 7 percentage points (from 58 to 51 per cent) between 1990 and 2005.[5] With the exception of a few positive examples such as Cameroon, Ethiopia, the

Image: ©Frank Sperling

Landscape, Tunisia, Northern Africa

Gambia, Ghana, Senegal and Morocco, the combined impact of the recent food, fuel and financial crises has also led to a reversal of the gains made in alleviating absolute poverty. Persistent high levels of rural poverty and the working poor (people who are unable to rise above the poverty line despite being employed) remain.[5] These facts show that current growth is vulnerable to external economic shocks and often bypasses large segments of society.

Environmental sustainability is particularly important to African livelihoods and economic activities, which are heavily dependent on natural resources. Land degradation, excessive extraction of groundwater, and air and water pollution pose threats to human health as well as undermining the ability of ecosystems to deliver essential goods and services. The continent's population is projected to increase from roughly 1 billion people today to about 1.6 billion people by 2030.[6] In conjunction with urbanization trends and a rising global population, there will be further pressure on Africa's natural resources.

Climate change is superimposed on these challenges, multiplying existing risks while introducing new ones, such as shifts in vector-borne diseases to areas with no prior experience of them. The African Development Bank (AfDB), together with nine other bilateral and multilateral agencies, highlighted early on in an inter-agency report that climate change is a development problem that will constrain progress towards and beyond the Millennium Development Goals if no remedial measures are taken.[7] The report emphasized the importance of mainstreaming adaptation to climate change into development planning, recognizing that adaptation is a necessary complementary measure to mitigation. In a nutshell, the challenge for humankind is to adapt to climatic changes that can no longer be avoided and to avoid changes that societies cannot adapt to.[8]

Within this context, the implications for Africa are two-fold. First and foremost, Africa needs to 'climate-proof' its development by managing existing climate risks and adapting to climate change. The continent is already highly vulnerable to current climatic variability, as the prevalence of weather and climate related disasters shows.[9] Due to the underlying environmental and socioeconomic conditions, hazards frequently translate into disasters. This adaptation deficit needs to be addressed by scaling up preventive disaster risk management efforts. Livelihoods and sensitive economic sectors — particularly health, agriculture and infrastructure — also need to be prepared for climatic changes that are likely to hinder their development.

Secondly, Africa's development will take place in an increasingly carbon-constrained world if dangerous levels of climate change are to be avoided. The development pathways Africa chooses will influence in part the climate change impacts it will suffer. Historically, Africa's per capita and aggregate greenhouse gas emissions have been low compared to other economic regions. It is clear that other countries need to take the lead in reducing emissions. However, significant emission reductions are needed if global warming is to be limited to 2°C.[10] The energy infrastructure decisions Africa takes today will have repercussions on its future carbon intensity. Through its natural resource wealth, Africa also holds an important key to keeping carbon out of the atmosphere. With international support and in recognition of the principle of differentiated respon-

Image: AfDB

Solar power project

sibilities enshrined in the United Nations Framework Convention on Climate Change, Africa will have to play a role.

Towards green growth in Africa

The focus on green growth is a focus on the quality of growth. There should not be a trade-off between development objectives and their sustainability. The very rationale behind the concept of green growth is that by not adequately valuing social and environmental assets, the current economic model leads to false development choices.

A green growth model for African economies will need to be tailored to their particular development circumstances, and there will be marked differences between middle-income and low-income countries. The definitions used by the Organisation for Economic Cooperation and Development (OECD), the World Bank and others recognize this. However, in practice the discourse is often reduced to a discussion on low-carbon development. As a result, green growth may be perceived as a constraint to development rather than as a necessity or an opportunity for countries where aggregate and per capita emissions have been low.

For the least developed countries, increasing access to energy, improving transportation systems and strengthening urban infrastructure are essential prerequisites for development. Meeting these objectives may require increases in emissions, albeit from a very low baseline in comparison with other regions in the world. It has to be clear that these essential development objectives cannot be let go. However, there are multiple ways to reach these objectives. Decisions taken on infrastructure today have long-term implications for development pathways. Recognizing that we are living in an interconnected world that is increasingly crowded and carbon-constrained enables us to identify opportunities early on that meet these development objectives in a more energy-efficient manner.

Integrating these regional and global trends into development programming, creating the right incentives and regulatory frameworks, can help countries avoid locking into development pathways that are not sustainable and will require costly changes of direction later on. In fact, greenhouse gas abatement cost curves for Africa by McKinsey suggest there are many sector-specific measures that can result in cost savings. Yet these measures often are not taken due to lack of awareness, upfront investment and political will.

Another important aspect of any green growth strategy in Africa will have to be an emphasis on sustainable land and water management. As a continent facing steep environmental gradients, widespread land degradation and climate change, Africa needs to shift to a sustainable and efficient use of its natural assets if it is to meet the needs of a growing population.

With increasingly integrated markets, African countries must strengthen their risk management mechanisms and diversify their economies to reduce vulnerabilities to environmental and socioeconomic changes and to buffer themselves against exogenous shocks. This includes helping livelihoods and economic sectors manage current climate risks and adapt to climate change over time, but it also means building the resilience of Africa's development against other types of shocks, such as fluctuating prices for Africa's commodities on world markets. Hence, strengthening

Image: AfDB

Tropical forest rehabilitation programme in Congo

risk management mechanisms and diversifying economies will be important ingredients for strengthening the robustness of growth and development in Africa.

Enabling green growth

OECD has spearheaded the conceptual thinking on green growth, providing frameworks and indicators to track progress. Other global institutions such as the World Bank have also taken on green growth as a key development concept for the twenty-first century. Complementary to this, UNEP has championed conceptual and analytical work to identify the building blocks of a green economy, which is framed as a mechanism for achieving sustainable development pathways.

While both the scope of green growth and a green economy are comprehensive and it is generally acknowledged that concepts need to be adjusted to particular development contexts, there is still a widespread perception that the main emphasis is on low-carbon development and that other environmental issues are secondary concerns. Hence, it is important that developing countries take ownership in defining green growth.

Regional development banks such as AfDB can play an important role in ensuring that green growth becomes a practical concept for Africa, meeting the specific development needs of its people and economic sectors while ensuring that the continent is also better prepared to address current and future environmental challenges. Ultimately, practical green growth concepts need to build a bridge between global, regional and local concerns.

Consequently, AfDB is functioning as a catalyst for ideas and practical concepts, technical assistance and financial support for its regional member countries (RMCs). The bank is developing its long-term strategy, which promotes inclusive green growth to guide its interventions in RMCs. AfDB will assist the transition of African countries towards a green economy in a manner that responds to Africa's needs.

AfDB can build on its financial and operational experience in implementing a range of programmes and activities related to the Rio Conventions. In particular, as Africa's premier regional development bank, it can build on experiences with innovative finance instruments and funding mechanisms such as the African Water Facility, Climate Investment Funds and the Global Environmental Facility, with the aim of promoting integrative solutions that allow African countries to obtain support for addressing upfront financing issues in the transition towards green growth.

A necessity and an opportunity

Green growth should not be seen as a constraint but as both a necessity and an opportunity for Africa. With the need to develop much of the continent's infrastructure and economy, African countries hold the key to a more sustainable future. The decisions taken today will in many ways determine the energy and resource efficiency of African economies in the future, as well as their resilience to cope with and adapt to the environmental and socioeconomic challenges of the twenty-first century. Hence, African stakeholders need to define and implement a green growth concept that meets their development needs while also allowing Africa to adapt to a changing world.

Swedish perspectives on sustainable development

Gunilla Carlsson, Minister for International Development Cooperation, Sweden

Over the last 30 years, the world has changed dramatically. Globalization and economic growth are enabling increased trade and mobility. Technical advances and innovations are helping to solve our common problems and increasing numbers of people are moving out of poverty and political oppression. At the same time, we are facing numerous challenges and crises, such as climate change, depletion of biological diversity, threatened ecosystems and a vulnerable situation regarding food security.

Sustainable development presupposes democracy, respect for human rights institutions that enable transparency and accountability, free access to information and gender equality. Women's economic and political participation are necessary conditions, not only for equality, but also for economic growth alongside equitable and sustainable development. Market economy and free trade, alongside innovation, research and technical progress, are crucial instruments for long-term and inclusive welfare. Efforts to achieve sustainable development must focus on creating conditions and opportunities for individuals to control their own lives. Shifts towards economically and environmentally sustainable forms of production and consumption require trust in the institutions and authorities that lead the way.

When people have the necessary knowledge and insights about the need for sustainability, change is possible at local, national and global levels. However, there is a particular need to reform and strengthen international structures and frameworks to better integrate the three dimensions of sustainability – economic, social and environmental – across all levels. To deal with the crises as well as manage the opportunities facing decision makers, collaboration between a wide spectrum of actors is needed, from civil society organizations and the private sector to local and national governments.

Important issues in the development of sustainability policies include:

- Access to, and sustainable use of, energy, water and sanitation for all people, particularly women and children. The way these resources are used is a major determinant of people's health, access to food, agriculture and, more widely, the private sector, as well as inclusive growth and development
- Sustainable urbanization — more than half the world's population already lives in cities and urbanization is set to continue. This requires a holistic perspective, including integrated planning, energy- and resource-efficient techniques, and participation, employment and access to welfare services for poor people
- Correct pricing and valuation of ecosystem services — there is need for economic incentives to make the polluter pay, as well as for phasing out environmentally harmful subsidies. The validation of ecosystem services in national accounts and in business plans is an important step towards shaping economic incentives for the conservation of biodiversity. New indicators for measuring sustainable development that complement the growth of Gross Domestic Product are also needed
- Sustainable agriculture, forestry and fishing — the role of these sectors in the shift to a green economy should be highlighted, alongside their importance in improving people's living conditions. Nature's resources must be used in a responsible and sustainable manner

Image: Solvatten

The Swedish 'Solvatten' purifies water by exposing it to sunlight through the foldable container/purifier. This is an example of Swedish green technology being exported

Image: Dan Ljungsvik

The Lysekil municipality at the west coast of Sweden compensates clam farmers financially for nitrogen and phosphorus purification — an example of the pricing of an ecosystem service

- The business sector — business has a decisive role in mobilizing resources, creating employment, upholding corporate social responsibility and promoting new ideas and perspectives. The expertise, resources and innovative nature of this sector need to be tapped further. Cooperation between private and public sectors requires more development
- Trade and sustainable development — the participation of developing countries in the international processes of environmental and climate standardization and certification will facilitate increased market access for sustainable products and services. More efficient use of resources in production and consumption are preconditions for sustainable development.

These are some of the areas where Sweden would like to see rapid progress at the international level, but the country is also active in promoting sustainable development both at home and with partners abroad. The Swedish example shows that economic growth and reduced greenhouse gas emissions are compatible. From 1990 to 2007, Sweden reduced its emissions by 12 per cent, while experiencing constant economic growth over the same period. Important factors behind this example include increased energy-use efficiency and greater use of renewable energy sources. New and even more ambitious targets have now been set in these and other areas of a combined energy and climate policy.

Paying for ecosystem services

Put simply, ecosystem services are all those benefits society obtains from nature. Wood from forests and food from the fields are obvious examples. The capability of ecosystems to clean or neutralize emissions is another.

Paying for ecosystem services is a relatively recent approach to natural resource management and is preferable from a societal point of view. It is already in use in Sweden and elsewhere. One example comes from the Lysekil municipality on the west coast of Sweden. Instead of adding a nitrogen purification unit to its sewage disposal plant, an agreement was signed with a clam farmer, who now is now paid by the municipality for each ton of nitrogen absorbed by the harvested clams. This means the clams are delivering an ecosystem service that is paid for by water and sewage consumers. The service paid for under this agreement is water purification, which means Lysekil saves an estimated €100,000 each year, compared to the cost of purifying water through the sewage disposal plant.

Another example is Söderhamn, in mid-Sweden, which established a wetland attached to a sewage disposal plant, as part of a Government investment programme. This resulted in reduced nitrogen and phosphorus emissions at a cost lower than it would have been to extend the plant.

Compared to other countries, Sweden has very good access to high-quality water. This is partly due to natural conditions and low population pressure, but also partly due to long-term environmental policies and efforts. Nonetheless, emissions from a large number of sources still cause serious environmental problems, for instance, in the form of nutrients from households and farms. These problems affect both freshwater and oceans. To maintain high-quality water resources in

Image: Kristofer Samuelsson /Johnér

The Hammarby Sjöstad, Stockholm, has set a new standard for future housing development with its integrated planning approach

times of increased human influence and the growing need for drinking water, prudent water management is essential, together with technical innovations.

Sweden takes an integrated approach to water management, beginning with the movement of the water through the landscape and on to the drainage area. In 2011, a new Agency for Marine and Water Management was established. Its objective is to further integrate marine water management, allowing better conditions for sustainable water use. The serious environmental conditions in the sea surrounding Sweden are a Government priority.

Sweden has a long coastline and this is a great responsibility for marine environments. When increasing numbers of offshore facilities for wind and wave energy are added to fishing and transportation, the need for marine resource planning and management becomes more urgent. Marine planning allows for use — without misuse — of sensitive seas. Such work is jointly undertaken with neighbouring countries. For example, in the Baltic Sea, Sweden and Finland are collaborating in the Plan Bothnia project, which is aimed at ecosystem-based marine planning.

There is also wider collaboration around the Baltic Sea, where 132 pollution hotspots were identified in the 1990s within the framework of the Helsinki Commission. The Swedish International Development Cooperation Agency and its partners in various countries have been involved in about 40 water and wastewater projects, resulting in a 40 per cent reduction in nitrogen and phosphorus discharges over a ten-year period. This translates into a total reduction of 3,500 tons of phosphorus into the Baltic Sea each year, which is more than the total national discharges of Sweden.

Courses and training sessions are undertaken in Sweden and abroad with the purpose of enhancing capacity in this field. One example is the Swedish support given to the Indian organization Tarun Bharat Sangh, which is active in more than 1,000 villages in Rajasthan. Improved management has resulted in raised water tables, increased access to water and higher agricultural yields, which in turn has contributed to improved incomes and reduced poverty.

Sweden is host to two important international resource centres in the field of water management, the Global Water Partnership and the Stockholm International Water Institute. The latter hosts the largest annual international water conference — World Water Week — and has emerged in recent years as an international knowledge and capacity centre for water issues.

Sustainable cities

More than half the world's population lives in cities, and urbanization continues at a rapid pace. Urbanization is inherent in economic and cultural development and these trends are universal. Life chances and economic opportunities are often better in cities, even for the many poor and disadvantaged.

How urban growth is managed has enormous implications for whether the potentially disastrous impact of climate change can be avoided. A number of environmental problems — many of them related to climate change — must be dealt with in cities. Large-scale urban growth, particularly in parts of Asia and Africa, has created a pressing need for more holistic planning and

Image: SWECO

The eco-city Caofeidian, China, is developed by Swedish urban planners

governance of urban development, which includes environmental system solutions. There is also an urgent need for improved management and operation of municipal technical infrastructure. Against this backdrop, Sweden initiated and presented the Sustainable City — SymbioCity — concept at the United Nations World Summit on Sustainable Development in Johannesburg, in 2002.

The SymbioCity concept has been developed within the context of Swedish urban planning. The setting is decentralized, with Swedish municipalities enjoying a planning monopoly and the right to tax their residents. This provides scope for innovative approaches. Some examples of cases in which a holistic perspective has been applied to sustainability are the 'Bo-01' project in Malmö, 'Hammarby Sjöstad' in Stockholm and the emerging 'Djurgårdsstaden', also in Stockholm. The 'Hammarby model', applied in a newly constructed city district in Stockholm, has set a new standard for future housing development. It has been presented in China, Canada and South Africa as a model for other cities.

Plans were made in the 1990s to build Hammarby Sjöstad in a former brownfield area of wharves and docks. The first construction phases were finalized in 2000. By 2015, there will be 11,000 apartments, 25,000 residents and 10,000 workplaces. The district is now famous for its integrated planning approach, where every aspect has been developed with the whole in mind. Investments include:

- Automatic underground waste collection systems
- District heating and cooling fuelled partly by local waste collection and by heat exchangers in water treatment
- Solar-powered hot water and electricity
- Biogas from household sewage water and waste
- Collection and filtration of runoff water
- Super-efficient buildings, triple-glass windows and green roofs.

The results delivered by this approach are truly fantastic. A general assessment indicates a doubling of total environmental performance, with:

- 40 per cent less environmental stress
- 50 per cent less eutrophication
- 45 per cent less ground-level ozone
- 40 per cent less water consumption.

The SymbioCity concept has been built around the invisible links and synergies between various systems in cities including energy, waste management, water supply and sanitation, traffic and transport, landscape planning, sustainable architecture and urban (housing, industry and service, along with recreational and cultural) functions. These sectors typically live their lives independent of one another, which leads to sub-optimization. The SymbioCity approach finds links between the sectors and their system investments in order to optimize results and make economic gains.

While the SymbioCity concept has been developed as a component of Swedish city planning, this resource base is also in demand to help develop integrated solutions in collaboration with local resource bases in other parts of the world. Such interventions form part of the Swedish development cooperation. Within these projects, a number of stakeholders, such as municipalities and other public authorities at national, regional and local levels, along with institutes, universities, companies and networks, need to be involved.

The Swiss commitment and priorities for sustainable development

Daniel Ziegerer, Head of Global Affairs Section, The Federal Office for the Environment

Switzerland is committed to the concept of sustainability, which has the status of a national constitutional objective. This commitment has translated into many endeavours, such as a public transport network that includes two railway base tunnels through the Alps, creating a north-south axis through Europe and facilitating a sustainable European transport policy. Other examples are the recent decisions to phase out nuclear energy production within the next two decades and the Government's commitment to a green tax reform. Environmental awareness paired with innovative capacity has also resulted in the cleantech sector, which is currently developing at a faster rate in Switzerland than any other technology sector. Switzerland has made significant advances towards sustainable development at an institutional level as well as in numerous political and social fields. Nevertheless, it is far from achieving sustainability and dedicated further action is needed at the national as well as at the international level. In addition, Switzerland remains committed to assisting developing countries and countries in transition in their efforts to follow a sustainable development path.

For Switzerland, sustainable development is more than just another policy concept. In fact, the Swiss Federal Constitution declares sustainable development as one of the principal national objectives. The Constitution also calls upon the Confederation and the cantons to strive for "a balanced relationship between nature and its ability to renew itself, on the one hand, and the demands placed on it by the human race, on the other." Since 1997, the Federal Council has implemented these constitutional obligations not only through mainstreaming them into relevant policy areas, but also through formulating sustainable development strategies. The Sustainable Development Strategy 2012-2015 is the fourth and most recent of these. It underscores the Federal Council's commitment to sustainable development and sets out its strategic approach, focus areas and concrete measures for the implementation of sustainable development policy in Switzerland for the next four years.

The approach to sustainable development on which the national strategy is based goes back to the broad definition that was drawn up in 1987 by the World Commission on Environment and Development for the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, also known as the 'Brundtland Definition'. According to this definition, development is sustainable if it guarantees that the needs of present generations can be met without compromising the ability of future generations to meet their own needs. Two complementary aspects of sustainable development are of key importance for Switzerland:

- The idea that there are limits to what the global ecosystem can bear
- The priority that must be given to satisfying essential needs, particularly those of the poorest sections of society.

This definition has an ethical foundation. It expresses the belief that power for a generation to do as it pleases with regard to the future should be replaced by a sense of responsibility towards the future, rooted in a just and fair division of resources between generations (intergenerational solidarity) and regions of the world (intragenerational solidarity). The basis of human life should be secured on just and fair terms for all.

Based on this understanding, the Swiss Sustainable Development Strategy 2012-2015 identifies the following 10 key challenges:

- Protecting the climate and managing natural hazards
- Reducing energy consumption and promoting renewable energies
- Ensuring sustainable spatial planning
- Increasing economic productivity while decoupling from resource and energy usage, aligning consumption with sustainable development
- Using natural resources sustainably
- Strengthening social cohesion, encouraging cultural development and integration, and tackling demographic challenges at an early stage
- Improving public health
- Taking responsibility for global developmental and environmental challenges
- Ensuring long-term financing for public budgets and the social security system
- Applying education, research and innovation consistently to the implementation of sustainable development principles.

The strategy also identifies specific measures to address each of the 10 key challenges. Some examples are described below.

Greening of the tax system

The Swiss Government is working on reforming its tax system in order to provide better incentives for reducing negative impacts on the environment. No new revenues will be generated through the tax reform, but Switzerland's ecological footprint will be improved by eliminating environmentally harmful tax and subsidy incentives.

CO_2 emission regulations for cars

This measure stipulates a reduction in carbon dioxide (CO_2) emissions for all new cars to approximately 130 grams per kilometre by 2015 and is entrenched in the

Image: FOEN

The Cleantech Master Plan intends to boost the innovative capacity of the Swiss economy

Image: FOEN

Areas for conservation provide an ideal habitat for endangered species such as the bearded vulture

CO_2 law. In the first year (2012), an average of 65 per cent of the most efficient new cars per importer must achieve this target. If this is not the case, manufacturers and importers will be sanctioned. Any income from the sanction will be reimbursed to the general public.

Energy strategy 2050
The Federal Government's energy strategy is being revised as a result of the Federal Council's decision to withdraw from nuclear power generation. As part of this new energy strategy, a broad-based action plan is being drawn up which will place greater emphasis on energy efficiency and the continued expansion of renewable energies.

EnergieSchweiz programme
EnergieSchweiz is the intervention programme for energy efficiency and renewable energies. The Confederation, cantons, municipalities, environmental and consumer organizations, and key economic players, enter into partnerships and implement voluntary measures together. The goal is to increase the percentage share of renewable energies by at least 50 per cent between 2011 and 2020.

Strengthening public transport
The appeal of public passenger transport and freight transport by rail should be heightened or at least remain the same. To achieve this, expansion projects must be fleshed out, long-term funding secured, non-discriminatory network access guaranteed in trans-European freight transport, and the road-to-rail shift target achieved.

Sustainable construction
The construction sector is of particular importance owing to annual investments of around CHF57 billion. To promote the varied activities in the area of sustainable construction in a targeted manner, the Confederation procures construction work and buildings that meet extremely high economic, social and environmental requirements throughout their entire life cycle. It has a bearing on construction norms and regulations within the scope of its powers, and manages its extensive real estate portfolio according to sustainable development criteria.

Cleantech Master Plan
The Cleantech Master Plan for Switzerland is intended to boost the innovative capacity of the Swiss economy, in particular by bundling resources and improving coordination between the various players. Cantons, universities and the private sector are invited to implement the activities set out as recommendations in the master plan and coordinate them with the Confederation.

Integrated product policy
The Federal Government wishes to steadily reduce resource consumption and the negative environmental impact of product manufacture and consumption. To achieve this, it encourages measures to close the materials cycle and to develop life cycle assessments, and is helping to improve information on the environmental impact of individual products. In public procurement, it also pays special attention to goods and services that satisfy high economic, social and environmental requirements throughout their life cycles.

Social housing
The Government specifically supports social housing developments by offering financial incentives for non-profit property developers who must, in return, fulfil high requirements with respect to ecological, energy efficient construction with easy access.

Biodiversity Switzerland strategy
The aim of the new Biodiversity Strategy for Switzerland is to ensure that biodiversity remains rich and resilient to change. Biodiversity targets are to be factored into all sectoral policies and the strategy articulates 10 strategic goals including securing areas for conservation and networking; the sustainable use of resources; the promotion of diversity in built-up areas; the inclusion of biodiversity in national social welfare surveys; and a more active international commitment in this area.

Combating poverty and promoting a green economy

Switzerland has increased its share of public development assistance to 0.5 per cent of gross domestic product. The main focus of its international commitment to developing and emerging countries is on combating poverty, in particular by fulfilling the Millennium Development Goals. A key aspect of this is supporting partner countries' efforts for transforming towards a green economy. These programmes relate in particular to the environment, energy, climate conservation, biodiversity, sustainable agriculture/food security, chemicals and waste, sustainable trade, clean production/technology transfer, water and forests.

In order to make the vision of sustainable development a reality, all forces of society need to contribute. The private sector bears a particular responsibility. Swiss companies are among the vanguard of corporations that have expressed a commitment to sustainable development. There are dedicated business associations and industrial federations such as the Netzwerk für ökologisches Wirtschaften (Swiss Sustainable Business Network, Öbu), and swisscleantech, which support and reinforce the private sector's sustainability efforts. Many Swiss companies actively pursue sustainable products and production processes. For example, the biggest retailers are also the main promoters of sales of labelled products. Most large Swiss companies have also signed up to the United Nations Global Compact.

Despite all these efforts, it should be noted that in absolute terms, Switzerland is far from being sustainable. This is illustrated first of all by the ecological footprint, which reminds us that Switzerland consumes almost three times the quantity of natural capital and environmental resources than would be globally sustainable in the long run. At the same time, the rapidly growing needs of developing countries, especially emerging countries, are likely to further increase the pressure on the Earth's ecosystems. This underlines the urgency for developed and developing countries to cooperate in adopting more sustainable consumption and production patterns.

The United Nations Conference on Sustainable Development (Rio+20) provides a major opportunity in this regard. It enables the international community to take stock and to take collective action in order to promote sustainability at all levels. Switzerland is committed to working constructively towards a successful and ambitious outcome of Rio+20, which should renew and strengthen the political commitment to sustainable development.

Switzerland welcomes the thematic focus of Rio+20 on green economy in the context of sustainable development and poverty eradication. The conference should demonstrate that a green economy provides solutions for taking into account natural resource use and its environmental and social impacts on a long-term basis. It should also advance the understanding that a resource-efficient economy creates green jobs in sectors of all levels of development and that it contributes substantially to national competitiveness. In doing so, Rio+20 should also contribute to achieving greater equity and to addressing poverty in developed, middle income and developing countries, while renewing the commitment of the international community to support developing countries on their sustainable development pathway. Switzerland is convinced that Rio+20 could be an important milestone in the transition towards a green economy that contributes to sustainable development and poverty eradication. The focus should be on specific goals and measures with clear timelines for their achievement. Switzerland has therefore proposed the establishment of an international Green Economy Roadmap which assembles these goals, measures and timelines.

With regard to the second theme of the conference, the strengthening of the international institutions in charge of sustainable development,

Image: FOEN

Energy efficiency in housing is being promoted through the EnergieSchweiz programme

Switzerland expects the Rio+20 conference to agree upon a comprehensive package of reform measures both for the strengthening of governance for sustainable development in an integrative manner and for international environmental governance. The Commission on Sustainable Development, established after the United Nations Conference on Environment and Development in 1992, has not succeeded in playing the role it was meant to play. Switzerland therefore proposes to strengthen governance for sustainable development by establishing a Sustainable Development Council that replaces the existing Commission for Sustainable Development. This council should in particular be better equipped to monitor progress in achieving sustainable development, for example through a progress assessment mechanism which effectively facilitates the sharing of experiences and best practices.

With regard to strengthening international environmental governance, Switzerland is also looking towards a package of targeted reform measures including:

- Establishing universal membership in the governance body of a strengthened anchor institution on the basis of the United Nations Environment Programme
- Establishing a United Nations system-wide strategy for environmental matters, increasing authority to provide oversight, guidance, coordination and coherence
- Enhancing synergies among multilateral environmental agreements.

Last but not least, Switzerland expects Rio+20 to agree on the establishment of global Sustainable Development Goals, including their characteristics, priority themes and the process for their detailed elaboration.

Through these measures in particular, Rio+20 will prove to be a real milestone on the pathway to sustainable development for which we will be esteemed by future generations.

Building blocks for a green economy: experiences of the African Development Bank

Alexis Rwabizambuga, Chief Climate Change Officer and Anthony Nyong, Manager, Compliance and Safeguards Division, the African Development Bank

Recent economic, social and environmental crises have led to the realization that there is a need to reorient current development models towards a more efficient, inclusive and sustainable economy by enhancing the resource efficiency of national economies and decoupling economic activity from environmental degradation. In this context the transition to a green economy represents a paradigm shift in valuing the contribution of natural resources to sustainable development objectives, in accordance with the principles and recommendations of the 1992 Rio Summit (reiterated at the 2002 World Summit on Sustainable Development).

Two major issues will receive close attention at the United Nations Conference on Sustainable Development (Rio+20):

- Transition to a green economy in the context of sustainable development and poverty eradication, including its means of implementation
- The institutional framework required to advance the global sustainable development agenda.

One likely outcome of Rio+20 is the elaboration of Sustainable Development Goals (SDGs) that support the transition to a green economy.

Promoting clean energy solutions

Image: AfDB

Addax Bioenergy Sierra Leone project (€25 million)
The project consists of the development of:

- A greenfield sugarcane plantation (approximately 10,000 hectares)
- An integrated bioenergy facility including a sugarcane crushing facility and ethanol distillery
- A 32-megawatt (MW) biomass cogeneration power plant.

It will generate roughly 960,000 tons of sugarcane per year, which will be used to produce 83,000 cubic metres (83 million litres) of anhydrous ethanol for export and possibly domestic consumption; and 165 gigawatt hours (GWh) of electricity, of which roughly 100 GWh will be delivered to the domestic market.

The project carries minimal risks to the environment, while its benefits extend beyond access to clean energy to include broader local economic development in accordance with the development pathway, including:

- Creation of employment opportunities
- Increase in household incomes
- Stimulation of local economic growth, including opportunities for microenterprises and small businesses
- Generation of much-needed electricity
- Reduction of carbon emissions
- Increased agricultural productivity and food production in the project area
- Enhanced access to markets and social services for the local population
- Skills training.

In January 2011, the African Union Heads of State endorsed the Africa Consensus Statement for Rio+20. This represents Africa's negotiation position and aspirations for the Rio+20 outcomes and identifies basic building blocks that should be included in the SDGs.

In the context of Africa, the SDGs should at least seek to:

- Grant universal access to modern energy services
- Eradicate poverty
- Protect and enhance the natural resource base
- Increase resource efficiency
- Increase agricultural productivity
- Promote inclusive growth
- Move the continent towards low-carbon development.

Pursuing these goals offers win-win opportunities to integrate economic development with environmental sustainability in all African countries, regardless of the structure of their economy and their level of development.

Supporting the transition to a green economy

Initiatives to support a transition to a green economy are not new in Africa, and regional support programmes in several African countries have already begun to identify opportunities and challenges. As Africa's premier development finance institution, the African Development Bank (AfDB) has a mandate to steer the continent towards a safer and sustainable development path and is at the forefront of supporting Africa's transition to a green growth pathway.[1]

Internally, AfDB has adopted and implemented social and environmental safeguard policies throughout its lending operations. New departmental units have been established to design and mainstream the bank's social and environmental sustainability management instruments,[2] to ensure that its development funding operations are embedded in sustainable development principles.

This process has had far-reaching implications beyond the exercise of designing policy implementation guidelines. It has triggered a bank-wide dialogue and debates that have improved the bank's operational culture. In parallel, AfDB has increasingly played an active role in global and regional political debates on development, environmental sustainability and climate change and their implications for Africa. The bank's support throughout the various processes of the United Nations Framework Convention on Climate Change has both boosted Africa's capacity and awareness on climate change issues and enhanced its endeavours to ensure that the continent speaks with one voice during global climate negotiations.

Additional environmental benefits will include the creation of ecological corridors and buffer zones for conservation purposes, and a decline in greenhouse gas emissions by an estimated 200,000 tons per year.

Cabeolica wind power project (€15 million)

Four onshore wind farms will be constructed, operated and maintained on four islands of the Cape Verdean archipelago (Santiago, São Vicente, Sal and Boa Vista). These will have a combined installed capacity of 25.5 MW and will be connected to the existing electricity grid on each island. Each wind farm will include towers with wind turbines, transformers, a substation, a command centre, an underground transmission line and an access road.

The project was developed by InfraCo, an infrastructure development company established by the Private Infrastructure Development Group to develop viable private infrastructure investment opportunities that balance the interests of host governments, the national and international private sectors and providers of finance. It is key to achieving the country's targets in terms of renewable energy generation (25 per cent of total generation by 2011 and 50 per cent by 2020). The project helps the country expand its clean energy infrastructure to address environmental and climate change concerns, while providing economic development opportunities.

Sahanivotry Plant (€13.9 million)

Located on the Sahanivotry River 30 kilometres south of Antsirabe in the province of Antanarivo, the Sahanivotry Plant is Madagascar's first privately owned and operated hydroelectric power plant and the first hydropower plant to be built on the island since 1982. It has an installed capacity of 15 MW and an average gross electricity generation of 90 GWh. The people living in the towns supplied by these grids used to be plagued with chronic power cuts and load shedding. The plant has facilitated a 50 per cent increase in new consumer connections at affordable tariffs. A more reliable and clean supply of electricity has had a profound impact on local economic development.

Source: AfDB, Energy, Environment and Climate Change Department (ONEC)

Supporting sustainable agriculture & fisheries projects

Image: AfDB

Support project to the fishing communities of Tulear, Madagascar (€21 million)

Traditional sea fishing in Madagascar is practiced by about 59,000 fishermen in coastal and coral reefs, especially in the south-west province of Tulear. The canoes have a less than 10-kilometre range of action, so the coastal zone is currently overfished and yields are very low. However, traditional fishing is the only source of income for coastal communities, especially in the province of Tulear, where drought has pushed people to the coast of mainland areas.

Intensive exploitation of the same fishing grounds has put species such as octopus and lobster in danger of overexploitation, while species such as sea cucumber have virtually disappeared. Annual exports of fishery products in the Tulear region (nearly 90 per cent octopus) were estimated at US$16 million in the evaluation of the project. The Support Project to the Fishing Communities of Tulear aims to promote sustainable development of traditional fisheries by supporting maritime organizations and recipients of state services, the coordinated and responsible management of fisheries resources, and adequate equipment for fishermen.

Source: AfDB, Agriculture & Agro Industry Department (OSAN)

Investing in ecosystem restoration programmes

Image: AfDB

Congo Basin Ecosystems Conservation Support Programme, Cameroon (€37 million)
Deforestation and forest degradation constitute the largest source of CO_2 emissions in Central Africa, accounting for about 90 per cent of the annual release from the region. The Congo Basin forests contain an estimated 25-30 billion tons of carbon, or roughly four years of current global anthropogenic CO_2 emissions. The programme aims to ensure that people living in the forests can earn sustainable livelihoods while slowing the rate of deforestation. Protecting an additional 1 per cent of forests in Central Africa would preserve about 230 million tons of carbon, worth hundreds of millions of dollars in the carbon markets.

Institutional support to African Climate Institution Project (€23 million)
This multinational project aims to strengthen the capacities of African regional climate centres to generate and disseminate climate information to support economic development. The primary beneficiaries are the regional climate centres, including the African Centre of Meteorological Application for Development in Niger, the Climate Prediction and Applications Centre in Kenya and the Drought Monitoring Centre in Botswana, as well as an estimated population of 480 million people in 25 countries who directly depend on climate-sensitive sectors in Africa. Local farmers, private sector entities, community groups, non-governmental organizations and civil society organizations will be trained in the use of climate information to plan their livelihood activities. Dissemination channels for the climate information include policy briefs, specialized training sessions on the use of the data tailored to the needs of various target groups, use of community radio, local publications in local languages and seasonal Regional Climate Outlook Forums. Building awareness through access to information is essential in sensitizing communities throughout AfDB's regional member countries to optimal use of their respective ecosystems.

Kandadji Ecosystem Restoration and Development of the Niger Valley: development of a comprehensive development resettlement plan (€46.3 million)
The programme will create a water reservoir of sufficient capacity to mitigate the degradation of the Niger River ecosystem and ensure adaptation to drought conditions for the sustainability of socioeconomic activities in the area. Through the programme, water flows will be regulated to ensure continuous adequate moisture in the river valley, resulting in the preservation and restoration of multiple natural habitats, biodiversity and improved soil fertility. In addition, the water stored will secure the drinking water supply for the population and offer opportunities for the progressive expansion of irrigable land in the valley (122,000 hectares) and hydroelectric generation (629 GWh).

The programme also includes capacity-building and the preservation and management of existing natural forests and other income-generating activities. The ecosystem of the Niger River offers significant goods and services to local communities, and the project preserves the natural environment while boosting development opportunities.

Watershed Management and Development Project, Cape Verde (€6.9 million)
Cyclic periods of drought and intermittent run-offs from heavy rains are the main causes of watershed degradation and consequent food deficits and potable water shortages in Cape Verde. The Watershed Management and Development Project led to diversification and increased agricultural production through efficient restoration of the watershed, whose untapped irrigation potential is about 1,380 hectares or 46 per cent of the national irrigation potential.

The project beneficiaries are the communities living in the watershed and dependent on the natural resources for their livelihoods. Restoring the productive capacity of the watershed enables the communities to continue their agriculture production and to control the flows of water on slopes to mitigate potential floods. The project is based on a participatory approach that requires a continuous dialogue with all actors concerned with the issues of food insecurity in Cape Verde.

Source: AfDB, Water & Sanitation Department

Furthermore, AfDB has gradually reoriented some of its development funding activities towards addressing sustainable development commitments. It has invested in projects and programmes in the clean energy, transport, water and agriculture sectors, promoting low-carbon development while meeting development concerns such as universal access to modern energy services, eradicating poverty, protecting and enhancing the natural resource base, increasing agricultural productivity, and promoting inclusive growth.

AfDB is investing in projects and programmes that take advantage of the opportunities inherent in the

Mobilizing environmental finance for agricultural development

Image: AfDB

Global Environment Fund equity investment (€14.8 million)
The fund focuses on sustainable forestry as a private sector approach to protecting global forest areas while delivering profit to its investors, employees and surrounding communities. It is designed to invest in forestry and forestry-related companies in sub-Saharan Africa, including greenfield and existing plantations, in activities such as forest products processing and manufacturing, biomass cogeneration facilities and natural resource management.

African Agriculture Fund equity investments (€29.7 million)
The African Agriculture Fund invested in a private equity fund in response to the food crisis that severely impacted the continent in 2008 due to escalating food prices and staple export bans. The increased support to the African Agriculture Fund, whose total target size is US$300 million, is part of a coordinated response involving the French Development Agency, the International Fund for Agricultural Development and the West African Development Bank, to prevent the crisis from reversing decades of progress, growth and investment in Africa. The fund's main focus is African agribusiness companies operating in food production, processing, packaging, cold storage, distribution and marketing.

Source: AfDB, Energy, ONEC

proposed SDGs, promoting the sustainable exploitation of its natural resources to expand access to clean energy. These projects are already yielding positive impacts and contributing to achieving the aims that the Africa Consensus Statement hopes to see in the proposed SDGs. For instance, AfDB is investing around US$6.4 billion over the next four years in the energy, transport, water and agriculture sectors to support low-carbon and climate-resilient development in Africa.

The programmes and projects shown on these pages are examples of building blocks that are contributing to Africa's transition to a green economy by creating living conditions wherein social, environmental and development concerns are comprehensively and sustainably addressed. Although they were initiated in the context of climate change, the projects' benefits encompass a wide range of social, economic and development opportunities with broader positive spillover effects for beneficiary communities and support a green economy. For example, social benefits of the clean energy projects have included the reduction of carbon emissions through the generation of clean energy; increased agricultural productivity and food production in the project area; the creation of employment opportunities; and enhanced access to markets and social services for the local population. The ecosystems restoration projects have contributed to the preservation of natural ecosystems, preserving and enhancing the goods and resources they provide to local communities.

The provision of innovative and adequate finance is a major ingredient to ensure the implementation of a green economy. In this regard, AfDB has created innovative finance vehicles such as the African Water Facility, the Sustainable Energy Fund for Africa, the Congo Basin Forest Fund and the Rural Water and Sanitation Initiative. The bank is also an implementing entity for several global funds, helping to increase Africa's access to resources such as the Climate Investment Funds, the Global Environment Facility and the Adaptation Fund. As requested by Africa's Heads of State, AfDB is also designing the Africa Green Fund to help channel resources to support Africa's transition to a green economy.

AfDB is capitalizing on its rich technical and institutional experience in implementing sustainable development policies, investing in green projects and actively participating in regional and global policy processes under the Rio Conventions on Biodiversity, Climate Change and Desertification. It is at the forefront in mobilizing the financial resources required to support a successful transition in Africa. In doing so, the bank plays a catalytic role in helping African economies move towards a greener pathway.

Strategies for sustainable growth in Singapore

Ministry of the Environment and Water Resources, Republic of Singapore

For Singapore, the green economy is about sustainable development. This means growing the economy while protecting the environment in a balanced way. Singapore practised sustainable development before the term became widely used. While pursuing economic growth to better the lives of our people, we also recognized the importance of safeguarding our living and natural environment.

Singapore is a small island with limited water supplies and no natural resources. We import most of the food and water we consume, as well as the resources and materials our industries need. Forty years ago, Singapore faced overcrowding, poor living conditions and a lack of infrastructure. Yet we have overcome our constraints, achieved economic growth and developed into a modern city. Through imaginative city design, careful planning and judicious land use, we house about 5 million people today in a clean and green city, with one of the best urban environments in the world. This transformation was achieved with the support of people and businesses.

Our efforts at sustainable development have been guided by three principles:

- Long-term integrated planning — from energy to transportation and waste management, policies are crafted with a long-term and holistic view of Singapore's needs and circumstances
- A pragmatic and cost-effective approach — to achieve the twin goals of promoting economic growth and maintaining a good environment. Measures adopted to achieve long-term goals might incur short-term costs, but we pace the implementation and provide help to temper the short-term costs to businesses and individuals
- Flexibility — economic growth and a good environment are long-term goals, so we must be ready to adjust to changes in technology and the global environment. We invest in building our capabilities today to better respond to the challenges of tomorrow.

Image: MEWR Singapore

Singapore has won international recognition for its holistic approach to the environment

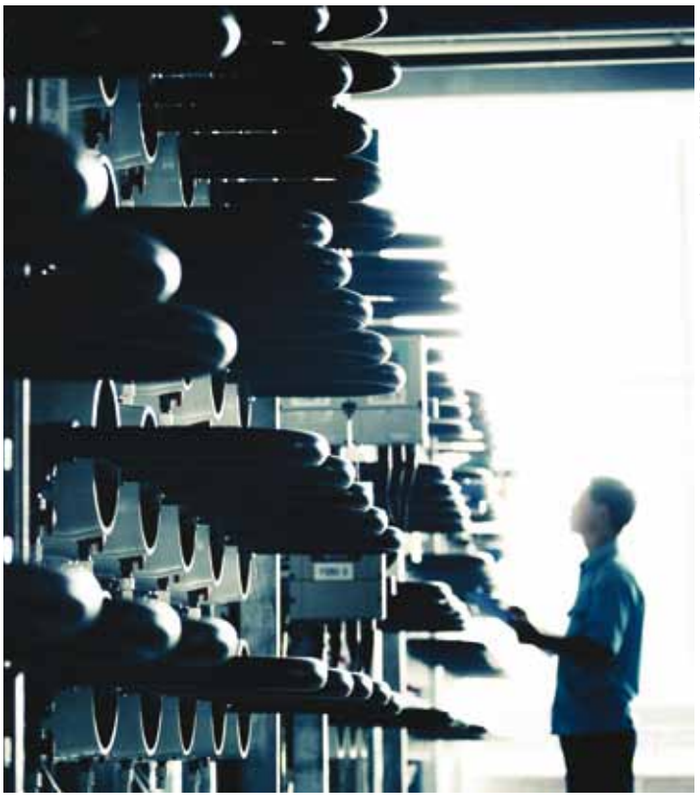


Image: MEWR Singapore

Rigorous environmental regulations govern industry in Singapore

Image: MEWR Singapore

Singapore's air quality compares well with that of major world cities

The Singapore way

Singapore has gained international recognition for its attractive and liveable environment.[1] Its holistic approach to environmental standards can be seen in a number of areas.

Land use planning

The Concept Plan is Singapore's long-term strategic land use and transportation plan, which guides development over a 40-50 year timeframe. The plan is jointly conceived by agencies involved in economic, social, environmental and infrastructure development and is reviewed every decade to ensure there is sufficient land to support future economic and population growth while we pursue our development objectives. The Master Plan translates the broad, long-term strategies of the Concept Plan into detailed steps. It guides Singapore's medium-term development over a 10-15 year period. The Master Plan is reviewed every five years in consultation with stakeholders in the people, public and private sectors.

Pollution control

Singapore has rigorous environmental regulations and city planning guidelines to manage pollution from industries. We locate heavy industries mainly in Jurong Island and Tuas, as far away from residential areas as possible. We stringently review industrial development proposals and only approve projects that can comply with pollution control and waste disposal standards. Although it is a densely populated city state, Singapore's air quality compares well with major cities, with the daily Pollutant Standards Index in the 'good' range for 96 per cent of 2011.[2]

We have also developed a comprehensive approach to controlling water pollution. Singapore's national water agency, PUB, repairs and upgrades sewers to prevent leakages and contamination at source and improves the flow of water in reservoirs and waterways to ensure higher water quality and to promote aquatic life. PUB's public education programmes also encourage the public to play an active role in caring for waterways and reservoirs.

Water management

Singapore adopts the 'Four National Taps' strategy to ensure a resilient and diversified water supply:

- Water from local catchments
- Imported water
- NEWater
- Desalination.

Expansion into urban catchments has maximized local water sources, increasing Singapore's water catchment to two-thirds of its total land area. However, given our land constraints, we have embarked on large-scale used water recycling to supplement our water needs. NEWater is produced by purifying treated used water using advanced membrane filtration technologies, and is supplied mainly to non-domestic customers. Improvements in membrane technology have also significantly decreased the cost of desalination, making it a viable water supply option. Together, NEWater and desalination can provide for up to 40 per cent of Singapore's current water needs. Singapore's achievements in integrated water management and NEWater have won it numerous international accolades, including the Stockholm Industry Water Prize in 2007.

Image: MEWR Singapore

The Stockholm Industry Water Prize went to Singapore in 2007 for the country's integrated approach to water management

Waste management

- Singapore has developed an effective, integrated waste management system. Refuse is collected daily and waste that is not recycled is incinerated in efficient waste-to-energy plants which meet stringent emission standards. This allows us to save on landfill use while generating 2-3 per cent of Singapore's electricity needs. Our only landfill, the Semakau landfill, is located offshore. It is expected to last around 40 years and will become part of our future land stock when completely filled. Our efforts to conserve biodiversity during the construction of the Semakau landfill have allowed a rich variety of flora and fauna to thrive on the island. Semakau landfill was lauded in New Scientist magazine in 2007 as the 'Garbage of Eden' — showcasing an environmentally friendly system of waste management.
- To reduce the need for incineration and landfills, we promote recycling and reduction of waste. Under the National Recycling Programme, we provide centralized recycling bins for public and private housing estates. The National Environment Agency also launched a voluntary Singapore Packaging Agreement to reduce packaging waste. Over the last decade, Singapore's domestic waste disposal per capita has been falling despite continued growth, achieving a recycling rate of 59 per cent in 2011 compared to 41 per cent in 2000.

Energy policy

- Singapore does not subsidize energy so as not to encourage overconsumption. Instead, the electricity industry was restricted to introduce greater market competition, which encourages innovative solutions and technologies to generate power more efficiently. As a result, electricity is largely produced from natural gas-fired combined cycle power plants, which are more efficient and cost-effective than oil-fired steam plants. Between 2000 and 2007, electricity produced by natural gas increased from 19 per cent to 79 per cent of total electricity production, and overall generation efficiency rose from 37 per cent to 44 per cent.
- The Singapore Government also launched the national energy efficiency plan, E2Singapore, to encourage more efficient energy use in industries, buildings, transport and households. The plan includes initiatives to raise public awareness of energy efficiency and promote energy-saving technologies and systems, and sets minimum standards for household appliances which consume large amounts of energy. Singapore's energy intensity (energy consumption per dollar of gross domestic product in 2005) improved by 33 per cent between 1990 and 2010.

Transport management

- Singapore plans for sufficient transport capacity as it develops. Commercial activities are located closer to homes, while self-contained residential communities reduce the need to travel. We have invested in a comprehensive and robust public transport system and in 1998, we introduced Electronic Road Pricing, where motorists pay a toll for entering congestion-prone areas. The Vehicle Quota System, introduced in 1990, also helps to regulate increases in the number of vehicles. As a result, although Singapore is the world's second most densely populated country, its transport system is consistently ranked

Image: MEWR Singapore

Centralized recycling bins are provided for public and private housing estates

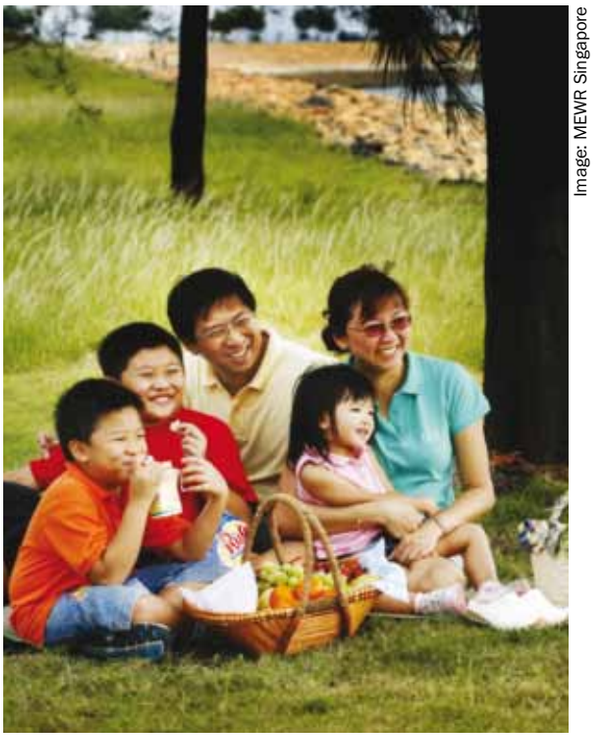


Image: MEWR Singapore

Ten per cent of Singapore's land is set aside as green space, half of this as nature reserves

among the top three in the world[3] with 71 per cent of journeys completed in less than an hour.

Urban environment

- Measures are in place to ensure that noise levels remain acceptable in a densely built-up city like Singapore. Noise limits are enforced to control noise emissions from construction sites, while stipulating a minimum distance between roads and buildings reduces the impact of traffic noise. In order to preserve greenery, land has been set aside for parks which are linked to our nature areas by park connectors. Unique areas of biodiversity and selected nature areas have been placed under conservation. Ten per cent of Singapore's land is committed as green spaces, half of which are nature reserves. If we add this to our extensive roadside greenery and island-wide park connector network, almost half of Singapore is covered by greenery. Our city is home to 2,900 species of plants, 360 species of birds and 250 species of hard corals.

Sustainable Singapore Blueprint

- To further address the challenges of sustainable development, the Inter-Ministerial Committee on Sustainable Development released the Sustainable Singapore Blueprint (SSB) in April 2009. The SSB sets out our 2030 targets for sustainable development and four strategies to help us achieve these. In 2009, Singapore also pledged to undertake mitigation measures to reduce greenhouse gas emissions by 16 per cent below business-as-usual level, contingent on a legally binding global agreement. The four strategies are detailed below.

Boosting resource efficiency

- Singapore's small land area, geographical location and other physical attributes make it energy poor. It depends on fossil fuel imports and has limited access to alternative energy sources. We therefore aim to achieve a 35 per cent improvement in energy efficiency from 2005 levels by 2030, as well as optimizing land use and attaining a recycling rate of 70 per cent. We also aim to reduce domestic water consumption to 140 litres per person per day (PPPD) by 2030, down from 156 litres PPPD in 2008.
- Several measures are being taken to achieve these goals, including pricing energy to reflect the environmental impact of production and providing more information to help raise people's awareness and management of their energy consumption. Financial incentives, new standards and new legislation like the Energy Conservation Act are helping to promote energy-efficient designs, processes and technologies in industry. Solar technology test-bedding projects will prepare Singapore for larger-scale use when the cost of solar energy falls closer to that of conventional energy. We are promoting resource-efficient buildings with a requirement that they meet minimum Green Mark certification standards. Recycling facilities in housing areas will be increased and we will pilot usage-based pricing for household waste disposal fees, as well as promoting recycling for large sources of waste such as plastic and food waste.
- We continue to expand local water catchments, increase water recycling rates and extend the coverage of the Mandatory Water Efficiency

Labelling Scheme for water fittings. Where feasible, industries will be encouraged to implement water recycling and replace potable water with NEWater or seawater, and co-funding is available to help companies redesign processes and reduce waste in their production.
- In addition to reclaiming more land and building more intensively, Singapore will develop an underground land-use master plan that identifies potential uses for this space. In addition, Marina Bay and Jurong Lake District will be developed into a new generation of sustainable high-density districts.

Enhancing the urban environment
- Singapore's clean and green environment has improved the quality of life for its population and made Singapore more attractive to investors and visitors. We now aim to:
- Reduce the level of fine particulate matter (particulate matter 2.5) to an annual mean of 12 ug/m3 by 2020, and cap sulphur dioxide (SO2) at an annual mean of 15 ug/m^3
- Provide 0.8 hectares of green space per 1,000 people and increase greenery in high-rise buildings to 50 hectares by 2030
- open up 900 hectares of reservoirs and 100 kilometres of waterways for recreational activities by 2030
- improve walkways and cycling infrastructure for pedestrians and cyclists.
- In order to improve air quality, we will regularly review air emission standards for industry and transport and benchmark ourselves against top cities in Asia, without imposing prohibitive costs on industry. We will test new technologies such as diesel hybrid vehicles, electric vehicles and diesel particle filters, and promote the use of more efficient pollution control equipment for industries as well as more efficient sulphur recovery systems for refineries. In the longer term, the Government will consider financial measures to better reflect the costs of pollution.
- We will also continue with efforts to keep our streams, canals and reservoirs clean. We will undertake more regular and efficient cleaning of public areas while enhancing public education and stepping up enforcement against littering.
- Improvements to our public transport system will continue, and the Land Transport Authority will make it easier for people to walk or cycle to key transport hubs or to get around towns. By 2020, we aim for 70 per cent of journeys during the morning peak hours to be made by public transport.
- New parks, park connectors and leisure options will enhance our greenery. The Government will work with various agencies to research cost-effective ways of introducing more greenery in high-rise areas, and give incentives to the private sector to do the same. The PUB will expand its Active, Beautiful and Clean Waters programme to transform Singapore's reservoirs, canals and drains into beautiful lakes, rivers and streams that can support more water-based activities. The National Parks Board will also implement a green National Biodiversity Strategy and Action Plan to document and conserve Singapore's biodiversity.

Building capabilities
- Having achieved both economic growth and environmental sustainability, Singapore is well placed to serve as a living laboratory for companies and research organizations to research, develop and test ideas on environmental sustainability in a high-density urban setting. Singapore will build new environmental and technological capabilities so that it can be a global centre for knowledge and ideas on sustainable development in a high-density urban setting.
- In line with this, we will invest in research and development and facilitate the international sharing of knowledge. Together with the private and academic sectors, the Government will test-bed new technologies in areas such as land-use planning, water technologies, vertical greenery, solar adoption and green building and adapt them to our local needs. We will encourage more research in our local universities and test new technologies in key public projects such as Marina Bay, Punggol new town and Jalan Bahar CleanTech Park.
- The Centre for Liveable Cities has been established to promote the sharing of best practice between Singapore and other cities. Singapore regularly hosts events such as the Singapore International Water Week and the World Cities Summit to promote sustainable development.

Fostering community action
- To build a sustainable economy and environment, community support is vital. Community, business leaders, and non-government organizations (NGOs) have a role to play in promoting an environmentally responsible lifestyle. Schools will have to inculcate this consciousness in our young, and communities will have to care for our environment on an ongoing basis. We will facilitate this by:
- Promoting community efforts — community groups and NGOs are key to engaging and educating the public on eco-friendly lifestyles. Organizations within the people sector can also form partnerships with environmental groups, grassroots organizations and educational institutions to promote environmental awareness and action
- Promoting industrial efficiency — businesses can promote resource efficiency as part of their productivity efforts, and adopt new processes and systems to reduce the environmental impact of their operations
- Setting the pace — the public sector will act as an enabler and pace-setter. It will take the lead to make Government agencies and public buildings more resource efficient.

By working together, we can keep Singapore economically and environmentally sustainable well into the future. We can overcome our natural constraints and geographical confines, and cooperate with other countries on global environmental problems, particularly the increasing pressures that development is placing on our planet. By doing so, we can build a Singapore that we and future generations will cherish and be proud to call home.

The generation contract — Norway's strategy for sustainable development

Kjetil Lund, State Secretary, Ministry of Finance, Norway

The 1987 World Commission on Environment and Development (the Brundtland Commission) defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

The concept of sustainable development is not a new invention. For example, a decent farmer will always try to hand over his farm to the next generation in at least as good a condition as it was when he inherited it. This ensures that livelihoods are maintained and the next generation can take over valuable resources and live good lives. In Norway, we have called this mutual dependence between generations the 'generation contract.'

The total value represented by the workforce, natural assets, production capital and finance capital should be maintained or preferably increased over time. Sustainable development is, therefore, also a guiding principle for sound long-term economic policies.

A strategy for sustainable development was first presented to the Norwegian Parliament, the Storting, in 2003. The Ministry of Finance is responsible for the strategy and for coordinating and reporting on the Government's work in the area in the annual budget proposal submitted to the Parliament. The updated strategy for sustainable development from 2011 is based on the following key principles:

- Equitable distribution
- International solidarity
- The precautionary principle
- The polluter-pays principle.

Image: Øyvind Markussen/Scanpix

The generation contract is a matter of handing over a sustainable planet and community to future generations

The strategy has several priority areas. International cooperation to promote sustainable development and combat poverty is one of the main areas. In the area of the natural environment, climate change and long-range air pollution, together with biodiversity, hazardous chemicals and cultural heritage, stand out as the most important challenges. Taking into account sami perspectives on environmental and natural resource management covers the indigenous population. Sound management of natural resources and sustainable economic and social development have a prominent place in the strategy.

The strategy should be followed up not only by national authorities, but also local authorities, the business sector, organizations, research communities and individual citizens. So this is not a strategy for the Government alone, it also describes how other groups can contribute to sustainable development.

We use a set of 17 indicators to assess if we are moving in a sustainable direction. These indicators are also used by the various Ministries in their reports to the Ministry of Finance. Statistics Norway plays an important role in analysing and reporting on annual developments of these indicators.

Sustainable development cannot be achieved in one country alone, independent of the rest of the world. Poverty alleviation, pandemic preparedness and trade are only a few examples demonstrating why international cooperation is required to ensure sustainable development. That is why Norway is a major supporter of the United Nations and has delivered on official development assistance commitments for several years, providing more than one per cent of GNP.

Norway has not always been a rich country. The sharp rise in prosperity since the 1970s is often attributed to the discovery of oil in the North Sea and the oil revenues that began to flow into Norway's coffers. However, this is only one of several factors.

The revenues from oil extraction made it possible to import more goods without increasing employment in mainland industries that are exposed to international competition. At the same time, we saw a marked increase in jobs in sectors that were not exposed to international competition. The increase in these sectors kept pace with the increase in female participation in the labour force. Between the years 1972-2005, the participation of women aged 25-54 in the workforce increased from about 50 per cent to more than 80 per cent. Rough estimates indicate that GDP would have been 15 per cent lower if the percentage of women in the workforce had remained at the level it was at the beginning of the 1970s.

Women's entry into the workplace has been a significant factor for economic growth, which helped to build up a strong welfare state and made it easier to phase the oil revenues into the Norwegian economy. A comprehensive welfare system requires a high level of employment to fund the broad range of welfare services offered.

Norway has considerable non-renewable resources in the form of offshore oil and gas reserves that will not last forever, and we will need a strong mainland economy with a sufficiently large sector exposed to international competition.

When Norway discovered oil in the 1960s, it was already a well-developed democracy with sound institutions we could build on. The new petroleum industry brought both opportunities and challenges which saw Norway go through a period of trial and error during the 1970s and 1980s.

Image: Kai Jensen/Scanpix

On the basis of this experience, we have developed a framework for the use of oil revenues that facilitates stable economic development and ensures that future generations also benefit from the revenues. This is part of the generation contract. The framework rests on two pillars:

- The oil revenue is invested abroad in the Government Pension Fund Global
- The fiscal rule, which ensures that we phase oil revenues into the Norwegian economy gradually and in a predictable manner at a level that can be maintained over time.

Both the fiscal rule and the savings put aside in the Government Pension Fund Global contribute to stable economic development in Norway. By phasing in oil revenues gradually and investing what we do not use outside Norway, we are also helping to prevent the crowding out of industries competing on the world market. The Fund is a long-term investor. A good return in the long term is regarded as being dependent upon sustainable development in economic, environmental and social terms. The Fund has guidelines for

Over the past 30 years the Norwegian fishing industry has developed from unregulated fishing to a sustainable and regulated industry subject to quotas and licensing systems

responsible investment that require consideration of good corporate governance and environmental and social issues to be integrated into the management of the fund.

The Pension Fund Global, together with the remaining oil and gas reserves on the Norwegian continental shelf, account for just under 10 per cent of our national wealth. Labour is by far our most important resource and accounts for around 85 per cent of our national wealth. It is therefore vital to ensure the best possible return on our workforce. This again underscores the importance of maintaining a well-qualified work force and a high employment rate. An important task is therefore to secure full employment and development of the workforce.

We have a long tradition of social dialogue in Norway. This dialogue, called tripartism, is a formalized collaboration between workers, employers and the Government. It ensures a legislative framework in line with international standards – independent partners that negotiate rights, standards, wages and reforms, and engage in political dialogue. It was borne out of, and still is particularly important during, times of crisis and reform.

The principle of keeping within environmental limits is important for putting the generation contract into practice. From the perspective of sustainability, environmental degradation in the form of air, water and land pollution is particularly serious as the consequences may be irreversible. A precautionary approach has to be taken.

Norway is still learning its lessons with regard to management mechanisms for sustainable use

Teaching future generations

The Natural Satchel is a project for Norwegian pupils in primary and secondary schools, aimed at implementing education on sustainable development into mainstream education. The main goals are to develop curiosity and knowledge about nature, awareness of sustainable development and increased commitment to the environment. For example, one primary school wanted to look into the causes of the reduction in Norwegian lobster stocks. Here, pupils take part in a larger research project, registering the lobster population development in the reserve Risoer. Through this project, the school wants to give pupils a curiosity and knowledge about relationships in nature and the interaction between human harvesting and lobster stocks.

Image: Guri Dahl/tinagent.com

Policies that promote women's participation in the workforce have contributed to economic growth and benefited both women and society as a whole

Image: Statoil

Oil for development

Oil and gas hold the promise of becoming vital resources for economic and social development in a number of countries. However, in many cases it proves difficult to manage petroleum resources in a sustainable way. The principle behind Oil for Development is to share Norway's experience and expertise. The scheme aims at assisting developing countries in their efforts to manage petroleum resources in a way that generates economic growth, promotes welfare of the population in general and is environmentally sustainable. The scheme enhances the focus on environmental issues, good governance, transparency and anti-corruption. The objective is not to export a specifically Norwegian model for sound petroleum resources management, but to cooperate with developing countries in addressing the challenges within the individual country.

of natural resources. Regulatory frameworks developed and managed by local authorities are put in place to avoid overfishing, overhunting and other forms of degradation of natural assets. When resources are harvested sustainably, most parties benefit in the long term. Conflicts with regard to long-versus short-term aspects of the capacity of ecosystems arise, often initiated at local level, but over time it has become apparent how important regulations are to ensure sustainability of important economic resources.

For example, Norway has successfully regulated fishing in order to build up the cod stock, has established quotas for the number of moose and other wild animals that may be hunted, and discussions are currently under way on adjusting the reindeer population to grazing resources. Concerning environmental resources such as water and air, Norway has similar guidelines for how much these can withstand before the quality becomes unacceptable. When it comes to resources shared with other countries, guidelines are negotiated and agreed with neighbouring countries to reflect the transboundary nature of ecosystems, as is the case for long-distance air pollutants.

Putting a price on resources – and making the polluter pay – is the key to making progress towards a green sustainable economy.

Renewable energy at home and abroad

Renewable energy accounts for more than 60 per cent of Norway's total energy use. Norway has been a major hydropower producer for more than a hundred years, and today the country is the world's sixth largest hydropower producer. Many developing countries have considerable unrealised potential for hydropower development: for example, as little as seven per cent of African hydropower capacity is estimated to have been developed, compared with 75 per cent in Europe. Norwegian hydropower companies have built plants in Asia, Africa and South America. However, since hydropower development often involves substantial investment and a certain level of risk, it is usually undertaken within a framework of cooperation between the authorities in Norway and the host country. Norway also has expertise and technology to offer in the areas of wind and solar power.

We introduced green taxes in the early 1990s and today more than 70 per cent of emissions of greenhouse gases are covered by economic instruments (taxes or quotas).

Green growth: the way to achieve sustainable development

Young-sook Yoo, Minister of Environment, Republic of Korea

It is a common aspiration for all humanity to lead a happy life. There are many elements that determine one's happiness, but of all things, creating a life of material sufficiency is crucial. Humanity has pursued development and growth to secure material prosperity, resulting in mass production and excessive consumption. Economic growth during the 1970s relied upon the use of fossil fuels, and the increase of greenhouse gases in the atmosphere due to human activities further led to the destruction of the ecosystem.

In 1992, leaders across the world gathered in Rio de Janeiro, Brazil to come up with an all-round solution to address the major challenges that humanity faces. In pursuit of a prosperous and sustainable future, they adopted a strategy of sustainable development, which encompasses economic development, environmental preservation and social integration.

The United Nations Conference on Sustainable Development (Rio+20), which will be held in Rio in 2012, 20 years after the Rio Summit, bears extremely meaningful significance as it looks back on our past footpath, as well as looking ahead to our future journey towards global sustainable development. If we are to make significant progress, the whole of humanity needs to join this move to safeguard our precious planet. If there are shortcomings in our efforts, we would certainly need to do more to make up for them.

After the mid-1990s, developing countries underwent rapid economic growth, and we witnessed vast international agreements being signed in the areas of climate change, biodiversity, and anti-desertification. Yet we still have a long way to go. People across the world are still struggling to make ends meet, and the challenges of climate change and resource scarcity are adding to such difficulties. Recently, extreme weather conditions as well as frequent droughts and floods across the world are threatening the survival of humanity. This is especially true for the poor and the vulnerable in developing countries. Last winter saw very unusual cold weather and heavy snowfall around the world. China recently suffered the worst drought in 50 years, which is likely to hurt its crop production.

Image: Min of Env. Rep of Korea

Green Card encourages people to become greener in their daily lives. President Lee became the first Green Card holder

At a time when the international oil price has soared to well over US$100 a barrel, a continuous rise in energy prices not only puts a huge burden on production, but also hampers consumption. Needless to say, the damage is especially profound on the poor and vulnerable. Today, environmental disasters and economic crises are not challenges confined to a single country. They are global phenomena, and need to be tackled by both advanced and developing countries.

The main agenda for Rio+20 is 'Green Economy in the context of Sustainable Development and Poverty Eradication'. This is a very important point for discussion in dealing with the environmental, economic and social challenges of today and tomorrow, and in achieving the goal of sustainable development. According to the 2011 Green Economy report from the United Nations Environment Programme (UNEP), green economy refers to a low-carbon, resource-efficient, socially integrated economy. It is an economy that deals with environmental risks and bioresources scarcity, and improves social equity. At the same time, it contributes to poverty eradication through investment and innovation in the environmental sector.

There is no single set of rules for implementing a green economy. Each country needs to set its own strategy, taking into account its socioeconomic conditions and national priorities. And each of these national green economy strategies must be able to create synergies to achieve the ultimate goal of global sustainable development.

Korea has made tireless efforts to achieve sustainable development and a green economy. Since the middle of the twentieth century, Korea has achieved remarkable economic growth and democracy through a systematic economic development plan. Since President Lee

Image: Min of Env. Rep of Korea

The Korean government implemented policies to commercialize electric vehicles which will help people lower their carbon emissions in their daily lives

Myung-bak declared a new national strategy of 'Low Carbon, Green Growth' in 2008, the Korean Government has strongly pursued green growth strategies. To this end, the Green Growth Committee was established, together with Low Carbon, Green Growth Act. The Government also committed to scale up the greenhouse gas emission reduction target to 30 per cent compared to the projection rate, and made a decision to invest 2 per cent of the national gross domestic product in the green growth sector. Green growth refers to a strategy that creates jobs, boosts income, and promotes economic growth, while avoiding environmental degradation. This is a Korean model of sustainable development, and we believe that it is the most-effective and substantive means to achieve a green economy.

The initiative that is especially notable is the Four Rivers Restoration Project, which was launched in order to effectively manage water resources and to strengthen our capacity to deal with natural disasters such as droughts and floods caused by climate change. This project is an exemplary case of Korea's green growth strategy. The Korean Government invested KRW22.2 trillion in this project, created 340,000 jobs and reaped economic benefits equivalent to KRW40 trillion. Despite last year's record level of torrential rain, the damages were reduced to 10 per cent of those in previous years with similar precipitation.

On top of that, the Korean Government expanded available eco-friendly energy sources while preparing regulatory measures and support for efficient energy use, in order to encourage the general public to consume less resources and turn to ecologically friendly products with high energy efficiency. As part of such efforts, incandescent light bulbs will no longer be sold after 2013, and wider use of light-emitting diode light bulbs with high energy efficiency will be encouraged. In addition, strengthening of greenhouse gas emission standards for vehicles has facilitated the high-efficiency and low-emission vehicle market. Households which demonstrate a green lifestyle — such as purchasing eco-friendly products, using public transport and saving energy — will receive 'Green Card.' The 'Green Card' will reward them financially and encourage them to become greener in their daily lives. Moreover, daily household waste such as plastic and bottles is recycled, and out of the waste that used to end up in landfill, flammable waste is turned into an energy source through refuse-derived fuel production. Biomass produced from waste is also widely used for

Image: Min of Env. Rep of Korea

The Four Rivers Restoration Project will restore ecosystems and generate green jobs

agricultural purposes. Through such efforts, Korea is striving to achieve green growth throughout the entire production-distribution-consumption-waste management cycle.

Taking things one step further, Korea is making efforts to spread its green growth initiative throughout the world and help the global community to take part in it. Korea, once a recipient of economic aid from advanced countries, joined the Organisation for Economic Cooperation and Development (OECD) Development Assistance Committee and transformed itself into a donor country. It expanded its official development assistance in green growth finance up to 12.4 per cent, and plans to increase it by 30 per cent by 2020. With the aim of not only providing the financial assistance for green growth but also sharing related experiences and know-how to developing countries as a model of economic development, Korea set up the Global Green Growth Institute (GGGI) and the Greenhouse Gas Inventory and Research Center, and is helping developing countries to effectively reduce greenhouse gases.

A green economy is not a matter of choice: it is the call of our time. Angel Gurria, Secretary General of the OECD, stated that green growth is not 'a way' but 'the (only) way' to overcome environmental crisis. I hope that the Rio+20 summit will stimulate momentum for every participant to bear commitment and leadership towards green growth and step forward to achieve the global goal of sustainable development. In this regard, Korea suggests a brand new outline of global green economy partnership. This will take a very creative format, one where advanced and developing countries, public and private sectors will not only provide financial support, but also will share experiences of green growth and support for capacity building. All this will provide a solid foundation for the world to march towards a green economy. The Green Growth Knowledge Platform, established by GGGI, OECD, UNEP and the World Bank in January, 2012, is expected to demonstrate best practice for the new partnership.

My hope is high for Rio+20 to serve as an effective guidepost, which will help all of us to deal with the challenges of today and tomorrow and find a path towards a better, happier future.

Is going green a threat to growth? Poland proves the contrary

Marcin Korolec, Minister of the Environment, Poland

The policy of efficient use of natural resources aims mainly at separating Gross Domestic Product (GDP) growth from the degrading of environmental resources. In Poland, the consumption of natural resources amounts to 16 tons per capita each year. Our economy is still twice as energy- and resource-intensive and produces three times as much greenhouse gas emissions as other OECD countries. However, provided that we continue our growth, we can join these countries in enjoying the continuous decrease of the economy's impact on the environment. Over the past 20 years, Poland recorded 200 per cent growth in GDP and managed to cut GHG by 30 per cent. The resource efficiency factor in the last decade has increased by 15 per cent. Our economy continues its fast growth, increasing the standard of living and reducing poverty for many, while proving that sustainable and green growth is possible, if the proper policy framework and tools are put in place.

Policy path

Poland began on its path to sustainable development about 20 years ago, following the switch to a market economy, accompanied by deep social and economic reforms. The first strategic document designed to include sustainable and green development was the Environmental Policy of Poland, which was adopted in 1991. It laid the foundation for the current system of market-based environmental protection. The strategy, which was aimed at sustainable economic growth, was the first comprehensive document of its kind in Poland — also in Eastern and Central Europe — and one of the first in the world.

Another strategy, for energy security and the environment, is now included in policy targeted at sustainable and low-emission growth. Building on the 1991 Environmental Policy, the strategy shows how these two fields often overlap and their smart combination should bring important synergies.

One of nine papers covering the Polish economy, Poland 2030, builds an integrated vision for future development, using extensive strategies that replace the previous 420 produced over the past 20 years. Each paper has similar overarching objectives, such as creating effective management systems to improve the efficiency of budget spending and increasing the transparency of strategic programming.

Another important policy document promoting the concept of sustainability in Poland is the National Reform Programme (NRP), which documents the country's response to challenges due to be faced in upcoming years. The NRP has been structured to promote three main growth priorities:

- Smart — developing an economy based on knowledge and innovation
- Sustainable — promoting a more resource-efficient, greener and more competitive economy
- Inclusive — fostering a high-employment economy to ensure economic, social and territorial cohesion.

Achieving these objectives will be key to implementing the social vision of a market economy for the twenty-first century.

Preparation of the National Programme for the Development of a Low-Emission Economy is underway to address long-term objectives. These include realizing economic, social and environmental benefits from a green, low-emission economy, developing and applying new technologies, improving energy efficiency and creating new, sustainable jobs.

The Programme's main objective is to develop a low-emission economy and it is underpinned by six specific goals:

- Development of low-emission energy sources,
- Energy efficiency improvement,
- Resource and material efficiency improvement,
- Development and use of low-emission technologies,
- Waste management improvement, including waste generation prevention
- Promotion of sustainable consumption and production patterns.

Financing and project implementation

External sources of financing are usually scarce and will therefore remain additional to the resources that must be mobilized domestically to foster foreign investments and the technological shift needed for building a green economy.

Poland has wide-ranging experience in creating innovative funding mechanisms and implementing green projects; there are a number of tools that we have found useful over time and would like to share our knowledge in relation to their design, fine-tuning and implementation.

Generating domestic revenues — 'polluter pays' principle

Full implementation of the 'polluter pays' principle is key to mobilizing financial resources and stimulating investment. This principle was successfully introduced in Poland by implementing a system of environmental fees, charges and

Image: Ministry of Environment, Poland

Poland's resource efficiency factor has increased by 15 per cent in the last decade

fines, while revenues were directed to dedicated environmental funds. The most important of these is the National Fund for Environmental Protection and Water Management. Established in 1989, in combination with regional funds for environmental protection and water management, it underpins the country's environmental protection financing.

The Fund is the largest public finance sector institution in Poland and runs its own financial management, supplied mainly from fees and fines generated in a variety of areas, including the environment, service and concession fees and recycling fees. Between 1989 and 2010, the National Fund allocated more than US$9.5 billion financing of environmental undertakings across 16,000 contracts. Its average annual funds disbursement — mainly soft loans and grants — amounts to US$1.3-2.6 billion. Initially, significant support was earmarked for water conservation and management, as well as air protection, which resulted in the country's improved living conditions.

A measurable effect of projects being financed by the Fund is environmental improvement, including reductions in air pollutant emissions, power consumption and wastewater, along with better waste management and increasing environmental awareness. The number of cities supported by sewage treatment plants has doubled since the Fund began, while there have been significant decreases in untreated sewage discharged to water or land (90 per cent), emissions of particulates (95 per cent) and GHGs released into the atmosphere (63 per cent).

Today, the key priorities are energy efficiency improvement, climate protection and renewable energy sources development. The Fund will play a major role in supporting the greening of the Polish economy. These include:

- Renewable energy programmes with a budget of US$660 million
- Highly efficient energy generation, including construction and upgrading of heat and power generation facilities and co-generation, with a budget of more than US$90 million
- Energy distribution will be improved through power reduction and heat network losses with a budget of about US$180 million.

The Fund also supports activities aimed at meeting Polish obligations resulting from the Climate Convention, the Biodiversity Convention and a number of European Union programmes as well as financing environmental education in the country. Its success is a result of earmarking revenues, separate from the state budget, in the form of a dedicated fund with strict financing rules, with proper management the key to ensuring effectiveness and transparency. This is a universal tool that can easily be implemented in many countries to leverage 'green' investments.

Using the global carbon market

Economic restructuring in the 1990s focused on reducing national economic impact on the environment and decoupling GDP growth from emissions levels. As a result, Poland will have GHGs well below the target set under the Kyoto Protocol, amounting to a surplus of around 500 million Assigned Amount Units (AAUs) in the period 2008-2012. In order to manage the proceeds from selling AAUs, a Green Investment Scheme (GIS) was established.

GIS supports investments in areas where the potential for GHG reduction is measurable and verifiable, and where public funds are needed to remove major

Image: Ministry of Environment, Poland

Companies selected for the GreenEvo project participate in specialized training sessions

bottlenecks to sustainable investing. It is most effective in areas to ensure quick mitigation, where demand for investments exists in both private and public sectors.

Priorities within GIS include:

- Energy management in public service buildings, aimed at reducing or avoiding carbon dioxide emissions through co-financing projects which improve energy efficiency
- Biomass power plants programme to construct biomass-fired facilities — for either heat, or heat and power generation — to distribute sources of nominal thermal capacity below 20 MW
- Agricultural biogas plants programme — supporting construction of power or power and heat production facilities — to build or upgrade installations producing agricultural biogas allowing injection into the gas distribution network
- Upgrading the electricity grid to connect renewable sources of energy, covering the construction, expansion and upgrade of networks — mainly wind.

The GIS budget is nearly US$105 million, with its record proving it was right to establish a dedicated mechanism connected with the global carbon market. This system has been instrumental in facilitating a technology shift, transferring know-how and implementing an eco-design approach across many facilities and products.

'Swap for green': foreign debt-for-environment swap

In 1991, the Paris Club united countries that were creditors of Poland and decided to reduce Polish debt by fifty per cent providing the remainder was paid off by 2010. Poland proposed a further 10 per cent should be written off, provided that the corresponding amount was allocated for supporting the most urgent environmental protection needs. The Polish EcoFund Foundation was established in 1992 to manage its funds, until in 2009, Polish debt to the Paris Club was fully repaid and the programme had run its course.

The 'Swap for green' project was the first project of its kind in the world. It was an innovative way of allocating a portion of government-secured debt to environmental protection. During the operating period of the Foundation, its budget amounted to over US$570 million, which included contributions from USA, France, Switzerland, Italy, Norway and Sweden. The Treasury paid the money into the Foundation's account as instalments of the Polish debt were due and it was the basic source of the Foundation's revenues, which were subsequently invested in environmental protection projects.

Applicants could obtain grants for the implementation of projects within five priority sectors: air protection, water protection, climate protection, nature conservation and waste management. Activities within each sector were focused depending on the urgency of needs and the availability of mature, well-developed project proposals.

Existing nature protection measures were complemented by environmental protection and selected sustainable development approaches, not commonly recognized at the time. The Foundation was launched to be the agency responsible for managing the debt-for-environment swap programme by providing grants

Image: Ministry of Environment, Poland

SMEs are encouraged to create strategies for environmentally friendly actions

only for investment projects in line with the objectives of the international environmental agreements. Decisions to finance projects were made on the basis of their eligibility, after the project effectiveness had been established. All decisions had to be approved by the Foundation Council, which was made up of representatives from Poland and the donor countries.

Given that many developing countries are facing significant problems in mobilizing financial resources for greening their domestic economies — while being committed to paying their debts — the eco-conversion approach is a widely used support tool that is flexible enough to be tailored to specific national circumstances, needs and priorities. Poland is ready to share its experience to facilitate progression towards a green economy.

Green Technology Accelerator

The aim of this project is to help Polish green technologies win foreign market share. The Accelerator (GreenEvo) is designed to make it easier for companies to find appropriate sources of co-financing for the projects they undertake. It provides entrepreneurs with help to navigate a complex maze of legislation, rules and regulations, in order to make use of the support available to producers of environmental solutions.

The project involves carrying out studies of selected international markets and identifying the needs of countries to which technologies could be transferred. Companies selected for GreenEvo participate in a series of specialized training sessions in which they learn how to manage their products in a competitive environment. Training also covers the appropriate legal regulations and the technical standards relevant to the markets they are interested in.

Participants in the GreenEvo project are ready to share their technologies, experience and expertise, with countries facing environmental problems.

Small and medium-sized enterprises (SMEs) on the green path

SMEs have an important role in the Polish economy, not only because they make up the vast majority of all companies, but because they are responsible for a large part of the GDP. It is essential to ensure they operate according to environmental standards and contribute to a green economy.

Financing is of major importance to SMEs, so the focus should be on ensuring accessible and affordable solutions for these enterprises. In Poland, SMEs are encouraged to use the Eco-Management and Audit Scheme management system, ISO14000 or corporate social responsibility standards. This helps them to voluntarily create their own strategies for environmentally friendly actions and, at the same time, improve their economic and financial performance. The role of the Government in this process is to provide SMEs with relevant information and demonstrate the potential benefits.

In addition, Poland is also taking action in the following:

- Identifying and evaluating sustainable production patterns used by SMEs, along with current trends and development in this area
- Identifying SME sectors with the greatest influence on the environment and assessing their capabilities in implementing sustainable production
- Identifying barriers to implementing sustainable production
- Recognizing competency gaps — including knowledge and skills — of entrepreneurs and those employed in SMEs, within a green economy context
- Defining appropriate forms of support, incentives and proposals, for changes in the law.

Research and investment are vital

The strategies adopted in Poland are supported by a number of measures as described here, with limited funds channelled towards stimulating sustainable and green growth. As the global situation is dynamic, it is difficult to build the framework so that it is resilient to new challenges within it, but we are doing our utmost to be flexible and adapt quickly. To maintain a competitive edge, the emphasis must be on research and development, investment in human capital, and sustainable and green-based growth.

We know that Poland has a relatively short history on the path to green growth. However, the country has an excellent record in managing the transformation to a market-based economy and steady growth; switching to sustainable mode is simply another transformation we are initiating. With this in mind, coupled with the fact that our transformation was prompted by the Solidarity movement and has always been based on the principle of solidarity, we are ready to share our experience and hope some countries will find this helpful on their way towards a green and sustainable economy.

Governing sustainable development in Malaysia

Adnan A. Hezri, Institute of Strategic and International Studies, Malaysia,
Wasis Ahmad Kamal, Economic Planning Unit, Prime Minister's Department, Malaysia, and
Pek Chuan Gan, United Nations Development Programme, Malaysia

Malaysia is often hailed as an example of a successful developing country. With a population of 28.7 million, Malaysia is currently on track to achieve most of the Millennium Development Goals (MDGs) in aggregate terms ahead of the 2015 deadline. This has been made possible largely because of strategic and proper planning as well as investments in physical infrastructure, primary education and primary healthcare services over the last four decades. Notably, the country has largely achieved the MDG objective of eradicating poverty, which fell from 17 per cent in 1990 to 3.8 per cent in 2009, based on the national poverty line. It has also achieved gender parity at all levels of education, surpassing parity at the universal level.

The Government has outlined its commitment to the MDG-Plus agenda (which features targets that go beyond the original MDGs) through its Tenth Malaysia Plan, 2011-2015, with 30 per cent of development expenditure allocated to the social sector. In 2011, Malaysia's Human Development Index was 0.761, giving the country a rank of 61 out of 187 countries with comparable data, and also above the East Asia and the Pacific regional average. In the Economist Intelligence Unit's Quality of Life Index, Malaysia is ranked 36th out of 111 countries.

To conserve and sustainably utilize its rich biological diversity endowment, Malaysia continues to commit at least 50 per cent of its land areas as forest cover, which according to the Food and Agriculture Organization in 2010 now stands at 62.4 per cent. In the Environmental Performance Index 2012, an international benchmarking survey of national environmental stewardship, Malaysia is ranked at 25th position among 132 countries surveyed. Rapid development and environmental transformation in Malaysia has proven to be a success in economic terms. For instance, a Federal Land Development Authority (FELDA) rural development scheme, which was originally meant to release citizens from the vicious circle of poverty through planned and coordinated development of land and socioeconomic activities and to ensure that economic development goes hand in hand with social development, together with other poverty eradication programmes have managed to reduce poverty to 3.8 per cent. The FELDA scheme has received accolades as a successful policy for bringing about social and economic benefits and setting a good example to other developing countries.

Image: Ali, Noorhisham, Economic Planning Unit, Malaysia

Malaysia is on track to achieve most of the Millennium Development Goals

Planning system and sustainable development

Traditionally, environmental policies across the world have been, and often still are, developed in a reactive, fragmented and uncoordinated way. The shortcomings of this approach have become manifest in rising environmental pressures and the displacement of problems rather than the provision of solutions. With the advent of sustainable development, questions about how economic, environmental and social interests can be accommodated simultaneously, and how more comprehensive and integrated policies can be developed, become more prominent. However, there are many technical and political difficulties in integrating the three objectives for sustainable development. In view of this, central to Malaysia's success is its national vision and strategy for development. The vision is based on long-term policy design beyond electoral cycles that seeks to change key societal structures.

In Malaysia, attempts have been made to mainstream environmental concerns and priorities into economic and social development plans since the 1960s, backed by strong institutions, which have proved able to accommodate changes yet durable and stable enough to ensure continuity of actions. For instance, in 1967 the Prime

Image: Department of Wildlife and National Parks, Malaysia

In its approach to conservation, Malaysia has influenced developing global standards

Minister's Department introduced the Land Capability Classification (LCC) system for broad regional planning and resource development. The purpose of the LCC scheme was to delineate zones of land development for mining, agriculture, forestry, recreation and wildlife, based on economic criteria that categorize five classes of land uses. This land-use instrument safeguarded Malaysia's natural ecosystems from rampant degradation during the periods of rapid socioeconomic and physical development.

As a result, Malaysia has performed well in certain areas of environmental policy without compromising the socioeconomic progress of its populace. Malaysia has accumulated considerable experience in pollution control since the 1970s. The ambient water quality was progressively improved by the mid-1980s through more effective control of effluent from palm oil mills, rubber factories, and related agro-industries regulated under the Environmental Quality Act of 1974. Malaysia has also received praise for its successful compliance with the Montreal Protocol in phasing out ozone-depleting substances. Economic analysis suggests that Malaysia has avoided the 'resource curse' thesis[1] and was mainly on a sustainable path throughout the 1980s and 1990s.The convergence between environment, social and economic goals in national development requires a strategic approach, which is mid- to long-term in its perspective or integrated in linking up various stakeholders and processes. Since the 1950s, Malaysia's economic planning system has involved the tradition of preparing periodic development plans. This approach has seen comprehensive policy development, involving the formulation of objectives across sectors for the medium (Five-Year Malaysia Plan) to long term (Outline Perspective Plan), and the means of achieving them. Apart from setting out broad goals, the national development plans include projects and activities to be funded from the annual recurrent and development budgets.

Malaysia's development planning agenda is supported by sectoral policies and plans such as the National Policy on Biological Diversity 1998,[2] National Policy on the Environment 2002,[3] National Climate Change Policy 2009, National Green Technology Policy 2009, and various strategic action plans to steer Malaysia towards sustainability. One of the objectives of the National Policy on the Environment is to 'conserve Malaysia's unique and diverse cultural and natural heritage with effective participation by all sectors of society' through a broad-based strategic approach in promoting environmental soundness through research and development, economic efficiency, social equity, responsibility and accountability. The National Policy on Biological Diversity aims to ensure conservation and sustainable utilization of the unique biological resources of the nation for the benefit of present and future generations.

Image: Yeong Chee Meng Kelvin, Economic Planning Unit, Malaysia

A Central Forest Spine promotes the protection of biodiversity-rich core areas

The New Economic Model 2010 includes sustainability as one of its three pillars for Malaysia to achieve developed country status by the year 2020.

These policies were considered in spatial terms through the National Physical Plan in 2005 by establishing a general direction for physical development and conservation of the entire region of Peninsular Malaysia. This Plan coordinates and converts the nation's sectoral policies into physical dimensions, providing a framework for planning at regional, state and local levels. Prepared for a period up to 2020 and due to be reviewed every five years, it clearly deals with sustainability through policies that are directed towards conserving natural resources and the environment. It also proposes an Environmental Sensitive Areas (ESA) instrument, suggesting a system of ranking to guide the management of ESAs. The Plan also highlights the need to establish a Central Forest Spine to form the backbone of the ESA network and promotes the protection of biodiversity-rich core areas, interconnected by a system of large forest complexes where ecologically sound land use is practised.

Fiscal and financial incentives have also been made available to the private sector to encourage incorporation of pro-environment initiatives. In March 2004, responsibility for the environment was vested in a newly established Ministry of Natural Resources and Environment. By combining fourteen environment-related portfolios under a single authority, this effort was part of a comprehensive plan to tackle the fragmentation that characterized Malaysia's environment and sustainable development policy domain. In addition, statistics on the environment to enable planning and decision-making have been compiled and made available through the Compendium of Environmental Statistics Malaysia by the Department of Statistics. Together, all these policy instruments provide the central integrative process that gives Malaysia a sense of direction and ensures a concerted effort to achieve strategic goals and objectives of sustainable development.

Harnessing the green economy

As an upper-middle-income country, Malaysia aims not only to graduate into the high-income category in

the medium term (by 2020), but also to strengthen its economic foundation in order to shift to a new period of a low-carbon economy. Arguably, the process of greening Malaysia's industry started as early as the 1970s, first exemplified by the introduction of regulations to manage pollution from the palm oil industry. Revenues from pollution licences show that discharges from palm oil wastes declined by 88 per cent in 12 years, and effluents from rubber wastes by 44 per cent in 10 years. The 1974 Environmental Quality Act has also been amended to suit the changing realities of regulating pollution from agro-based and manufacturing industries. In energy development, Malaysia's policy framework evolved from a sole focus on fossil fuel supply in the 1970s to a diversification of supply sources, which included renewable energy, by 2000.

More recently, Malaysia has introduced a more systemic architecture to respond to the global green economy agenda. The nation has certainly sent a strong signal that it intends to change its policy course. At the Copenhagen climate change meeting in December 2009, Malaysia declared its commitment to voluntary emission reductions of up to 40 per cent by 2020 over 2005 levels, measured in terms of emissions intensity of GDP, conditional on receiving transfer of technology and finance of adequate and effective levels. The National Climate Change Policy introduced in 2009 aims to ensure climate-resilient development to fulfil national aspirations for sustainability. It also serves as a framework to mobilize and guide Government agencies, industry and communities as well as other stakeholders and major groups in addressing the challenges of climate change in a concerted and holistic manner.

In April 2009, the Malaysian government announced the incorporation of the green technology portfolio into a newly established Ministry of Energy, Green Technology and Water (replacing the Ministry of Energy, Water and Communications). The central role of green technology was emphasized by the release of a National Green Technology Policy, overseeing greening in four sectors — energy, buildings, water and waste management and transportation. Green technology is earmarked as an important driver for the twin goals of high income and sustainability. Malaysia's early success is evident in attracting $4 billion worth of foreign direct investments to the solar photovoltaic industry in 2011. Green technology also encourages the business sector to invest in environmental protection, a role hitherto played mainly by Government. The greater role accorded for the business sector is consistent with changes in national development planning in Malaysia, from an approach underpinned by central planning to one aimed at creating enabling conditions to accommodate greater partnership for the delivery of better development outcomes.

Malaysia also places greater emphasis on sustainable consumption and production as a strategy to transition to a green economy. To promote cleaner technology and production, a National Lifecycle Inventory Database is being developed for primary industries and activities such as electricity generation, water supply, petroleum and natural gas exploration and production as well as petrochemicals. The purpose of the database is to facilitate efforts by industries to develop life-cycle approaches in their product and manufacturing processes. The Government has also put in place a National Eco-Labelling Programme (NELP) to ensure that businesses make credible claims about their products and to raise awareness among both consumers and manufacturers about environmentally friendly products and services. The NELP is meant to be a precursor to the new Green Procurement Strategies, which will seek to promote and facilitate green procurement by both the Government and private sector. Over the past few years, cleaner production and energy efficiency auditing have been carried out nationwide, involving largely small and medium-scale enterprises. Based on the finding, the Government plans to establish a model 'cleaner production' plant in each state involving food and beverage industries. The focus is on resource and input savings and reducing pollution at sources.

In conservation and sustainable utilization of its forest resources and biodiversity, Malaysia has developed comprehensive forest management practices which have provided the basis for developing global standards. Malaysia has also developed its own Criteria and Indicators to ensure that timber products are made of resources harvested from sustainably managed forests and comply with consumer needs. Malaysia has also made great strides in promoting sustainable practices in palm oil cultivation. The Roundtable on Sustainable Palm Oil (RSPO) is an initiative by the industry to provide a platform for oil palm growers to adopt good practices in their oil palm cultivation.

A more recent highlight is the formulation of the Renewable Energy Act 2011 with a feed-in tariff to encourage the growth of a clean energy industry and facilitate the transition to a low-carbon economy. The law is being administered by the newly established Sustainable Energy Development Authority. The quantitative targets set are: 6 per cent (or 985 megawatts) of national energy mix to come from renewables by 2015; and 11 per cent (2 gigawatts) of electricity generation to come from renewables by 2020. In choosing the low-emissions, high-growth option, Malaysia is gearing itself to harness the opportunities from the green economy imperative to achieving sustainable development.

On track for sustainable development

Since independence, Malaysia has embarked on rapid industrialization. The ensuing decades saw a steady transformation of the natural environment, from forests to agricultural land and industries including urban settlements. However, the proportion of forested land is still 62.4 per cent, a notable figure in comparison with other developed and developing countries. During the industrialization process, the country scored very well as far as the social component of sustainable development is concerned, with the poverty eradication programme recording an enviable success. Malaysia is on track to achieve all the MDG objectives. Moving forward, Malaysia's agenda on sustainable development is advanced within the context of quality of life and the protection of the environment by embarking on low-carbon, climate-resilient growth and enhancing conservation of the nation's ecological assets. Echoing other countries, Malaysia is committed to making substantial progress in meeting the sustainable related objectives.

Priorities in the transition towards a green economy

Kozue Hoshino, Global Environment Division, International Cooperation Bureau, Ministry of Foreign Affairs, Japan

Japan has taken various measures towards the achievement of sustainable development. Especially regarding a green economy, which is one of the themes of the United Nations Conference on Sustainable Development (Rio+20), Japan has made green innovation one of the major pillars of its New Growth Strategy adopted in 2010 and has carried out diverse measures to this end. In this context, Japan is regarded as a 'green economy advanced nation'. In addition, Japan has been promoting the concept of human security. In delivering official development assistance, Japan has focused on individuals and taken into consideration the capacity-building of communities through human resource development. Japan considers that sustainable development can be achieved only when each human being can realize their rich potential and participate in building a better society.

Japan attaches great significance to the ideal of a green economy, which it describes as "an economic system which promotes sustainable growth while improving human well-being, by pursuing economic growth and environmental conservation in tandem, properly utilizing and conserving natural resources and ecosystem services". In order to achieve a global transition to a green economy, the following areas should be given priority:

Green innovation

The key to achieving the transition to a green economy is green innovation. Energy-efficient technologies are widely available in Japan, both in the private and public sectors, and low-carbon life styles have been widely adopted there. Various measures have been introduced, including the Top Runner standard, which sets a target for the highest level of energy efficiency for each electrical appliance in the market, in order to encourage competition among manufacturers. Japan is one of the most energy-efficient countries in the world. It is the very technological innovation through everyday research and development that supports the elements needed to achieve sustainable development, such as: energy conservation, renewable energy, smart grids, resource recycling, communication technology innovation, net-zero-energy homes and sophisticated systems for global earth observation, climate change projection and data integration and analysis.

Japan's top-ranking energy-efficient technologies are indispensable in particular for emerging economies, where energy demand is expected to grow. Japan is contributing to the transition to an energy-efficient and low-carbon economy by making available its energy-efficient products and systems. In addition, Japan supports capacity-building of human resources by sending experts and receiving trainees. Japan has highly sophisticated environmental technologies such as photovoltaic generation and water desalination and has implemented financial and technical assistance in many developing countries. Through these activities, Japan is contributing to solving problems related to the environment and climate change in these countries.

Innovation in science and technology is essential for achieving sustainable development. In order to deal with global challenges such as climate change and large-scale natural disasters, timely, qualified long-term data should be obtained and shared among the international community. The importance of global observation activities was emphasized at the World Summit on Sustainable Development in 2002. As an executive member of the Group on Earth Observation, Japan has played a dynamic role regarding the construction of the Global Earth Observation System of Systems through its pivotal involvement in establishing a constellation of satellites and in sharing data from the satellites measuring greenhouse gas (GHG) emissions. Additionally, Japan has proposed a global mapping project, an international effort to develop global geospatial information utilized with earth observation data, and has been playing the central role as the Secretariat. Considering recent increases in the incidence of large-scale natural disasters, earth observation is expected to play a more significant role in terms of disaster risk reduction as well.

Human security (human-centred growth)

Japan has actively promoted the concept of human security, which focuses on individuals and aims at building a society where all human beings can realize their rich potential, through protection and empowerment. It is important to tackle social challenges such as alleviating poverty and narrowing disparities with cross-sectoral, comprehensive and people-centred approaches. Building a resilient society, a prerequisite for the realization of sustainable development, is possible only when vulnerable and threatened people such as the aged, women, children and the poor are protected and empowered, so that they can cope with threats by themselves, exercising the ability to decide and act on their own.

In 1999, the United Nations Trust Fund for Human Security was established by Japan's initiative. Japan has implemented concrete projects that meet the concept of human security, contributing JPY41.3 billion (approximately US$370 million) in total for 211 projects in 123 countries and regions. Moreover, it has itself implemented 1,176 projects in 122 countries and one region as of FY 2010 alone, within the Grant Assistance for Grassroots Human Security Projects framework.

One example of Japan's assistance through the United Nations Trust Fund for Human Security is the Integrated Community Empowerment and Peace-Building Support in Ituri project in the Democratic Republic of the Congo. In this project, four international organizations, namely UNDP, FAO, UNICEF and UNHCR, conducted activities to strengthen the human security of a number of displaced persons affected by the civil war. Activities included restoring production assets, securing access to social services such as local administrations and medical care, and developing a culture of peaceful coexistence of communities. Japan has been providing bilateral assistance to complement these activities, which contribute to comprehensive, multi-faceted and multi-layered assistance to the target community.

Japan's efforts towards sustainable development

To realize sustainable development, Japan has taken various measures as follows:

Disaster risk reduction

Japan has consistently advocated the importance of disaster risk reduction, by hosting the 1st (Yokohama: 1994) and 2nd (Kobe: 2005) United Nations World Conferences on Disaster Reduction. The Hyogo Framework for Action 2005-2015, adopted at the 2nd Conference in Kobe, stipulates the priority actions for disaster risk reduction and has been the guideline for each country as the single international agreement in this field. At the Asia-Africa Summit in 2005, Japan announced the contribution of more than US$2.5 billion over five years for disaster risk reduction and reconstruction. Since then it has steadily disbursed this assistance as part of its enthusiastic extension of assistance for disaster risk reduction.

Last year, Japan experienced the Great East Japan Earthquake, which was an unprecedented disaster for the country. In order to build a more resilient and sustainable society, Japan is ready to share its experience and the lessons learned from this earthquake with the international community. For this purpose, Japan will hold a High-Level International Conference on Large-Scale Natural Disasters in Tohoku this year and will pass on the results of this conference for the formulation of a post-Hyogo Framework for Action statement at the 3rd United Nations World Conference on Disaster Reduction, which Japan expressed its intention to host.

Climate change

Japan announced Japan's vision and actions towards low-carbon growth and a climate-resilient world on the occasion of the United Nations Framework Convention on Climate Change 17th Conference of the Parties (UNFCCC/COP 17) in Durban, South Africa at the end of last year. In order to address the issue of climate change effectively, it is necessary for both developed and developing countries to achieve low-carbon growth all over the world, by fully mobilizing technology, markets and financial resources through public-private cooperation, along with establishing international frameworks. Japan is ready to contribute to the reduction of GHG emissions on a global scale through this vision. To this end, Japan announced assistance of approximately US$15 billion up to 2012 for developing countries that are making efforts to reduce GHG emissions and that are particularly vulnerable to climate change. Japan has already implemented US$12.5 billion as of the end of October 2011, and is going to continue to implement its commitment steadily, focusing mainly on vulnerable countries. Japan has promoted regional cooperation initiatives such as the African Green Growth Strategy, which was adopted under the framework of the Tokyo International Conference on African Development (TICAD), and the East Asia Low-Carbon Growth Partnership under the East Asia Summit architecture. With regard to the latter, Japan hosted a conference in April this year to share best practices, expertise and information in East Asia.

Food security

Japan has been promoting Responsible Agricultural Investment (RAI), which aims to harmonize and maximize benefits to investors, recipient countries and local communities, in cooperation with the relevant international organizations. In addition, Japan has been endeavouring to increase agricultural production and productivity by actions such as improving irrigation infrastructures in developing regions and disseminating cultivation techniques. To develop rural areas and to facilitate appropriate management of natural resource, Japan has been making efforts to promote international cooperation such as through technical, financial and food assistance, including South-South cooperation, joint assistance by Japan and Brazil in Mozambique and the Coalition for African Rice Development, including the promotion of the New Rice for Africa project. At the G8 L'Aquila Summit, Japan pledged a minimum of US$3 billion for agriculture-related sectors from 2010 to 2012 and has been steadily disbursing this assistance.

In the field of water, which is closely related to food security, Japan, as the top donor of official development assistance in the field of water and sanitation, has been contributing to the improvement of water and sewage systems as well as to water resource management, in order to solve diverse issues related to water. Japan has been leading the way as regards international assistance in the field of water and sanitation, particularly by announcing JPY30 billion in grant-aid assistance at TICAD IV in 2008.

Biodiversity

Japan hosted the 10th Conference of the Parties of the Convention on Biological Diversity (CBD/COP 10) in Nagoya City, Aichi Prefecture in 2010 and has been exercising initiatives such as the CBD/COP 10 Presidency and establishing the Intergovernmental

Science and Policy Platform on Biodiversity and Ecosystem Services. It also announced the Life in Harmony Initiative, which allocated US$2 billion over three years starting from 2010 in order to assist developing countries' efforts to achieve their targets. As a concrete measure under this initiative, Japan established the Japan Biodiversity Fund (JPY1 billion) and the Access and Benefit Sharing Nagoya Protocol Implementation Fund (JPY1 billion). The aim is to support developing countries in revising their national biodiversity strategies and action plans based on the Aichi Biodiversity Targets, which comprise the global strategic plan for biodiversity, in order to support developing countries' efforts to implement the outcomes of CBD/COP10.

Sustainable production and consumption

To realize sustainable production and consumption, environmentally sound management of waste is crucial. Since proposing the 3R (Reduce, Reuse, Recycle) Initiatives at the G8 Sea Island Summit in 2004, Japan has been actively promoting the 3Rs through such means as:

- Amending the Waste Management Law for appropriate disposal
- Enacting the Green Procurement Law, in order to promote Government procurement of products and services that contribute to reducing burdens on the environment
- Enacting the Green Contract Law to promote contracts which give due consideration to the reduction of GHGs
- Enacting the Environmental Consideration Law to promote environmental reporting
- Encouraging the use and purchase of environmentally friendly goods and services by introducing eco-points for electrical appliances, a home eco-point system, eco-reform and eco-action points
- Encouraging low-carbon facilities through an eco-leasing subsidy programme for households and businesses
- Promoting a low-carbon society by subsidizing interest in projects that encourage environmentally friendly management.

Producers bear a heavy responsibility as regards achieving sustainable production and consumption. Therefore, it is critical that businesses conduct their activities in an environmentally friendly manner, through products, production processes and business models that restrain waste generation as well as through the transition to a recycling-centered society, focusing on emitters' responsibility and extended producer responsibility (EPR).

Cities

Since large parts of the global population live in urban areas and urban populations are expected to grow, sustainable city building is an urgent task. Japan has been promoting its Future City initiative with the aim of selecting qualified cities as the models for Future Cities, which continuously create economic, social and environmental values by generating successful cases in terms of technologies, systems, services and city planning, while tackling environment challenges and the issues of an ageing society and a declining birth rate. In December last year eleven cities were selected as Future Cities, including those in the disaster-affected areas. In order to further refine the Future City concept, Japan intends to collect and disseminate information on domestic and international best practices in the areas of the environment and dealing with an ageing society and a declining birth rate. Japan has been conducting the Challenge 25 Local GHG Reduction Model Project to promote action plans in local municipalities to tackle global warming, based on the Act on the Promotion of Global Warming Countermeasures and to verify effective and advanced measures for CO2 reduction such as low-carbon transportation systems and the utilization of untapped energy in urban areas. Japan also has been conducting verification of next-generation energy and social systems to promote smart communities that tackle the improvement of local transportation systems. Eco Model Cities have also been introduced to achieve a low-carbon society and local revitalization.

The City of Tokyo started to require large-scale offices above a certain standard to report and disclose their CO2 reduction plans in 2002. An upper limit for CO2 emissions for large-scale offices was introduced in 2010. When buildings with a large amount of floor space are built or extended, the Tokyo Metropolitan Government requests them to submit construction plan to ensure they are equipped to save energy and are environmentally friendly. The authorities have also introduced labelling for apartment buildings, showing how energy-efficient they are. Through these measures for the greening of offices and apartment buildings, CO2 emissions from large offices were reduced by 12.7 per cent from 2005 to 2009, and a series of Green Buildings have been constructed, demonstrating the highest energy efficiency levels in the world. Based on these results, Japan would like to promote the Future City concept to the rest of the world.

Education for sustainable development

In order to achieve a sustainable society, not only is it important to take individual measures in fields such as disaster risk reduction, biodiversity, climate change and human rights, but education for sustainable development (ESD) is also indispensable, as it aims to develop human resources capable of confronting challenges in these areas comprehensively and taking the necessary actions to settle them. Japan advocated the United Nations Decade of Education for Sustainable Development (DESD) and will host the UNESCO World Conference on ESD to mark the final year of the DESD in 2014. It intends to work continuously to promote ESD and to enhance cooperation.

Sharing best practices

Through the activities outlined in this article, Japan has been making efforts to realize sustainable development. Japan sincerely hopes that not only its own best practices in various fields but also those of other countries will be shared with the international community and that progress towards sustainable development will be made on the occasion of Rio+20. Japan is ready to support measures taken by other countries, utilizing its past experiences and undertakings as a 'green economy advanced nation'.

Moving towards healthy, sustainable economies

José Maria Cardoso da Silva, Fábio Scarano and Fábio Arjona,
Conservation International Foundation

The challenges confronting our global environment and the needs of the world's human populations have never been greater: the future, quite literally, is in the balance. Every person on Earth deserves a healthy environment and the fundamental benefits that nature provides. But our planet is experiencing an unprecedented drawdown of these resources, and it is only by protecting nature that we can ensure a better life for everyone, everywhere. To address this ongoing crisis we must develop healthy, sustainable economies (HSEs), which enhance social capital and equity and improve human well-being. HSEs require the integrity, resilience and productivity of natural ecosystems and their biodiversity. If societies recognize the importance of the values of nature to social development and mainstream those values in decision-making, then natural ecosystems will be protected more effectively than ever.

Image: ©Pete Oxford/iLCP

Networks of protected areas can help in the conservation of critical natural capital

Natural capital and ecosystem services

A country's income and economic well-being depend on its wealth, where wealth is defined in the broadest sense to include natural, produced, human and social capital. Natural capital includes all renewable (but not inexhaustible) resources (for example, all products derived from ecosystems and their services) as well as non-renewable stocks of exhaustible useful substances generally found underground (oil, gas, minerals and so on). Produced capital includes all physical assets or durable goods (such as man-made infrastructure) as well as finance (liquid assets). Human capital is the stock of competences, knowledge and personality attributes that individuals acquire through research, education and practice, embodied in the ability to

Image: ©Olivier Langrand

Ecosystem services include both direct and indirect contributions of ecosystems to well-being

perform labour so as to produce economic value. Social capital includes institutions and social relations that determine, depending on the context, how efficiently the first three types of capital can be combined (for example, governance).

The four capitals outlined above comprise the productive base of an economy. However, non-renewable natural capital (nature and its services) underpins all other capitals. Its contribution to an economy is best understood through an analysis of its services. Ecosystem services are defined as the direct and indirect contributions of ecosystems to human well-being. There are four major categories of ecosystem services:

- Habitat or supporting – those services associated with the maintenance of species and all ecological processes that comprise the base for all other ecosystem services
- Regulating – those services that ecosystems provide by regulating the ecological processes that are critical for human survival, such as air quality, flood and disease control, pollination and biological control
- Provisioning – those services that provide the material outputs from ecosystems, such as water and food
- Cultural – those services that include the non-material benefits (for example aesthetic, spiritual and psychological) that people obtain from contact with nature.

Supporting and regulating services influence one another. They are mostly intermediate ecosystem services; those that are not directly consumed by people but which underpin the production and/or flow of other services. Regulating services have insurance values, as they reduce the risk of loss of ecosystem service flows in the face of disturbances in the environment. People directly consume provisioning and cultural services. When combined with elements of built (or technical) and human (labour) capitals, these services generate products that have market values. There are buyers and sellers, and each product's value can be estimated from this interaction. As a consequence, provisioning and cultural services are an important part of the flows of goods and services that compose national and global economies.

Transforming societies towards HSE

To move from a traditional economy towards HSE, societies have to be prepared to follow a different development path. We envision six major transformations.

The first transformation requires that societies maintain their critical natural capital. Critical natural capital is the portion of a region's natural capital that is irreplaceable for the functioning of the ecosystem, and hence for the provisioning of its services for local societies. We believe that without critical natural capital, societies are not resilient against global changes and cannot sustain socioeconomic development. The conservation of critical natural capital requires careful design and implementation of networks of protected areas, as well as all other strategies that seek to maintain or restore ecosystems outside protected areas.

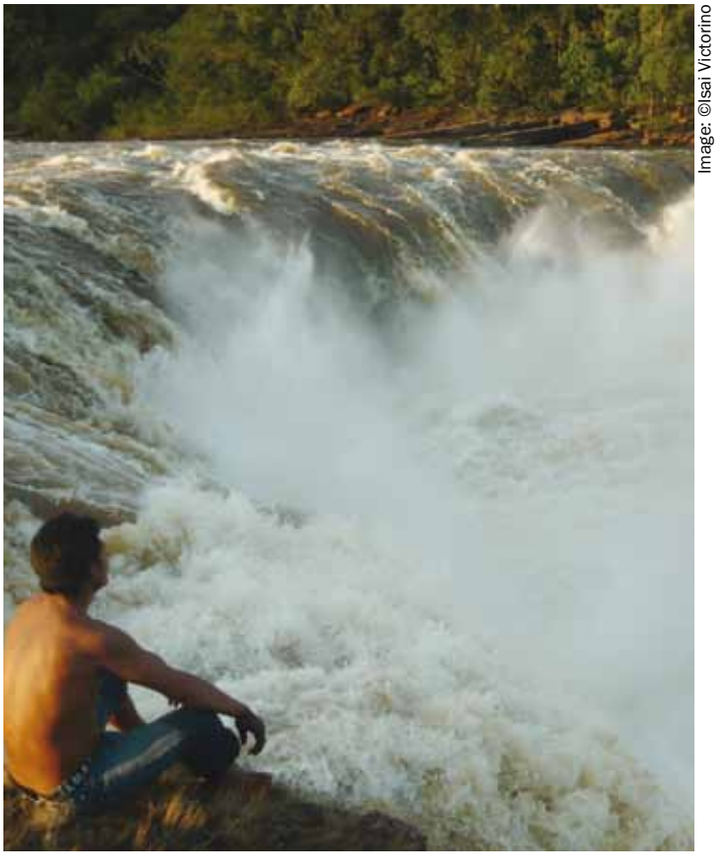


Image: ©Isai Victorino

The Apaporis River in the Colombian Amazon: non-renewable natural capital must be protected

Image: ©Conservation International/photo by Haroldo Castro

Local community, Choco Manabi corridor, Ecuador 2006

Image: ©Robin Moore/iLCP

Cajas Park, southern Ecuador, 2007. Healthy, sustainable economies depend on natural ecosystems

The second transformation requires that production systems become more efficient (that they produce more while consuming less) and that the impact of the man-made infrastructure that is needed to realize their market values is minimized, mitigated or compensated. Production systems and infrastructure should be well planned following the best benchmarks available and constrained by the protected area network that protects the region's critical natural capital.

For the third transformation, markets for ecosystem services must be created or expanded following a sustainable path, and incentives adopted to correct potential market failures. The values of the necessary ecosystem services to a specific product have generally not been incorporated in the prices, as they are perceived to be free of charge. Initiatives such as payment for ecosystem services for freshwater and carbon, as well as green taxes, are the first steps towards the recognition of monetary values for nature's services by national societies.

The fourth transformation requires the progressive reduction — and eventually the complete elimination — of the aggregate consumption of products that are not produced following the best sustainability standards available. The power of consumers is immense and has not been adequately used to promote transformational changes to how the markets operate. In a country whose government is an important consumer, legislation supporting only the purchase of sustainable products by governmental organizations can quickly promote the incentives that sustainable products need to become competitive in the market.

For the fifth transformation, financial resources coming from individuals, corporations and government must be directed mostly at sustainable economic activities. Developed countries should make sure that overseas development aid is used to maintain critical natural capital and support the emergence of sustainable economic activities, rather than to support the traditional development models that have failed everywhere. The private sector should incorporate social and environmental safeguards in its investments above and beyond the requirements of national legislation. Global standards built by different stakeholders working together will certainly put some constraints on how investment flows circulate around the world and which activities they support.

The sixth transformation is one that assumes that HSEs require a positive societal relationship with nature's values and effective governance of ecosystem services. As a consequence, societies need to develop new and innovative social agreements that define how ecosystem services will be valued and managed. To be effective, these agreements should define in simple terms:

- How the values of ecosystem services will be incorporated in national accounts
- Who will own or have the rights to use ecosystem services
- The process and tools that will be used by societies to make decisions on the management of ecosystem services.

All this must be done while taking into consideration the interests of all stakeholders, particularly the most vulnerable sectors of society.

The quest for the ultimate energy for sustainable development through laser technology

Young-Gil Kim, PhD, President, Handong Global University, Korea

At the World Future Energy Summit in January 2012, the United Nations called for action to achieve sustainable energy for all by 2030. "We are here to build a new energy future… A future that harnesses the power of technology and innovation in the service of people and the planet," said United Nations Secretary General Ban Ki-Moon in his opening remarks at the summit in Abu Dhabi, United Arab Emirates. Ban Ki-Moon stressed that energy is central to everything, from powering economies to achieving the anti-poverty targets known as the Millennium Development Goals (MDGs); from combating climate change to underpinning global security. He emphasized the need to scale up successful examples of clean energy and energy-efficient technologies, innovation that can spread throughout the developing world, partnerships with the private sector, and visionary leadership.

In June 1992, the Rio Declaration on Environment and Development proclaimed in its ninth Principle: "States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies."

In order to address the development of green technology for sustainable development in the twenty-first century, the construction of global research networks has never been so vital.

Green technology for sustainable development

In the technology-driven world of the twenty-first century, the global community is confronted with a

The role of green science and technology

Source: Handong Global University

The United Nations Academic Impact Global Hub for Capacity Building

Source: Handong Global University

severe energy crisis, climate and ecosystem changes due to global warming, and water and food contamination. The whole world faces tremendous challenges to close the gap between projected energy demand and the known supply of sustainable, carbon-free, affordable energy. Today, about 80 per cent of the world's total primary energy demand is met with fossil fuel, which emits significant quantities of the greenhouse gas carbon dioxide into the atmosphere. Safe, environmentally sustainable and commercially viable sources of energy with an inherent security of supply and the capacity to meet the base level of the world's demand are vital to modern civilization.

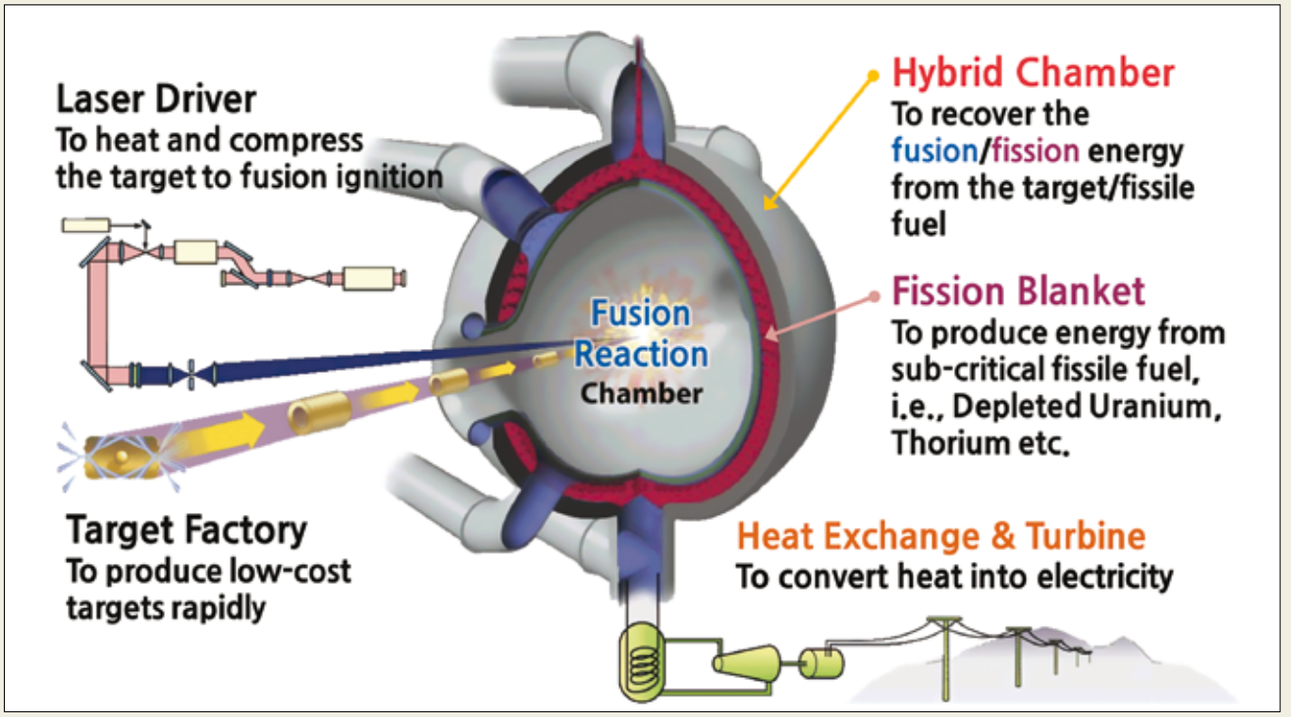
As ecological destruction has a uniform effect on the whole globe, it requires global awareness, and green technology development needs to be pursued as a global project. Green growth offers us a way to maximize the synergistic outcome of protecting the green environment and growing the global economy. Sustainable development emphasizes a holistic, equitable and far-sighted approach to decision-making at all levels. It emphasizes not just strong economic performance, but also intragenerational and intergenerational equity. Its success rests squarely on integration and a balanced consideration among social, economic and environmental goals and objectives in the decision-making process, both in the public and private sectors.

Mankind is now on a quest for new energy sources; this is a search for the holy grail of the ultimate renewable energy of the future — one that can meet the base-load demand as well as environmental concerns. Renewable energy sources such as solar, photovoltaic, wind and hydro power will play an essential role in meeting this challenge, but they require huge storage capacity or available land to meet the base-load power requirements of most countries. Nuclear energy offers many advantages, but requires the addressing of safety and proliferation problems associated with enrichment, reprocessing and high-level waste storage. Therefore, this energy source is not expected to meet the majority of global base-load electricity needs.

The main alternative to burning fossil fuels, with no carbon emissions, is nuclear energy. Atomic fusion power is the power generated by nuclear fusion processes. In fusion reaction, two light atomic nuclei fuse together to form a heavier nucleus in contrast with fission reaction. In doing so, the reaction releases a comparatively large amount of energy arising from the binding energy caused by the strong nuclear force, which is manifested as an increase in temperature of the reactants. The term 'fusion power generation' is commonly used to refer to potential commercial production of net usable power from a fusion source, similar to the usage of the term 'steam power generation'. The leading designs for controlled fusion reaction use either magnetic or laser inertial confinement of a plasma, with heat from the fusion reactions used to operate steam turbines, which in turn drive electrical generators, similar to the process used in fossil fuel and nuclear fission power stations.

Hybrid fusion-fission nuclear power was proposed in 1979 by the American Nobel Laureate Hans A. Bethe. It uses more widely available reserves of nuclear fuels than uranium, such as thorium, for power generation. Thorium is more abundant and carries less risk of nuclear proliferation problems. This would result in

Conceptual design of a stable atomic fusion energy hybrid power plant



Source: Handong Global University

a diversification of energy sources, and can offer a model for the sustainable, clean energy we seek.

Bringing star power to Earth

For the last 50 years or so, it has been recognized that nuclear fusion may provide a highly attractive solution to society's demand for safe, secure, environmentally sustainable energy on a scale that would meet its long-term needs. The clean sources of energy pursued currently by mankind all originate from the Sun's energy, which is itself generated by the nuclear fusion reactor of the Sun located in space. The nuclear fusion reactor described above is essentially an artificial realization on Earth of the ultimate source of the Sun's energy, and may be the answer to the quest for the ultimate source of energy. There are two major alternatives to this nuclear fusion: magnetic field and laser inertial confinement. Despite its tantalizing benefits, laser inertial confinement fusion has largely been ignored in energy policy discussions. It has been viewed as a technology too immature to affect energy production over the next few decades, when it is most needed. However, drawing on huge investment in the Laser Inertial Fusion Energy (LIFE) research programme conducted by the National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory (LLNL) of the Department of Energy of the US, and linking it with recent innovations in the semiconductor industry, we are about to see a major shift in the paradigm for using atomic energy, from conventional nuclear fission (atoms splitting) to nuclear fusion (atoms fusing) for new power generation.

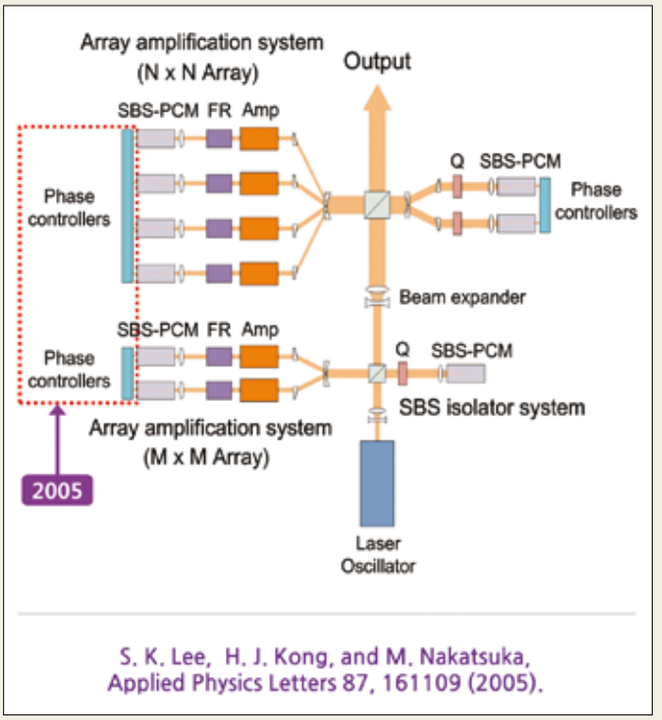
Dedicated in May 2009, the NIF is the world's largest and highest-energy nuclear fusion system. Its goal is to ignite a self-sustaining nuclear fusion reaction and produce net energy gain (more fusion energy out than the energy the laser beams deliver to the target) — the very same fusion energy generation process that makes the stars shine and the Sun provide life-giving energy. NIF's 192 laser beams are capable of directing nearly 2 megajoules of ultraviolet laser energy in billionths of a second to a fusion target.

Global Institute of Laser Technology

In response to the need for safe, secure, environmentally sustainable energy, the Global Institute of Laser Technology (GILT) was established in May 2009 at Handong Global University (HGU) in Pohang, Korea through the formation of a global network of universities, research institutes and industries in the field of laser fusion energy. In December 2011, HGU signed an agreement with LLNL in Livermore, California to promote collaboration in the design and development of power plants based on LIFE for an abundant, inherently safe, cost-effective, low-carbon and low-waste source of base-load electricity.

GILT is now cooperating with the NIF while searching for complementary core technologies as well as alternatives to those being worked on now. As for the development of a high repetition rate power laser technology, GILT possesses its own technology for which it is trying to improve its power. So far, the laser fusion community has not yet found a solution for a laser driver with high enough energy (>500 kJ) along with a high enough repetition rate (>10 Hz) with an alignment precise enough for the target. The solution to the high power/high repetition rate problem can be achieved

Wavefront dividing method



Source: Handong Global University

by combining multiple laser beams; for example, the Stimulated Brilloium Scattering (SBS)-phase conjugate mirror (PCM) method researched by Professor H.J. Kong at KAIST.[1] Besides, in order to produce a laser beam with the power and repetition rate high enough for commercial power generation, the laser medium should not only be large, but should also be able to be cooled down rapidly.

In order to maximize the energy efficiency of the present laser fusion, the excess neutrons from the fusion reaction may be utilized to induce a high-yield fission reaction in the surrounding subcritical fissionable blanket. The net yield from the hybrid fusion-fission process can provide a targeted gain of three or four times over that from the fusion alone, which may be enough to tilt the viability equation of the fusion energy sooner. For such a technology, development of a subcritical fissional blanket that can be used within a fusion reactor is imperative. The atomic power industry in Korea, which has been successful as a major export industry with its products, should be able to tackle the task. GILT is collaborating with the existing atomic power industry in the development of subcritical safe power plants.

The critical technologies vital for the task at this juncture are the laser diode, which is the key for the high power and high repetition rate laser, and the technology for design and qualification of an unconventional and safe reactor. Fortunately, Korea also has strength in the solid-state electronics necessary. GILT is partnering with the major IT industries in Korea to develop laser diode production technology to lower the cost of laser-driven power plants.

For this kind of research, education not only for the existing researchers but also for future researchers is imperative. Education is paramount because the endeavour demands not only a steady supply of experts to develop the necessary core technology itself, but also active participation of the entire global community including developing countries. Higher education has a vital role to play in shaping the way in which future generations learn to cope with the complexities of sustainable development. In order to cultivate the emerging new fields of green science and laser technology, the Handong Graduate School of Advanced Green Energy & Environment (HGS AG&E) opened in September 2011 to offer Masters and PhD level programmes in the fields of laser technology and green science. HGS AG&E is partnering with the UNESCO/UNITWIN International Centre for Global Development and Entrepreneurship at HGU and the United Nations mandated University for Peace Asia-Pacific Centre.

UNAI Global Hub for Capacity Building

HGU has had a global educational vision since its opening in 1995, and it has been focusing on global education for capacity-building of sustainable development ever since. As a result, in April 2007, UNESCO designated HGU as the UNESCO/UNITWIN International Centre for Capacity Building of Sustainable Development. In January 2011, the United Nations also designated HGU as the United Nations Academic Impact (UNAI) Global Hub for Capacity-Building,[2] which focuses on the following three fields:

- global collaborative research for green growth for sustainable development through GILT
- education for global development and entrepreneurship to strengthen endogenous capacity-building for sustainable development in developing countries
- global partnership for prosperity through the reduction of the knowledge gap between developed and developing countries, through the ongoing programme of UNESCO/UNITWIN capacity-building for sustainable development.

Pursuing the goal of ultimate energy for green growth

In solving the global issues facing us in the twenty-first century, global collaboration is essential. As the frontier research programme for green technology for sustainable development of green growth, GILT of HGU in Korea, in partnership with NIF of LLNL in the US, will focus on the development of the high power and high repetition rate laser with self-navigation capability, which will serve as a beacon in the quest for the holy grail of ultimate green energy for commercial power generation. For that effort, GILT, in cooperation with the Government of the Republic of Korea, is aiming to develop a pilot-scale, stable atomic fusion energy, fusion-fission hybrid power plant of a 500MW class by 2030 through domestic and global collaboration.

Through global collaborative research between GILT/HGU and NIF/LLNL, the long-sought ultimate dream of bringing star power to Earth as the limitless and ultimate green, clean energy source for sustainable development could finally be realized by the year 2030.

Renewable energy as a driver for economic and sustainable growth — the Icelandic perspective

Gudni A. Jóhannesson, Director General at Orkustofnun, the National Energy Authority of Iceland

Iceland is a country with its most northerly parts touching the Arctic Circle, but although it is surrounded by the Gulf Stream, temperatures are moderate. Winter averages about 0°C, while in summer the highest monthly average is about 14°C. However, these temperatures, together with the fact that the number of daylight hours in the capital Reykjavik during the winter solstice is less than seven hours, mean that heating is required all year round. About 70 per cent of the population lives in the area south-west of Reykjavík, with the remainder mostly distributed along the 1,400 km Road 1, which follows the coastline around the island. Icelandic geology is distinctive, possessing volcanoes, high inland glaciers and abundant water resources both above and below the ground. Energy consists mainly of hydropower and geothermal sources at various temperature levels up to 350°C and beyond. Wind, sun, waves and tides are potential sources of energy, but the high cost of accessing these means they are unable to compete with hydropower and geothermal energy as a renewable resource.

Renewable energy driving economic growth

Economic growth and development of the nation into a modern community with a relatively high standard of living goes hand in hand with its exploitation of sustainable natural energy resources. The development of small-scale hydropower, along with local use of geothermal resources, began in the early twentieth century. During the 1960s, major development of hydropower projects for larger energy-intensive industries began and during the 1970s — in the wake of the energy crisis — considerable national effort was initiated to identify geothermal sources and distribute their energy to more remote communities. In the late 1980s extensive development of geothermal power from high temperature sources became a competitive alternative to large-scale hydropower.

Growth in the use of electricity from hydropower — and both electricity and heat from geothermal sources

Image: Gudni A. Jóhannesson

Placing power plants sensitively is difficult in barren landscapes

Image: Oddur Sigurdsson

Geothermal wells piping in hot water to reservoir tanks above Reykjavik

— paralleled the economic growth of the country. Although growth in energy used from fossil fuels has developed more slowly, the increase in consumption coincides with improved living standards, higher mobility and a bigger fishing fleet, which has more than compensated for the reduction in fossil fuel-based heating. Relatively big steps in electricity generation during 1970, 2000 and 2007 were due to major industrial investments, mostly in smelters.

Today the nation's electricity production is almost entirely from renewable sources — 74 per cent from hydropower and 26 per cent from geothermal power — with less than 20 per cent of total electricity production being sold to small and medium-sized customers. As 90 per cent of space heating is sourced from geothermal origins and 10 per cent mostly electricity from renewable sources, the positive effect on the country's economy and trading balance is extremely significant, irrespective of any environmental benefits. With increasing oil prices it is becoming very clear that living standards are affected.

But there are many challenges to be overcome. Some are common to many projects where renewable and sustainable energy is being implemented, including Government strategies for basic research and development, a strong and sustainable base for building up knowledge and skill, the need for long-term capital and economic risk mitigation, legal and regulatory framework and market issues. Others are more specific, such as the long-term management and ownership of geothermal resources, and concessions and special environmental concerns in barren volcanic landscapes.

Geothermal direct use

Early in the twentieth century attempts were made to heat Icelandic houses by piping water in from natural hot springs and later, from shallow boreholes. The first district heating system in Iceland came into use in 1928. A kilometres-long pipeline extended from hot springs in Reykjavik to a swimming hall and nearby houses. The largest increase in the use of geothermal heat took place as a result of large investments in exploration and district heating developments, a result of the rising price of oil and the energy crisis of the 1970s.

District heating has been extended to cover 90 per cent of all house heating in Iceland, a country of 103,000 km^2 with 333,000 inhabitants. The longest distance between source and customer is 63 km. Environmental gain through building up infrastructure for district-wide heating and cooling can be as great as 70 per cent due to the flexibility associated with using various sources for heating, such as that from industrial processes waste, low-grade fuels such as garbage and waste from forestry and heat pumps. Geothermal heat accounts for the remaining 30 per cent. In many countries the general attitude is that introduction of such an infrastructure is beyond reason in established, well-populated areas. However, examples from Iceland and Scandinavia may prove the opposite.

Image: Oddur Sigurdsson

Training local experts in geophysical surveys

Cascading use in energy quality management

The energy quality, or ability of a certain amount of energy to generate electricity, increases with temperature and pressure. Harvesting significantly deeper geothermal energy at higher temperature and pressure levels — even in a supercritical state — conserves energy quality compared to letting it dissipate closer to the surface with lower pressure and lower boiling point. In the Iceland Deep Drilling Project (IDDP) the aim is to drill closer and deeper to magma reservoirs to obtain supercritical fluids at 500-600°C. Many difficult challenges must be overcome, such as the need for more precise mapping of magma intrusions in the crust, and technical equipment and components that can operate at high temperatures while withstanding highly aggressive chemistry. If this technique proves successful, an average borehole could yield enough power to generate about 50 MW of electricity compared with 5 MW from an average borehole today. The first IDDP hole drilled in north-east Iceland hit a magma intrusion at only two kilometres deep, with the highest water temperature at 450°C and although promising, plans are to connect with magma at a deeper level in order that the desired supercritical pressure is also reached.

The Blue Lagoon, a large geothermal spa and health centre in Iceland, is an example of how high-temperature electricity generation and recreational thermal facilities can coexist in a cascading geothermal operation. Today, the power generating industry is producing more low-temperature heat than it used to. Research on, and development of, new low-end use activities is important in the sustainable use of geothermal resources.

Fuel generation within the transport energy sector

The greatest challenge remains implementing renewable energy sources within the transport and remote energy sector.

Small population densities, vast distances from other countries and the importance of high-seas fisheries for the economy depend on transport that until now has run mostly on fossil fuels. With renewable electricity it makes sense for the transport sector to adapt to using the hydrogen cycle, batteries for storing electricity, or liquid fuels such as methanol and dimethyl ether (DME). Methanol is produced from the hydrolysis of hydrogen, with a relatively small amount of CO_2 separated from borehole geothermal fluids at the plant site. Methanol is then blended into fuel for use in standard petrol cars. Other commercially viable options include using methane gas from landfill as a fuel alternative in

modified petrol cars and gathering animal and vegetable fat from restaurants and the food-processing industry which is converted into oil for diesel engines. The latter has been tested on cars, city buses and a fishing trawler, with encouraging results. Small-scale experiments that involve growing biofuel plants such as rapeseed have shown promising economic outcomes in Iceland, although it is clear production will vary considerably from year to year as a result of naturally occurring climate variations.

Although DME may be used in diesel engines when fuel tanks are modified to withstand higher pressure, a feasibility study carried out on behalf of a major 300 MW plant in western Iceland that produces DME — from hydrogen and CO_2 from a ferrosilicon plant — showed that the production cost is prohibitively high when compared to fossil oil, despite the considerable environmental benefits.

Iceland has also participated in several larger projects relating to the introduction of the hydrogen cycle into the transport energy sector. Cars and buses have run on hydrogen, as have electrical generators for ships, and a hydrogen filling station is now operating in Reykjavik. However, advances in fuel cell technology, although effective, have not delivered the cost reductions that were anticipated at the start of the century.

National master plan

The Iceland Government has announced a holistic energy policy which focuses on the transition from imported fuels to renewable energy, capitalizing on both hydropower and geothermal resources to protect the unique features of Icelandic natural and cultural heritage. Stronger focus will be placed on the diversity, sustainability and high technology content of these new energy-intensive industries. New power plants will be scheduled under the continuing master plan programme, which is expected to go through parliamentary process during the first half of 2012. These planned enterprises have been evaluated and ranked according to their power and economic potential, socioeconomic effects, impact on natural and historic sites and any conflicting interests. In addition, the master plan will define any limitations to existing hydropower and geothermal plants. The Bill containing the legal framework for the master plan was passed through parliament in 2011, with the associated Act stating that a new, revised listing, including classifying power plant options, should be presented to parliament within four years of the previous version.

The international perspective

Geothermal resources are found mostly along the margin between the Littorian borders of the crust. In earlier assessments, the total potential for electricity generation from geothermal sources around the globe amounted to more than 160 GW, with recent studies showing even higher values. Investment in the exploitation of this amount of power could mean an investment of more than US$600 billion. Such ventures depend on human resources unavailable today, so it is enormously important to expand capacity by educating and training a new generation of experts and skilled workers. The United Nations University Geothermal Training Programme has run in Iceland for more than 30 years, teaching and now training from 20-30 students every year in exploration and utilization. Although the programme is offered only to developing countries, similar initiatives are available for students from developed countries at universities in Iceland. Nations such as Kenya are now building significant capacity in geothermal power and financing extra students in a scheme to meet the country's urgent need for more skilled staff in the area of geothermal power generation.

A considerable portion of Icelandic aid is channelled into helping developing countries exploit their geothermal sources. As Icelandic geothermal power capacity has expanded considerably over recent years, the nation's experts have received up-to-date training and are now active in most countries where geothermal energy is on the agenda. But a significant drawback is that some of the available geothermal sources are in remote places far from major markets. Renewable electricity from hydropower and geothermal sources in Iceland is now produced at five times the amount needed to serve an average community of 330,000 inhabitants, yet distances from the nearest markets range from 1,200 km to 1,800 km. Until now, electricity has been marketed to international companies as energy-intensive processes, including aluminium smelters and data centres with established plants in Iceland.

Plans for long distance cables to Europe are being discussed, but the longest subsea cable to date is the 600 km NORNED cable between Norway and the Netherlands. Advances in technology mean this could prove a viable alternative in the near future. Another method of exploiting stranded renewable power is by using hydrogen and CO_2 to manufacture synthetic fuel from the process industry, as described above.

Challenges and opportunities for a renewable future

Environmental concerns, including those associated with generating renewable energy must be taken seriously. Vegetation, animal life, scenic landscapes, the perception of wilderness, cultural heritage and alternative land use such as in tourism or agriculture may be affected, which is why Iceland outlines examples in its master plan of how national schemes may consider these factors.

Geothermal energy has been a success in Iceland, as well as other countries, for direct heating and generation of electricity. But for many developing nations, adopting geothermal energy is the most promising path for escaping energy poverty and improving daily life through food production and conservation. International cooperation on research, developing effective technologies and capacity building, can improve the odds for success.

The majority of the most cost-effective renewable energy sources today — such as hydropower and geothermal energy — are classified as stranded power, due to being located far from their biggest markets. One solution is to move energy-intensive industries closer to the sources, although advances in long-distance subsea cables and the generation of synthetic fuels may provide solutions for the future. Synthetic fuels could also offer a link between fixed renewable energy sources and the transport energy sector. For a country like Iceland, with its abundant renewable energy resources, this appears the most urgent area for development.

Taking responsibility for people and the planet

Jana Velichkova, Director, Investments, Innovation and Entrepreneurship, Ministry of Economy, Energy and Tourism, Bulgaria

The 20-year period following the United Nations Conference on Environment and Development in Rio de Janeiro has been marked by progress on a number of issues concerning poverty and imbalance in the environment. Nonetheless, many issues related to implementation of the Millennium Development Goals still need to be addressed. A broader and more pragmatic approach is required to find solutions.

Against the background of these global issues, the attention of the world public is turning again to Rio. The Republic of Bulgaria, as a European Union Member State, is involved in efforts to solve the challenges associated with laying the foundation for the transition to a green economy and sustainable development. We consider that the transition to a competitive economy and a society with low carbon intensity is important to stimulate sustainable growth and innovation, enhance energy security while decreasing dependency on imported fossil fuels, ensure new jobs, strengthen competitiveness, improve air quality and diminish risks to human health. The integration of sector policies concerning climate change is another key issue. Energy, transport, industry and urban construction all play important roles in this process.

Image: Diana Gyncheva

The European Strategy on Clean and Energy Efficient Vehicles supports sustainable growth

The EU recently adopted several strategic documents on medium- and long-term planning for low carbon development. One of these is the European Strategy on Clean and Energy Efficient Vehicles, which has a key role to play in implementation of the priorities for intelligent and sustainable growth. Within this process, Bulgaria is one of the nine EU Member States that have signed the Joint Declaration on Electric Mobility in Europe, which places electric motor vehicles in the spotlight and offers perspectives on how a competitive approach can combine industrial development and sustainability.

Bulgaria's decision to give priority to electric car production as a part of its development strategy is based on an economic policy aimed at promoting investment activities in priority sectors which create higher added value and increase the competitiveness of the economy. The electric motor car sector fully corresponds to this economic strategy. The innovative technology will accelerate the development of other sectors such as information and communications technology, intelligent energy networks and services. Sales of 'eco' automobiles are forecast to exceed €40 billion by 2015, including electric motor cars and hybrid vehicles.[1]

According to the most optimistic prognosis, the share of 'eco' motor cars may exceed 15 per cent of total cars by 2020, after which it could sharply increase under the influence of economic and technological factors.

Because this is a relatively new industry, which will be developed both in Europe and globally, new market niches and opportunities will emerge. Bulgaria has traditions, expertise and advantages that equip it to successfully enter this market. At present many Bulgarian enterprises, some of them owned by well-known international companies, partner with leading automobile companies as sub-contractors of units, components and auto parts. We expect that they will also take advantage of the new market opportunities in the production of electric motor cars and development of charge networks. The Bulgarian Government pursues a proactive investment policy in this field. We share the opinion of some European countries that under good management, electromobility could be developed to become one of the key technologies to secure employment and growth in the next decades.

The electric motor car is also a factor in implementing our national target for renewable energy sources, namely to increase the share of renewable sources in total energy consumption to 16 per cent by 2020, and to 10 per cent in transport. As part of the development of 'smart networks', these sources will play a substantial role in the energy system. Through the introduction of low-carbon and energy-saving technologies we will secure the sustainable future development of transport. Dependency on oils and fuels will decrease, leading to a reduction in pollution emissions and the achievement of new climate targets.

Bulgaria is in need of urgent renewal of its automobile park, which is currently in an unsatisfactory condition. The old park leads to considerable pollution of the environment, resulting in risks for human health. The development of sustainable urban mobility (beginning with the larger cities) will improve the air quality.

Bulgaria could become a positive example for successful implementation and development of electric mobility using its existing traditions and advantages along with favourable new opportunities. A draft national action plan promoting the production and accelerated introduction of ecological transport vehicles (including electromobility) in Bulgaria for 2012-2014 has emerged as a result of dialogue and partnership with stakeholders, including ministries, municipalities, non-governmental organizations and business.

To stimulate production, we envisage financial support for:

- Development of start-up enterprises
- Introduction of innovative products, processes and services
- Technological modernization and development of technological centres and clusters
- Promotion of investment in high-tech production through introduction of incentives for 'class-investments' as well as additional incentives for priority projects.

Image: Diana Gyncheva

Vice President of the EC, Antonio Tajani and Bulgaria's Minister of Economy, Energy and Tourism, Traycho Traykov, participate in a test drive at the Conference on Electric Vehicles

Another focus of our efforts is to guarantee the sustainability and predictability of policy in support of innovations. At present, we are trying to establish a mechanism for setting up and implementing the state policy in this sphere, with the main accent on defining the responsibilities and obligations of the participants in the innovation system. As a result, we expect to see promotion of private investment in innovation as well as improvement of the connection between science/education and enterprises/entrepreneurs. Innovation in new products and services relevant to electromobility will be one of the priorities in the forthcoming policy in this sphere.

At the same time, the higher price point of electric vehicles at this stage leads us to conclude that the successful introduction and development of the sector will not be possible without achieving a good balance between measures for promoting the production of such vehicles and those promoting demand for them. As a result of detailed analysis and dialogue with interested parties, measures have been formulated to promote both demand for and consumption of ecological vehicles. Among the variety of measures to be accomplished this year, including stimuli for the encouragement of consumption, the most important are:

- Changes to the taxation system of vehicles through introduction of an 'eco' component in the tax basis to determine the size of the annual duty on vehicles. The amount of annual tax will increase proportionally according to the volume of emissions in respect of damage caused to the environment
- Introduction of a preferential channel for initial registration of 'eco' vehicles
- Introduction of differential fees for use of the road infrastructure
- Measures to ensure a single time subsidy or bonus for physical and legal persons when buying new electrical and hybrid vehicles
- Free parking for electric motor cars in the central zones of towns and villages.

In addition to these measures, others have also been envisaged to accelerate the charging infrastructure, promote research and development activity in technologies for sustainable mobility, enhance the knowledge and capacity of interested parties and the general population, and encourage entrepreneurship and professional training and education.

Changes have been introduced in the field of public expenditure on new vehicles to create favourable conditions for selling clean and energy-efficient vehicles. When buying vehicles for public administration purposes, purchasers are now required to consider their energy efficiency and their impact on the environment throughout the whole exploitation period of the vehicles in respect of carbon dioxide emissions and other air pollutants. As a result, we expect that public procurement for buying new vehicles and other products will contribute to promoting

Image: Diana Gyncheva

(I to r) Bulgarian Premier Boyko Borissov; Vice President of the EC, Antonio Tajani; Bulgarian Minister of Economy, Energy and Tourism, Traycho Traykov and Mayor of Sofia, Yordanka Fandukova

a more ecological and competitive economy, based on effective use of resources. In this respect, a National Action Plan for Green Public Procurement has been adopted. By 2014, public procurement for buying electric motor cars and charging infrastructure in the central administration, public organizations and local administration must reach 6 per cent of total procurement for buying new vehicles. After 2014 the scope of the plan will be extended with new products and services and the goals will be considerably more ambitious.

Stimulation measures have also been introduced to establish 'green employment' by encouraging employers in 39 fields of economic activity to support sustainable economic development and environmental protection.

Taking into consideration the existing goals in sustainable development, our ambition is for Bulgaria to be among the Member States of EU that have introduced stimuli to promote the sustainable mobility and also among those countries where taxes and duties on vehicles are entirely or partly based on emissions and/or fuel consumption. The initiatives and decisions of local authorities will be of decisive importance for the successful development of sustainable urban mobility. That is why we will continue to maintain and develop our dialogue and partnership with all stakeholders.

We expect Rio+20 to mark the beginning of a profound, accelerated transition to a global green economy that will generate the desired economic growth, establish employment, contribute to abolishing poverty, invest in the preservation of natural capital for the long-term survival of the planet and guarantee the future on which the next generations depend. Of course, the achievement of these goals would not be possible without the reform of the international management of sustainable development.

We cannot resolve all these issues without will and effort. To be responsible for the sustainable future of the planet and its people, it is necessary to overcome the existing contradictions and to find acceptable answers for the unresolved issues. Bulgaria, as a Member State of the EU, is ready to participate actively in and to contribute to the successful development of this process.

Innovating to develop sustainable environments on an urban scale

Steve Lewis, Chief Executive Officer, Living PlanIT

Every civilization has contended with powerful trends that have shaped how and where human settlements are built. Each has built its cities and expansions of those cities, with the best technology, materials and skills available at the time.

Today however, rapid population growth, increasing urbanization, environmental pollution and resource depletion are some of the megatrends that will challenge urban dwellers for many years to come. But when cities for the future are built today most, if not all, these problems can be alleviated by the best technology available now. This includes technologies for designing and operating the urban environment to produce smart sustainable eco-cities run on clean energy, or 'living cities'.

Living Cities incorporates key concepts we believe are integral to successfully envisioning, retrofitting, building and managing cities in the 21st century including: recognition of the need for continual evolution, the importance of clear metrics and analytics, the increased connection between urban dwellers and the buildings in which they live and work, a sense of possibility and openness, increased efficiency, generative structures that learn, agile infrastructures that serve multiple functions and respond to environmental and other changes, and resilient systems able to recover without breaking down and resist obsolescence. We see Living Cities as generative, inclusive, agile, dynamically evolving and resilient.

While both governments and industry acknowledge that sustainable development is driving innovation, they are uncertain of how this can be properly structured, financed and profitably managed, beyond existing products or services. Using the full range of new software, networking and sensors needed to run a smart city is enormously complex and beyond the scope of even sophisticated and well-established industries, partly because many and diverse technologies and practices are involved. But it is also because a smart community can only become cost-effective through efficiencies created in its planning, design, financing, commissioning, construction and operation. And it can only be sustainable if built to be economically, socially and

Image: Quintain Estates and Development 2012

The O2 Centre and the Greenwich Peninsula. Canary Wharf is directly north, opposite the peninsula

Living PlanIT's Urban Operating System

Source: Living PlanIT 2012

technologically sound. This requires insightful knowledge by the industries involved and the capacity to absorb the range of business segments to produce a coherent whole.

Living PlanIT offers the technology, strategy, tools and services for smart sensor-networked cities. It enables major companies to work together on urban development, improving efficiency and greater sustainability in the build environment. This reduces the lead time, cost and risk associated with the innovative introduction of a new business model for a diverse customer base.

Strategic partnerships in technology

Living PlanIT is a privately held technology company founded to develop software for enabling intelligent environments and making them commercially viable, by providing innovation for the changes global megatrends will continue to cause in the future. Alongside a growing community of partner companies, Living PlanIT is focused on optimizing urban development efficiency. It owns key technologies essential to running a smart city and also integrates and monetizes a range of ancillary technologies for its partners.

Through its partnerships with Microsoft Corporation and Cisco Systems, Living PlanIT licenses its software — the Urban Operating System (UOS) — and other intellectual property, for the urban environment. Buro Happold provides urban planning and engineering expertise with its McLaren Electronic Systems sensor analytics technologies, monitoring and managing built environment operations. Living PlanIT provides the platform that makes cities smart, efficient and sustainable, by embedding sensors directly into building fabrics for extracting data, and through analytics that improve both management and performance of the built environment.

The company is working with these partners to introduce cloud computing and machine-to-machine communication for smart cities to collect, manage and distribute data on all aspects of city activities. Collection of empirical real-time data will change fundamentally how cities are managed, by providing for city functions to be changed in response to conditions and events as they occur. The UOS centrally collects, aggregates, orchestrates and analyses the data in a sensor-rich environment. This allows access to applications, management tools, services and a wide range of intelligent devices, from those embedded in the fabric of buildings to those that manage services such as energy, water, waste, education and transportation, as well as medical and interactive surfaces.

Urban regeneration in London

The opportunity in London grew from the relationship between Living PlanIT, Quintain and the Living PlanIT-led Technology Strategy Board, funded by the Rapid Application Platform for Transport and Retail project based at Greenwich Peninsula.

Image: Quintain Estates and Development 2012

6 Mitre Passage is a green office building at the heart of central London's newest business district

Led by Living PlanIT with Cisco Systems and Infusion as partners, this initiative encourages independent developers to write applications for retail and transportation uses. General Electric, Hitachi Consulting Company and Philips have all recently formed partnerships with Living PlanIT, with some considering locating research and development resources at the Peninsula so that they can integrate their technologies with the UOS and establish their interests there. The companies will eventually work together to put in place technology strategies that will optimize and integrate building control systems and promote utility efficiency. The collaboration will lead to a wide range of new choices for residents, workers and students at the the Peninsula, by enabling the development and distribution of applications on the UOS platform — essentially a Windows for the built environment.

To research and perfect new urban technologies at full scale, Living PlanIT hopes to deploy its technologies with selected strategic partners. Living PlanIT, the Lend Lease Corporation and Quintain Estates Development are discussing the introduction of innovation in real estate operation and efficiency at the Peninsula, using Living PlanIT's UOS as the centrepiece for management of the growing digital community in London. The move is attracting major technology companies to the Peninsula development, which is a £5 billion programme that will create a new district of 10,000 homes along with 22,500 new jobs over the next decade.

Achieving sustainable development goals

The wider adoption of smart city concepts would impact on urgent problems such as population growth, increasing urbanization, climate change and resource depletion. These well-designed and well-managed smart eco-cities can be net energy producers — carbon neutral and powered by waste recycling and clean energy sources. Smart cities can be cost-effective investments due to efficiencies created in their planning, design, financing, commissioning, construction and operations.

Smart technologies provide significant economic development, growth and job creation opportunities by opening up new production sectors. Public sector investments for urban development can be significantly reduced when financing smart sustainable cities in partnership with the private sector, because they are able to become self-financing. New urban growth can be absorbed in cost-effective ways to limit new slum and informal settlements formation, particularly in least developed countries. It is crucial that governments provide the appropriate policies along with the fiscal and regulatory environments to support private sector collaboration.

Sustainable development policy

Despite these advantages, the widespread adoption of smart cities requires the long-term commitment of public institutions and private sector partners for sustainable development to fully benefit from the latest and best technology. Municipal governments need to embrace smart city concepts in their planning, zoning and regulatory requirements. Policies to stimulate private sector innovation and promote the wider application of smart city concepts need to be developed, documented and disseminated.

Companies involved in smart city investment need to engage with urban planners, architects, municipalities and national governments on classifications and technology choices. There is also a need to design smart city technologies for developing countries and capacity-building to managing these, so that existing urban software systems for municipal services, such as traffic control, public lighting, waste treatment and energy networks can be rationalized for efficiency gains.

The cost-effectiveness of investments in smart cities and their capacity for innovative financing must be carefully analysed to determine the positive impact of efficiencies created from urban planning, architectural design, financing, commissioning, construction and operations.

A proof-of-concept smart city development is needed to serve as a test bed for smart technologies; a centre for publicizing innovation and an incubator for technology start-ups, demonstrating how public-private engagement across multiple industries and levels of government can work. This model city would be designed to show that collaborative communities can research, develop and demonstrate integrated urban technical, economic and social infrastructure. It would seek to integrate companies, education and government into the urban environment.

In order to promote greater international cooperation in this field, the terms, definitions and units of measurement of smart eco-cities will require greater attention so that they may contribute to establishing international norms, standards and trade. The term 'living cities', as described here, deserves careful consideration.

New voluntary bottom-up urban planning and forest conservation methods in Finland

Ville Niinistö, Minister of the Environment, Finland

As the pressure on the natural environment has intensified globally, it has become essential to find new ways to secure the well-being of nature and its vital life-supporting functions. New, voluntary and locally driven bottom-up methods have been tested in Finland during the past decade and are now being widely applied. Most importantly, these include the national urban parks — a concept that provides blue and green areas in cities — as well as the Forest Biodiversity Action Programme for Southern Finland 2008-2016 (METSO) programme, which provides incentives to private forest owners in the region to participate in conservation efforts. These two models are described in detail below to provide inspiration for the conservation of nature in a world where urbanization, population growth and the rising demand for raw materials will undoubtedly overshadow all progress achieved so far unless further action is taken.

Blue-green spaces in the middle of the city

With continuing urbanization, it is important to protect both biodiversity and cultural heritage as well as to ensure blue and green spaces for city dwellers. In Finland, this has been achieved by creating national urban parks.

Green urban areas provide many benefits for city dwellers, including the possibility of outdoor activities and spending time in nature without having to leave the city. In addition, green areas provide many beneficial ecosystem services, such as noise reduction and purification of the air. People living close to such areas have also reported being less prone to allergies than those without access to green areas.

There is a global trend to build more compact towns and cities, leaving less room for green urban areas. In

Image: Lentokuva Vallas Oy

Hämeenlinna National Urban Park combines historical city blocks with lakes and forests

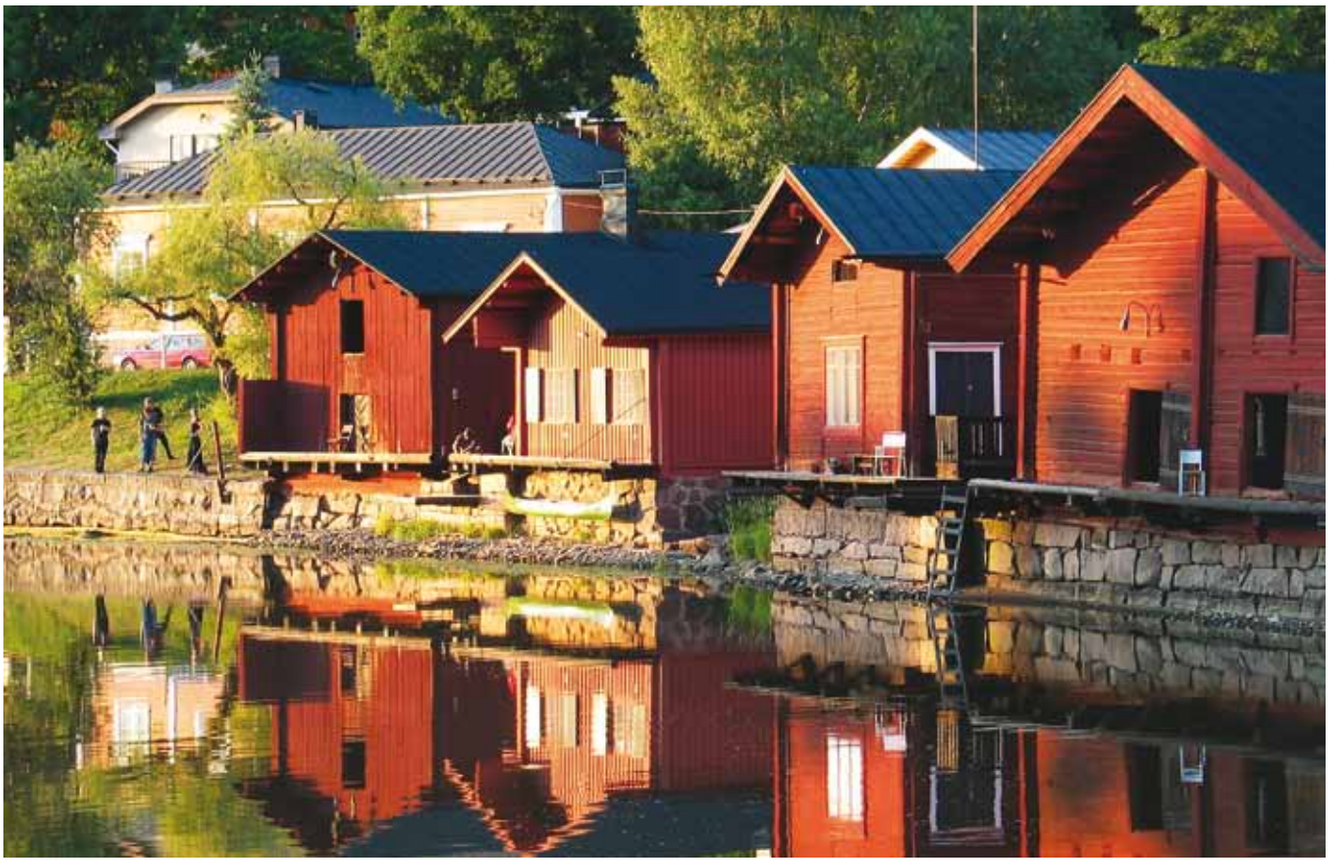


Image: Ministry of the Environment, Finland

Porvoo National Urban Park is a mix of urban natural and cultural heritage with early settlement dispalys from the Middle Ages

Finland, infill housing within sparsely built parts of many urban areas has grown dramatically since the 1990s. This process of creating more compact settlements has raised a common concern in Finland about the need to preserve biodiversity and cultural heritage, both within and in proximity to urban settlements.

The Finnish national urban park concept, which is part of the Land Use and Building Act, has proved to be a successful tool for solving this problem. A national park may be established to protect and maintain the beauty of the cultural and natural landscape, biodiversity, historical characteristics or other special townscapes, as well as the social or recreational values of an area within an urban environment. So in a sense, the national urban park is a certificate that ensures a beautiful and experiential environment with buildings, parklands and other natural areas. The national urban park concept is unique, since it does not differentiate between the natural and cultural heritage, but considers them as a whole. National urban parks are also tailored to the specific characteristics of each city, hence, there are no one-size-fits-all solutions

Special criteria for identifying potential national urban parks have been prepared which state that these should be:

- Natural areas that are important for the preservation of urban biodiversity
- Cultural milieus, for example, including buildings important for understanding the nation's or city's history, as well as parks and green areas of architectural or aesthetic significance
- Extensive and continuous
- Able to facilitate an ecological corridor that will contribute to species movement and interaction, while creating direct links with natural areas both outside the city and in the surrounding countryside
- Part of the urban structure
- Started in the core of the city or its immediate vicinity.

The urban park concept not only works as a strategic instrument, but also opens up discussion and a learning forum between municipalities, environmentalists and citizens, to analyse and determine whether sufficiently large areas remain within the city structure with high mixed cultural and natural values worth preserving and managing as national urban parks. Applications for developing these spaces are submitted to the Ministry of the Environment by local authorities after discussions between the municipality, citizens, environmentalists and other stakeholders.

The goal is to create a network of national urban parks, with each having a special role in it. At present, the Finnish network of national urban parks consists of parklands in five cities: Hämeenlinna, Heinola, Pori, Hanko and Porvoo. With regard to their cultural heritage and urban biodiversity, these cities are very different from one another. Turku, the former capital of Finland, submitted its application last year and its new national urban park, which includes the northernmost oak forests in the world, will be added in this year of the United Nations Conference on Sustainable Development (Rio+20).

Image: City of Hämeelinna

The METSO programme is a public-private partnership that aims to secure forests and their ecosystem services in Southern Finland

Encouraging voluntary forest conservation

Forestry is very important to the Finnish economy and few forested areas are outside commercial use, particularly in southern Finland, where the majority are privately owned. The METSO programme was launched in 2005 to give incentive to private forest owners to take part in conservation efforts.

Worldwide, forestry is responsible for 17 per cent of all greenhouse gases, mainly as a result of deforestation. Forests also account for roughly half the world's biodiversity. Therefore, conservation and sustainable management of forests are critical to address climate change and safeguard the Earth's biological diversity.

By 2020, METSO aims to halt the decline in forest species and biotopes in order to create favourable trends in forest biodiversity. To this end, it is offering a payment scheme for ecosystem services. Compared to previous top-down efforts, METSO stands out, since conservation measures under the programme are based entirely on forest owners' voluntary tendering. Private owners may be compensated for conserving valuable forests permanently or temporarily, for a period of 10-20 years. Additionally, natural resource management and ecological restoration of habitats is supported. The State compensates forest owners depending on the measures used, for loss of income and the market price of the land. If a forest owner signs a permanent conservation agreement, compensation is tax free.

The Finnish Government funds the METSO programme to €40 million each year, which allows it to deliver annual yields of about 5,000 hectares of permanently protected areas, with temporary agreements signed to protect 6,000 hectares a year. Biodiversity values of key biotopes in commercially managed forests are enhanced by ecological restoration of about 1,500 hectares each year. Authorities carry out site selection based on ecological criteria, but another important consideration is the proximity of potential sites to the current network of protected areas. Impacts on sustainable economic activities, recreation, tourism and cultural values may also be considered.

The voluntary approach of METSO is highly valued by forest owners, who appreciate the bottom-up approach and the chance to retain their property rights. METSO has succeeded because, in addition to forest owners and authorities, a comprehensive group of forestry stakeholders accepts and supports its implementation in practice. This collaborative effort between different stakeholders — including nature conservation organizations, companies and the Forest Owners' Union — provides political credibility and social sustainability for the programme.

Global summits as impetus for national changes

Bosiljka Vukovic, Head, Division for the Support to the National Council for Sustainable Development, Ministry of Sustainable Development and Tourism, Government of Montenegro

After the United Nations Conference on Environment and Development (UNCED) in Rio in 1992, each country was given the task of implementing and adapting to national circumstances the universally agreed Bruntland definition of sustainable development. Meeting the needs of present generations, without jeopardizing the ability of those coming after us to meet theirs, was an enormous task for individual countries, at all levels of policymaking. For countries undergoing multiple and simultaneous transitions, national, political, economic, social and cultural — as in Montenegro — this was particularly challenging.

With the adoption of the Declaration of Montenegro as an Ecological State by its Parliament in 1991, the country committed to making the environment a foundation of national development. During the disintegration within former Yugoslavia, the Declaration postulated that 'no difference among us is as great as the changes our natural environment is exposed to [and that] regardless of our national, religious, political and other convictions and feelings, we know and accept that both the dignity and sacredness of human beings are organically connected to the sacredness and the purity of nature.'[1] These bold statements were followed by unique constitutional amendments in 1992, which defined Montenegro as an Ecological State and paved the way for long-term sustainable development in the country. Unfortunately, the geopolitical environment of the Balkans during the 1990s hindered implementation of this commitment and Montenegro waited a decade until the next global summit on sustainable development, before returning to these ideals.

A process for all

In preparing for the World Summit on Sustainable Development, held in Johannesburg in 2002, the overwhelming sentiment in Montenegrin society was that for sustainable development to be successfully implemented on the ground this concept should be treated as a wider societal priority, not just within the scope of one ministry or solely a government policy. Rather, it was strongly believed it should involve shared responsibility and joint effort. As a result, in the last ten years — particularly since its independence in May 2006 — the commitment to sustainable development by Montenegro has been incorporated nationally through an elaborate and inclusive institutional framework.

Institutional framework

By forming the National Council for Sustainable Development (NCSD) in 2002, Montenegro became the first country in the region to institutionalize the involvement of different stakeholders in both the decision-making process and consultation on issues of sustainable development. Since its inception, the NCSD has gone through several reforms, which have strengthened its mandate. Today it has 23 members representing all structures equally within society — key ministries, local self-governments, business, academia, civil society and independent experts. The NCSD is chaired by the Prime Minister, reflecting the highest political commitment to this path.

- Following the national model, the municipality of Danilovgrad established the first local institutional framework for sustainable development, forming a multi-stakeholder council for sustainable development and adopting a local sustainable development strategy
- In light of preparations for the United Nations Conference on Sustainable Development (Rio+20), the NCSD reassessed its work and mandate, concluding that for sustainable development to become the mindset of every citizen, a stronger focus was needed to implement the principle of subsidiarity. To bring the concept closer to the public as well as stimulating regional and local self-governments to more actively engage in sustainable development processes, the NCSD decided to hold its regular sessions in different cities throughout the country.

With assistance from the United Nations Development Programme in 2006, the Government established the Office for Sustainable Development (OSD) — an independent institution within its General Secretariat — which was tasked with monitoring the implementation of the National Strategy of Sustainable Development (NSSD) and ensuring coordination of line ministries in sustainable development. The OSD, now integrated into the larger Ministry for Sustainable Development and Tourism, serves as secretariat to the NCSD and represents an institutional link between Government decision-making and various stakeholder positions. The OSD ensures the NCSD deliberates on all the Government's strategic and long-term development policies and strategies, and that it provides feedback on integration across the three pillars of sustainable development.

Horizontal coordination

In addition to the continued emphasis on involving stakeholders in all decision-making, national annual sustainability reports showed that without a strong horizontal coordination mechanism in public administration sectors, the policies, even when integratively

Image: NGO ADP ZID

Students and youth volunteers responding to the call from the Local Council for Sustainable Development in the Municipality of Danilovgrad to join in greening the city

designed, are unlikely to be implemented effectively and efficiently. So in 2011, the Government of Montenegro established two permanent multi-sectoral bodies for sustainable development, comprising representatives from each ministry. The former Office for Sustainable Development acts as secretariat to these bodies, a necessary precondition for their effective work.

Integrated policies as preconditions

Strengthening the institutional system has been followed by increased integration of sectoral issues when both designing policies and dealing with some of the key development-related challenges. The first strategic document amalgamating all three pillars of sustainable development and giving a long-term development vision of Montenegro was the NSSD.

- The NSSD was prepared through a process of wide consultations and the assistance of international partners (UNEP/MAP, UNDP, Italy). Adopted during 2007 in an integrative and balanced manner, with a five-year action plan, it contains measures for concretization of the five NSSD-defined visions of sustainable development of Montenegro, including ethical and cultural goals, alongside economic, social and ecological development. The NSSD will be revised after Rio+20
- The all-encompassing participatory spirit in which the NSSD was created has been replicated during preparation of the Communication Strategy for Sustainable Development and adopted by the Government in 2010, to support implementation of the NSSD while promoting the sustainable development concept and enabling the public to understand it. The goal of this document was to ensure a strategic and coherent approach from the various ministries communicating with the public on issues of sustainable development and to strengthen the inter-sectoral cooperation within Government. As a result of their cross-sectoral nature, both strategies required new and permanent institutional mechanisms for their implementation.

Innovative policy design is the way forward

One of the most recent innovative policies embedded within the integrative approach to policy design is the Law on the Legalization of Informal Objects. The problem of illegal and informal construction impacts many reinforcing aspects of development in Montenegro, including economic capabilities and possibilities, disaster risk over extended infrastructure and stress on ecosystem services. In the most underdeveloped region of Montenegro, the north, the likelihood of living in an informal settlement increases proportionately with the poverty rate, result-

Image: NGO ADP ZID

Secretariat of the National Council for Sustainable Development opening the first Solar Station for Electrical Bikes in Montenegro (wooden construction with solar panels behind). Member of the Council joining all generations of citizens participating in the cycling ride organized to promote alternative transport and the use of renewable energy sources

ing in multiple vulnerabilities of the poor. As building work was not controlled by adequate planning procedures, it often took place in areas prone to flooding. The new Law:

- Brings multiple benefits in terms of more transparent and efficient legalization procedures, instalment-based collection of unpaid communal charges and — in accordance with the Vienna Declaration — provision of alternative accommodation for owners of informal settlements where these are their primary housing and will have to be removed during the regularization process
- Means a wide societal consensus across all Montenegrin citizens is necessary to ensure maximum efficiency in engaging all available capacity with the main goals being to improve the quality of environment, land and life conditions, infrastructure in areas of existing informal settlements and, in an equitable manner, to contribute to sustainability, static and security factors in the housing sector.

Tackling the energy consumption of informal settlements is challenging to implement. Assuming tens of thousands of existing informal objects have a similar average energy consumption profile to regular houses, it is estimated that the informal housing sector accounts for over a quarter of Montenegro's residential energy consumption and seven per cent of the country's energy-based greenhouse gas emissions. Informal housing is further characterized by relatively high energy poverty and although systematic data is scarce, some observations suggest that up to 40 per cent of people living in informal housing do not have access to sufficient energy services to ensure a healthy lifestyle for themselves and their families. To resolve these issues, the planned strategy includes innovative cutting-edge solutions and formalization to integrate climate change mitigation and disaster risk reduction, with an objective of scaling up to a full national territory. The main solution relies on designing a programme that uses energy efficiency and disaster risk reduction as incentives for both households and government to address the impacts of illegal construction. This will result in sustainable revenues for local and national government, better living standards and purchasing power for households, along with pollution and disaster risk reductions. Pilot projects are expected to be implemented by 2015.

Rio+20 opportunity for action

Since 2002, Montenegro has been continuously working on strengthening the internal mechanism for ensuring measures and principles in its sustainable development strategy are fully respected and that economic progress and growth are followed by equally high social and environmental standards. An important part of those efforts focuses on creating an adequate institutional framework that encourages multi-stakeholder dialogue, intrasectoral cooperation and integrative planning. In this context, Montenegro sees the Rio+20 Summit as an important opportunity to further reform its national structure and adapt to the new and emerging challenges the world is facing. In defining national solutions, Montenegro remains committed to regional and international cooperation as core values and operational principles needed to move to the future we want.

Mitigating vulnerability for sustainable development

Hassan Ahmad, Kyaw Swa Soe, Nursyahida Othman, Mercy Relief, Singapore

Developing nations, which are constantly besieged by natural or man-made crises, commonly struggle to develop beyond their prevailing economic and living standards. The world's largest continent with three-fifths of the world's population, Asia is rich in natural resources including petroleum, forests, fish, water, rice, copper and silver. It accounts for about half of global trade and is expected to develop into a global economic powerhouse. While Asia has seen a significant decline in man-made menaces over the past decade, it faces the increasing occurrence of natural disasters such as floods, droughts, earthquakes, cyclones, storm surges and tsunamis. On average, 100,000 lives are lost each year, with more than 200 million others affected by these hydro-meteorological and geological hazards.

Hazards become disasters in the absence of development and adequate investment in risk reduction. More natural disasters and extreme weather events are anticipated due to climate change and communities must develop effective preventive and response mechanisms, incorporating adaptation to reduce the impacts. Reducing vulnerability means improving infrastructure, education, food source, security and other factors that contribute to peace and stability for growth. More investment is needed to reduce the gap between rapid economic growth and disaster risk reduction, in order to protect social and economic assets.

The impacts of natural disasters fall disproportionately on developing communities in the region, causing loss of lives and damage to the economy and environment. This affects peace and stability and leads to severe setbacks for social development. Impoverished areas are the most susceptible to catastrophic damage from natural disasters, due to a reduced capacity to prevent damage before and during a disaster and to recover afterwards. Asia remains the most vulnerable continent, with US$243 billion of economic losses due to natural disasters in 2011 alone. Such massive losses hinder much-needed development in the region, which has the world's largest percentage of people living in poverty.

Image: Mercy Relief

Mercy Relief's response team distributing aid to the victims of the massive Thailand floods in 2011. The country's lack of risk prevention and intervention have affected foreign investors' confidence

Case study 1: Storm Washi — Mindanao, the Philippines

In December 2011, severe tropical storm Washi struck Mindanao, bringing over 142 millimetres of rainfall within 12 hours and triggering deadly flash floods from three major rivers.

A total of 624,600 people were affected as 1,470 people died, 1,074 were unaccounted for, nearly 2,020 were injured and 430,500 were displaced. An estimated US$39 million was required for immediate relief activities.

Within 48 hours of the international appeal by the Philippines Government, Mercy Relief (MR) was in Mindanao to help address the critical and essential needs of the affected communities. MR's five-week relief engagement included a food programme, provision of clean drinking water and tarpaulin sets to help displaced families overcome overcrowding issues at evacuation centres and avoid the risk of disease. A psycho-socio programme provided books and games to enable children to learn and play while taking their minds off the trauma.

The devastation caused by Washi had varying impacts on neighbouring municipalities. Communities in Cagayan de Oro and Iligan were badly affected, while those in Gingoog experienced minimal damage.

Gingoog's resilience was due to a community-based disaster preparedness and risk reduction programme that had been implemented by MR in collaboration with the Citizens' Disaster Response Center, a local non-governmental organization, following typhoon Ketsana in 2009. The programme included the formation of community-based disaster preparedness committees (DPCs), educational workshops on disaster preparedness, community-wide drills and natural resource management at 24 landslide and flood-prone communities over seven municipalities and three cities, including Gingoog.

With the instilled culture of preparedness, the village DPC and residents of Gingoog continuously monitored the increasing intensity of Washi, measured rising water levels and rainfall, and rang church bells to warn villagers to evacuate to higher ground. A two-metre high breakwater, built during the CBDPRR programme as part of its structural defence, prevented river waters from overflowing into the villages so that only 100 of the 600 households experienced a mere half-metre of flooding.

The resilience of these communities illustrates the effectiveness of investment in adaptive DPRR activities, which put them in a better psychological state to manage, overcome and recover from a disaster with minimal physical and psychological trauma.

With critical factors such as rapid urbanization, environmental degradation, population growth and climate change, more communities are occupying densely-populated high-risk areas, heightening their vulnerability to disaster impacts. While governments have placed emphasis on disaster risk reduction in disaster management planning, real investments into longer-term mitigation mechanisms and activities remain insufficient and disproportionate to the scale and intensity of imminent threats. The cost of inaction or lack of investment could be disastrous for human lives and economies, both for Asia and the rest of the world. Failure to establish and ensure peaceful and stable environments not only thwarts development potential, but could also destroy what has been built.

Maintaining peace and stability

Development can be defined as providing improved access to basic human essentials including potable water and proper sanitation, basic housing, healthcare, sufficient livelihood opportunities, and structured education with emphasis on knowledge acquisition and employability.

Achieving peace and stability — the key prerequisites of development — means overcoming or mitigating the vulnerabilities that affect them, and nations that have consciously addressed these issues have gone on to develop and prosper.

A significant example is the island state of Singapore. Despite its limited size and natural resources, including lack of self-sufficiency in food and potable water supply, Singapore has seen rapid development of its people and economy — ascending from a Third World state to a First World nation within three decades of its independence.

Apart from its remarkable natural harbour occupying a prized location at the junction of communications of the Indian and Pacific Oceans, Singapore's geographic location shelters it from most natural disasters. However, during its earlier years of nation-building, Singapore could not insulate itself from man-made menaces such as ethnic conflicts, high levels of unemployment, lack of sanitation and scarcity of potable water — all of which affect peace, stability and security, and in turn influence growth.

Major policies, strategies, mechanisms and activities were adopted and adapted to mitigate Singapore's vulnerabilities, promote peace and stability and establish foreign investors' confidence for international trade and economic development. The Government also exercises perpetual vigilance on and social discipline of its population, implementing extensive research and careful planning to preserve elements which determine its independence and development. This paired emphasis on vulnerability and excellence is the basis of the country's unique and sustained success.

Conversely, the massive floods in Thailand during 2011 affected its rice harvest by almost 6 million tons. As Thailand is the world's largest rice exporter, such losses not only impacted the country's ability to meet its export contracts, but also put further pressure on global commodity prices. The disaster also rippled through the supply chains of Japanese automobile and electronics makers in Thailand, as parts shortages affected operations across the globe. More than 200,000 workers from these industries in Thailand were affected. Thailand's

Case study 2: Japan earthquake and tsunami — Tohoku, Japan

Japan, the world's most prepared nation against natural disasters, faced a complex humanitarian crisis in March 2011. A 9.0 magnitude earthquake, the most powerful to hit the country, caused widespread destruction and triggered a tsunami of 9.3 metres, which damaged about 400 kilometres of coastline including the Fukushima nuclear power plants, exposing the world to a radiation threat.

A total of 15,845 people died, with 3,375 others missing and hundreds of thousands displaced. Tsunami waves with a run-up height of up to 40.5 metres swept through the regions of north-eastern Japan, inundating 561 square kilometres of land and requiring an estimated US$300 billion for reconstruction.

MR deployed its first response team within 24 hours of the international appeal by the Japanese Government. Six other relief teams served in the Miyagi and Iwate prefectures in the Tohoku region over four months, addressing survival and wellness needs including food, water, fresh vegetables, establishment of cold storage facilities and a children's nutrition programme. Hundreds of radiation protective suits were provided to help local workers in their search-and-rescue efforts in and around Fukushima.

Risk mitigation initiatives were well planned and implemented by the Japanese authorities, including tsunami warning systems and solid breakwaters along most of the Japanese coastline. Unfortunately, these mechanisms were breached due to the speed and strength of the waves, but the impact could have been much more extensive had there been no structural protective measures in place. Over in Kamaishi, the locals ignored the tsunami warning and chose not to flee, believing they were protected by a world-record breakwater. The US$1.6 billion breakwater — which took three decades of research and construction and was 2 kilometres long, 63 metres deep and 7 metres above water — gave way.

The major and costly failure of the Kamaishi breakwater and the indifference of the Kamaishi community to the tsunami warning, highlight the need for an immediate, unbiased and exhaustive assessment of Japan's comprehensive structural and non-structural DPRR initiatives, including the inadequacies of earlier research and the design, planning and implementation of the risk mitigation measures. Lessons learned from this and associated counter-measures will greatly benefit Japan and other countries with similar geographical conditions and challenges but fewer resources.

lack of risk prevention and intervention caused several major Japanese companies, Thailand's largest foreign investors, to consider diversifying investments inside Thailand and to other countries. Foreign investors' confidence waned, which will affect local economy and livelihood opportunities.

Risk reduction and adaptation

Natural disasters are no longer seen as extreme events created solely by forces of nature, but as manifestations of unresolved development problems. In any vulnerability analysis there are no straightforward solutions. Multidimensional approaches and innovative institutional arrangements are required to reduce the risks of future harm or loss and threats to planned development. Hazard assessment must include economic, physical, social and political risks.

Despite rapid economic growth and structural transformation in Asia, poverty remains high and the poor are the most vulnerable to natural disasters. In order to ensure cost-effective, well-paced continuous development, developing nations must create a peaceful, safe and secure environment conducive to uninterrupted growth. This is especially so for disaster-prone nations, as the threat and extent of disasters are difficult to anticipate. The process of managing disaster risk effectively begins with risk identification and hazard mapping, which comprise an understanding of the vulnerabilities to determine potential impacts and devastation. Vulnerabilities that threaten growth and development must be adapted and mitigated, if not eliminated.

There is widespread emphasis on post-disaster relief and support for economic recovery such as livelihood regeneration, as governments curb risk mitigation initiatives and divert funds towards reconstruction and recovery efforts, which require extensive resources and time. Given the increasing occurrences of natural disasters, it is imperative that national strategists and humanitarian implementers put in place critical processes and capacity-building strategies, driven by disaster preparedness and risk reduction (DPRR) and adaptation initiatives to prepare vulnerable communities for future calamities.

DPRR can be defined as the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

DPRR propagates a set of activities to minimize vulnerabilities and disaster risks in society, and to avoid and limit the adverse impact of hazards within the broad context of sustainable development. It is imperative that community-based DPRR (CBDPRR) interventions build resilience among vulnerable and disadvantaged communities in a sustainable manner that integrates participation across different demographics within targeted societies.

Case Study 3: Mount Merapi eruptions — Central Java, Indonesia

Mount Merapi, Indonesia's most active volcano, started erupting in October 2010 with continuous eruptions thereafter.

The eruptions took 386 lives and displaced more than 300,000 people as thick ashes, boulders and rivers of hot mud destroyed farmlands as far as 20 kilometres from the volcano, causing US$781 million in financial losses.

MR was on site within 48 hours of the first eruption, supporting the evacuation of tens of thousands of villagers, setting up a central kitchen to feed the survivors and providing respiratory care equipment at local medical centres. The ensuing rehabilitation and reconstruction efforts included a comprehensive disaster risk mitigation programme focusing on structural and non-structural components, and developmental projects including the rehabilitation of community water systems and provision of further respiratory care equipment for three health centres where medical personnel were trained on first response and respiratory care management. Merapi tends to erupt every four to five years, hence two large multipurpose halls were constructed at schools in the Dukun and Muntilan sub-districts, for conversion into relief evacuation centres in future emergencies. An early warning system was established and educational workshops and disaster preparedness drills were held to prepare communities for future eruptions.

MR partnered with the local government and community to introduce adaptive DPRR activities through a full-scale disaster preparedness exercise for the Magelang district, involving an emergency response specialist agency, Singapore Civil Defence Force.

Although there was an existing framework for disaster management within the villages near Mount Merapi, it was found to be insufficient during the response as allocated evacuation centres did not have adequate water and sanitation facilities, and the scale of eruption was more severe than anticipated.

MR's integrated DPRR programme included activities with longer-term development goals and the strengthening of core public institutions during peace time. It emphasized the need to customize DPRR based on geographical, cultural and awareness aspects with alternative contingencies and complex emergency crisis management planning, and the sharing of experience and expertise by specialized international organizations. DPRR adaptation in both structural and non-structural components is critical to effective emergency responses, including cultivating community resilience. Its effects await discovery at the next eruption of Merapi.

Development of a nation and DPRR initiatives must run simultaneously. But what mechanisms should be put in place? Which sectors require priority focus? And how much should be invested in these initiatives? All of these call for an integrated approach incorporating adaptation and effective advocacy plans with extensive research and careful planning for effective cooperation and communication within communities, to address prevailing and unique sets of challenges and constraints. This must be accompanied by master prevention plans and robust crisis management systems.

Focus on communities

Effective DPRR requires an integrated stakeholders' approach where strategies and policies are appropriately adapted at all levels. There must be greater and immediate focus — in terms of attention and resources — on communities where prevailing and unique challenges and the threat of disasters are imminent.

Adaptation of DPRR must be in consultation with local communities, enabling them to share their experiences, concerns and knowledge of the local terrains, culture and history with planners and policymakers. Local governments should invest more in vulnerability assessments based on geographical, cultural and awareness levels as part of capacity-building initiatives. For central governments, adaptive DPRR activities should be set as development criteria to allocate funds to local governments for area development. Development agencies should incorporate adaptive DPRR activities in their development and capacity-building programmes, and disaster relief agencies should include longer-term development and risk reduction goals in relief and reconstruction programmes.

There is also a need for critical supply chain management of acute disaster relief items, including optimized stockpiling of survival essentials. Coupling community-based DPRR and development projects will aid the sustainability of disaster-resilient communities as economic development is directly linked to structural resilience measures, and investment in non-structural DPRR measures would be beneficial. International donors should share their expertise and provide funding for appropriate DPRR adaptation activities through development projects, setting them as a priority.

Forward-looking measures

Budgeting for DPRR is generally less popular as the benefits are less visible and only seem useful to the local population upon realization of the anticipated risks. On the contrary, the willingness and ability to implement forward-looking measures by local governments and communities to prevent, and secure their area from, menaces to peace, stability and security may lead to increased confidence from domestic and foreign investors. This in turn would lead to resources being injected into local economies. Sustainable development hinges on proper planning and real resources.

As climate change creates more uncertainty in weather prediction, there needs to be a change of mindset from government agencies, decision makers and the public. Nature is a powerful force and there are limits to engineering solutions. Hence, community resilience is crucial. More focus and effort must be channelled to strengthen public awareness and a culture of preparedness. Communities must not only try to overcome the power of nature, but also learn to cope with it.

Notes and References

Ecuador: promoting the rights of nature

1 Fander Falconí, Presentation at the XVIII Meeting of the Forum of Environment Ministers and First Meeting of the Latin American and Caribbean Community of States, CELAC, Quito, 3 February, 2012.
2 Constitution of Ecuador, Art. 275, Quito, 2008.
3 Constitution of Ecuador, Art. 71, Quito, 2008.
4 Ministerio Coordinador de Patrimonio, Yasuní-ITT, *Una Iniciativa para Cambiar la Historia*, Quito, 2010.
5 Ministerio del Ambiente. *Mapa del Patrimonio de Áreas Naturales del Estado (PANE)*. Quito. 2011.
6 Ministerio del Ambiente. Manual Práctico. *Rendición de cuentas del plan de inversión de los socios comunitarios del Programa Socio Bosque*. Quito. 2011.
7 Banco Central del Ecuador. *Evolución de la economía ecuatoriana*. Quito. 2009.
8 Secretaría Nacional de Planificación, SENPLADES, Evaluación del Plan Nacional para el Buen Vivir. Quito. 2012.

Establishing Earth-based governance for the rights of the environment

1 Intergovernmental Panel on Climate Change. Climate Change 2007, Synthesis Report: An Assessment of the Intergovernmental Panel on Climate Change, p. 30. Geneva, Switzerland, 2007. Available from http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.
2 Ibid, p. 39.
3 International Energy Agency, World Energy Outlook 2011 Executive Summary, p. 2 (November 2011). Available from http://www.iea.org/Textbase/npsum/weo2011sum.pdf.
4 United States Defense Intelligence Agency. Global Water Security: Intelligence Community Assessment. 2 February 2012/ Available from http://www.dni.gov/nic/ICA_Global%20Water%20Security.pdf.
5 UNEP. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication (2011). Available from http://www.unep.org/greeneconomy/.
6 The European Commission has called for new levels of emissions cuts of 40 per cent by 2030 and 60 per cent by 2040 (as compared with 1990 levels). European Commission, A roadmap for moving to a competitive low carbon economy in 2050, p. 4. Brussels, 8 March, 2011. Available from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:EN:PDF.
7 Ewa Krukowska. EU Ministers to Discuss CO_2 Market Future after Price Slump. *Bloomberg Businessweek*. 3 April, 2012. Available from http://www.businessweek.com/news/2012-04-03/eu-ministers-to-discuss-co2-market-future-after-price-slump.
8 United Nations. Rio Declaration on Environment and Development (1991). Available from http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm.
9 Rights of Nature. Constitución de la República del Ecuador, Title II, Ch. 7 (Sept. 2008). Available from http://www.asambleanacional.gov.ec/documentos/constitucion_de_bolsillo.pdf.
See also the Preamble to the Constitution, celebrating and recognizing human dependence and interconnections with Nature, or Pachamama (Celebrando a la naturaleza, la Pacha Mama, de la que somos parte y que es vital para nuestra existencia).
10 Ibid, Art. 71 (with Google Translator). See also Art. 10, stating that Nature is a subject of rights in the Constitution.
11 Ibid, Art. 72 (with Google Translator).
12 Ibid, Art. 71 (with Google Translator).
13 Vilcabamba River v. Provincial Government of Loja, Provincial Justice Court of Loja, No. 11121-2011-10 (March 30, 2011), available from: http://earthlawcenter.org/static/uploads/documents/Vilcambamba_River_Decision_3_31_11.pdf. See also summary in English of decision at: http://therightsofnature.org/first-ron-case-ecuador/.
14 Gabriela León Cobo, Pachamama Foundation. News bulletin on the implementation of the first nature rights sentence (March 2012). Available from http://therightsofnature.org/rights-of-nature-laws/vilcabamba-river-1-year-after/.
15 Application Filed by the Inter-American Commission on Human Rights with the Inter-American Court of Human Rights against the Republic of Ecuador: Case 12,465, Kichwa People of Sarayaku and Its Members. Inter-American Court of Human Rights, Washington, D.C., April 2010. Available from http://www.cidh.org/demandas/12.465%20Sarayaku%20Ecuador%2026abr2010%20ENG.pdf.
16 World People's Conference on Climate Change and the Rights of Mother Earth. Universal Declaration of the Rights of Mother Earth. Adopted 22 April 2010. Available from http://pwccc.wordpress.com/programa/.
17 United Nations, Department of Public Information. Press Conference by Bolivia's President on People's Congress. New York, NY, May 7, 2010. Available from http://www.un.org/News/briefings/docs/2010/100507_Morales.doc.htm; see also http://www.un.org/webcast/2010a.html for press conference video dated May 7, 2010.
18 General Assembly of the United Nations. Interactive Dialogue on Harmony with Nature, April 2011. Available from www.un.org/en/ga/president/65/initiatives/HarmonywithNature.html.
19 United Nations General Assembly. Report of the Secretary-General. Harmony with Nature, A/66/302. 66th Session, August 15, 2011. Available from http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/453/14/PDF/N1145314.pdf?OpenElement. The Report also discusses in detail the history of scholarship and philosophy around the issue of the inherent rights of nature.
20 Pittsburgh Municipal Code, Title 6, Art. 1, Ch. 618, Marcellus Shale Natural Gas Drilling (Nov. 2010). Available from http://library.municode.com/index.aspx?clientId=13525.
21 See www.transitionnetwork.org/. See also www.earthlawcenter.org/earth-community/ for a map of organizations worldwide advancing actions that recognize the rights of the natural world and humans' interconnections with it. This map also includes laws, constitutions, court cases, and international agreements advancing legal rights for ecosystems and species.

Approaching harmony with nature

1 Madison, James (1818). Speech to the Agricultural Society of Albemarle VA, on 12 May.
2 For further information: Anna Lofdahl, Communications Office of the SEI In Stockholm, Sweden.
3 International Union for the Conservation of Nature and Natural Resources (IUCN) in cooperation with UNEP and the WWF and in collaboration with FAO and UNESCO, World Conservation Strategy: Living Resource Conservation for Sustainable Development, 1980.
4 General Assembly, Resolution 37/7, 28 October 1982, World Charter for Nature, adopted by a vote of 111-1-18.
5 Ibid, second and third paragraphs of the Introduction, Titles of Parts I,II and III and paragraph 1 of Part I.
6 These texts were the United Nations Millennium Declaration (resolution 55/2 of 8 September 2000) and the 2005 World Summit Outcome (resolution 60/1 of 16 September 2005). Neither the United Nations Conference on Environment and Development and its follow-up in Johannesburg, nor the major policy- setting texts adopted by the United Nations on the eve of the twenty-first century, give much attention to the philosophical and spiritual roots of relations between humanity and nature.
7 General Assembly Resolution 60/192 of 22 December 2005.
8 General Assembly Resolution 63/278 of 22 April 2009.
9 General Assembly Resolution 64/196 of 21 December 2009.
10 Ibid, preambular paragraphs and paragraph 1.
11 General Assembly Resolutions 65/164 of 20 December 2010 and 66/204 of 22 December 2011.
12 United Nations, Harmony with Nature, Report of the Secretary General, 19 August 2010, A/65/314, and United Nations, Harmony with Nature, Report of the Secretary General, 15 August 2011. For texts and videos of the Dialogues go to: Interactive Dialogue of the General Assembly on Harmony With Nature, 20 Apr 2011 to 20 Apr 2011, available from www.uncsd2012.org/rio20/index.php?page=view&nr=252&type=13&menu=23; Interactive Dialogue of the General Assembly on Harmony With Nature, Scientific findings on the impacts of human activities on the functioning of the Earth System, 18 Apr 2012, available from www.uncsd2012.org/rio20/index.php?page=view&nr=840&type=13&menu=23.
13 Havel, Vaclav (2002). The Challenge of the World. Is There a Purpose in Nature? How to Navigate Between the Scylla of Mechanism and the Charybdis of Teleology. Ed. Ivan Havel and Anton Markos, Prague: *Vesmir*, vol. 11.
14 Maeterlinck, Maurice. *The Blue Bird: A Fairy Play in Six Acts*. Middlesex TW118HH: The Echo Library, 2006. Original version published in translation in 1910; and *The Life of the Bee*. Mineola, NY: Dover Publications, 2006. First published in 1901. Maeterlinck was awarded the Nobel Prize for Literature in 1911.
15 Tolkien, J.R.R. (1966).On Fairy Stories. *The Tolkien Reader*, New York: Ballantine Books.

16 Stuart Mill, J. (1848). The Art of Living, from *Principles of Political Economy*. Book IV, Chapter VI, Section II, as it first appeared in 1848.
17 Feynman, Richard P. The Meaning of it all. Available from www.inf.fu-berlin.de/lehre/pmo/eng/Feynman-Uncertainty.pdf, p. 7.
18 Webster, Kirk. Nature Has All the Answers, So What's Your Question?* and A Page From a Treatment-Free Beekeeping Diary. Available from http://kirkwebster.com/index.php/nature-has-all-the-answers-so-whats-your-question-and-a-page-from-a-treatment-free-beekeepers-diary.
19 Groh, Trauger and McFadden, Steven (2000). Farms of Tomorrow Revisited: Community Supported Farms – Farm Supported Communities. Kimberton, PA: Biodynamic Farming and Gardening Association.
20 Reference to Secretary General Ban Ki-moon's statement at Davos can be found, inter alia, at the following web address: www.un.org/en/ga/president/65/initiatives/HarmonywithNature.html.

Sustainability programmes recognized byZayed International Prize for the Environment

1 Available from http://esango.un.org/civilsociety/showProfileDetail.do?method=showProfileDetails&profileCode=2478.
2 Video is available on request.
3 Available from http://islandpress.org/ip/books/book/islandpress/E/bo3560587.html.
4 Available from http://eng.me.go.kr/board.do?method=view&docSeq=9176&bbsCode=new_news&currentPage=3&searchType=&searchText=&categoryCode=08.
5 Available from http://zayedprize.org.ae/inner.aspx?PageId=271.

List of sources

- Ninth GCSS/GMEF 2006, Dubai. Available from http://www.unep.org/gc/gcss-ix.

The impact of climate change on sustainable development in Latin America and the Caribbean

1 IPCC (2007a).
2 Ackerman and Stanton (2011).
3 In addition, climate change can affect climate variability, which modifies weather patterns in a very short time period (4-10 years). This of course can also have unexpected impacts on ecosystems and humans.
4 Vergara (2009).
5 IPCC (2007).

Sustainability research using spatially explicit land-use change scenarios

1 Kato, E., T. Kinoshita, A. Ito, M. Kawamiya, and Y. Yamagata (2011). Evaluation of spatially explicit emission scenario of land-use change and biomass burning using a process-based biogeochemical model. *Journal of Land Use Science*, doi:10.1080/1747423X.2011.628705.
2 Kinoshita, T., E. Kato, K. Iwao and Y. Yamagata (2008). Investigating the rank-size relationship of urban areas using land cover maps. *Geophysical Research Letters*, vol. 35.
3 Masui, T., K. and others (2011). An emission pathway for stabilization at 6 Wm-2 radiative forcing. *Climatic Change*, vol. 109, pp. 59-76.
4 Yamagata, Y., H. Seya, and K. Nakamichi (2011). Scenario analysis of the future urban land use in the Tokyo Metropolitan Area. *Environmental Science*, vol. 24 (No. 3), pp. 169-179, in Japanese.

Save the Earth: sharing Japan's experience with the world

1 To be supplied – unattributed quote
2 The Takakura Method was developed by Dr. Koji of JPec Co., a division of the J-POWER Group.
3 The concept of 'Mottainai' implies respect for the essence of things. Its meaning is very similar to the promotion of the 3Rs (reduce, reuse, and recycle).
4 The Base of the Pyramid (BoP) business model aims at balancing improvement of living standards and corporate profits in developing countries. JICA has been supporting preliminary surveys by Japanese enterprises developing BoP businesses since 2010.

Success with sustainable development in the Dominican Republic

1 IUCN, Insular Caribbean WCPA Report to the World Parks Congress, Durban 2003

Sustainable development in Kuwait

1. KEPA (Kuwait Environment Public Authority) (1996). *Law of Establishing the Environment Public Authority No. 21 of 1995, amended by Law No. 16 of 1996, and General Policies and Objectives of the EPA, State of Kuwait*. KEPA, Kuwait.
2. KEPA (Kuwait Environment Public Authority) (2001a). *Decision No. 210 of the Year 2001 Regarding the Executive Bylaw of the Law Establishing the Environment Public Authority*. Kuwait Al-Youm, Appendix of vol. 533, The 47th year (in Arabic).
3. Al-Awadhi, S.A.A., and Bu Rahma, A.N. (2002). *The Most Important Achievements of the State of Kuwait in Accordance with Articles and Requirements of Agenda 21*. Environment Public Authority, Kuwait.

4 KEPA (Kuwait Environment Public Authority) (2002). *Environmental Strategy of the State of Kuwait*. KEPA, Kuwait (in Arabic).
5 Muqeem, S.H. (2009). *Assessment of Management Practices of Operating Municipal Solid Waste Landfill Sites in the State of Kuwait*. Unpublished MSc. Thesis. Arabian Gulf University, Bahrain.
6 Al-Mudhhi, S.M. (2011). 'Waste management in Kuwait: An overview with emphasis on the role of KEPA and other main stakeholders'. In *Proceedings of the International Conference on Kuwait Energy and Infrastructure Projects 2011*, MEED, Kuwait.
7 Al-Saad, A. (1993). *Oil lakes*. Lecture presented at Kuwait Engineering Society, Kuwait, 32p.
8 El-Baz, F. (1994). Gulf War disruption of the desert surface in Kuwai'. In El-Baz, F., and Makharita, R.M. (Eds.) *The Gulf War and the Environment*. pp. 131-161. Gordon and Breach Science Publishers, Lausanne.
9 Bu Farsan, A., and others (2002). Compositional changes induced by evaporation of Burgan crude oil spilled into the desert of southern Kuwait. Environment Geosciences, vol. 9, pp. 8-16.
10 Saeed, T., Al-Hashash, H. and Al-Matrouk, K. (1998). Assessment of the changes in the chemical composition of the crude oil spilled in the Kuwait desert after weathering for five years. *Environment International*, vol. 24, pp. 141-152.
11 Balbà, M.T., and others (1996). Remediation and rehabilitation of oil-lake beds in Kuwait: 1. Bioremediation of oil-contaminated soil. In Balbà, M.T. et al. (Eds.) *Restoration and Rehabilitation of the Desert Environment*, pp. 21-40. Elsevier Science B.V., Amsterdam.
12 Al-Sarawi, M., Massoud, M.S. and Al-Abdali, F. (1988). Preliminary assessment of oil contamination in soils contaminated with oil lakes in the Greater Burgan oil fields, Kuwait. Water, Air & Soil Pollution, vol. 106, pp. 493-504. Massoud, M.S., Al-Sarawi, M. and Wahba, S.A. (2000). Post-War changes in the chemical properties of soils contaminated with oil lakes in the Greater Burgan oil fields, Kuwait. *Water, Air and Soil Pollution*, vol. 118, pp. 281-297.
13 Zaman, S. (1998). Impact of the Gulf War on Kuwait's desert flora and soil. In Omar, S.A.S., Misak, R. and Al-Ajmi, D. (Eds.), *Sustainable Development in Arid Zones*, vol. 1, pp.69-82. A.A. Balkema, Rotterdam, Netherlands.
14 Batanouny, K.H. (1992). *The War and Devastation of Environment*. Al-Beeah, Kuwait (in Arabic), vol. 104, pp. 31-35. Husain, T., Sadiq and Khan, A. (2002). Framework for ecological risk assessment: deterministic and probabilistic analyses. In Khan, N.Y., Munawar, M. and Price, A.R.G (Eds.) *The Gulf Ecosystem: Health and Sustainability*, pp. 377-396. Backhays Publishers, Leiden, Netherlands.
15 Al-Awadhi, E., and others (2006). *Identification and Quantification of Different Hydrocarbon Groups in the Groundwater of Kuwait*. Report No. KISR 8072. Kuwait Institute for Scientific Research, Kuwait.
16 Balba' et al. (1996). op. cit. Al-Abdali (2010). Bioremediation Pilot Study: KOC experience (Abstract). In *Oil Lake / Soil Remediation Forum*. Kuwait National Force Point (KNFP), Kuwait. Balbà, M.T. (2010). Bioremediation of oil-contaminated desert soil: KISR's Experience (Abstract). In Oil Lake/Soil Remediation Forum. KNFP, Kuwait.
17 Tessitore, J. (2010). Remedial technology assessment overview from the oil lakes monitoring and assessment studies (Abstract). In *Oil Lake / Soil Remediation Forum*. KNFP, Kuwait.
18 Public Authority for Assessment of Compensation (2005). *History, Role and Structure of PAAC*. Available from http://www.paac.org.
19 Office of Consultation and Career Development (2010). *Programmatic Management Plan (including Adjunct Plans and Reports)*. College of Engineering, Kuwait University, Kuwait.
20 *ibid*.
21 Kuwait Environment Public Authority (2001b). *Fish Kill Incidents in Kuwait and Action Plan Set and Implemented*. Unpublished Technical Report. KEPA, Kuwait.
22 Utilities Developing Company (UDC) (2005). *Sulaibiya Waste water Treatment and Reclamation Plant*. UDC Publication, Kuwait.
23 Al-Qallaf, H., and others (2011). *The effect of using the RO-treated wastewater on the soil and groundwater at Al-Abdally farms*. Final Report No. KISR 10781. Kuwait Institute for Scientific Research. Kuwait.
24 *ibid*.
25 KEPA (2002). *op. cit*.
26 Marafi, S. (2011). Projects being undertaken by Ministry of Electricity and Water and Future Plans. In *Proceedings of the International Conference on Kuwait Energy and Infrastructure Projects 2011*. MEED, Kuwait.

27 Ibid.
28 Al-Hajraf, S. (2011). Solar energy and supply diversification for Kuwait's future energy mix. *In Proceedings of the International Conference on Kuwait Energy and Infrastructure Projects 2011*. MEED, Kuwait.
29 Al-Mudhhi, S.M. (2010). Role of Environment Public Authority in supporting Kuwaiti Engineering and Consultancy offices to establish the culture of the water and energy saving and environment friendly green buildings and setting a local code for investment in this field compatible to international criteria in design. In *Proceedings of the Fourth Arabic Consultancy Engineering Conference on the Role of Consultancy Engineering Offices in Development*, Kuwait (in Arabic).
30 Al-Mutawa, Kh. (2011). Green buildings in Kuwait. In *Proceedings of the International Conference on Civil and Chemical Engineering for Energy Consumption*, Jakarta, Indonesia.

Further reading

- Al-Tahw, G. (2006). *Application of Groundwater Vulnerability to Pollution from Activities in the State of Kuwait – Geographical Information Systems*. Unpublished MSc Thesis. Arabian Gulf University, Bahrain (in Arabic).
- Al-Yousifi, A.G. (1998). *The Evidence*. CRM Publishing, Canada.
- McKinnon, M. and Vine, P. (1992). *Tides of War: Eco-Disaster of the Gulf*. IMMEL Publishing, UK.
- *Major Environmental Treaties, Conventions, Protocols and Agreements signed and Ratified by the State of Kuwait*. Department of International Affairs, KEPA, Kuwait, 2009.
- *Utilities Developing Company (UDC) (2009). Sulaibiya Wastewater Treatment and Reclamation Plant*. Kuwait. Available from www.udcsulaibiya.com.

A regional initiative within the Pacific Oceanscape Framework

1 Pacific Islands Forum Secretariat Forum Economic Minister's Meeting, PIFS (10) FEMN.03, Alofi, Niue, 26-28 October 2012. Maximising the sustainable returns from fisheries resources in the Pacific. Available from http://www.forumsec.org.fj/resources/uploads/attachments/documents/FEMN.03_Maximising_Returns_from_Fisheries.pdf.
2 World Bank Pacific Islands Fisheries Sector Engagement Strategy. March 2012. Available from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/03/08/000333037_20120308233020/Rendered/PDF/AAA700ESW0whit0t0Strategy0TA0report.pdf.
3 Forum Fisheries Agency Economic Indicators Update, October 2011. Available from http://www.spc.int/oceanfish/en/tuna-fisheries/170-tuna-fisheries-of-the-western-and-central-pacific-ocean.
4 Secretariat of the Pacific Community: The western and central Pacific tuna fishery: 2010 overview and status of stocks. Available from http://www.spc.int/DigitalLibrary/Doc/FAME/Brochures/Policy_Brief14_12.pdf.
5 Gillett, Robert. (2009). Fisheries in the Economies of the Pacific Island Countries and Territories. Asian Development Bank. Available from http://www2.adb.org/documents/studies/pacific-fisheries/pacific-fisheries.pdf.
6 Pratt, Cristelle and Hugh Govan. November 2010. Our Sea of Islands – Our Livelihoods – Our Oceania: Framework for a Pacific Oceanscape. Pacific Islands Forum Secretariat. Available from http://www.sprep.org/att/IRC/eCOPIES/Pacific_Region/684.pdf.

Portuguese-Spanish transboundary water management cooperation

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Rwanda's firm steps on the road to Rio+20

1 Census on 1994 genocide victims in Rwanda, Ministry of Local Government (MINALOC), 2002.
2 Vision 2020, Government of Rwanda (GoR), 2000.
3 Government of Rwanda (GoR) Leadership Retreat, 2012.
4 *Economic Impact of Climate Change in Rwanda*, Stockholm Environment Institute (SEI), 2009.

Suggested further reading

- From Post-Conflict to Environmentally Sustainable Development, UNEP, 2011.
- Rwanda State of the Environment Report and Outlook, Republic of Rwanda (RoR), 2009.

Views from the ground: the role of subnational governments in sustainable development

1 Network of Regional Governments for Sustainable Development (nrg4SD): www.nrg4sd.org.
2 Down to Earth: Territorial Approach to Climate Change (TACC) programme. Available from http://web.undp.org/geneva/down_to_earth.html.
3 Decision X/22. Available from www.cbd.int/authorities.
4 Istanbul Water Consensus. Available from www.worldwaterforum6.org/en/news/single/article/the-istanbul-water-consensus-pact-historical-recognition-of-local-and-regional-authorities/?tx_ttnews%5bbackPid%5d=81&cHash=176e00bab04d9930563afa2e9801a733.

A sustainable, healthy, inclusive future – the ground rules must be different

1 International Trade Union Confederation (2011). Growing Green and Decent Jobs.

Social equity, gender equality and environmental justice

1 World Bank - World Development Report 2012, Gender Equality and Development http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2012/0,,contentMDK:22851055~menuPK:7778074~pagePK:7778278~piPK:7778320~theSitePK:7778063,00.html
2 FAO (2011). *The State Of Food And Agriculture 2010-2011*.
3 Nidhi Tandon (2012). Empowerment of women in a green economy in the context of sustainable development and poverty eradication.
4 See http://www.undp.org/women/CD-Gender-and-Budgets-2004/3.1-care.htm. Both these concepts (social capital and care economy) essentially capture the 'values' of human investment and activity in the economy.
5 Available from www.teebweb.org
6 An estimated US$700-900 billion of subsidies go to support fossil and nuclear energy annually. See UNEP, *Towards a Green Economy* (2011). Some USD 1 billion per day goes to subsidies for unsustainable agriculture (bad for public health, bees, ecosystems, soil, biodiversity).
7 A 2011 study by the UK trade unions shows that 70 per cent of the austerity measures are a greater burden on women than on men.
8 Preamble, WAA21. Available from http://www.iisd.org/women/action21.htm.
9 Rio Agenda 21, Chapter 24.
10 Agenda 21 formalized nine sectors of society through which all citizens could participate in the United Nations activities on achieving sustainable development. These nine sectors are officially called Major Groups.
11 The *International Journal on Cancer* published in its January 2012 magazine a new study from France, carried out by the national French institutes INSERM and IRSN in cooperation with the national child cancer registry of the hospital of Villejuif, including 2,753 child leukaemia cases diagnosed between 2002 and 2007 and a control group of 30,000. The addresses were geocoded around 19 nuclear power plants.
12 Available from www.uncsd2012.org.

How organizations can manage social responsibility for sustainability

1 Garriga, E., and Melé, D. (2004). Corporate Social Responsibility Theories: Mapping the Territory. *Journal of Business Ethics*, vol. 53(No. 1/2), pp. 51-71.
2 ISO 26000:2010(E). ISO 26000, Guidance on social responsibility (First edition). Geneva: International Organization for Standardization.

A vision for sustainability transformation at a knowledge base institution

1 University Sains Malaysia, USM (2007). *Constructing Future Higher Education Scenarios – Insights from Universiti Sains Malaysia*. Penerbit Universiti Sains Malaysia, Penang, Malaysia, ISBN 978-983-861-328-6.
2 Dzulkifli, R., Zakri, H., Zainal, A., Koshy, K. (2010). *Transforming higher education for a sustainable tomorrow case of learning by doing at Universiti Sains Malaysia*. Published by Tudor Rose on behalf of UNESCO, ISBN 0-9536140-8-5.
3 Ramlee, M. and Abu, A. (2004). Malaysia transitions toward a knowledge-based economy. *Journal of Technology Studies*, vol. 30. No. 3.
4 Zainal, A. and Hamoon, K. (2008). Regional Centre of Expertise as transformational platform for sustainability: a case study of Universiti Sains Malaysia, Penang. *International Journal of Sustainability in Higher Education*, vol. 9, No. 4, p. 487.
5 Universiti Sains Malaysia, USM (2008). Transforming Higher Education for a Sustainable Tomorrow, Penang, Malaysia. This strategy document formed the basis for USM's application for the APEX (Accelerated Program for Excellence) award in 2008. ISBN 978-983-3986-30-9.
6 Universiti Sains Malaysia, USM (2009). Transforming Higher Education for a Sustainable tomorrow 2009: Laying the Foundation. Universiti Sains Malaysia. ISBN 978-983-861-459-7.

7 Universiti Sains Malaysia, USM (2010). Transforming Higher Education for a Sustainable Tomorrow 2009: Laying the Foundation. Universiti Sains Malaysia. ISBN 978-983-861-507-5.
8 Universiti Sains Malaysia, USM (2011). Transforming Higher Education for a Sustainable Tomorrow 2011: Delivering Excellence. Universiti Sains Malaysia, Penang, Malaysia. ISBN 978-967-394-038-7.
9 MoHE (Ministry of Higher Education) (2007). National Higher Education Action Plan 2007-2010: Triggering Higher Education Transformation. 20August 2007, Putrajaya, Malaysia.
10 Omar, O. (2012). Bersama Untuk Kecemerlangan Universiti 2012, Menzahir Pencapaian. Together for excellence – Realising Performance, speech, 2012 by Vice-Chancellor Professor Dato' Omar Osman to the USM community. Available from http://www.usm.my/index.php/en/about-usm/vcs-views-a-comments/9578-bersama-untuk-kecemerlangan-universiti-buku-2012-menzahir-pencapaian.html.
11 Kim, W., and Mauborgne, R. (2005). *Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant*. Cambridge, Massachusette: Harvard Business School Press.
12 Koshy, K., Corcoran, P., et al. (2011), The Ethical Dimension of Sustainability in Higher Education: Applying the Principles of the Earth Charter in Malaysia and beyond. University Sains Malaysia, Penang, Malaysia, ISBN 978-967-394-040-0.

Sustainable development at the local level in Botswana

1 Arntzen et al (2007).
2 The Board of the STMT is guided by the Deed of Trust, Policies and Procedures for Trust Activities, Policies and Procedures for Enterprises and Santawani Lodge Operations Manual. Arntzen et al (2007). These provide the overall guidance in terms of how the STMT operates in all its aspects.

Strategies for sustainable growth in Singapore

1 Mercer Human Resource Consulting ranked Singapore 1st in Asia and 25th in the world in its 2011 Quality of Living Survey.
2 The Pollutant Standards Index (PSI) takes into account the ambient concentrations of sulphur dioxide, particulate matter, carbon monoxide, ozone and nitrogen dioxide, and translates them into an overall index ranging from 0 to 500. PSI levels of 0 to 50 are considered good, and levels from 51 to 100 are moderate. Index levels above 100 are considered unhealthy.
3 International Association of Public Transport (2006). *Mobility in cities* report.
4 The IMCSD was co-chaired by Minister (National Development) and Minister (Environment and Water Resources). The members are: Minister (Finance), Minister (Transport) and Senior Minister of State (Trade & Industry). The IMCSD completed its work with the launch of the Sustainable Singapore Blueprint in April 2009.

New voluntary bottom-up urban planning and forest conservation methods in Finland

List of sources

www.metsonpolku.fi/en.

www.ymparisto.fi > Land use and building > Living environment and urban structure > National urban parks.

Governing sustainabledevelopment in Malaysia

1 This term is used to describe the inability of some countries rich in natural resources to use this wealth to boost their economies.
2 The NPBD 1998 seeks to 'conserve Malaysia's biological diversity and to ensure that its components are utilized in a sustainable manner for the continued progress and socioeconomic development of the nation'.
3 The NPE aims at achieving continued economic, social and cultural progress in Malaysia and enhancing the quality of life of its people, through environmentally sound and sustainable development.

Food, nutrition and sustainable agriculture within a green economy

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1 Statement to the High-Level Roundtable on Food and Nutrition Security and Sustainable Agriculture held on 15th March 2012 in New York.
2 UNEP (2011). Agriculture – Investing in natural capital. In *Green Economy Report*, p.50. Available from www.unep.org/greeneconomy/Portals/88/documents/ger/GER_2_Agriculture.pdf.
3 Agriculture at a crossroads, International Assessment of Agricultural Knowledge, Science and Technology for Development. IAASTD, *Global Summary for Decision Makers*, 2008. Available from www.agassessment.org, p.16.
4 Ibid, p. 47.
5 Niggli, U., and others (2009). *Low Greenhouse Gas Agriculture: Mitigation and Adaptation Potential of Sustainable Farming Systems*. FAO, April 2009. Available from http://orgprints.org/15690/1/niggli-etal-2009-lowgreenhouse.pdf.
6 IAASTD 2008, op. cit., p.109.
7 Werner Harder, BLW, BAFU magazine, *Umwelt*, vol. 2, 2008.
8 International Assessment of Agricultural Knowledge, Science and Technology for Development. IAASTD, *Global Summary for Decision Makers*, 2008. Available from www.agassessment.org.
9 UNEP, *Green Economy Report* (2011), op. cit., p.55.
10 UNEP, *Green Economy Report* (2011), op. cit.
11 FAO, *Agricultural Biodiversity* in FAO, 2008; see also www.fao.org/biodiversity/geneticresources/bio-crops/en/.
12 Forum Biodiversität Schweiz, Hotspot, 12/2005, p. 18.
13 Fischler, M. (2010). *Impact assessment of push-pull technology developed and promoted by ICIPE and partners in eastern Africa*, Intercooperation.
14 UNEP and UNCTAD (2008). Organic Agriculture and Food Security in Africa. Development.

The Farmer Communication Programme in East Africa

1 Biovision Farmer Communication Programme (FCP), c/o ICIPE, P.O. Box 30772, 00100; Duduville Kasarani, Off Thika Road, Nairobi/Kenya; damudavi@biovisionafricatrust.org.
2 Anderson, J.R., and Feder, G., (2004). Good intentions and hard realities. The World Bank Res. Obs. 19, 1. Jagtap, S.S., and Abamu, F.J. (2003). Matching improved maize production technologies to the resource base of farmers in a moist savanna. *Agricultural Systems*. vol. 76, pp. 1067–1084.
3 Ballantyne, P. (2009). Accessing, sharing and communicating agricultural information for development: emerging trends and issues. *Information* Development, vol. 25 (No. 4), pp. 260–271. Kesavan P.C, and Swaminathan M.S. (2008). Strategies and models for agricultural sustainability in developing Asian countries. *Philosophical Transactions of the Royal Society of London* B. vol. 363, pp. 877–891. doi:10.1098/rstb.2007.2189. Liang, L., and Brookfield, H. (2009). Sharing knowledge on agrodiversity for conservation and livelihood improvement. LEISA Magazine, vol. 25 (No. 1), pp. 23-25.
4 Available from www.srfood.org/images/stories/pdf/press_releases/20100622_press_release_agroecology_en.pdf.

Building blocks for a green economy: experiences of the African Development Bank

1 Following the request of African Heads of State, the African Union, the African Development Bank, United Nations Environmental Programme and The Economic Commission for Africa jointly coordinate Africa's participation at the United Nations Conference on Sustainable Development (Rio+20), including promotion of Africa's perspectives on green growth.
2 These include the bank's Climate Change Action Plan, its Social and Environmental Safeguard System, and Climate Safeguard System and green growth strategy.

Green growth: necessity or opportunity for Africa?

1 Millenium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC. 155 pp.
2 IPCC Intergovernmental Panel on Climate Change, 2007: *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Parry, M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds. Cambridge University Press, Cambridge, UK, 976 pp.
3 Crutzen, P. , 2002. Geology of mankind. *Nature*, vol. 415.
4 Zalasiewicz, and others (2008). Are we now living in the Anthropocene? GSA Today, vol. 18, No. 2.
5 AfDB et al. (2011). *Assessing Progress in Africa towards the Millennium Development Goals*. MDG Report 2011 prepared by the African Development Bank, Economic Commission for Africa, African Union and United Nations Development Programme.
6 UN Population Division Database.
7 AfDB et al. (2003). *Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation*. Inter-agency report by the African Development Bank, Asian Development Bank (ADB), Department for International Development (DFID, UK), Directorate-

General for Development of the European Commission (EC), Federal Ministry for Economic Cooperation and Development (BMZ, Germany), Ministry of Foreign Affairs – Development Cooperation (DGIS), The Netherlands, Organization for Economic Cooperation and Development (OECD), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP) and The World Bank. 43 pp.
8 Scientific Expert Group on Climate Change (SEG) (2007). Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable. Rosina M. Bierbaum, John P. Holdren, Michael C. MacCracken, Richard H. Moss, and Peter H. Raven (Eds.). Report prepared for the United Nations Commission on Sustainable Development. Sigma Xi, Research Triangle Park, NC, and the United Nations Foundation, Washington, DC, 144 pp.
9 EM-DAT International Disaster Database. See www.emdat.be.
10 Meinshausen, M., and others (2009). Greenhouse gas emission targets for limiting global warming to 2°C. *Nature*, vol. 458.

Voices of the forest: a community reclaims its livelihood

1 Dierberg, F. and Kiattisimkul, W. (1996). *Environmental Impacts of Shrimp Aquaculture*.
2 Barbier, E. B. (2003). *Ecosystems as Natural Resources*.
3 Silori, C. S. et al (2009). *Links between Biodiversity Conservation and Livelihood Security in Practice: A Case Study of Community Conservation of Mangroves in Pred Nai*, Thailand. Paper presented in the International Workshop on Community Forestry, September, pp. 15-18, Pokhara, Nepal.
4 United Nations (2007). *The role of coastal forests in the mitigation of tsunami impacts*. FAO, Bangkok pp. 28-30.

The quest for the ultimate energy for sustainable development through laser technology

1 *Applied Physics Letters*. 93, 131116, 2010.
2 Available from http://outreach.un.org/UNAI.

Suggested further reading:

- The role of global institute of laser technology in green technology. *UN Chronicle*, January-March Issue 2012.
- Safe and sustainable energy with LIFE. *Science &Technology Review*, April/May 2009, Lawrence Livermore National Laboratory.
- Igniting our energy future. *Science &Technology Review*, July/August 2011, Lawrence Livermore National Laboratory.
- A nuclear third way. *The New York Times*, 24 March 2011.
- DOE looks again at inertial fusion as a potential clean energy source. *Physics Today*, vol. 64, issue 3, March 2011.

Changing unsustainable consumption and production patterns

1 UNESCO (2010). *Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: a 10-year framework of programmes on SCP patterns*. Report of the Secretary General. Commission on Sustainable Development. 13-14 May 2010. E/CN.17/2010/8.
2 UNESCO (2010). *Discussion papers submitted by major groups. Contribution by workers and trade unions*. Commission on Sustainable Development-18th session. 3-14 May 2010. E/CN.17/2010/11/Add.6. §74.
3 CSD18-SGR, §54.
4 CSD18-SGR §53.
5 CSD18-SGR §54.
6 CSD18 Chair's Summary.
7 Agenda 21, §4.23, chapter 4.
8 COM(2003)302.
9 COM(2008)400.
10 Available from www.guidedesachatsdurables.be.

Qatar's commitment to sustainable development: a forward-looking vision

1 Source: Qatar Petroleum. *Sustainable Development Industry Report 2010*.

Taking responsibilityfor people and the planet

1 Sources: European Automobile Manufacturers' Association, European Electro Motor Cars Association, J.D. Power and Associates.

Advancing the green economy in solid waste management across the Middle East and North Africa

1 Karl Burkart. Available from www.mnn.com/green-tech/research-innovations/blogs/how-do-you-define-the-green-economy.
2 Maria Sarraf et al, METAP/The World Bank, 2001-2006.
3 The World Bank (2012).
4 With the exception of Tunisia and Jordan, where almost 80 per cent of municipal waste is disposed of in sanitary landfills.
5 CDM Validation Projects http://cdm.unfccc.int/Projects/Validation/index.html.
6 Hans Willumsen, Managing Director at LFG Consult, personal communication, March 2012.
7 Landfill gases contain 50-60 per cent methane, which contributes to climate change.
8 Highest composting level in Lebanon and Egypt has reached nine per cent of generated waste.
9 World Bank (2009). First Carbon Finance Agreement on Solid Waste Composting http://go.worldbank.org/RCXF1KHD10.
10 Project Design Documents form (CDM-PDD) (2006).
11 Challenges and opportunities for SWM in the Mashreq and Maghreb Region. SWEEP-Net, (2010). Available from www.sweep-net.org/ckfinder/userfiles/files/Regional per cent20report/sweepnet-regional-report-final-en-2011.pdf.
12 For more detailed facts and figures on the SWM situation in the SWEEP-Net partner countries, see www.sweep-net.org/ckfinder/userfiles/files/Regional per cent20report/sweepnet-regional-report-final-en-2011.pdf.