United Nations Development Programme

Charting A New Low-Carbon Route To Development

A Primer on Integrated Climate Change Planning for Regional Governments

Cover & Design: Krešimir Kraljević

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A Primer on Integrated Climate Change Planning for Regional Governments

A publication undertaken at the initiative of Christophe Nuttall and Yannick Glemarec under the Territorial Approach Programme, and as a contribution to the implementation of UNDP's Climate Change Strategy. For further information on the UNDP Climate Change Strategy, please contact Veerle Vandeweerd, Director, Environment and Energy Group, UNDP.

Prepared under the direction of

Yannick Glemarec

Authors

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List of Acronyms

ADEME	French Agency for Environment and Energy Management
AER	Assembly of European Regions
AIACC	Assessments of Impacts and Adaptations to Climate Change
BAU	Business as usual
CBO	Community-based Organisation
CCPSP	Climate Change Profile and Strategy Platform
CDIAC	Carbon Dioxide Information Analysis Centre
CDM	Clean Development Mechanism
CENBIO	Centro Nacional de Referencia em Biomassa (Brazilian Reference Centre on Biomass)
CER	Certified Emission Reduction
CFL	Compact Fluorescent Lamp
CNRM	Centre National des Recherches Meteorologiques (French National Centre for Meteorological Research)
CPMR	Conference of Peripheral Maritime Regions
DRM	Disaster Risk Management
DTP	Downtown Transportation Plan
EDF	Électricité de France
EEA	European Environmental Agency
ENCORE	Environmental Conference of the Regions of Europe
ERU	Emission Reduction Unit
ESCO	Energy Service Company
FOGAR	Forum of Global Associations of Regions
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
HDR	Human Development Report
IBRD	International Bank for Reconstruction and Development
ICCPS	Integrated Climate Change Profile and Strategy
IDA	International Development Association
IEA	International Energy Agency
IGCC	Integrated Gasification Combined Cycle Technology
IPCC	Intergovernmental Panel on Climate Change
IPCC AR4	IPCC Fourth Assessment Report
IPCC SRES	IPCC Special Report on Emissions Scenarios
IRR	Internal rate of return
ITCP	Integrated Territorial Climate Plan
JI	Joint Implementation
MDG	Millennium Development Goal
NGO	Non-governmental Organisation
Nrg4SD	Network of Regional Governments for Sustainable Development
ODA	Official Development Assistance

ODS	Ozone Depleting Substances
OECD	Organisation for Economic Cooperation and Development
PDD	Project Design Document
PIP	Policy and Investment Platform
PPM	Parts per million
PPP	Partnership Policy Platform
RCCCC	Regional Climate Change Coordination Committee
SEFI	Sustainable Energy Finance Initiative
TCG	The Climate Group
UCLG	United Cities and Local Governments
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNDP ART	Articulation Framework and Network
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VC/PE	Venture Capital/Private Equity
VER	Verified Emission Reduction
WBGU	German Advisory Council on Global Change
WG	Working Group
WRI	World Resources Institute

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Foreword

Climate change is a defining challenge of our time. Science tells us that if immediate action is not taken to slow down - and reverse in a few years – the growth of greenhouse gas emissions, changes in our climate could have catastrophic consequences for the entire planet. We also know that the resultant negative effects would hit many of the poorest people in the world more quickly, and will be felt more deeply in many developing countries.

Mitigating and adapting to climate change is entirely compatible with pursuing development. Our experience at UNDP, working on these issues over the past two decades, indicates that the right mix of policies, skills, and incentives can influence behaviour and encourage investments in climate-friendly businesses and activities. Thereby, we can help reduce greenhouse gas emissions and generate new economic opportunities and jobs. This calls for fully integrating thinking about climate change into how we go about our development work.

Charting a New Low-Carbon Route to Development helps advance this notion, arguing that the full engagement of sub-national authorities is important to move the climate change and development agendas forward. It suggests that taking the necessary action to tackle climate change will meet with stronger public consensus and be more effective if it helps address local development issues, such as the provision of basic services, greater energy and food security, and employment.

This publication addresses options which, when tailored to specific circumstances, could help balance the pursuit of both climate change mitigation and the investments needed to accelerate poverty reduction and development. It also considers how to meet the adaptation needs that many countries will face.

It is my hope that *Charting a New Low-Carbon Route to Development* will contribute to the ongoing discourse about the links between development and climate change, and help provide sub-national authorities with new insights and guidance as they seek to take steps to mitigate and adapt to climate change.

Helen Clark
Administrator
United Nations Development Programme

Executive Summary

Charting a New Low-Carbon Route to Development

A Primer on Integrated Climate Change Planning for Regional Governments

This Primer introduces a set of approaches to help sub-national authorities through the whole process of designing their Integrated Territorial Climate Plan (ITCP), from setting objectives and participatory arrangements for the preparation of the Plan, to financing priority activities. The main audience for this publication is the public development practitioner at the sub-national level, as well as domestic and international experts involved in assisting with regional development, who wish to examine and understand the instruments available for regional and local governments to become engaged in climate change mitigation and adaptation as an integral part of their development and planning process.

The Primer is divided into two parts - Part 1: Scaling Up Efforts to Address Climate Change and Part II: Preparing an Integrated Territorial Climate Plan.

Part I contends that the world only has 100 months to address climate change (Chapter 1) and that scaling up efforts to meet climate change challenges will require a dramatic shift in public and private investments from fossil fuels to more sustainable climate-friendly alternatives (Chapter 2). It will also require the full engagement of regional and local governments, whose decisions can influence 50-80% of greenhouse gas emissions and most site-dependent adaptation initiatives (Chapter 3), as well as the formulation of innovative policy development and planning instruments, such as ITCPs, to promote long-term planning and to incorporate climate change considerations into decision-making (Chapter 4).

Part II describes possible approaches to developing ITCPs and serves as an introduction to four methodological handbooks: (i) *Developing an Integrated Territorial Climate Plan: a Partnership Policy Framework*; (ii) *Climate Change Impact Scenarios and Vulnerability Mapping*; (iii) *The Technology Needs Assessment Handbook*; and (iv) *The Climate Change Policy and Investment Handbook*.

One factor that is crucial to the preparation of ITCPs is partnership building, and Chapter 5 summarises some of the key principles spelt out in *Developing an Integrated Territorial Climate Plan: a Partnership Policy Framework* to establish such a partnership platform. Based on the approach advocated in *Climate Change Impact Scenarios and Vulnerability Mapping* and the *Technology Needs Assessment Handbook*, Chapters 6 and 7 set out guidelines on how to develop a mitigation and adaptation strategy at the regional level. Finally, Chapter 8 summarises how regional governments can seek financing for their climate change initiatives based on available and newly-emerging resources and how national governments, multilateral and bilateral donors, the private sector and the civil society can play a part in providing these resources. It summarises the more comprehensive methodological guidance provided in the *Climate Change Policy and Investment Handbook*.

The key issues addressed in *Charting a New Low-Carbon Route to Development* are summarised below.

Part I: Scaling Up Efforts to Address Climate Change

We have 100 months to scale up climate change mitigation and adaptation action

The next 10 years will be critical for the future of our planet. Radical measures must be taken both on climate change mitigation and adaptation before we are locked into potentially irreversible, catastrophic climate transformations, whose impacts are expected to substantially change the environment and our lives on this planet.

The 2007/2008 UNDP Human Development Report estimates that stabilising greenhouse gas concentrations in the atmosphere, at a level that prevents catastrophic climate change, will require a 50% reduction of greenhouse gas emissions by 2050 from 1990 levels. To achieve this global objective, the Report recommends that developed countries cut greenhouse gas emissions by at least 80% by 2050, with 20–30% cuts by 2020. For major emitters in developing countries, it recommends aiming for an emission trajectory that would peak in 2020 with 20% cuts by 2050.

The target reduction can be realised through emissions reductions of ~1.5% per year, provided such reductions begin today. However, if actions are delayed by approximately 8 to 10 years, the future declines required to realise the target reduction will have to be greater than 3%, a reduction rate widely regarded as beyond current technological means.

There are additional, compelling reasons to start tackling climate change now. Many infrastructure investments and planning decisions, such as water and transportation infrastructure, building design and urban/land-use planning, require substantial lead-time for conception and implementation. By the end of this century, today's ongoing investments may have to cope with climate conditions that are radically different from current ones, or otherwise risk becoming obsolete or sustaining damages due to the impacts of climate change. Adapting reactively would cost far more than implementing proactive anticipatory strategies as soon as possible. In areas where flooding is a real possibility, plans for flood protection must begin today. Nicholls et al. (2007)[1] estimate that in 2070, up to 140 million people and US$35,000 billion of assets could be dependent on flood protection in large port cities around the world, because of the combined effect of population growth, urbanisation, economic growth and sea-level rise.

Furthermore, climate change is also expected to create human security risks stemming from a change in the availability of and access to natural resources. A 2007 report from the Hadley Centre predicts the surface temperature for the coming decade based on a global climate model. It warns that each year from 2010 to 2014, the world has at least a 50% chance of exceeding the record high temperature set in 1998 (average global temperatures reached 14.54°C in 1998). Beyond 2014, the odds of breaking the temperature record rise even further. As climate change develops, large-scale climate change impacts, such as extended droughts over large areas affecting water availability and food security, become more likely.

Climate change will exacerbate existing economic, political, and humanitarian stress. It will compound existing water scarcity problems, such as increasing the number of people suffering from water stress and reduced access to safe drinking water. It will have an impact on rain-fed and irrigated agriculture, affecting both local cropping patterns and international production and trade. By 2020, 75-250 million people across Africa could face water shortages and rain-fed agriculture could drop by 50% in some African countries by 2020. Crop yields could increase by 20% in East and Southeast Asia, but decrease by up to 30% in Central and South Asia. According to a risk assessment conducted by the German Advisory Council on Global Change (WBGU), without resolute action climate change will overstretch the adaptive capacities of many societies in the coming decades.

As competition over land and water resources increases, conflicts over access to resources are expected to become more frequent in the years to come, at the regional and local levels. To avoid becoming firefighters, forced to rush from one blaze to another trying to put out continuous fires, regional and local governments need to take immediate action to address climate change challenges today.

[1] Nicholls, R.J., S. Hanson, C. Herweijer, N. Patmore, S. Hallegatte, J. Corfee-Morlot, J. Chateau, and R. Muir-Wood, 2007. Screening Study: Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes, OECD Working Paper, available on http://www.oecd.org/document/56/0,3343, en_2649_201185_39718712_1_1_1_1,00.html

Reaching these ambitious goals will not be easy. The world is already struggling to meet the Kyoto target of reducing GHG emissions by 5.2% compared to 1990 levels and with 2007 emissions at 11% above 1990 levels, the risk is high that it will not be met. New types of policies, partnerships and instruments, which dramatically scale up present climate change efforts, will be needed, if efforts to mitigate climate change and adapt to its effects are to succeed.

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Shifting financial flows from fossil fuels to green energy technologies and climate resilient practices

The sums involved in a shift to a low-carbon economy are daunting. For example, the IEA estimates that limiting GHG concentrations to 450 ppm CO_2eq would require US$550 billion to be invested in clean energy from now to 2030. UNDP estimates the cost of adaptation at US$86billion. Most of the financing in the coming years will have to come from private sources, or from innovative funding mechanisms currently available or being developed. Current levels of ODA, while significant, are unlikely to be sufficient to finance the necessary investments. For example, for energy-related activities, ODA, at present, provides US$5-7 billion per year, which is only 1% of the total amount required.

The international community is currently piloting a number of public policies, new market-based instruments and innovative financial mechanisms, to attract and drive direct investment towards lower-carbon and climate-resilient technologies and practices. In 2007, the private sector invested nearly US$150 billion of new money in clean energy technologies in response to these new policy and financial incentives. Although there is some concern that the current financial crisis may freeze financing for green energy projects, or that a number of financial incentives for energy efficiency and renewable energy will be phased out by governments trying to trim budget deficits, it is expected that by 2012 investment in clean energy technologies will resume its growth to about US$450 billion by 2012 and US$600 billion by 2020. However, these financial flows often remain restricted to OECD countries and a small number of rapidly developing countries; barriers still need to be removed before they can be widely disseminated for easier access by other developing countries.

For example, the Kyoto Protocol created the Clean Development Mechanism (CDM) to promote both sustainable development and GHG emission reduction in developing countries. The CDM is a global cap-and-trade mechanism, which allows developing countries to earn credits for their emission reduction projects and sell these cheaper credits to industrialised countries. Despite its potential, there is strong concern that only a limited number of countries will benefit from the CDM, and that this mechanism could bypass Africa entirely. Only five countries – China, India, Brazil, South Korea, and Mexico – are expected to generate over 80 percent of CDM credits by 2012. Current market rules all too often fail to attract investors into lower-carbon technologies and sustainable land-use projects. The specific market conditions of developing countries will need to be incorporated into the design of new market-based and innovative financial mechanisms. A number of reforms to the CDM are currently being discussed to achieve this objective (programme approaches, etc.). At the same time, developing countries will need assistance to put into place an enabling environment (e.g. public policies, institutions, human resources) so that they are in a better position to leverage these new sources of finance.

Key institutional players, such as regions, are still confronted with a number of constraints that limit their interventions

The implementation of the mitigation and adaptation policies necessary to successfully address the climate change challenge will only be achieved, and sustained, through involvement and commitment at all levels of decision-making. In particular, sub-national authorities (regions, provinces, states or municipalities) have a key role to play in actively incorporating climate change considerations in day-to-day business and in introducing climate-friendly policies, regulations and investment decisions at their level, as a direct outreach to the public. Adaptation to climate change is very site-dependent, and local planning decisions will be critical to tailor almost every single adaptation action to the conditions in which it will take place. Similarly, 50% to 80% of GHG emissions are influenced by local behaviour and investment choices.

However, a number of barriers will need to be removed to enable these key institutional actors to play a critical role in scaling up efforts to address climate change:

- There is an increasing body of scientific literature on global climate change impacts but a dearth of information at the local level. The necessary data, methodologies and technical assistance to assess the potential physical and economic impact of climate change at the regional and local levels and develop climate change strategies are not always available;
- In a "new" field like climate change, public authorities may have limited technical and financial capacities. This limits the capacity of countries to assess the risks and opportunities related to climate change, and to select the public policy solutions and financial instruments which are most applicable and effective in addressing them.
- Knowledge sharing is hindered by the varying roles and responsibilities of regions. The general level of decentralisation and division of responsibilities between administrative levels varies significantly among countries. Such heterogeneity hinders the exchange of information and replication of best practices between regions.

If regional and local authorities are to succeed in their efforts to address climate change, effective partnerships with their constituencies, the national government, neighbouring regions and countries, international donors, the academic community and technical centres of excellence, neighbouring regions/countries who share common interests and the private sector, must be formed.

The preparation of Integrated Territorial Climate Plans can remove some of these barriers

To date, much of the practice regarding climate change has focused on incrementally reducing emissions or reducing vulnerability through isolated projects. These incremental improvements are important first steps, but in the long-term, ambitious climate change mitigation and adaptation efforts will require a more systematic and strategic approach, integrating climate change mitigation and adaptation into a profound rethinking of development processes.

Climate change is unequivocal. Less certain is the timing and magnitude of climate change. Climate change represents a dramatic increase in uncertainty and new decision-making methods will be required to cope with it. For example, for the western Sahel in Africa different climate change models by the IPCC predict a significant drying, while others simulate a progressive wetting with an expansion of vegetation into the Sahara. Thus water infrastructure built in West Africa today could, over its lifetime, face a significant drying, a progressive wetting, or even an initial wetting period followed by a significant drying. Water engineers can easily design

water infrastructure adapted to a progressive drying or wetting but it will be infinitely more difficult to design infrastructure adapted to a full range of possible future climates.

While we know that our climate will change over the long-term, decision-makers may be confronted with a situation where the direction of change isn't fully clear at this stage. Yet they will still need to make investment decisions today, with incomplete information. The risk of simply reacting to changes in the short- or medium-term could result in poor investment decisions, the cost of which could exceed the direct costs of global warming.

However, strategies which cope with this climate uncertainty and which yield benefit, regardless of how the local climate will change, do exist. Examples include risk management practices (like risk-informed land-use planning) and water management (like drainage infrastructure improvement in cities of the developing world). Prospective techniques such as scenario-based approaches can overcome some of the constraints posed by the lack of data and help regional and local planners deal with climate uncertainty and complexity. They can help planners and development practitioners identify and implement development strategies that can address different possible future climate conditions.

To facilitate long-term planning, an option for regional governments is to prepare integrated territorial climate plans. The objective of the integrated climate plans is to identify and prioritise adaptation and mitigation initiatives based on an assessment of physical and economic climate change impacts. While encouraging long-term thinking, these ITCPs will highlight the socio-economic benefits of addressing climate change in the short- and medium-term. With regard to adaptation, these plans should identify no-regrets options, such as disaster risk management and improving emergency response systems. A number of negative-cost or no-cost mitigation options should also be identified, such as energy-efficient appliances or building. This approach recognises that sub-national authorities will be able to create public consensus in favour of climate change action only if the recommended measures correspond to the fundamental development problems of the regions and municipalities, like the provision of basic services to the population, greater energy and food security and employment.

Climate-related policies will affect different sectors in different ways. The need for an extremely efficient inter-sectoral dialogue to understand and effectively resolve the potential trade-offs inherent in climate policy, is well-illustrated by the energy and water sectors. Water is necessary to generate electricity and electricity is necessary to generate water. On average 50% of the cost associated with water supply is related to energy, and water restrictions can hamper solutions for generating more energy. Water is generally regarded as an adaptation issue and energy as a mitigation issue. As such, they tend to be addressed by two distinct communities of professionals with limited contact. In some scenarios, this causes unnecessary competition or results in one resource being artificially boosted at the expense of another.

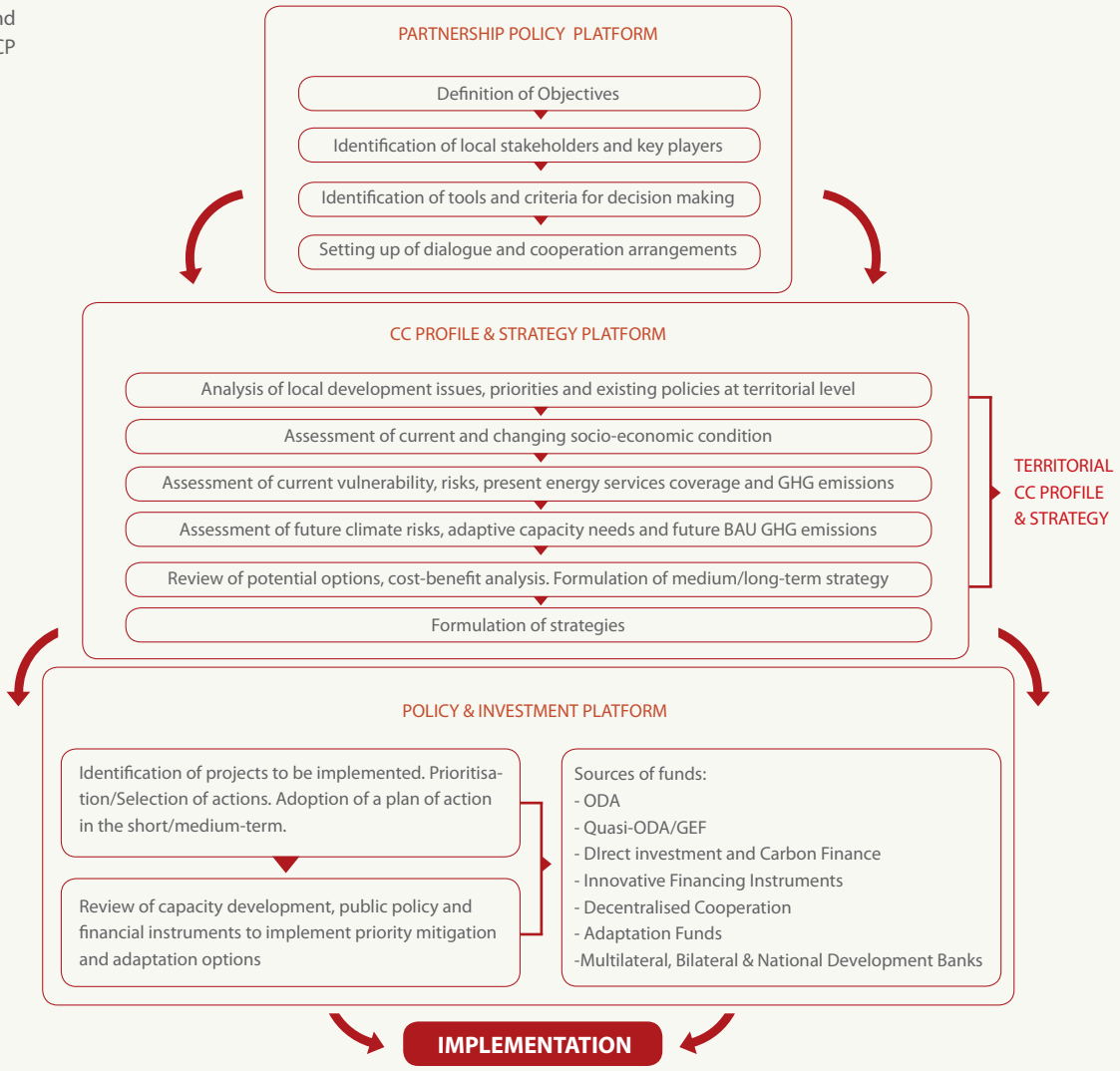
To break institutional barriers, integrated climate plans must be cross-sectoral in nature, covering adaptation and mitigation activities, and considering both synergies and trade-offs.They must incorporate the priorities of all involved parties, including organisations and individuals outside government. The Integrated Territorial Climate Plan should not be perceived as one that creates rules and constraints to development, but one that will continue to pursue social and economic objectives through orienting changes to the more sustainable development of the region.

Part II: Implementing an Integrated Territorial Climate Plan

Three methodological platforms can be used to prepare an Integrated Territorial Climate Plan (ITCP), as follows:

1. **Partnership Policy Platform (PPP):** helping identify a common ground among all partners. The key options for establishing a partnership policy platform are described in the UNDP handbook: *Developing an Integrated Territorial Climate Change Plan*;
2. **Climate Change Profile and Strategy Platform (CCPSP)**: explaining the steps to guide regional authorities in setting medium- to long-term mitigation and adaptation targets that balance development and environmental goals and identify and implement strategies for realising these targets. The approach is detailed in two handbooks (*Climate Change Impact Scenarios and Vulnerability Mapping and the Technology Needs Assessment Handbook*) and a series of technical documents (Energy and GHG Assessment);
3. **Policy and Investment Platform (PIP)**: assisting regional authorities to identify the most appropriate combination of policy instruments as well as to assess and access different sources of climate change funding, to finance the activities identified in the CCPSP above.The *UNDP Climate Change Policy and Investment Handbook* is available to assist regional authorities in conducting this exercise.

Figure 1: Methodologies and Process for Developing an ITCP



A participatory governance structure must be developed to prepare and implement these plans

National development plans are normally articulated along sectoral lines, which the sub-national authorities are then obliged to aggregate and translate into an achievable series of actions reflecting local-level realities. This translation of sectoral policies into territorial actions requires taking into account and balancing the diverse set of interests and needs of various sectors and constituencies. Thus, the active participation by all stakeholders, including public and private sectors, CBOs and international partners, at all levels (national, regional and local), will be a pre-condition for the successful preparation and implementation of an integrated climate plan.

In implementing a regional climate change initiative, it is important to avoid any duplication that may overburden national, regional and local government administration officials and result in competing roles, coordination fatigue, counter-productive measures, as well as the inefficient use of resources. Therefore, existing structures for administration and for coordination mechanisms should be used and strengthened as much as possible. To ensure they are embedded in the traditional planning process, the coordination mechanism established to guide the ITCP process should be overseen by regional planning authorities.

The most common mechanism used to facilitate communication on climate change at the national level, across ministries and specialised institutions, is the establishment of an inter-ministerial committee to coordinate all climate change related activities. As a first step in the preparation of an ITCP, a generic option is to establish a cross-sectoral ITCP Steering Committee. This Steering Committee could be composed of regional and local elected officials, as well as representatives of concerned national agencies, who will guide and be responsible for the oversight of the preparation and implementation of the planning exercise. Representatives from the academic community could also be invited to participate in the Steering Committee. Additional support could be provided to the Steering Committee by a Project Team and a Technical Committee. A similar institutional framework of coordination committees at both national and regional levels will facilitate communication and policy coordination between the different decision-making levels.

In addition to public authorities, the involvement of all key socio-economic stakeholders (private investors, trade unions, NGOs, aid partners, etc.) is crucial. This could be achieved through the establishment of a Regional Climate Change Coordination Committee (RCCCC). The RCCCC would act as an open forum to facilitate dialogue and coordination among all stakeholders, and be a pivotal mechanism for the co-development of the ITCP between public authorities and civil society. The consultative role of the RCCCC will need to be clearly distinguished from the policy formulation and approval role of the Steering Committee and of the sub-national authorities themselves.

Last, but not least, the establishment of working groups (WGs) focussing on key climate change related issues or areas can prove to be an effective mechanism to empower local authorities and foster multi-stakeholder governance. The focus of these groups should be defined according to the main issues identified at the regional level. For example, groups may be thematic (health, gender equality), geographic (municipal, district, coastal zone) or sectoral (buildings, transport, agriculture). When the intermediate level is non-elective (prefects, governors, etc), WGs can also be a mechanism to promote policy dialogue between non-elected and elected officials (mayors and administrators), as well as public, private and associated social actors. In some instances, the establishment of a "methodological support group" has also proven useful.

The main role of the working groups is to contribute to the mapping of risks and opportunities, and needs and resources at the regional level (climate profile), to suggest low-carbon and climate change resilient development strategies, and to identify capacity development and investment projects.

Regional governments can play a key role in promoting mitigation actions that can bring multiple development benefits

Many regional governments in low-income countries do not consider mitigation particularly relevant, as their emissions are small and because their main priorities are for energy access and economic growth. However, mitigation policies can, in fact, bring many development benefits with them, by increasing access to energy services; increasing the affordability of energy; reducing national reliance on oil imports and their price fluctuations; creating economic activities and employment; and reducing local pollution and health hazards. Local renewable energy sources, rather than fossil fuels, can provide clean, efficient and safe lighting or warmth, by using efficient materials and appliances. Compact fluorescent lamps; biomass generators; solar-powered lanterns and cooking stoves; and combustion of fatal gases, all provide the same (or better) energy, while using less fossil fuels and emitting less GHGs. UNDP's preliminary analysis to deliver basic energy services to poor people, currently "beyond the grid", is estimated at approximately US$10 billion per year, far below the US$858 billion the World Bank estimates is needed to provide universal electricity access by 2030, based on grid connectivity.[2]

Energy efficient consumption in urban areas can help reduce individual consumption, thus freeing capacity to supply other areas of the country or a growing urban population. Additionally, in rural areas where "grid" connection can be costly or difficult, decentralised local renewable energy solutions are easier to supply. The IEA has shown that, on average, an additional dollar invested in more efficient electrical equipment, appliances and building, avoids more than two dollars of investment in electricity supply. The ratio is highest in non-OECD countries.[3]

Reducing oil imports, particularly for oil-importing developing countries, increases their energy security, reducing their vulnerability to oil price fluctuations, which could cause them to lose economic ground. Clean energy options can also create local economic activity and employment, since they generally have a higher content of local jobs than traditional fossil fuel supply options. At the same time, they reduce local environmental and health hazards.

In essence, mitigation planning can be described as a choice between several development modes that are likely to lead to the same standard of living, but with different energy-consumption and carbon-emission patterns. Mitigation planning can also be described as a risk management measure to avoid building high GHG-emitting energy infrastructure that will need to be replaced by less GHG-emitting infrastructure in 20 or 30 years.

For regional governments, options for including mitigation in their regional plans could include:

1. Reducing emissions related to the equipment and services they operate directly, including buildings, education and healthcare centres, waste collection and treatment, energy production and distribution, public transportation, etc.;
2. Establishing building codes requiring energy-efficient designs and materials or minimum energy performance; designing spatial/land-use planning or transportation systems encouraging less carbon-intensive options;
3. Indirectly influencing emissions through: communication campaigns promoting low-carbon and energy-efficient behaviour changes, including in school education programmes; adapting regulations, fiscal policies or subsidies favouring energy-efficient or low-carbon technologies; and demonstrating the active adoption of low-carbon technologies as an example to the public or the private sector.
4. Attracting local green industries and services.

[2] Financing for a Sustainable World - UNDP Background Paper for the 2008 Accra High Level Forum on Aid Effectiveness, 2008.

[3] World Energy Outlook 2006. IEA, 2006

A key objective of the ITCP will be to assist regional decision-makers to identify priority actions in highly vulnerable sectors, to reduce adaptation costs

Even if the world stopped emitting greenhouse gases immediately, the effects of climate change are now unavoidable and the world will face an increase in average temperatures by 0.5 to 1˚C until about 2035. When and how hot the world will become depends on how much greenhouse gas we emit during the 21st century, and also on how the world's climate will react to the increased concentration of gases.

If emissions continue to rise at the rate of the past 30 years, the world should be prepared for a 4°C increase in warming. The last time the world experienced temperature rises of this magnitude was 55 million years ago, after the so-called Palaeocene-Eocene Thermal Maximum event. During this period, tropical forests sprang up in ice-free polar regions and sea levels rose to 100 metres higher than today's. Desert stretched from southern Africa into Europe.This period occurred during very different conditions (in terms of CO_2, the position of the continents, the earth's orbit), and care must be taken when extrapolating future climate change impacts from past conditions. However, it is clear that the impacts of a 4°C increase in world temperature could be devastating.

"If emissions continue to rise at the rate of the past 30 years, the world should be prepared for a 4°C increase in warming. The last time the world experienced temperature rises of this magnitude was 55 million years ago, after the so-called Palaeocene-Eocene Thermal Maximum event."

What is also clear is that the economic and human development impacts of climate change will not be equitable, with the poorest, and those living in tropical regions and island states, being affected the most (IPCC, 2007). Regions in Africa and Asia and the Pacific are already experiencing effects that are similar (albeit not in scale and magnitude) to those expected to appear with increased warming. Even in the event of a more moderate warming of 2˚C, certain provinces and districts in West and Southern Africa are likely to lose more than 40-60% of expected revenue from agriculture. Adaptation is not only about better risk reduction or coping with a new and unpredictable climate. Our way of living and doing business today, which evolved as an adaptation to the environment we live in, will have to change as the climate changes.

Formulating an adaptation strategy requires an analysis of the areas most vulnerable to climate change, followed by an estimate of the implications of climate change on key economic and social factors. This analysis should take into account the alternative possibilities of doing nothing (business as usual) and the host of adaptation activities that could be carried out in anticipation or in response to climate change. This will permit an evaluation of the comparative benefits of a range of adaptation options. This approach, however, requires specialised expertise in a variety of sectors, such as climate change science, economics or hydrology, among others, that require time and the resources of national or international expertise.

Adaptation actions will need to take place across all sectors over a long period of time. As such, they should be thought of as a collection of options to be deployed in tandem. To optimise the use of scarce resources, a key objective of the adaptation component of the ITCP will be to assist decision-makers in identifying three types of priority actions in highly vulnerable sectors:

1. No-regrets adaptation measures: This category includes measures which, when designed appropriately, do not only reduce climate change risks but also create conditions that enable net economic benefits across different sectors. They should be implemented as part of the sustainable development strategy of a region, even in the absence of climate change concerns (i.e. better building insulation; improved efficiency standards for appliances; improved water and energy pricing to encourage more efficient consumption);
2. Urgent adaptation measures: Irrespective of their immediate costs, this category includes time-critical adaptation measures that cannot be postponed, either because of the clear and present risks posed by climate change or the long implementation time of these measures (i.e., new cultivars and changes in farming systems to increase their resilience to drought, etc.);
3. Life-cycle risk reduction measures: This category includes measures that will address deficits in policies and practices to address both current and future climate-related risks, as well as avoid or reduce the likelihood of mal-adaptation costs associated with climate change uncertainty (e.g. introduce new building codes and spatial planning to avoid settlement in flood-prone areas, promotion of agricultural and non-agricultural diversification, choose between dense urban design and urban sprawl, etc.).

Priority mitigation and adaptation actions will have to be translated into a mix of optimal policy instruments and a set of coherent projects.

A huge array of public policy and financial instruments are available to help regional authorities successfully implement mitigation and adaptation measures in different sectors. This is best explained using wind energy as an example. Although it is a rapidly growing technology, it is not sufficient on its own to ensure its widespread development and to reduce costs. Only countries that have established an enabling environment, comprising stable comprehensive public policies, tools to manage externalities (e.g., noise and landscape for wind energy) and public consensus and acceptance, strong political commitment and adequate access to financing, have succeeded in tapping into its power as a major energy source. Policies in such countries/regions not only focus on reducing costs and improving revenues to increase profitability, but also on reducing risks. Therefore the development of a successful wind project will require a wide range of supportive activities, including the preparation of wind assessments; standards for wind turbines; model contracts; skills development of local technicians; information and communication; reviews for permitting and licensing regulations or modifications of charges to connect to the grid; and financial incentives in the form of feed-in tariffs, tax breaks or Tradable Renewable Energy Certificates. Ultimately, the most applicable and needed policy measures to promote wind energy (or other clean energy sources) will depend on the specificities and economic culture of each region.

Not only can a wide array of possible public policy instruments be used, but an even greater variety of financial instruments is also available. In 2008, UNEP identified over 50 different bilateral and multilateral funding sources accessible to developing countries and regions for climate change management. This diversity is outmatched by the existence of numerous market-based instruments, with close to 60 different markets for carbon cap-and-trade instruments alone. This diversity offers plenty of choices, but the downside is that it can lead to confusion. Moreover, in cases such as carbon finance, there are several pre-requisites to accessing the funds, including appropriate carbon institutional infrastructure to support certification of greenhouse gas emissions reductions and legislation on CER ownership. Thus, different financial resources may have to be accessed and sequenced to drive investments towards lower-carbon technologies. Public resources may be needed initially to put into place the policies or institutions required to create and regulate markets, establish infrastructure or remove perceived risks. Subsequently, the enabling environment can attract private investments or other sources, such as carbon finance.

In some cases, different financial instruments may need to be combined to provide a more attractive return to direct investors. Continuing with the wind energy example, the sale of power and carbon finance may not be sufficient to make it financially competitive with traditional coal-fired plants. A supplementary revenue stream, such as CDM or feed-in tariffs, may tip the profitability scale in favour of greater investment in wind energy.

Once priority mitigation and adaptation activities and technological/non-technological options have been selected in a country/region, the next step is to translate these options into a mix of optimal policy instruments and a set of coherent projects. Decision-makers at the local, regional and national levels will need to:

- Understand the specific workings of individual sectors/markets in order to design an appropriate mix of policy measures for priority mitigation and adaptation activities, including combining different financial instruments;
- Translate the policy measures into a synergistic set of adaptation and mitigation initiatives which include:
  - identifying and sequencing (a) projects that lead to policy change and institutional strengthening, and (b) individual investment projects
  - matching each investment project with the most appropriate available sources of funding (e.g., ODA, market-based mechanisms such as CDM, etc.)

- developing the required documentation and meeting the due diligence requirements that are unique to each source of funds
- when the chosen policy mix leads to increased pressure on certain actors, such as public budgets or individual consumers, reducing these pressures by developing innovative financing instruments.

To help regional authorities determine how best to implement their priority mitigation and adaptation actions, UNDP has designed a Climate Change Policy and Investment Platform (CCPIP). The CCPIP helps local decision makers to:

a. define for the relevant sector/market the most applicable policy measures;

b. identify how individual policy/capacity development and investment projects can be financed;

c. access funding from the appropriate sources (ODA, quasi-ODA, market-based instruments) by providing technical assistance for the development of project documents and conducting due diligence; and finally

d. identify other innovative instruments that can be used to defray the cost of mitigation and adaptation actions in line with local circumstances.

Using the CCPIP approach will ensure that, at the regional government level, the financing strategy is coordinated with all policies and instruments working in harmony.

Many regions in the world have already become involved in pioneering innovative ways to introduce clean energy technologies and/or to mobilise resources to fund such efforts. In October 2008, a major global initiative, led by nrg4SD, was launched at the first World Summit of Regional Governments on Climate Change, hosted by the Brittany Region in Saint-Malo (France). Some 100 regions from 65 countries of the 5 continents attended, and 33 successful experiences in managing climate change at the regional level were presented (see http://www.worldsummitofregions.org).

The *St. Malo Declaration* advocates for the acknowledgement of the policy and implementation competencies of regional governments, related to a range of sectors which both directly affect and are impacted by climate change. The Signatories to the Declaration also committed to actively participate and take action in future international climate change endeavours, in line with the principle of common but differentiated responsibilities and respective capabilities. A series of arrangements for twinning regions will provide a conduit for exchanging information and best practice experiences. Much can be learned from these experiences on how to scale up efforts to address the climate change challenge.

In 2008, California hosted the *Governors' Global Climate Summit*, which brought together regions from China, India, the United States, Canada, Mexico, Brazil and Indonesia. Participants committed to work together by signing a joint declaration to forge partnerships in the areas of forestry, cement, iron, aluminium, energy and transportation and to focus research, development and deployment activities on areas such as energy efficiency, renewable energy and zero- and low-carbon electricity generation and fuels. Exchanges are already well underway.

In December, 2008, building on the Montreal Declaration and on these international efforts, a *Statement of Action* was delivered to the UNFCCC in Poznan, Poland, on behalf of regions from around the world and supported by The Climate Group. The Statement contained new commitments by sub-national governments, from setting energy efficiency and renewable energy targets to specific exchanges in the areas of efficiency, renewables, clean transport and land-use, partnering with developing country regions through the UNDP, and supporting the work of the World Summit of Regions and the Governors' Global Climate Summit.

"Many regions in the world have already become involved in pioneering innovative ways to introduce clean energy technologies"

PART I:

SCALING UP EFFORTS TO ADDRESS CLIMATE CHANGE

1

Chapter 1

Avoiding Dangerous Climate Change: A Shrinking Window of Opportunity

1.1 The Carbon Budget for the 21st Century

Our climate is changing. This is unequivocal[4]. What is less certain, however, is the timing and magnitude of climate change. The critical question, when considering climate change management efforts, is how much time we have left to act.

There is a growing consensus among climate scientists about the threshold marker for dangerous climate change. That consensus identifies an increase of 2°C (3.6°F) in average global temperatures (over pre-industrial levels) as an advisable ceiling. Beyond this point, the risk of abrupt and catastrophic climate change, such as the break-up of the Greenland ice cap, rises sharply.

The UNDP Human Development Report 2007/2008[5] estimates that the increase in the concentration of carbon dioxide in the atmosphere must be limited to 450 parts per million (ppm) of CO_2e[6] if the world is to have a fifty-fifty chance of not crossing the temperature threshold. Working backwards, this means that no more than 1,456 Gt CO_2, or around an annual average of 14.5 Gt CO_2, of carbon dioxide emissions should be released into the atmosphere in the 21st century, in order to maintain this atmospheric concentration level. Our current annual emissions are running at twice this level, at 29 Gt CO_2. As Figure 2 shows, our maximum carbon budget for the 21st century could expire as early as 2032, if the world remains on the worst-case IPCC emissions scenario course (Curve 1).

4 Executive Summary- Fourth Assessment report, IPCC, 2007

5 *Human Development Report 2007/2008: Fighting climate change: Human solidarity in a divided world,* UNDP, New York.

6 The parts-per-million (ppm) notation is a convenient way to represent small proportions. For example, a concentration of 450 ppm is equivalent to 0.045%.

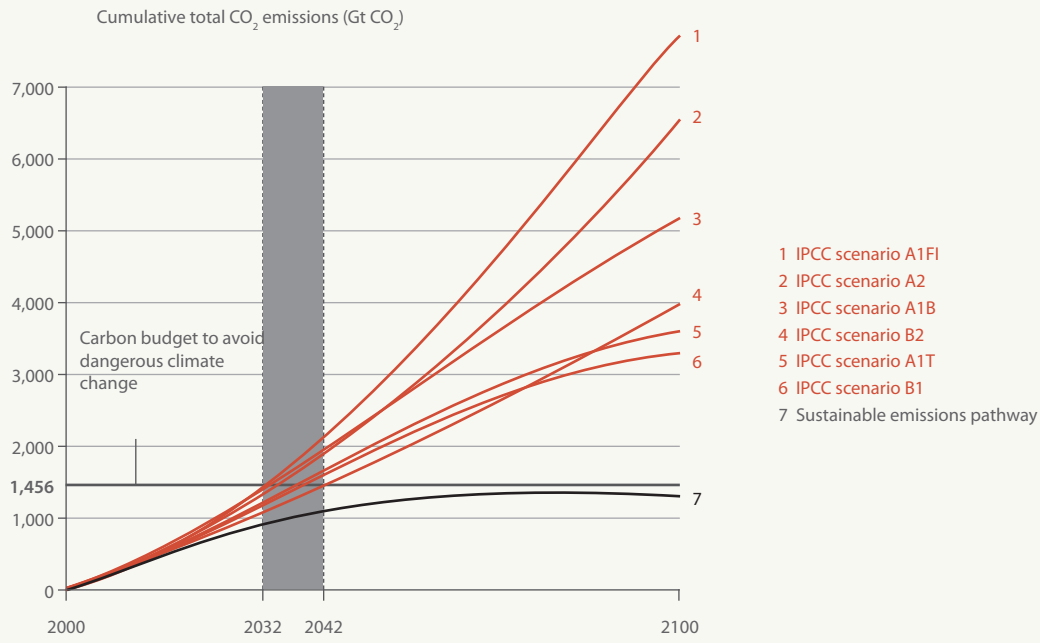


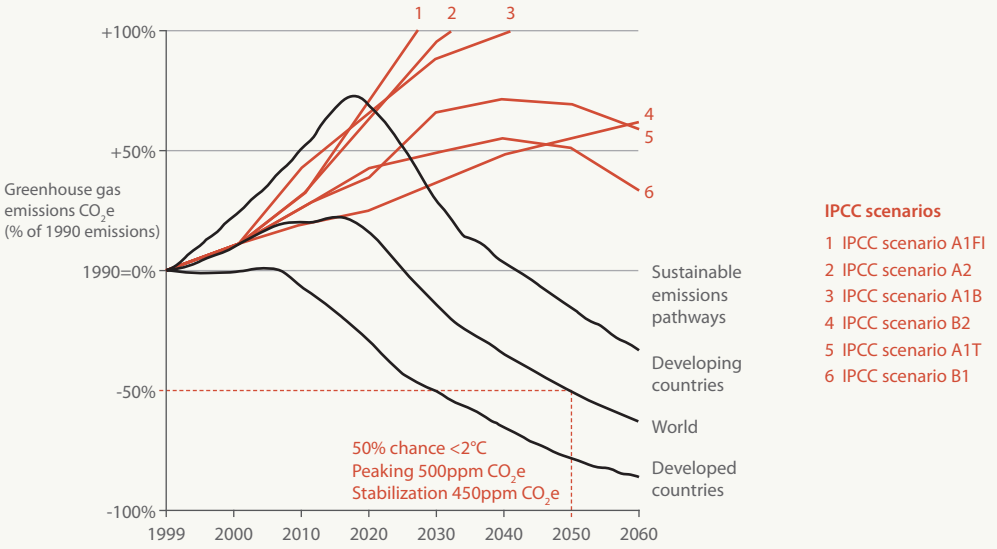
Figure 2: The 21st Century Carbon Budget

Note: IPCC scenarios describe plausible future patterns of population growth, economic growth, technological change and associated CO_2 emissions. The **A1 scenarios** assume rapid economic and population growth combined with reliance on fossil fuels (A1FI), non-fossil energy (A1T) or a combination (A1B). The **A2 scenario** assumes lower economic growth, less globalisation and continued high population growth. The **B1** and **B2 scenarios** contain some mitigation of emissions, for increased resource efficiency and technology improvement (B1) and through more localised solutions (B2).

Source: Meinshausen 2007.

The Human Development Report for 2007/2008 estimates that stabilising greenhouse gas concentrations in the atmosphere at a level that prevents catastrophic climate change, will require a 50% reduction of greenhouse gas emissions by 2050 from 1990 levels. To achieve this global objective, the Report recommends that developed countries cut greenhouse gas emissions by at least 80% by 2050, compared to the baseline year 1990, with 20–30% cuts by 2020. For major emitters in developing countries, it recommends aiming for an emissions trajectory that peaks in 2020, with 20% cuts by 2050.

Figure 3: Halving emissions by 2050 could avoid dangerous climate change



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Source: Meinshausen 2007.

1.1.1 How much time do we have to avoid dangerous climate change?

If we adopt the global objective to cut greenhouse gas emissions by at least 50% by 2050, compared to the 1990 level, the next question is what is the required emission reduction rate that needs to be achieved?

A recent paper on "Atmospheric Stabilization and the Timing of Carbon Mitigation" suggests that the longer one postpones mitigation efforts, the greater the percentage decline rate of emissions needed to achieve the same CO_2 concentration levels. Thus, the target concentration level of 450 ppm can be realised through emissions reductions of ~1.5% per year provided that reductions begin today (Figure 4). However, if actions are delayed by approximately 8 to 10 years, then the future declines required to realise the target concentration level of 450 ppm will have to be greater than 3%, a reduction rate widely regarded as beyond current technological means.

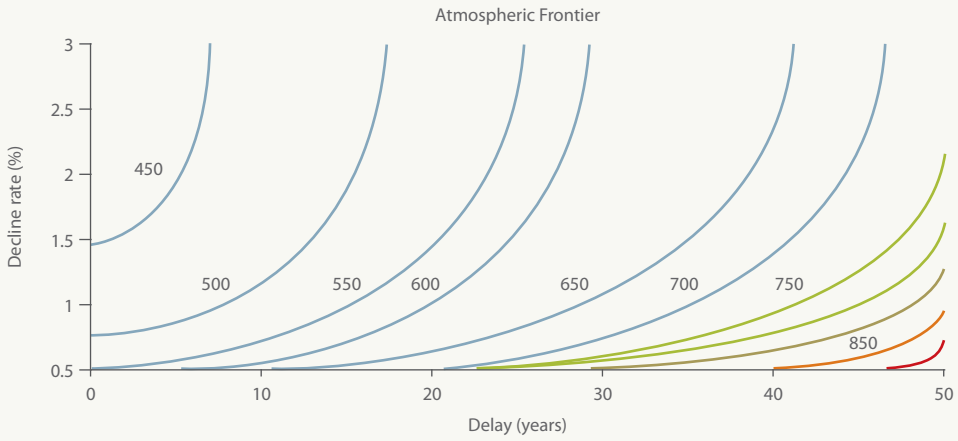


Figure 4: Timing of Mitigation

Source: Atmospheric Stabilization and the Timing of Carbon Mitigation. B.K. Mignone, R.H. Socolow, J.L. Sarmiento and M. Oppenheimer. Submitted for publication in Climate Change (2007)

While it is clearly imperative that emissions should be cut by 1.5% starting today, conversely the world is increasing its emissions. Despite recent efforts to curb carbon dioxide emissions, the Global Carbon Project reveals that since 2000 global emissions have grown four times as fast as during the previous decade. The growth rate of emissions from fossil fuels and cement was measured at 3.5% per year for the period 2000-2007, compared to 0.9% from 1990 to 1999.

This is greater than the most dire growth rates forecast for the decade 2000-2010 in the worst-case emissions scenario (A1FI – the most intense fossil fuel scenario) of the Intergovernmental Panel on Climate Change (IPCC), and is moving the world away from the stabilisation scenarios of 450 ppm (see Figure 5). The worst case IPCC-SRES scenario could lead to a temperature increase of 4-6°C – far above the threshold marker of 2°C for dangerous climate change.

The fact that emissions are increasing and not decreasing and, more importantly, are increasing at a much faster rate than previously estimated, highlights the urgent need for action. We only have 100-150 months to dramatically change the world's energy supply trajectory and avoid dangerous climate change.

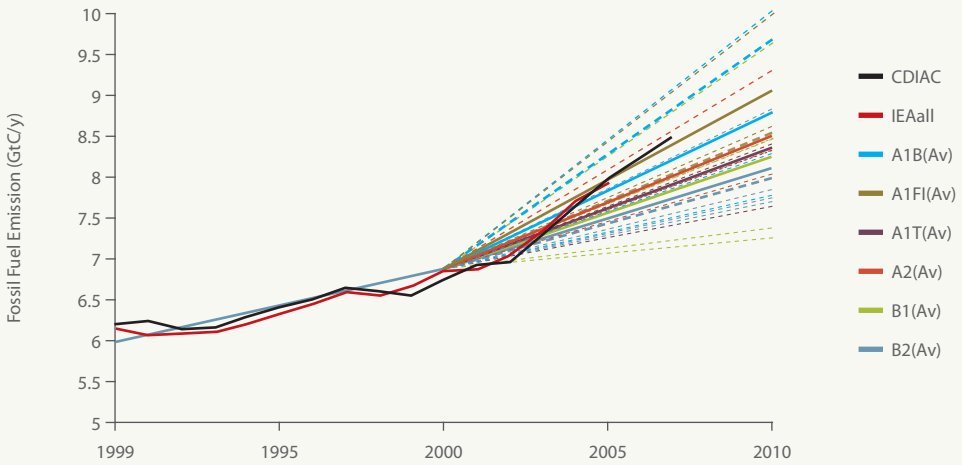


Figure 5: Fossil Fuel Emissions: Actual vs. IPCC Scenarios

Source: Global Carbon Project – Carbon Budget 2007; PowerPoint presentation; CDIAC stands for Carbon Dioxide Information Analysis Centre; IEA stands for International Energy Agency. Emissions are expressed in GtC and must be multiplied by 3.7 to be expressed in $GtCO_2$.

Can the world achieve such a feat? Reducing world carbon dioxide emissions by 50% by 2050, compared to 1990 levels, will require revolutionary changes in our energy production and consumption patterns. Notably, we will have to rapidly introduce mitigation technologies that are commercially viable and that have immediate impacts on GHG reduction at a negative cost. According to the IEA, many clean-energy technologies (renewable energy and energy efficiency) are ready to launch. Moreover, the bulk of end-use energy efficiency measures can be implemented at a negative cost (Figure 6).

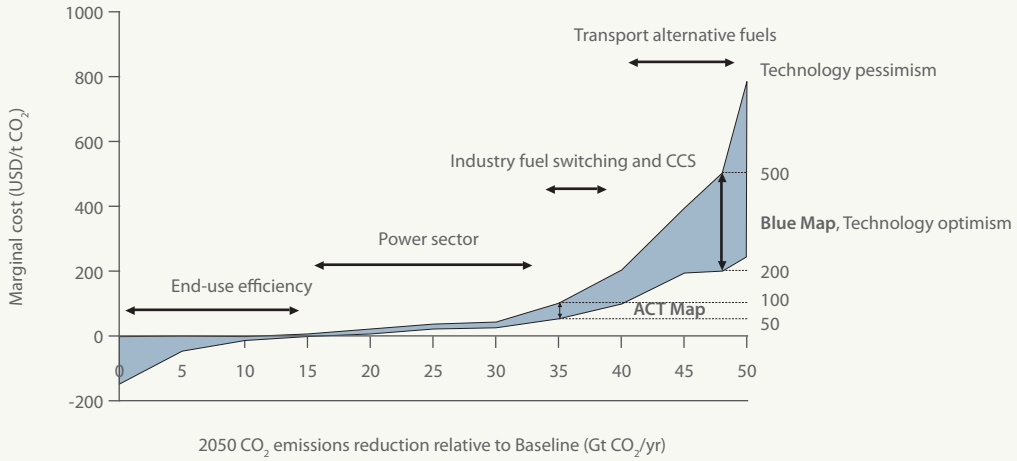
The McKinsey Global Institute has estimated that we could cut the projected growth of global energy demand up to 2020 by at least half, by capturing opportunities which increase energy productivity – the level of output we achieve from the energy we consume[7]. Additional annual investments of US$170 billion for the next 13 years would be sufficient to capture the energy productivity opportunity among all end users.

The economics of such investments are very attractive, with an average internal rate of return (IRR) of 17%, and are calculated to collectively generate energy savings, which can reach up to US$900 billion annually by 2020. In this scenario, 57% of the investments would occur in developing countries, notably China. Similarly, the IEA has shown that, on average, an additional one dollar invested in more efficient electrical equipment, appliances and buildings, avoids more than two dollars in investment in electricity supply. This ratio is highest in non-OECD countries[8].

7 The case for Investing in Energy Productivity – McKinsey Global Institute – February 2008

8 World Energy Outlook 2006 – IEA - 2006

Figure 6: Marginal emission reduction costs for the global energy system 2050



Source: (IEA Energy Tech Perspectives 08)

In addition, efforts to reduce GHG emissions by avoiding deforestation will need to be greatly increased. Most people assume that global warming is essentially caused by burning oil and gas. In fact, between 25 and 30 percent of the greenhouse gases released into the atmosphere each year – 1.6 billion tonnes – is caused by deforestation. Although fraught with methodological difficulties, reduced deforestation and forest degradation is one of the most cost-effective ways to curb carbon dioxide emissions and can potentially generate substantial socio-economic development benefits. By focusing on "avoided deforestation" we could gain critical time to fast-track the deployment of renewable energy technologies that would be fully competitive with fossil fuels.

Chapter 6 will further detail the key role that regional and local governments can play to develop and implement urgent and cost-effective mitigation action.

1.2 How much time do we have for adapting to climate change?

While there is a growing consensus on the need for urgent action to reduce GHG emissions, there is still a widespread belief that we have plenty of time left to adapt to the impacts of climate change. This is doubtful.

Many of the long-lived investment decisions made today are very climate-sensitive and will be drastically affected by changed climate conditions[9]. Examples of such decisions include urbanisation plans, risk management strategies, infrastructure development for water management or transportation and building design and norms. These decisions have consequences over periods of 50-200 years. Urbanisation plans influence city structures over even longer timescales. These kinds of decisions and investments are vulnerable to changes in climate conditions and sea-level rise. For example, many buildings that should normally last up to one hundred years will have to cope with climate conditions in 2100 that, according to most climate models, will be radically different from current ones. In addition, the lead-time for infrastructure projects is significant, which means that action must be taken far ahead of the time when climate risks materialise. For instance, previous coastal defence projects have shown that implementing coastal protection infrastructure typically needs a lead-time of 30 years or more. Likewise, urbanisation plans can only influence flooding risk over many decades. Action must, therefore, begin today to protect port cities and to manage flood risks for the climatic impacts expected bythe middle of this century. Nicholls et al. (2007)[10]estimate that in 2070, up to 140 million people and US$35,000 billion of assets could be dependent on flood protection in large port cities around the world because of the combined effect of population growth, urbanisation, economic growth and sea-level rise.

A second reason for the urgent need for adaptation action is due to the potential magnification of human security risks, stemming from a climate-induced change in the availability of and access to resources. A 2007 report from the Hadley Centre predicts a surface temperature for the coming decade based on a global climate model. It warns that each year from 2010 to 2014, the world has at least a 50% chance of exceeding the record high temperature set in 1998 (average global temperatures reached 14.54°C in 1998). Beyond 2014, the odds of breaking the temperature record rise even further[11]. As climate change develops, large-scale climate change impacts, such as extended droughts over large areas affecting water availability and food security, become more likely. In addition to the economic impact, the social and political impacts could be devastating, particularly if the risk of civil strife escalates as a consequenceof competition over scarce natural resources.

Climate change will exacerbate existing economic, political and humanitarian stress. It will compound existing water scarcity problems, such as increasing the number of people suffering from water stress and reduced access to safe drinking water. It will impact rain-fed agriculture, affecting both local cropping patterns and international production and trade. By 2020, 75-250 million people across Africa could face water shortages and rain-fed agriculture could drop by 50% in some African countries. Crop yields could increase by 20% in East and Southeast Asia, but decrease by up to 30% in Central and South Asia. According to a risk assessment conducted by the German Advisory Council on Global Change (WBGU), without resolute action, climate change will overstretch the adaptive capacities of many societies in the coming decades.

Climate change will certainly draw ever-deeper lines of division and conflict in international relations. It holds the potential to trigger numerous conflicts between and within countries over the distribution of resources, especially water and land; over the management of migration; or over compensation payments between the countries mainly responsible for climate change and those countries most affected by its destructive effects (see Figure 7). WBGU expects that climate-induced security risks will begin to manifest themselves in various regions of the world from around 2025–2040[12].

The map below illustrates the fact that the social impacts of climate change will vary in different regions of the world. The red hotspots indicate regions likely to face greater security risks associated with climate change, based on WBGU's analysis. These are areas where the potential for political and social crises and migratory pressures will intensify as a result of the interaction between increasing drought and the scarcity of water, high population growth, harvest failure, risks from sea-level rise, salinisation in agricultural areas, rising conflicts over access to water and energy resources, and poor political problem-solving capacities. This underscores the importance of effective climate change management as a preventative security policy.

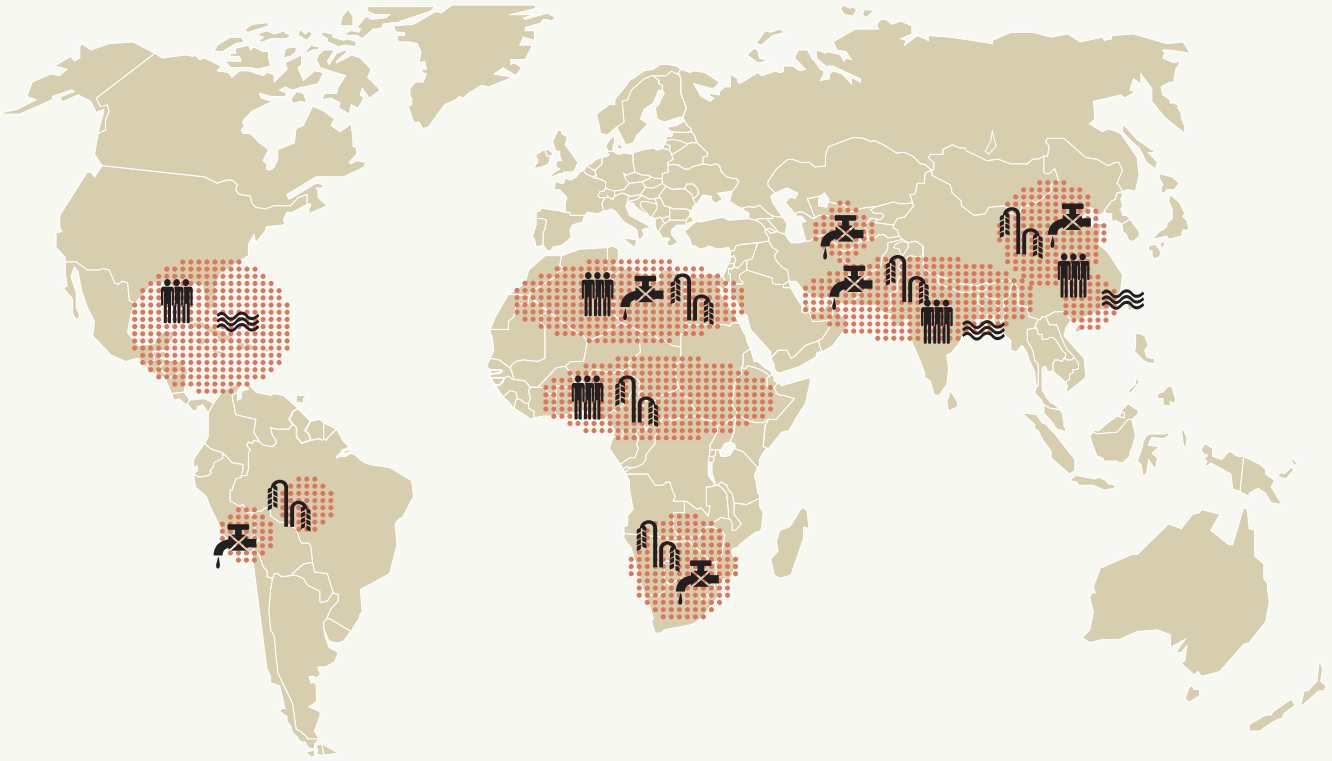
9 Adaptation to Climate Change: Do Not Count on Climate Scientists to Do Your Work, Stéphane Hallegatte, Related Publication 08-01, February 2008, Reg-Markets Center

10 Nicholls, R.J., S. Hanson, C. Herweijer, N. Patmore, S. Hallegatte, J. Corfee-Morlot, J. Chateau, and R. Muir-Wood, 2007. Screening Study: Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes, OECD Working Paper, available on http://www.oecd.org/document/56/0,3343,en_2649_201185_39718712_1_1_1_1,00.ht ml

11 UK Met Office Hadley Centre, "Improved Surface Temperature Prediction for the Coming Decade from a Global Climate Model", in *Science*, 10 Aug 2007.

12 German Advisory Council on Global Change (WBGU), *Climate Change as a Security Risk*, Earthscan, UK, 2008.

Figure 7: Climate Change Hotspots



Source: Adapted from WBGU 2008

The clear message is that the longer the world waits to develop its capacities to adapt to climate change, the less prepared it will be to cope with the growing likelihood of drastic climate impacts and the associated social and political instability. The impact of greater social instability will be most noticeable at the local level, making it critical that the local capacities for developing and implementing adaptation solutions be firmly in place. Adaptation efforts must, therefore, be taken into consideration immediately by local governments and communities.

Successful efforts for fighting climate change will require a dramatic increase in the support provided to developing countries for capacity development, technology transfer and investment. Although they have contributed the least to the atmospheric build-up of carbon dioxide and other greenhouse gases linked to the recent increase in global warming, the developing countries are the most vulnerable to climate change impacts because of their geographic location and heavy reliance on climate-sensitive economic activities, such as agriculture and fisheries. Furthermore, they will be the least able to cope, making it an issue of inequality and insecurity.

Chapter 7 will explore the key role that regional governments can play to develop and implement effective policies to encourage early adaptation action.

Conclusion

Faced with a shrinking window of opportunity on both mitigation and adaptation, it is clear that a dramatic scaling up of efforts at all levels will be necessary in the next few years. The next 10 years will be critical for the future of our planet. During this time, radical measures must be taken, both on mitigation and adaptation, before we lock into irreversible, potentially catastrophic climate changes with no ability to survive them.

It will be impossible to meet the targeted 50% reduction in carbon dioxide emissions by 2050 if we continue with our current ways of doing business. To stay within the carbon budget and achieve a sustainable emissions pathway will require a substantial paradigm shift in terms of our energy and socio-economic development patterns.

Such a paradigm shift will require a dramatic shift in public and private investments from fossil fuels to more sustainable climate-friendly alternatives. Chapter 2 discusses new sources of financing for mitigation and adaptation that can help scale up efforts on climate change.

“Faced with a shrinking window of opportunity on both mitigation and adaptation, it is clear that a dramatic scaling up of efforts at all levels will be necessary in the next few years”

Chapter 2

New Sources of Climate Change Financing

As highlighted in Chapter 1, the world only has 100 to 150 months to dramatically intensify efforts on mitigation and adaptation policies, if it is to avoid dangerous climate change and cope with the impacts of climate change that are already inevitable. Achieving this transformational exercise will require a dramatic shift in public and private investments from traditional energy supply sources and technologies to more sustainable climate-friendly alternatives. The IEA estimates that US$550 billion/year needs to be invested in clean energy, from now to 2030, if we are to limit GHG concentrations to 450 ppm CO_2e (IEA, 2008). Approximately 50% of this will be required for developing countries.

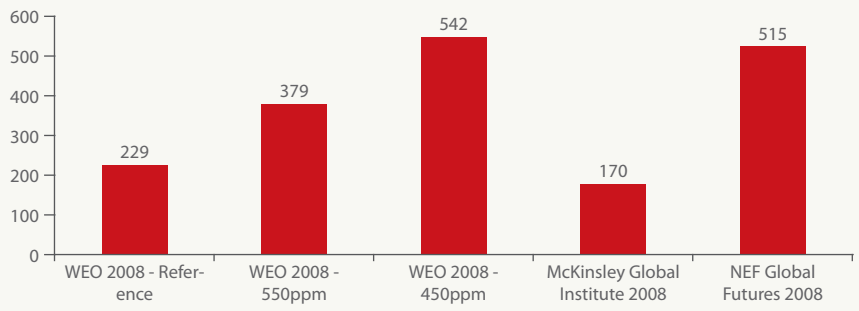


Figure 8: Estimated clean energy annual investment to 2030, US$ Billions

Source: Green Investing, WEF, 2009

Furthermore, UNDP estimates that at least US$86 billion will be required annually for adaptation to climate change by 2015. Official Development Assistance, at present, provides about US$10 billion per year for climate change-related activities, and is only a small percentage of what is required.

MITIGATION (BILLION US$)			ADAPTATION (BILLION US$)		
GEF	0.25	P.A.	LDCF & SCCF	0.3	P.A.
CARBON MARKET	8+	P.A.	ADAPTATION FUND	0.1	P.A.
WB CLIMATE INVESTMENT FUNDS (CIF)	5+	TOTAL	WB CLIMATE INVESTMENT FUNDS (CIF)	~0.5	TOTAL
OTHER			OTHER	0.6+?	P.A.
TOTAL	**~ 10**	**P.A.**	**TOTAL**	**~ 10**	**P.A.**

Table 1: Current dedicated resources for climate change in developing countries, US$ Billions

Source: World Bank, April 2009

A key challenge for developing countries is not only to find ways to attract enough direct investment to meet the growing energy needs crucial for low-income countries to sustain their economic development, but also to drive these direct investments towards lower-carbon technologies so that countries are not locked into unsustainable paths for 30 to 50 years. The international community recognises that most of the financing for energy and adaptation projects in the coming years will have to come from private sources. Therefore, a number of new market-based instruments and innovative financial mechanisms are currently being piloted to attract and drive direct investment towards lower-carbon technologies and practices and to cut the costs of adaptation. The potential of these instruments for galvanising both mitigation and adaptation efforts are discussed in the sections below.

2.1 Financing for Mitigation

Climate change has the potential to affect many companies in both positive and negative ways and is likely to result in a Schumpeter's cycle of "destruction-creation". The degree to which a company is exposed to climate change will depend on a variety of factors, including their business model and geographical location. Government policies to manage the climate can create new markets for low-GHG and climate-resilient products and services, and profoundly alter costs and companies' current comparative advantages. For example, a recent energy-efficiency standard, introduced for existing buildings in France, has the market potential of €350 billion by 2012. Companies and investors are quickly realising that climate change is not merely a social, political, or moral issue - it is an economic and business issue/opportunity as well[13].

13 Investing in Climate Change – An Asset Management Perspective, Deutsche Bank Group.

Table 2: Sources of Environmental Finance for Mitigation

	International Schemes	National and Sub-National Schemes
Public Funds	ODA (multilateral, bilateral and decentralised cooperation) Multilateral Funds	Green economic stimulus Environmental Fiscal Reforms Export Credits Rebates & Subsidies Tax credits & Tax Free Bonds Low interest loans
Private Funds	Green Equity Finance Private investment funds Foundations Non-Governmental Organisations Global Philanthropic Foundations Corporate Social Responsibility (MNCs)	National Philanthropic Foundations Corporate Social Responsibility (National corporations)
Market-based mechanisms	Tradable Renewable Energy Certificates Carbon Cap-and Trade Mechanisms (CDM, JI, voluntary) Tradable Renewable Energy Certificates Green insurance contracts Prog. Approaches (NAMA, etc.)	Tradable Renewable Energy Certificates Utility DSM Green mortgages Tax free climate change bonds Domestic carbon projects
Innovative instruments	Transaction Taxes (Tobin) International CC Finance Initiative Air Travel Levy Global Carbon Tax Debt-for-Efficiency Swaps International Carbon Auction Funds Int. non-compliance fees Efficiency Penny	Carbon Taxes Energy Taxes Auction of Emission Allowances National Non-compliance fees Green Investment Schemes Efficiency Penny

The past few years has witnessed the extremely rapid development of new sources of funding for clean energy and climate change management, to further encourage a shift in public and private investments from traditional energy supply sources and technologies to more sustainable climate-friendly alternatives. Table 2 lists a range of the new financing mechanismsfor mitigation, at the international and national/sub-national level.

The list is by no means exhaustive but it gives an indication of the diversity of schemes available. Some funding schemes operate at the international level and others are only available to domestic investors. These schemes can be divided into four main categories: (i) public funds providing either grant or loan assistance; (ii) private funds providing either grant or loan assistance; (iii) market-based instruments; and (iv) innovative financing instruments.

Market-based instruments and innovative financing instruments are two fairly recent developments in international finance. Market-based mechanisms, such as the cap-and-trade system, rely on markets to provide financial incentives to steer funding towards lower-carbon and climate resilient investments. Cap-and-trade schemes are intended to minimise the cost of a given level of pollution abatement by creating property rights to emit, administratively limiting the supply of permits to ensure the emissions target level is not exceeded and distributing permits (either by auction or by direct allocation). Subsequently a trade in permits is allowed so that emitters lacking permits are forced to buy them from those with a surplus because of abatement. Theoretically, this should result in the marginal cost of abatement equalling the price of a permit within the scheme, with emissions being cut by the most cost-efficient producers[14]. The term "Innovative Instruments" describes schemes that aim to mobilise greater investment towards low-carbon technologies through, among others, levies on carbon consumption, natural resource consumption, incentives for energy efficiency (energy efficiency penny, etc.) and the recycling of emission credits.

The private sector is reacting positively to both the strong likelihood of policies that support low-carbon development, and the financial pressures and incentives to encourage a move in the same direction. According to UNEP's 2008 Global Trends in Sustainable Energy Investment Report, the private sector invested nearly US$150 billion of new money in clean energy technologies in response to these new market opportunities in 2007, an increase of 60% over 2006.

Despite the turmoil in the world's financial markets, 2008 was another year of strong investment in clean energy technologies. However, the energy markets are not expected to remain immune to the financial crisis. The present credit crisis is freezing financing for green energy projects and there is a risk that a number of financial incentives for energy efficiency and renewable energy will be phased out as governments try to trim budget deficits.

[14] Mills, P. Greening of Markets. Finance and Development. 2008

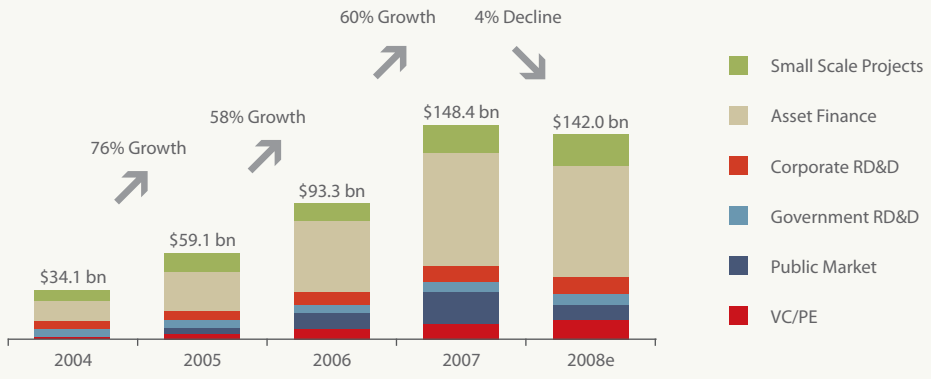


Figure 9: Growth of Private Investment in Clean Energy

Source: New Energy Finance 2009

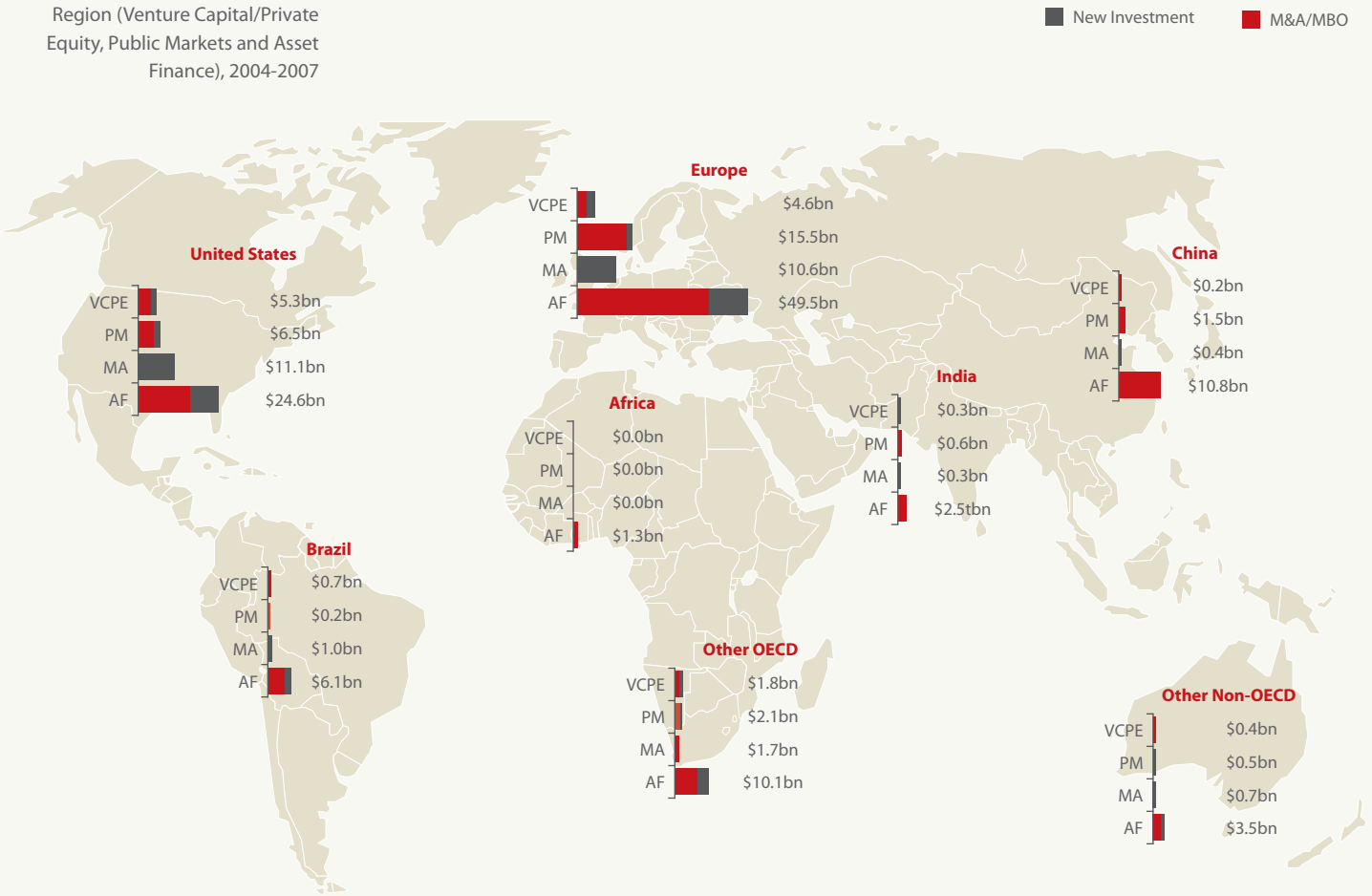
The challenge for the world's policy-makers in the short-term will be to maintain, throughout the financial crisis, the momentum gained for clean energy development over the past four years, thanks to carbon markets and other financial instruments. For this reason, greening part of the world's fiscal stimulus packages will be critical, both for short-term economic recovery and long-term sustainable economic growth. However, over the medium- to long-term, private investments in clean energy technologies are expected to resume their growth and to reach US$450 billion by 2012 and US$600 billion by 2020[15].

However, a key issue with a number of these new and innovative sources of finance is their acute regional and technological unevenness, with the bulk of these funds going to a few large emerging economies and to a small selection of technologies. The EU and the US currently receive the greatest share of both the new investment and the acquisition activity.

Developing countries shared 22% of new investment (venture capital/private equity, public markets and asset finance) in 2007, up from 12% in 2004. However, most of this investment was in China and Brazil, which together represented 17%. In actual financial terms, developing countries attracted US$26 billion in new investment in 2007, double 2006's total of US$13 billion (and 14 times 2004's US$1.8 billion). In 2007, investment in

[15] UNEP, SEFI, NEF, Global Trends in Sustainable Energy Investment 2008: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency, UNEP, 2008

Figure 10: New Investment by Region (Venture Capital/Private Equity, Public Markets and Asset Finance), 2004-2007



Source: SEFI, New Energy Finance

Note: Grossed-up values based on disclosed deals. The figure represents new investment only, and therefore excludes existing public stock changing hands, buy-outs and acquisitions.

the least developed regions, such as Africa, was limited to asset financing of US$1.3 billion – mainly for biofuel plants. Although an estimated 575 million people still rely on traditional biomass in Africa[16], the region accounted for less than 1% of the total private investment in clean energy in 2007.

A closer analysis of private investment, in terms of clean energy technologies, reveals the same picture. Private sector investment in clean energy is strongly biased towards certain technologies. Wind was once again the leading sector in 2007, accounting for US$50.2 billion (43%) of new investment and extending its 2006 lead, when it received 38% (see Figure 11). Solar and biofuels, respectively, attracted the second and third largest investment volumes. Together, all three technologies accounted for nearly 85% of new investment in 2007. In contrast, energy efficiency technologies, whose immediate deployment is critical to avoid dangerous climate change, (see Chapter 1) attracted only 2% of financing.

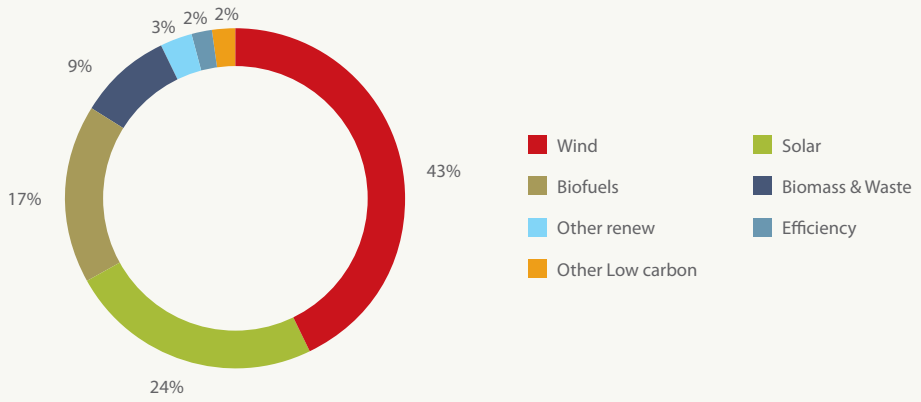


Figure 11: Global new investment by technology type, 2007

Source: New Energy Finance, 2008

Even financial instruments specifically established to drive and attract financial resources for developing countries display the same geographical and technological biases. One example is the Clean Development Mechanism (CDM). This cap-and-trade mechanism was established under the Kyoto Protocol to promote both sustainable development and GHG emission reduction in developing countries.

The CDM has huge potential in terms of allowing developing countries to earn credits for their emission reduction projects and to sell these credits to industrialised countries. The UNFCCC estimated that the CDM could range from US$10 and US$100 billion per year by 2030, depending on emission reduction targets and the price of carbon credits. A recent World Bank study on the potential for CDM in Africa concluded that 170 GW of additional power-generation capacity could be created in Sub-Saharan Africa through low-carbon projects eligible for CDM (i.e. projects recognised by the international community as reducing GHG emissions)[17]. This would equal roughly four times the region's current modern-energy production.

However, the analysis of the existing CDM pipeline reveals that only a limited number of countries are benefiting, and that the mechanism could bypass Africa entirely. Just five countries – China, India, Brazil, South Korea and Mexico – are expected to generate over 80 percent of CDM credits by 2012 (Figure 12). Almost half of these credits will come from non-CO_2 industrial gas emissions (such as HFC-23 destruction and N2O emissions capture) that are characterised by a high return on investment but have very limited sustainable development benefits.

Thus, while new sources of finance for GHG emission reduction hold the promise of attracting a much greater volume of resources, it is clear that developing countries need assistance to truly benefit from them. All too often, current market rules fail to attract direct investors into lower-carbon technologies and sustainable land-

16 WEO 2006

17 Low-carbon Energy Projects for Development in Sub-Saharan Africa – World Bank – 2008

use projects. To ensure that mechanisms such as the CDM achieve the objectives of both sustainable development and cost-effective GHG reduction, the specific market conditions of developing countries will need to be incorporated into the design of the new market-based and innovative finance mechanisms. In addition, developing countries will need assistance to establish an enabling environment (e.g. public policies, institutions, human resource capacities) at all levels, so that countries are in a better position to leverage these new sources of finance to obtain better access to clean energy services.

Furthermore, the potential of many of these instruments can be maximised by appropriately combining and sequencing different instruments. For example, the additional carbon revenues generated through the CDM for wind energy projects are not substantial enough to change the underlying profitability. In such a case, the use of feed-in tariffs in combination with carbon revenues can serve as the critical tipping point. Another example is when introducing regulations that require energy-efficient and climate-resilient building codes. Such regulations would be far easier to implement if they were combined with interest-free loans. Therefore another critical requirement will be to enhance the capacity of decision-makers at the local, regional and national level, to consider different options as part of an integrated climate change strategy.

Figure 12: Location of CDM Projects

Source: Data Generated from UNFCCC, 2007

2.2 Financing for Adaptation

The global cost of adaptation to climate change is difficult to estimate, largely because adaptation measures will be widespread and heterogeneous. The UNFCCC estimates that the additional investment and financial flows needed worldwide for adaptation will be US$60-182 billion in 2030. The largest component in this estimate is the cost of adapting infrastructure, which may require US$8-130 billion in 2030, one-third of which would be for developing countries. The UNFCCC also estimates that an additional US$52-62 billion would be needed for agriculture, water, health, ecosystem protection and coastal-zone protection, most of which again would be used in developing countries. In total, it is estimated that US$28-67 billion in additional investment and financial flows will be required in 2030 for adaptation in developing countries[18]. Others arrive at similar estimates for adaptation. The World Bank concludes that the incremental costs of adapting to the projected impacts of climate change in developing countries are likely to be approximately US$10-40 billion per year, while Oxfam International estimates this number to be over US$50 billion per year. UNDP suggests aid financing for adaptation could amount to US$86 billion per year by 2015.

The current levels of official development assistance (ODA) for adaptation in developing countries are extremely low (less than US$100 million per year). Even if increased significantly, they will probably be insufficient. Similar to mitigation, the past few years have witnessed an extremely rapid development of new sources of funding for adaptation and climate change management. Table 3 lists the potential sources of environmental finance for adaptation, in accordance with the typology adopted in Table 1. Public and private sources of funding for adaptation are very similar to those listed for mitigation in Table 2, with differences emerging in terms of market-based instruments and innovative financing instruments.

In terms of market instruments, weather derivatives and CAT bonds are particularly important for mobilising financing. As with mitigation, financial markets and the insurance industry can also play an important role in supporting adaptation to climate change, specifically through cutting the costs of adaptation — that is, how economies respond to climate change — by reallocating capital to newly productive sectors and regions and hedging weather-related risks.

18 Stockholm Environment Institute, "International Climate Policy", policy brief for the International Commission on Climate Change and Development, March 2008.

Table 3: Sources of Environmental Finance for Adaptation

	International Schemes	National and Sub-National Schemes
Public Funds	ODA Multilateral Funds	Rebates & Subsidies Tax credits & Tax Free Bonds Low interest loans
Private Funds	Global Philanthropic Foundations Corporate Social Responsibility (MNCs)	National Philanthropic Foundations Corporate Social Responsibility (National corporations)
Market-based mechanisms	CAT bonds Weather derivatives	Insurance pools CAT bonds Weather derivatives Green mortgages Tax free climate change bonds Green insurance contracts Flood indexes
Innovative instruments	Adaptation Fund (capitalised from a 2% levy on CERs generated through CDM) Transaction Taxes (proposed Tobin tax) Air Travel Levy Global Carbon Tax Debt-for-Adaptation Swaps Sale of AAUs (and GIS) Int. non-compliance fees	Carbon Taxes Auction of Emission Allowances National Non-compliance fees

Financial markets can help by increasing the ability to trade and hedge weather-related risk, which will probably increase as a result of climate change. Weather derivatives offer producers, whose revenue is vulnerable to short-term fluctuations in temperature or rainfall, a way to safeguard that vulnerability. Similarly, CAT bonds offer a new way for financial markets to spread catastrophic weather risk. They offer insurers more flexible ways to access the global capital markets in order to manage catastrophe risk, thus allowing insurance to continue to be provided despite climate change.[19]

After a slow start in the late 1990s, the exchange-traded weather derivatives and insurance markets have shown strong growth in recent years (see Figures 13 and 14), with a reported turnover of weather contracts exceeding US$19 billion in 2006–07, up from US$4–5 billion in 2001–04. However, here too, these innovative financial instruments are restricted to a few countries. For instance, exchange-traded weather derivatives contracts have focused primarily on short-term temperature trading in selected US and European cities.

There are, however, moves to make these instruments more accessible to developing countries. The World Bank Group is planning to use the weather derivative market as part of a comprehensive strategy to reduce the impact of drought in developing countries. Under a proposal approved recently by its Board of Directors, the World Bank will now offer financial intermediation services to the low-income client countries in its International Development Association (IDA), and will add weather derivatives to the range of risk-management tools available to middle-income client countries of the International Bank for Reconstruction and Development (IBRD). In the event of a severe weather event, client countries would receive a payout from the Bank, the total value of which would be based on an index of the estimated financial impact. This would be funded by the payout the Bank had received from the mirroring transaction.

Instruments such as flood indices enable countries to postpone large-scale investments in flood infrastructure and to adopt "soft" measures to adapt to different climate projections. Over the span of a century, climate change is dictated by variations in the concentration of GHG. However, over the span of a decade, climate varies according to changes in oceanic oscillations. Depending on the direction the Multi-Decadal Atlantic Oscillation takes in the coming few years, West Africa could either experience a moderate increase or decrease in rainfall during the next decade. In this regard, UNDP, in close collaboration with Insurance and Re-Insurance companies, is about to commence piloting flood indices in Africa.

[19] The Greening of Markets. Finance and Development. March 2008

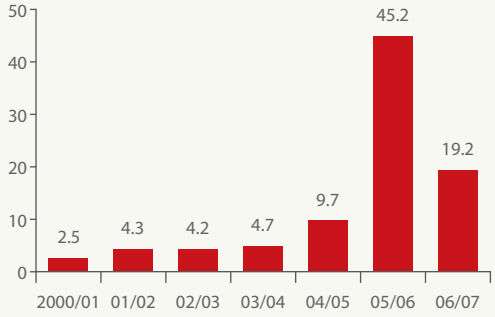
Figure 13: Growth in trading of weather derivatives

Figure 14: Demand for CAT bonds

Blowing hot and cold

The demand to trade contracts providing protection against excessive temperature and rainfall has grown considerably

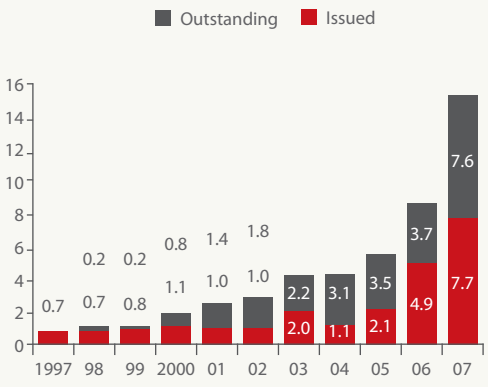
(weather derivativers: national value traded, billion dollars)



Weathering the storms

Demand for catastrophe (CAT) bonds has accelerated in recent years as investors search for risks that aren't correlated with other financial markets.

(catastrophe bond issuance amounts outstanding, billion dollars)



Source: The Greening of Markets

However, while market-based instruments are expected to play the leading role in mitigation, innovative financial instruments are likely to account for a larger share of funding in adaptation. One example of an innovative financial instrument is the Adaptation Fund. This Fund is unique in that it generates revenue through a two percent levy on emission permits – 'Certified Emission Reductions' (CERs) – generated by the emission reduction projects under the Kyoto Protocol's Clean Development Mechanism (CDM).

Figure 15 details the revenue potential of several international innovative financing mechanisms for adaptation. Likewise, similar innovative schemes can also be developed at the local, regional and national levels (e.g. water levy for surplus consumption at the watershed level).

Option	Revenue (US$)	Notes
Application of levy similar to 2% share of CDM proceeds to international transfers of ERUs, AAUs and RMUs	10-50 million Depends on size of carbon markets post-2012	Annual average 2008-2012 Any estimate for post-2012 requires assumptions about future commitments
Auction of allowances for international aviation & marine emissions	10-25 billion (air) 10-15 billion (sea)	Annual average rises from 2010 to 2030
International air levy travel	10-15 billion	US$6.50 per passenger per flight
Tobin tax	15-20 billion	0.01% tax on wholesale currency transactions
Donated special drawing rights	18 billion initially	Special drawing rights are a form of intergovernmental currency from IMF. Some could be donated to the Convention.

Figure 15: Examples of Innovative Financing Instruments for Adaptation

Source: UNFCCC 2007

Conclusion

While the private sector can greatly increase the available financing for implementing mitigation and adaptation actions through innovative financial instruments, it is equally clear that local capacities will have to be built to leverage this financing. To implement market-based instruments, such as flood indices, developing countries will need significant support to ensure financial markets are ready and that meteorological information is available for insurers to better assess local risks. Similar capacity development efforts will be required to identify and implement the most suitable innovative investment at different levels.

Chapter 3 details the key role that regional and local governments can play to scale up efforts to meet the climate change challenges and describes the ongoing initiatives by various regional associations to encourage collaboration and knowledge-sharing across regions.

Chapter 3

The Role of Regions, the Missing Link with Regard to Climate Change

Meeting the climate challenge not only requires a major scaling up of our efforts with regard to adaptation and mitigation policies (Chapter 1) but also calls for a critical shift from our business-as-usual interventions to innovative financing and partnerships. Chapter 2 demonstrates that mere ODA will not be sufficient and acknowledges the different sources of environmental finance that can be leveraged. To fully take advantage of these opportunities and be able to implement the ambitious integrated climate policies required, all stakeholders as well as decision-makers at all levels, will have to be mobilised. Even if the national government remains the central actor, establishing the overall enabling policy and regulatory and institutional frameworks, regional authorities should play an increasing role in tackling climate change.

3.1 The Roles of Regions in Scaling Up Efforts to Address Climate Change

3.1.1 Regions provide a number of opportunities to address climate change

The past two decades have witnessed significant changes in the role of government in relation to social and economic change. Notably, there is increased emphasis on the need for complementary contributions at various levels of government (global, trans-national, regional, local), to address the more complex problems of current society, among which global environmental risks figure prominently[20]. For example, the green paper from the European Union[21] emphasises the subsidiarity of adaptation actions at different levels.

Recognising that changing development pathways will require working with multiple actors, at multiple levels, does not imply a reduction in the role of national government. In particular, national governments should remain central actors in climate policy development as they establish the overall normative and regulatory framework and ensure the delivery of environmental protection to citizens. In accordance with the principle of subsidiarity, decentralised decision-making levels should be responsible for activities which can be performed effectively at a more immediate or local level.

While local and regional governments implement national policies, they increasingly have their own regulatory and planning functions in line with the subsidiarity principle. They are simultaneously policy-makers and investors in a number of sectors responsible for greenhouse gas emissions (basic services, transportation, construction, training, etc.) or impacted by climate change (disaster risk reduction, natural resource management, socio-economic development, etc.). Regions that do not have a policy-making authority can still play a critical role in shaping behaviours through their strategic planning, consensus-building and coordinating roles. Due to its close outreach to local levels and to civic society, the regional level also encourages public consensus by raising the awareness of citizens and integrating the poorest populations. Because the implementation of climate strategies relies heavily on local behaviours and investment choices, success can only be assured when activities at the regional and local level are carried out simultaneously with national level initiatives.

Accordingly, the EEA[22] stresses that adaptation to climate change in the water sector requires interaction between multiple levels of government, as each level can strengthen or weaken the adaptive capacity and action taken at other levels. Furthermore, it notes that "adaptation occurs mainly at the sub-national and local levels".

20 Howes, M. Politics and the Environment: Risk and the role of government and industry. Allen & Unwin: Sydney/ Earthscan: London, 2005.

21 European Commission, Adapting to Climate Change in Europe – options for EU action – Green paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, 2007

22 European Environmental Agency, Climate Change and Water Adaptation Issues - 2007

“Regional authorities are moreover responsible for planning and/or regulating certain investments with long-term impact and a long payback period. Depending on future climate conditions, these long-term investments could either provide sustained long-term benefits or be wasted and negatively impact the resilience capacity of the territory, depending on climate variability”

3.1.2 Regional authorities are in charge of a large number of areas which directly impact and/or are impacted by climate change

In many countries, regional bodies are entrusted with numerous responsibilities across a broad range of climate change related areas. The decisions taken by regional authorities in terms of transportation, land-planning, investments in infrastructure, waste management, public lighting, social housing or energy production all have direct or indirect mitigation and adaptation implications.

Through land-use planning, regional authorities can have a critical impact in different areas (forestry, water, agriculture, transport, etc.). In terms of adaptation, they can, for example, regulate coastal development to reduce the vulnerability in low-lying, heavily populated, coastal areas where sea-level rise is projected or in areas facing increased flooding, coastal erosion and exposure to extreme events. With regard to climate mitigation, land-use planning can determine the availability of land for forestry programmes and protect existing forests, thus increasing carbon sinks and/or biomass resources. Land planning documents can be important tools for promoting wind energy, but also for managing urban sprawl that increases the need for mobility and reduces the use of public transportation.

Regional authorities are moreover responsible for planning and/or regulating certain investments with long-term impact and a long payback period. Depending on future climate conditions, these long-term investments could either provide sustained long-term benefits or be wasted and negatively impact the resilience capacity of the territory, depending on climate variability. Setting-up a public transportation system takes time. A region's decision on whether to invest in building roads or railroads will have long-term implications on regional GHG emissions, energy access and industrial competitiveness.

Although the longevity of building infrastructure varies among countries, it tends to be between 20-100 years. Through procurement choices and/or building code standards, regional authorities can influence energy performance and GHG emissions. For example, in Russia, between 1998 and 2003, fifty-three regional governments adopted mandatory energy codes, covering more than three-quarters of new construction in the country. Building codes can also mandate that a certain percentage of renewable energy or materials be used during the construction of the building. The technical code of the autonomous region of Castile and León in Spain, for example, mandates that solar water-heaters provide part of the hot water and that photovoltaic cells be installed in buildings with high electricity consumption.

In countries where energy suppliers are regulated at the regional level, this creates mandatory feed-in tariffs or quotas (renewable portfolio standards) for renewable energy, or energy saving obligations (white certificates) for energy suppliers. For instance, the state government of Maharashtra (India) has implemented a fixed tariff price for wind electricity, guaranteeing a long-term contract for wind power producers at a fixed price that declines over time (i.e., a “feed-in tariff”). Commercial and industrial users have to pay a small, per unit, charge in support of non-conventional energy projects.

Regional authorities may also encourage the development of sustainable economic activities in their area, by providing the technologies, products and services necessary to adapt to climate change or achieve lower emissions. In areas where local food supplies are projected to be negatively affected by decreasing rainfall and shifts in ecosystem boundaries, regional authorities can encourage an agricultural transition towards other crops by providing training, making new cultivars available, promoting technological adoption through better access to financial risk management instruments, etc. Table 4 provides some examples of climate change mitigation areas typically influenced by regional authorities.

A number of the above-mentioned activities provide substantial development benefits. In addition to managing climate risks, a major driver for these actions was to foster regional development and job creation. Economic studies have shown that employment per unit of GDP is significantly higher in the ‘green’ sector. Indeed, a University of California study, published in October, 2008, discusses the economic impact of California's energy efficiency policies in detail and notes that California's energy efficiency policies created almost 1.5 million jobs between 1977 and 2007[23].Some of the corresponding jobs, in maintenance and installation, are necessarily local.

[23] “Energy Efficiency, Innovation, and Job Creation in California”, University of California Berkeley, 2008.

ENERGY EFFICIENCY	
Energy Building Codes/Building energy performance standards	Russia, Uruguay, USA (majority of States), South Africa (Western Cape), Spain (Castilla y Leon)
Performance Standards for products	Brazil (Sao Paulo)
Energy Efficiency Obligations/White Certificates	Belgium (Flanders), Australia (New South Wales – former system)
RENEWABLE ENERGY	
Mandatory integration of renewables in building regulations	Spain (Castilla y Leon)
Land Planning regulations	Germany(Schleswig-Holstein)
Regulation of energy suppliers (mandatory RE standards or feed-in tariffs)	China, India, USA
Regional Tax exemptions/Subsidies	India, China, Spain (Galicia, Navarra), Germany (Schleswig-Holstein, North Rhine-Westphalia)
GENERAL	
Regional Energy Agencies	Germany (North Rhine-Westphalia, Schleswig-Holstein), France (Ile-de-France, Midi-Pyrénées, Poitou-Charentes, Rhône-Alpes, etc), Serbia (Novi Sad, Beograd, Nis, Kraqjevac)
Regional GHG emission trading schemes	Spain (Aragon), USA (RGGI), Canada (Alberta), Australia (New South Wales)

Table 4: Examples of climate change mitigation areas typically influenced by regional authorities

3.1.3 Through territorial planning, potential sustainable development trade-offs can be managed at the regional level

Policy-making at the regional level is particularly important for mainstreaming climate concerns. Its geographical scale enables local outreach, and it encompasses the rural and urban dimensions. Indeed, it is well-suited to building linkages between different dimensions, which tend to be addressed separately, while their integration is central to effectively meeting climate challenges[24]: sectoral/spatial, rural/urban, environmental/economic/social, national/local, etc.

The ease or difficulty with which mainstreaming is accomplished depends on the design of the various mitigation and adaptation options. They must minimise conflict with other dimensions of sustainable development and equally identify and mediate conflicts between different economic sectors, public and private concerns, and urban and rural populations.

Though difficult, one of the main successes of regional water management in adaptation policies is the provision of information and co-operation with stakeholders[25].

Where trade-offs against other benefits are inevitable, empirical knowledge and coordination between stakeholders is needed to ensure that efficient choices and synergies with local sustainable development goals can be made. A certain number of trade-offs can be identified and managed at the regional level, due to the geographical size and through territorial planning.

24 Theys J., *L'approche territoriale du « développement durable », condition d'une prise en compte de sa dimension sociale,* Développement Durable et Territoires, 2002.

25 Regional Water Management in Adaptation to Climate Change – A survey based study among regions in Europe, Institute for Environmental Studies University of Amsterdam, 2008

In its contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Working Group III lists the potential sustainable development trade-offs with regard to mitigation options. Forestry policies provide a good example of the competing dimensions that have to be taken into account by the authorities. In the case of afforestation, for example, using land that could be used for agriculture could diminish food security and increase food costs. Moreover, monoculture plantations can reduce biodiversity and are more vulnerable to disease, while converting floodplains and wetlands could hamper ecological functions. Equally, preventing deforestation can result in a loss of economic welfare for certain stakeholders (landowners, migrant workers) and reduced timber supplies may lead to reduced timber exports and an increase in the use of GHG-intensive construction materials[26].

Addressing forestry issues at the regional level is particularly important. It combines the ability to undertake land-planning on a regional scale with an empirical knowledge of how to best-address the complexities of specific local contexts and characteristics. An example of this is the draft climate change strategy of the State of Sao Paulo in Brazil, which plans to establish economic incentives for the preservation of existing forests: voluntary compensation for tree-planting and recuperation of vegetation and protection of forests, including the certification of sustainable products which avoid deforestation within and outside the State boundaries.

The regional level is also well-suited to manage trade-offs across a broad range of sectors, such as agriculture, energy, and bioenergy production, by paying particular attention to land-use planning, water-management, energy supply planning, and the use of fertilisers.

Box 1: Managing the trade-offs between water supply and demand: the case of Limpopo Province (South Africa)

The regional authorities of the Limpopo Province (South Africa) worked jointly with their national and local counterparts, to address the problem of water limitation in Polokwane, the capital of the Province. They first undertook a planning analysis covering the next 50 years, which enabled them to understand how climate change would affect water resources and water supplies. This assessment enabled them to identify a series of decisions on the suitable use of this already scarce resource, dealing with the trade-off between increasing access to water and balancing urban, rural and natural water needs:

- promotion of demand management by expanding water metering programmes,
- local government establishment of a price structure in which water price rate increases with increased water usage,
- development of a drought management plan for the Olifants Basin, etc.

Source: Water Resource Planning and Natural Resource Management, Case Study, USAID, 2008, www.usaid.gov/our_work/environment/climate/docs/ap/southafrica.pdf

3.1.4 Regions can play a critical role in amplifying national policies and strategies and stimulating local activities

When regional authorities are entrusted with critical regulation prerogatives, they often become laboratories for developing new, innovative policies.They can tailor policies to fit their particular circumstances (e.g. geography and natural resources) and they are arguably more aware of their unique stakeholder interests than the national government. Currently, most energy and environmental issues in the US are handled jointly by state and federal governments, in order to capitalise on their respective strengths, and state policy innovation has become an impetus for pushing the national government to act[27].

Even when regulations or subsidy schemes are established at the national level, their results will depend on the implementation of activities and an ingrained behavioural change at the local level. Even though climate change is a global issue, many of the sources of emissions are diffuse and many of the climate change impacts are very much localised and differ from one territory to another in the same country. Successfully address-

26 Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2007.

27 Bottom Line on State and Federal Policy Roles, WRI, 2008, http://www.wri.org/publication/bottom-line-state-federal-policy-roles

ing climate change requires a transformation in the consumption and production behaviours of individuals. Therefore, it is critical that individuals understand and take ownership of the measures being proposed to ensure the success of climate change policies.

Thanks to their political legitimacy and their close outreach to their constituency, regions can contribute significantly to the diffusion of national policies through communication, education or incentive programmes.

For example, regions are often responsible for secondary and higher-level education as well as vocational training. It is therefore their responsibility to ensure that the professionals needed (technicians, engineers, architects) receive training on vulnerability assessment, new clean energy technologies, etc. For instance, the Aquitaine Region (France) included a number of training programmes in its 2006 Regional Climate Plan, such as raising the awareness of architects on the integration of environmental issues in building design, training and labeling installers for solar water-heaters. The Province of Quebec (Canada) announced that it would spend CAD6million from 2006 to 2012 to implement a programme to raise public awareness on the issue of climate change and to encourage the population to reduce their emissions. In many countries, regions also fund regional energy or climate agencies or centres that provide individual information, guidance and advice. In Greece, for example, regional energy agencies have been created in Thessaloniki, Macedonia and Crete.

Regional authorities can also influence and assist smaller local authorities in developing their own climate-related policies and projects. Where they have more technical and financial capacities, regions may be able to provide information, methodologies, support and incentives to municipalities, notably in rural settings. In France, for example, the Brittany Region has established a network of energy counsellors to help municipalities to reduce the energy consumption and GHG emissions of municipal buildings. The training and coordination of this network is organised and financed by the Region and its partners.

3.1.5 Regions are increasingly involving themselves in a number of pioneering climate change activities

The survey-based study by the Institute for Environmental Studies on regional water management, mentioned earlier, confirmed that all the European regions surveyed considered adaptation as a priority. As can be seen in Figure 16, most regions have already undertaken a current vulnerability assessment. A majority of the regions have also made an assessment of future climate risk, and more than half have also assessed the present-day and future socio-economic conditions.

A number of regions worldwide have already developed innovative instruments to tackle climate change. Sometimes they even become pioneers in this field, anticipating the effective commitment from their national government.

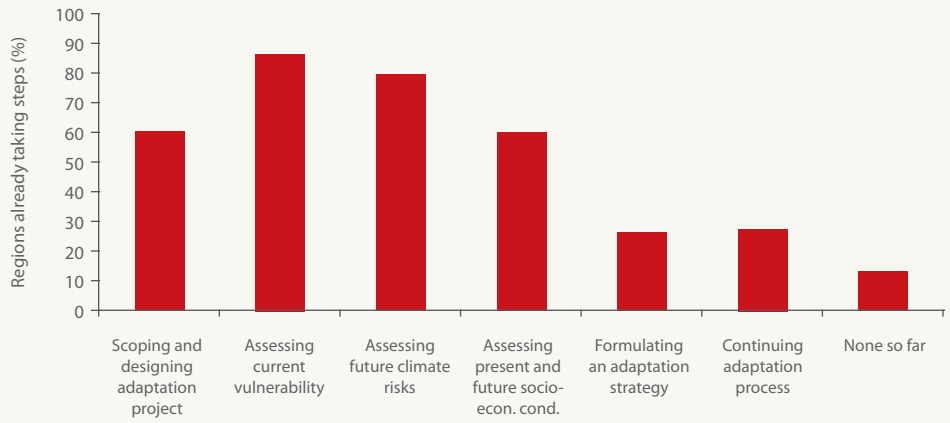


Figure 16: Survey on Steps of Adaptation Taken by European Regions.

Box 2: Shift in Canadian climate change politics through the commitment of its Provinces

Source: Provincial Power Play Breaking Away from Federal Inaction on Climate Change, Marshall Dale, David Suzuki Foundation, 2008

In 2008 the David Suzuki Foundation launched a report which looked at Canadian provincial and territorial action on climate change. When the Foundation first assessed provincial and territorial action on global warming in October 2005, the results were not encouraging. Only a smattering of policies in a few provinces addressed the issue. Despite some good policy proposals, most provinces and territories did not have an active climate change plan. However, a remarkable shift occurred in June 2006, when Quebec launched its climate change plan. Since then, other provinces have competitively followed suit. Four provinces (British Columbia, Manitoba, Ontario, Quebec) have put a broad range of solutions in place and have committed themselves to a cap-and-trade system with hard caps. British Columbia's carbon tax, implemented within months of its announcement, starts at a level five times greater than Quebec's. It also introduced mandatory targets for reducing pollution.

In addition to the integrated climate policies developed by regions and regional states from industrialised countries, regions from emerging countries are also becoming a major force for climate change management. For example, the Province of the Western Cape and the State of Sao Paulo are pioneers in integrated climate change planning at the sub-national level (see Box 3). Such sub-national entities shape an increasing trend of commitment with regard to climate challenge at the territorial level.

Box 3: Regions in Emerging Countries Define Ambitious Climate Plan

Sao Paulo State (Brazil)

- The State Climate Change Policy proposed to the Legislative Assembly had a target varying from a stabilisation of GHG emissions to a 20% reduction by 2020 compared to 2005 levels.
- Sao Paulo has developed large CDM projects in the field of biogas recovery from landfills. The two largest - Sao João and Bandeirantes landfills – both have electric capacities of 20MW.
- CENBIO (The Brazilian Reference Centre on Biomass) in Sao Paulo, supported by the EuropeanUnion, is implementing Project BEST: 160 buses running on bioethanol from 2006 to 2009.
- In April 2007, Sao Paulo created the State Special Commission of Bioenergy, to elaborate the State Plan of Bioenergy. It assesses potential opportunities to develop supply chains of biodiesel and ethanol, defining R&D directions and governmental areas of intervention.
- Sao Paulo is investing US$7.285 billion in the Metropolitan Subway and public transportation within the metropolitan area for the period 2007-2010, four times more than the total invested between 1995 and 2006.
- The Riparian Forest Project, created in 2007, promotes afforestation by extending the forest cover from 13.9% to 20% of the state territory.
- A detailed Ecological-Economic Zoning Map for the sugarcane sector was launched in 2008. It defines where production can be expanded, contained or prohibited, taking into consideration underground water vulnerability, biodiversity, and mechanical harvesting potential.

Western Cape (South Africa)

- Objectives: 15% of renewable energy generated (electricity only) in 2014 off a current consumption baseline of 4200MW; 14% CO_2 emissions reduction by 2014 based on 2000 levels; 10% of renewable energy purchased by Provincial Government by 2010.
- Willingness to mainstream the use of renewable energy technologies within all public buildings in the province through measures such as solar heating, retrofitting and more energy efficient building designs. Energy audits in selected public buildings to be conducted.
- Development of a Sustainable Energy Strategy to ensure energy security, promote a more sustainable supply-side mix, as well as promote energy efficiency and renewable energy. The Department of Environmental Affairs and Development Planning has embarked on a roll-out of 1000 solar water geysers.
- Establishing a CDM Desk in the Province to facilitate and coordinate CDM project applications.

See: http://www.theclimategroup.org/major_initiatives/states_and_regions/sao_paulo_state

http://www.theclimategroup.org/major_initiatives/states_and_regions/western_cape

Regions are also pioneers in assessing, codifying and disseminating local knowledge. In Kairouan, for example, a semi-arid region in Tunisia, a survey was conducted to evaluate the impact of the current climate variability on wheat production[28]. As a result, long-term adaptation objectives in the agricultural sector were identified. Among other results, it appeared that only 12% of the sample population knew of the existence of adaptation methods. Consequently, the farmers' community is now aware of the possibility of using different crop varieties, to adapt their sowing and their cultural techniques to climate change.

3.2 Constraints faced by Regions to Scale Up Climate Change Management Efforts

Numerous untapped opportunities exist at the regional level to tackle climate change, but this decision-making level still faces a number of constraints.

3.2.1 Knowledge sharing is hindered by the varying roles and responsibilities of regions

In the last twenty years decentralisation has established itself as a political and institutional phenomenon in most countries around the world. Whether by choice or as a result of external pressures, a large majority of developing countries are currently involved in some form of decentralisation, with varying degrees of commitment and success[29].

Decentralisation is not new. Since the early 1950s, a wide range of institutional reform programmes have been promoting it. But the current wave of decentralisation is considered to be qualitatively different[30]. These processes are fundamentally changing the institutional landscape in developing countries. Not only are they adding a new sphere of government at the sub-national level, they are also increasingly mandating the regional/local authorities to provide a wide range of public goods and services. As a result of the consistency of the process and the outcome of decentralisation, the regional perspective on economic sustainable development has begun to gain importance. However, the general level of decentralisation varies significantly among countries. There are significant differences in the competence of regions in areas related to climate change. Even in a relatively homogenous unit, such as the European Union, levels of competence are not uniform, as illustrated by the table below.

28 AIACC, 2006. http://www.aiaccproject.org/Final%20Reports/Final%20Reports/FinalRept_AIACC_AF90.pdf

29 *Decentralization and Local Democracy in the World*, UCLG First Global Report, 2007: In its 2007 Global Report, UCLG looked across a worldwide and diverse set of nations and decentralisation processes. It concluded that nations have moved on decentralisation in half a dozen distinct directions, and have not held close to any single normative framework to guide the formulation and implementation of decentralised governance

30 Supporting Decentralisation and Local Governance in Third Countries, EuropeAID, Tools and Methods Series, Reference Document n°2, January 2007

Table 5: Competences of Some European Regions in Climate Change Mitigation-related Areas

	Economic Development, Job creation, New firms	Public Transportation, Roads	Environment	Welfare	Regional Development	Energy	Secondary & Higher Education	Territorial Planning / Land Planning
Austria		x	X			X		
Belgium	x	x	X		x	X		
Cyprus		x						
Czech Republic	x	x	X	X	x		x	
Denmark	x	x					x	X
France	x	x					x	X
Germany			X	X			x	
Italy		x				X		X
Poland	x	x	X	X	x		x	
Slovakia	x	x		X	x		x	X
Spain	x	x	X	X	x		x	
Sweden		x (optional)			x		x (optional)	

Source: Data generated from Europa Regions Magazine

Such heterogeneity hinders the exchange of information and replication of best practices between regions, which would otherwise prove extremely beneficial for such a "new" field of intervention. The EU Green Paper on adaptation, for example, stresses the need to share methods, tools and best practices. The experience gained in responding to extreme climate events and from the implementation of and collaboration on specific and proactive climate change risk management plans, will strengthen the capacity to adapt.

From a broader international perspective, one can also acknowledge the diversity of situations. Box 4 presents the variety of trends among countries with regard to land-use planning responsibilities - a prerogative which plays a central role in terms of climate mitigation and adaptation, as previously stated.

Box 4: The degree of devolution of land-use planning from central to regional, provincial or district level

The degree of devolution of land-use planning responsibilities from central to regional, provincial or district authorities varies widely among countries, depending on their national circumstances and institutional set-up. At the national level, three trends can be observed with regard to the multisectoral and multilevel integration of land-use planning processes:

1. The development of more comprehensive and longer-term national strategies for sustainable land use (e.g., Costa Rica, Mexico, China);
2. Growing decentralisation and devolution of power in land-use planning and management (e.g., Mali, Brazil, Finland, Denmark);
3. Broader consultation and public participation in land-use planning and decision-making (e.g., France, Burkina Faso, Senegal).

A growing number of OECD countries have delegated substantial responsibility for land-use planning to regional or provincial authorities and to municipalities, (e.g., Finland, Denmark). Some regional authorities are also responsible for issuing regional land-use policy statements (e.g., New Zealand) and land-use legislation and regulations (e.g., Canada). In such cases, regional and local authorities establish multisectoral mechanisms to better respond to multiple stakeholder demands (e.g., the coordinated resource management mechanisms in the United States of America).

In Honduras, agricultural, forestry and marketing institutions have been decentralised. Detailed planning is the responsibility of local authorities, which promote citizens' participation, while plans prepared by the regional authorities to preserve landscape values and ecological sustainability are ratified by the Ministry of the Environment.

Source: Integrated Planning and Management of Land Resources ECOSOC, 2000 http://www.un.org/documents/ecosoc/cn17/2000/ecn172000-6.htm

Mali is one of several developing countries that consider the planning and management of their natural resources, and land in particular, as an essential aspect of decentralisation. Mali's new Code Domanial identifies public lands that can be transferred from the Forestry Department to local authorities.

From a general perspective, it is therefore acknowledged that the trend in most countries worldwide consists of giving greater responsibility to sub-national entities. But the transition towards effective decentralisation at the regional level is relatively recent, resulting in an uneven process. There is therefore no easily available one-size-fits-all strategy that could be replicated in all regions. According to their legal, technical, financial possibilities and development priorities, each region needs to define its own strategy and policy mix. Because there is no single, common pattern, sharing and dissemination of experience is more difficult.

3.2.2 Uncertain mandates

A number of regions also suffer from the lack of a clear division of responsibilities between decision-making levels.

Decentralisation at the regional level is still in its infancy with regard to other political processes. One consequence is the lack of a mandate and/or of a clear division of responsibilities between governmental levels, especially when it comes to issues which can easily lead to conflicts, such as those related to natural resources.

These constraints were identified by the World Bank as two of the five critical challenges of the decentralisation policy in Albania in 2004[31]. The World Bank observed that the "undefined role of the regions" could complicate the uniform distribution of responsibilities. Although Albania is a small country, its territory was formally divided into 374 first-level local self-government units (65 municipalities and 309 communities). Thus 48% of these self-governing units, representing 17% of the country's population, are made up of communities of less than 5,000 inhabitants. As with many other European countries in transition, this fragmentation and the lack of a coordinated driving force between national and local levels, raises both political and economic efficiency concerns (e.g., economies of scale, externality spillovers, etc). In 2000, the territorial administrative reform established a second level of local self-government: the Regional Councils. The law assigned them the exclusive functions of planning and coordinating regional actions and of delivering public services. In practice, however, the precise definition of the responsibilities to be assigned to local authorities is still awaited, pending further specific regulation, although considerable efforts have been made to finalise this.

This situation could be attributed to the fact that Albania has experienced almost half a century of an extremely centralised government. But in countries where an ambitious and far-reaching decentralisation policy has been internationally welcomed and acknowledged, such as in Uganda since 1992[32], the same phenomenon occurs to a certain if not sizeable extent. The assignment of environmental prerogatives among the central authorities and the highest level of local government (e.g. district councils) also suffers from a certain ambiguity, thereby undermining the ability of districts to make laws and deliver outcomes in the environmental area.

A 2003 WRI working paper demonstrated this in its analysis of the Ugandan 1997 Local Government Act[33]. The second schedule of this Act details the responsibility of the district councils for assisting "government to preserve the environment through the protection of forests, wetlands, lake shores, streams and the prevention of environmental degradation" (RoU 1997) and lists their detailed prerogatives in this field. However, the same schedule also acknowledges the national Government's ability to make laws with regard to the use of each resource, though recognised as locally managed (forest reserves; forests or trees on public or privately-owned land; wetlands; wildlife; and hilly or mountainous areas, etc).

The failure to assign defined prerogatives to regional/local authorities often leads to conflicts over land ownership and natural resources management. The WRI paper notably explains that, along with other complex factors, this type of conflict increased in Indonesia following the fall of Suharto, which is well-illustrated in a 2002 study on the decentralisation process in this country[34].

3.2.3 Insufficient financial and technical capacities

In countries where the decentralisation process has only recently begun, the transfer of funds to regional authorities has not always been thorough enough to enable them to build capacities and act upon all their mandated areas.Especially in a new field like climate change, technical and financial capacities may be limited. With regard to adaptation, the IES survey-based study[35] demonstrated that regional adaptation efforts in water management were constrained by difficulties in finding financing.

One consequence is that there is a limited understanding of the risks and opportunities related to climate change and the potential development benefits of climate change related activities. Another result is the limited ability to integrate climate change in all relevant sectoral activities and in development strategies in general.

"The failure to assign defined prerogatives to regional/local authorities often leads to conflicts over land ownership and natural resources management"

31 World Bank Report No.: 27885-alb, Albania: Decentralization in Transition, Volume 1, 2004

32 Kullenberg L. and Porter D., Accountability in Decentralized Planning and Financing for Rural Services in Uganda, Entwickling und Landlicher raum, 32 (3), 1998.

33 Bazaar Nyangabyaki, Decentralization, Politics and Environment in Uganda, Working Paper Series, World Resources Institute, 2003

34 Suwondo, 2002. http://www.infid.be/INFID%20Background%202002%20Decentralisation.pdf

35 Regional Water Management in Adaptation to Climate Change – A survey based study among regions in Europe, Institute for Environmental Studies University of Amsterdam, 2008

3.3 Overcoming the Barriers to Increased Regional Climate Change Related Action

More regions must be involved in climate change activities, complementing countries and cities, to tap the significant mitigation and adaptation potential that exists. However, overcoming the existing barriers requires a number of transformations.

- An empowerment of regional bodies, through training and capacity building with regard to climate issues and policies: alongside the usual capacity building methodologies, increasing knowledge transfer between regions should prove influential. This can be done by extending existing decentralised cooperation partnerships to climate change and creating new partnerships. Regional governments have hands-on experience in handling a range of local issues and on how to respond to the needs of their communities and constituencies. Experience exchanges between peers can therefore facilitate the capacity-building process, both through concrete cooperation activities developed in the field and the establishment of knowledge platforms.
- Increasing the capacity of regional authorities to access new sources of financing for adaptation and mitigation policies and projects. Regions need to gain the knowledge and understanding of these new types of climate-related funds but also be able to design projects capable of attracting the interest of potential financiers.
- Shifting from a project-based approach to an holistic approach. Despite the developing trend for joint programmes and aid harmonisation, the dominating approach for delivering donor support to local development still remains a sectoral and project approach (either focusing on selected geographical areas or specific separate discrete areas, with individual project institutional arrangements). This top-down approach seems to drive a development path conceived abroad and which lacks consistency. This addition of partners and their respective fragmented and dispersed projects is unlikely to make a development strategy. Conversely, integrated approaches based on regional development priorities can facilitate stakeholder participation and endorsement.

Associations and regional networks also focus more and more on climate change, enabling the exchange of experience and best practices among their members and increased recognition. (See Box 5.)

In October 2008, a major global initiative was launched, supported by nrg4SD, and the first World Summit of Regional Governments on Climate Change in Saint-Malo (France) was organised. Some 100 regions from 65 countries of the 5 continents attended. The Saint-Malo Declaration advocates for the acknowledgement of the policy and implementation competencies of regional governments, related to a range of sectors, which directly impact and are impacted by climate change. Signatories to the Declaration also committed to actively participate and take action in future international climate change endeavours, in line with the principle of common but differentiated responsibilities and respective capabilities[36].

[36] See: http://www.worldsummitofregions.org/pub/focus/7_doc_10_saintmalo_declaration-en.pdf

- **nrg4SD:** the Network of Regional Governments for Sustainable Development was formed by the regional governments that attended the Johannesburg World Summit on Sustainable Development (2002) to share information and experiences about sustainable development policy-making at the regional level. On November 2008, its Secretariat committed itself to fully participate in the preparation of the roadmap towards a Post-Kyoto regime within the framework of the UN.

- **AER:** Bringing together over 270 regions from 33 countries and 13 interregional organisations, the Assembly of European Regions aims at a triple objective through its activities in the environmental field: it draws regions' attention to the challenges linked to climate change, encourages them to mainstream environmental concerns in their policy-making processes, and take measures for safeguarding their natural resources. Climate change was the theme of the recent meeting of the Assembly, which took place in the Limousin Region (France) in March 2009.

- **ENCORE:** The Environmental Conference of the Regions of Europe is dedicated to political co-operation between the regional environment ministers of the European Union. Through this co-operation ENCORE aims to contribute to the effective implementation of EU environmental policy, at improving environmental governance and sustainable development in EU regions.

- **Climate Group:** Launched in 2004, this network builds the economic case for taking action against climate change. It is of particular interest as it created a coalition of regional and municipal governments and of major business companies to reach its goal. One of its main initiatives, "States and Regions", consists of cooperating with sub-national governments to explore how they can act against change and demonstrate to their national and international counterparts that a prosperous low-carbon economy is possible.

Box 5: Regional associations advocate for the recognition of the territorial level as a relevant scale for the implementation of climate change policies.

Conclusion

This chapter established that greater recognition is needed of the role that regional governments could play to address climate change, in line with and to complement the efforts undertaken at the national, international and local levels. The regions have already begun to engage themselves and are willing to work with their national counterparts in the field of climate change. The next chapter describes the methodology developed by UNDP for the preparation of Integrated Climate Change Action Plans at the regional level to enable the Regions to identify priorities and opportunities to maximise their potential to scale up international climate change management efforts.

Chapter 4

The Need for New Decision-Making Tools

We have previously discussed the need for a dramatic scaling up of mitigation and adaptation efforts at all levels, the identification of new environmental financing sources and the leading role regional authorities will be expected to play in the future. Regional authorities will additionally need to adopt new long-term, strategic planning approaches for scaling up their climate change management efforts.

4.1 Why do we need long-term, integrated, cross-sectoral and participatory planning?

4.1.1 A long-term horizon

As mentioned in Chapter 1, climate change represents a dramatic increase in uncertainty for decision-makers, and new decision-making methods must be developed to cope with it. In the past, the climate parameters pertinent to most human activities could be observed and measured. Consequently, engineering and investment appraisal methods were designed to produce the most appropriate solutions for known climate conditions. In the future, substantial climate uncertainty may make such methods more difficult to apply[37]. Using two different climate models (HadRM3H from the Hadley Centre and ARPEGE from the CNRM) and the IPCC SRES-A2 emission scenario, Figure 17 provides an artificial view of present climate conditions in 17 European cities and projections of where these cities would be located by 2075[38].

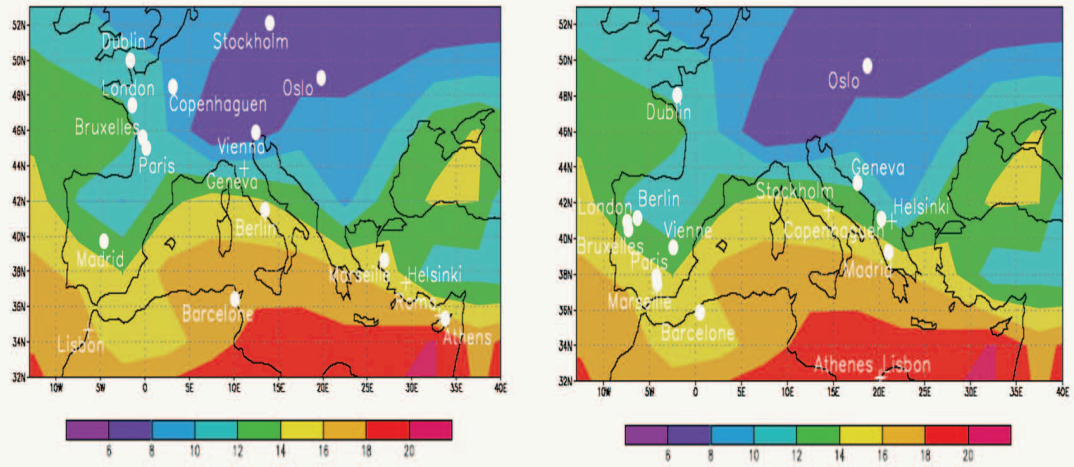


Figure 17: Climate Analogues of the Future Climates of 17 European Cities by 2075

Source: S. Hallegatte ; J.-C. Hourcade ; P. Ambrosi, Using Climate Analogues for Assessing Climate Change Economic Impacts in Urban Areas, in Climatic Change 82 (1-2), May, 2007, pp. 47-60.

The availability of two climate analogues (equivalents) for each city provides a useful estimate of the uncertainty of the expected magnitude of climate change and the required adaptation strategies. For example, Paris' climate in 2075 could either be similar to the present climate of Bordeaux (ARPEGE model) or Cordoba (HadRM3H model). These are two very different scenarios. The first outcome could mean a fairly easy adaptation, whereas the second would represent a significant change in climate conditions. The 2003 heatwave in France, which is similar to an ordinary summer in Cordoba, was responsible for more than 15,000 premature deaths and €13 billion in economic loss[39].

37 Adaptation to Climate Change: Do Not Count on Climate Scientists to Do Your Work, Stéphane Hallegatte, February 2008

38 Climate analogues are based on recorded conditions that are considered to adequately represent future conditions in a study region. Their selection is guided by information from sources such as global and regional climate models.

39 Using Climate Analogues for Assessing Climate Change Economic Impacts in Urban Areas, S. Hallegatte and J.C. Hourcade, 2005.

The infrastructure in Paris will have to be able to cope with this wide range of possible climate scenarios. One adaptation strategy could be to wait and invest in widespread air-conditioning throughout the city, in case the future climate of Paris becomes like that of Cordoba. This strategy would avoid investments which would not be necessary if the future climate in Paris became similar to that of Bordeaux.

A major drawback of the 'wait-and-AC' strategy is that it will require an investment in additional power-generating capacity of 10GW to cope with the summer peak in electricity demand generated by the constant use of air conditioners. The additional electricity bill will represent a significant burden for low-income families, who usually live in less thermally-efficient homes. Furthermore, this increase in power-generating capacity might hinder the city's efforts to achieve zero-carbon emissions by the end of this century.

As highlighted by Hallegatte et al (2007), a second adaptation strategy could be to adjust building standards and urban planning to ensure that new buildings are less vulnerable to higher temperatures. Although the costs of upgrading thermal standards for new buildings are relatively small, the time-scale of this strategy would be about 150 years. Any delay in the implementation of this second adaptation strategy would require the earlier replacement or costly modification of existing buildings.

A key challenge for planners in Paris and the Ile-de-France Region will be in designing different climate and socio-economic scenarios, assessing possible adaptation strategies, and in line with these long-term projections, identifying and implementing development strategies which can cater to a wide range of possible climate futures for the Region.

Planners in developing countries will find this more challenging, because of the marked scarcity of hydro-meteorological data and the lack of regional climate change studies. For example, in the western Sahel in Africa, there are still major discrepancies between the different global climate change models retained by the IPCC. Some project a significant drying while others simulate a progressive wetting, with an expansion of vegetation into the Sahara.

Furthermore, there is growing evidence linking droughts in West Africa to decades-long fluctuations in the strength of major ocean circulations. Depending on the trends in these ocean fluctuations in the coming decades, a third and potentially truly catastrophic scenario for the Sahel, could be an initial increase in rainfall in the next decade followed by a significant drying thereafter.[40] The population that would initially have moved north to capitalise on the new farming opportunities offered by the expansion of vegetation, would then find themselves trapped in a very hostile environment once the African Monsoon had reversed.

The current water infrastructure in West Africa could face a significant drying, a progressive wetting, or even an initial wetting period followed by a significant drying period, over its lifetime. Water engineers can easily design water infrastructure adapted to progressive drying or wetting. However, it is infinitely more difficult to design water infrastructure adapted to the full range of possible future climates.

Thus, while we know that our climate will change over the long-term, in many cases decision-makers may be confronted with a situation where the direction of change isn't fully clear at this stage. Even with this imperfect information, they will still need to make investment decisions today to protect their citizens from climate fluctuations, because infrastructure projects and actions must be initiated far ahead of the time when climate risks become real.

Decisions on which development trajectory to pursue and how to modify investments today will necessarily have to be made with a long-term horizon, taking into consideration a number of uncertainties. Simply reacting to changes in the short-term or medium-term without attention to fluctuations over the long-term could result in poor investment decisions; the costs of which could exceed the direct costs of global warming. Fortunately, and as further discussed in Chapter 7, many strategies which cope with these uncertainties can be identified and implemented and a number of flexible, prospective tools can be used by sub-national governments to conduct this type of prospective exercise, even in the absence of comprehensive datasets (Hallegate, 2009)[41].

[40] Climate change: The Next Ten Years, Fred Pearce Michael Le Page, New Scientist, August 2008

[41] Hallegatte, S., 2009: Strategies to adapt to an uncertain climate change, *Global Environmental Change* 19, 240-247

Reducing emissions also requires a long-term planning horizon. In the long run, countries will certainly have to find ways of satisfying the energy needs of their populations with near-zero net CO_2 emissions in order to avoid crossing the 2°C threshold. Because power plants built today have a long life-cycle and are not easy to upgrade at a later stage, decisions made now will have a major impact on energy security and carbon emissions in the coming years.

Business decisions vary under different policy conditions, and climate policy certainty can dramatically strengthen investment incentives for low-carbon technologies. For example, coal is the single largest fuel source for a number of countries today, and no resource will challenge that position in the immediate future. Coal-fired plants using integrated gasification combined cycle technology (IGCC) can supply electricity, liquid fuels, or hydrogen at lower pollution levels than traditional pulverized coal boiler power plants. In addition, IGCC makes carbon capture and sequestration much easier and cheaper, and thus can enable a smoother transition from coal to alternative energy supply technologies in coal-dependent countries.

However, IGCC plants are currently more expensive than conventional coal-fired plants and the only financial rationale for applying the technology today is to achieve compliance with future climate change policy. Therefore, uncertainty in future climate policy strongly affects the economic case for IGCC investment. To stimulate investment in low-emitting technologies, climate change policy must be rooted in the long-term development plans of the regions and be designed to provide as much strategic certainty as possible. While policy-makers cannot count on scientists to reduce climate change uncertainty (S. Hallegatte, 2008), they have a key role to play in helping define clear-cut climate change policies which provide incentives for low-emitting investments and avoid locking regions and industries into unsustainable development pathways.

“Not only do climate change management efforts have to be planned with a long-term perspective, but they must also be cross-sectoral in nature”

4.1.2 Integration of mitigation and adaptation

Not only do climate change management efforts have to be planned with a long-term perspective, but they must also be cross-sectoral in nature. Climate change policies cannot be developed in an isolated context. Promoting increased resilience to the impacts of climate change (adaptation) and a lower GHG emission economy (mitigation) are both closely intertwined with development choices and actions that cover a variety of sectors, such as energy, agriculture, health, water resources and infrastructure. It is essential that both synergies and trade-offs between adaptation and mitigation activities be considered, including the possible positive and negative side effects.

For example, agriculture will be one of the key human activities affected by climate change. Reducing soil carbon emissions through sustainable land management practices not only contributes to climate change mitigation, but can also strengthen the adaptive capacities of vulnerable communities; reduce biodiversity loss; enhance water conservation; and boost agricultural productivity and economic growth. At the same time, as adaptation and mitigation strategies in agriculture are implemented, modifications to local agricultural practices aimed at maintaining production and income, to alleviate the potential negative effects of climate change, may hamper mitigation efforts (e.g. land use changes, heavy reliance on fertilisers, etc.).

Another example is the case of infrastructure and city design. Depending on its design, a city will be more or less vulnerable to flood (because low-density cities need more land and are pressured to use all available land, including flood-prone areas) and heatwaves (because a large city causes more urban heat that increases nighttime temperatures). A city's design will also affect transportation demands which makes it either more or less difficult to implement efficient public transportation, leading in turn to more or less emissions. It is therefore crucial to take into account both adaptation and mitigation in a consistent framework when deciding on city design.

In urban areas, enacting new building codes to promote thermally-efficient houses, planting trees in cities, and encouraging integrated water resource management practices, are also examples of possible synergies between adaptation, mitigation and socio-economic development efforts. Conversely, extensive urban sprawl, the broad use of air conditioning and reliance on individual transport infrastructure will increase climate change risks.

> Focusing too much on individual mitigation or adaptation goals, without considering side effects and linkages with other goals, could also lead to missed opportunities

Focusing too much on individual mitigation or adaptation goals, without considering side effects and linkages with other goals, could also lead to missed opportunities. For example, improving the energy efficiency of buildings in line with new building codes might require the removal and replacement of old refrigerators and air conditioners. A narrow focus on this goal alone might lead to scant consideration being given to the proper disposal of old appliances. This could result in the release of ozone-depleting substances (ODS) into the atmosphere. As ODS have a far greater global warming potential than carbon dioxide, this narrowly focused mitigation activity could actually lead to a net GHG emission increase rather than a decrease. Furthermore, ODS removal can mobilise finance from carbon markets, and this potentially rich source of financing would not be available if ODS is not taken into account when planning mitigation efforts.

Unfortunately, most climate change plans tend to look at either mitigation or adaptation but not both. They also rarely consider the possible side effects. A wide range of barriers currently discourages the tighter integration of adaptation and mitigation efforts. Mitigation and adaptation decisions are made by two different communities - energy practitioners and development practitioners. These different actors operate across different sectors and on different spatial, temporal and institutional scales. They manage different budgets, and sometimes compete with one another for resources.

The ability to create synergies is further constrained by a limited understanding of the actual synergies, conflicts and trade-offs which can exist between mitigation and adaptation measures at the local level, and of the possible options for the effective climate-proofing of regions and cities. A key element of an integrated regional and local level climate policy should be the introduction of economic and policy instruments which encourage the systemic review of cooperation and conflict-resolution options.

Once a common climate profile has been prepared, the different actors will be empowered to identify the 'common ground' of adaptation and mitigation. The most important sectors for integrated climate change action are likely to include land-use planning, nature conservation, agriculture and forestry, energy supply and mobility.

4.1.3 Participation and reiterative planning

Climate change management actions not only fall across a variety of sectors, but are also largely the responsibility of organisations and individuals outside the government. Thus, the involvement and commitment of the private sector and civil society must be emphasised when planning climate change management efforts.

Key challenges for the successful implementation of an integrated climate change policy will include:

- achieving a balance between the different objectives and priorities of various groups;
- clarifying the distinct and accountable roles of each partner in the realisation of the policy;
- stimulating private sector and community involvement in activities, both as investors and as consumers (e.g. early retirement and recycling of energy efficient appliances; adoption of new production and consumption patterns; planting of trees);
- encouraging public-private and cross-sectoral partnerships; and
- establishing active communication channels between partners to share information and adjust targets and measures as required.

Despite decades of effort, insanitary landfills remain among the most vexing environmental problem for both developed and developing countries. By providing an additional revenue stream for the recovery of landfill methane emissions, GHG cap-and-trade instruments, such as the Clean Development Mechanism, provide unprecedented opportunities to address this concern. However, a successful landfill methane recovery project

might require the involvement of numerous actors: the community, in sorting and collecting garbage; the public authorities, in stipulating environmental and social safeguards to be met by project developers,and also in granting operating licences and clarifying GHG emission reduction ownership rights; and the private sector, which provides expertise and investment. A participatory and reiterative planning process can promote the required public-private partnerships in a cost-effective manner, ensuring that the potential of mitigation initiatives, which provide multiple development benefits, do not remain untapped in low-income countries (see Chapter 3 on the regional unevenness of access to CDM).

Traditional planning is frequently perceived as a tool for creating rules and constraints to development. Integrated climate change management planning, by contrast, should be regarded as a process that determines changes based on a participatory analysis of the region and its potential evolution, and which develops concrete projects and initiatives benefitting the entire community. It should be a dynamic, three-pronged process: developing a long-term vision based on the key problems of local communities; concentrating activities around the most urgent problems; and developing communication and collaboration among all core stakeholders within the community.

Over the past two decades, local institutions have initiated a wide range of initiatives targeting citizens' participation and the piloting of different participatory methodologies. This wealth of experience provides the foundation for integrated climate change policy development at the regional and local levels.

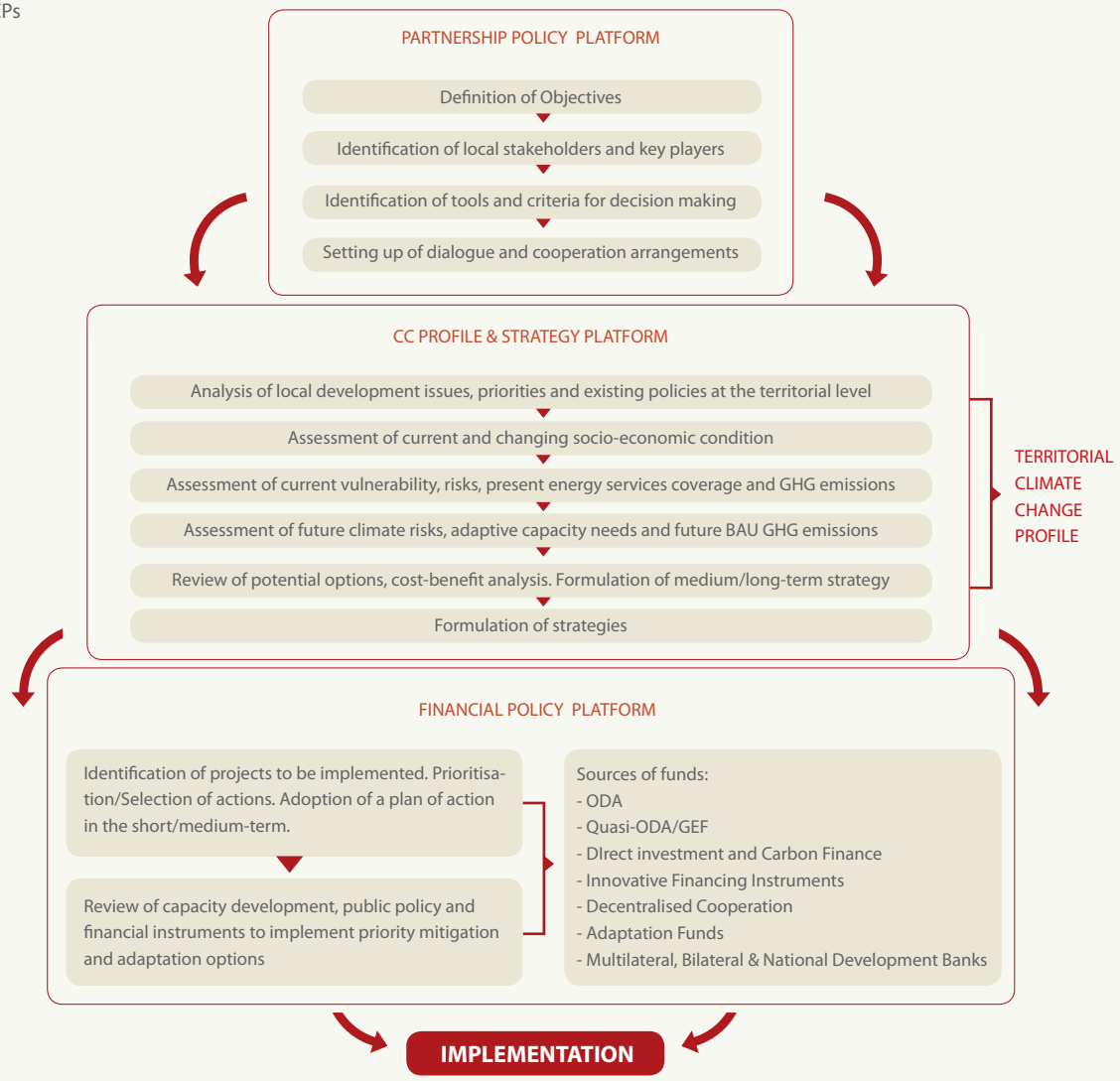
4.2 How do Integrated Climate Change Action Plans work?

To support regional authorities in planning climate change efforts in line with the above-outlined planning principles (long-term horizon; integration of mitigation and adaptation; participatory and reiterative processes), UNDP has developed and adapted a menu of tools for the preparation of Integrated Territorial Climate Plans (ITCPs). These tools are grounded in tried and tested approaches to planning and are underpinned by academic knowledge. They can be customised to meet the unique requirements of each region and have been consolidated into three principal platforms (see Table 6):

Table 6: Key objectives of the Three Platforms

Platform	Handbooks and Tools	Objectives
Partnership Platform	Developing an Integrated Territorial Climate Change Plan: A Partnership Policy Framework	Helps identify a "common ground" among all partners on the objectives of the ICCAP, and puts effective feedback mechanisms in place.
Climate Change Profile and Strategy Platform	Climate Change Impact Scenarios and Vulnerability Mapping Technology Needs Assessment Handbook GHG and Energy Assessment	Helps regional authorities to conduct a physical and socio-economic impact assessment of climate change in their territories, to set medium- to long-term mitigation and adaptation targets that balance development and environmental goals, and identify and implement strategies for realising these targets.
Policy and Investment Platform	Climate Change Policy and Investment Handbook	Assists regional authorities to identify the most appropriate combination of policy instruments (regulatory, economic, etc.), as well as assess and access the different sources of climate change finance needed to finance the activities required to achieve mitigation and adaptation targets.

Figure 18: Methodologies and Process for Developing ITCPs



The following section briefly presents these three platforms in an idealised and linear fashion for the sake of clarity and brevity. In practice, these tools will need to be used in a very flexible and reiterative manner in light of the huge range of local circumstances, as seen in Chapter 3. The actual planning process is likely to change and evolve continuously in order to meet the unique needs of the regions and of their institutions. A more detailed and nuanced description of the different platforms is given in the second part of this Primer and its companion methodological handbooks.

4.2.1.Establishing a Partnership Policy Platform (PPP)

ITCP preparation must start from a thorough understanding of the situation on the ground (real development problems/issues, major priorities, actual policy, regulatory and institutional frameworks, power brokers, etc). By recommending that one of the first steps of the preparation process should be to establish a clear organisational and partnership structure, the proposed approach recognises that a range of actors will need to be involved at a very early stage. These will include representatives from the central government, regional government, NGOs, and the private sector, among others. As mentioned earlier, each of these groups may have differing opinions on the objectives of the ITCP (creation of green jobs, universal energy access for the poor, zero net emissions to comply with national standards, etc.). Moreover, the tendency of the few existing regional plans is for them to be skewed in one particular direction - for example, by focusing on mitigation alone but not on adaptation.

The preparation of an ITCP can only succeed if focused, persistent and competent efforts are secured for a long enough period to create a stream of positive results leading to tipping points, starting with quick initial successes and continuing with addressing the complex issues as well. As a precondition to securing such long-term support, the purpose of establishing a Partnership Policy Platform (PPP) is to provide an opportunity for all actors to present their views, and to come to a collective agreement on the main objectives of the ITCP. It will ensure that the ITCP does not overlook issues perceived as critical by key constituencies. It will also enable project proponents to develop a good appreciation of the actual implementation capacity of the concerned institutions and to adjust the implementing approach and mechanisms accordingly.

In addition, the PPP should enable regional actors to agree on the success criteria of the ITCP, to continuously appraise its performance and intervene at critical junctures to adapt the strategy in light of lessons learned. Knowledge creation and capture seldom happens by itself - in order for it to occur, it must be planned and adequately resourced.

The last proposed step of the PPP ("setting up dialogue and cooperation arrangements") aims to ensure that two critical political ingredients for successful climate change efforts are in place:

- A political commitment: deciding to enter a process and vote on the decision, giving the responsibility of overseeing the process to one elected representative.
- An organisation: setting up a team in charge of elaborating, implementing and monitoring climate change activities.

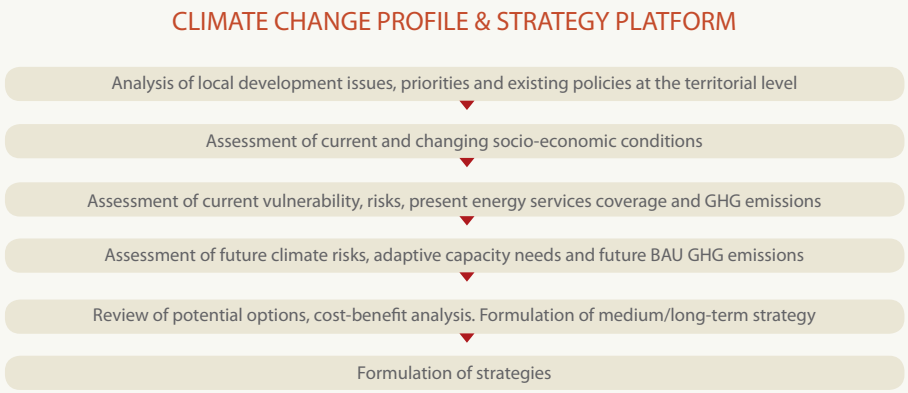
Figure 19: Partnership Policy Platform

Chapter 5 further describes the various instruments available for establishing an efficient partnership platform, adapted to the unique circumstance of each region. For project proponents, detailed information on these instruments is given in the methodological handbook "Developing an Integrated Territorial Climate Change Plan: A Partnership Policy Framework".

4.2.2 Climate Change Profile and Strategy Platform (CCPSP)

The objective of the CCPSP is to assist regional authorities to move from the implementation of one-off and dispersed mitigation and adaptation projects to a medium- to long-term strategic process, capable of transforming the development of the region in ways that meet development objectives without compromising on climate change targets. UNDP and its partners stand ready to assist regions through the different steps of preparing a CCPSP by providing them with tools, methodologies and training, as well as by facilitating exchanges and the dissemination of best practices. Several elements of this process are described below.

Figure 20: Climate Change Profile and Strategy



(I) Analysis of local development issues, priorities and existing policies at the territorial level

Opportunities to create synergies are greater in some sectors (agriculture and forestry, energy, buildings and urban and transport infrastructure, risk reduction, water resource management) than in others (health, tertiary services). An analysis of local development issues could enable planners to forge a better understanding of the synergies, conflicts and trade-offs between mitigation and adaptation measures.

(II) Assessment of current and changing socio-economic conditions

A good understanding of the socio-economic patterns of the region and how these are likely to change over time is an important foundation for developing effective mitigation and adaptation strategies. This is because socio-economic conditions affect vulnerability to climate risks. How people live and work in communities, how regional government policies encourage certain socio-economic activities and discourage others, and the prevailing forms of social solidarity and organisation are all factors that influence both the vulnerability to climate

risks and how best to adapt. They also influence energy production and consumption patterns, land-use and mitigation options. The challenge is to develop mitigation and adaptation strategies that are applicable to that region's society in the future.

(III) Assessment of current vulnerability, risks, present energy service coverage and GHG emissions

Understanding the historical interactions between society and climate hazards is a critical step in determining how to build resilience to future climate risks. What kind of climate risks is the region currently facing, who is affected and how vulnerable are they, and how has the region traditionally managed/adapted to these risks? Having precise answers to the above is critical for building resilience to future climate risks. Even if future adaptation strategies are very different from those currently in use, past and present approaches to increasing climate-resilience will help in selecting those strategies which are best adapted to the region's general coping mechanisms and behaviours.

Vulnerability assessments can help regional decision-makers assess the extent to which anticipated benefits from existing development projects are sensitive to the risk of climate change. This is particularly important for developing countries that are witnessing the rapid build-up of long-lasting civil infrastructure (such as irrigation systems, transportation networks, and urban settlements). Through a structured step-by-step process, regional authorities will be able to agree on how vulnerability should be defined in their particular context; identify and characterise vulnerable groups and/or sectors; assess current and future vulnerability of the target groups/sectors using indicators; and finally, identify intervention points for increasing climate-resilience.

For mitigation purposes, an analysis of the balance of emissions and their possible changes could be undertaken to identify priority sectors (buildings, transportation, industry, energy, waste, agriculture and forests) and possible mitigation options (lower the energy consumption of new buildings, promote shifts in transportation modalities, strengthen reduction, re-use and recycling of waste). Quantifying GHG emissions and their evolution trends can be conducted through carbon budget assessment tools. The objective here is to plan for a series of measures around a targeted magnitude of emissions, not to produce detailed accounting. The exercise is not a ticker to clock actual emissions.

(IV) Assessment of future climate risks, adaptive capacity needs and future BAU GHG emissions

Information on what the future climate may be like has increased substantially in the past decade. Regional authorities can use these sources to better understand how the climate is likely to change in their region and the probable impact on human and natural systems. Through a number of assessment methods of future conditions, they can assess basic vulnerability and establish critical climate thresholds (levels at which serious damage can occur). Selecting the appropriate tools to assess future conditions will depend on available data, existing technical capacity and the specific objectives of the ITCP. Regions can construct relatively simple storylines in some cases, or use global climate models to develop climate projections and identify climate analogues in others.

It is important to note that precise, detailed and certain impact assessment is not a requirement for the implementation of adaptation policies. Sometimes a simple assessment can prove sufficient to identify that some development strategies are more robust than others at coping with changes in climate conditions. Moreover, when climate projections from various models disagree, it is useful to work using 'what-if' scenarios: What will I do if precipitation increases by 10%? What will I do if precipitation decreases by 10%? What can we do to make our region more resilient in both cases?

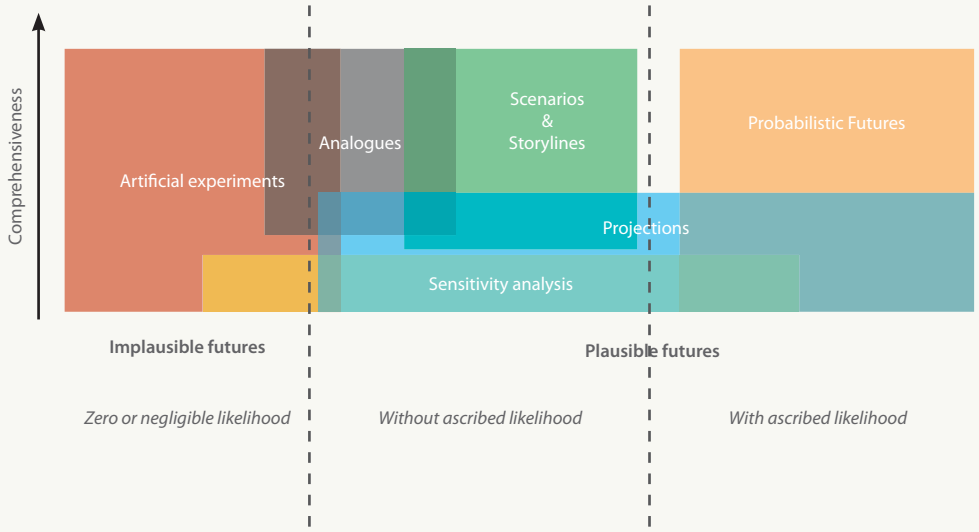


Figure 21: New Assessment Methods and Characterisation of Future Conditions

Source: IPCC, 4th Assessment Report, WG II, Chapter 2

Adaptive capacity is the ability of a system to adjust its characteristics or behaviour in order to increase its capacity to cope with existing climate variability or future changes in climate conditions. It is how a system copes with evolving hazards and the stress of reducing the occurrence of the harmful impact of climate-related hazards or decreasing the magnitude of the adverse outcomes. Regional authorities will need to determine what adaptive capacity already exists, what capacities will need to be developed, and what measures need to be taken to acquire these capacities.

On the mitigation side, assumptions must be made on how emissions will change over time, in order to set targets and design a mitigation strategy after current emissions have been assessed. These assumptions, based on a business as usual scenario where no new actions are implemented, can be used as a reference point to estimate the extent of the efforts needed. As often as possible, the macro-economic scenarios used to build these assumptions will be the reference scenarios used by the implementing country. These scenarios should take into account, amongst other things, national and regional goals in terms of economic development and access to energy services.

(V) Review of potential options and cost-benefit analyses

The selection and prioritisation of actions is a critical procedural step, particularly where human and financial resources are limited. The selection process should help identify actions with a low or negative cost and with high social benefits, or those with a low cost that reduce the risk of particularly catastrophic outcomes. These actions can be implemented first, to quickly demonstrate the initial results of the strategy. In addition to costs and benefits, the selection of actions should also be based on their technical feasibility and political and social acceptability.

The selection process should also be driven by synergies with other objectives. In a world of competing priorities, options that help regional governments realise other objectives simultaneously, such as job creation and improved potable water supplies, are more likely to be implemented.

(VI) Elaboration of a medium- to long-term strategy

Based on the information gathered in the above steps, a Climate Change Profile and Strategy is then prepared for the concerned region.While encouraging long-term thinking, a particular objective of the ITCP is to highlight the short- and medium-term socio-economic benefits of addressing climate change. For adaptation, these plans should identify no-regrets options, such as disaster risk management and improving emergency response systems. A number of mitigation options with negative cost or no cost should also be identified, such as energy-efficient appliances or building. This approach recognises that sub-national authorities will only be able to create public consensus in favour of climate change action if the recommended measures correspond to the fundamental development problems of the regions and municipalities, like the provision of basic services to the population, greater energy and food security and employment.

In the end, the adoption of a long-term climate strategy will enable regional authorities to plan and sequence adaptation and mitigation actions, fully taking into account the long lead-times between investment decisions made today and realising the beneficial impacts of those investments. Climate management is a long-term process, and therefore the implementation of the strategy must be seen as a reiterative, continuous learning process. The process will not end with the development of the strategy; rather, it marks the beginning of a cycle in which lessons learned from implementation are fed back into improving the strategy.

Chapters 6 and 7 provide further information on possible instruments for preparing a Climate Profile and Strategy, and highlight successful adaptation and mitigation experiences at the sub-national level throughout the world. For project proponents, detailed information on these instruments is given in the methodological handbooks "Climate Change Impact Scenarios and Vulnerability Mapping" and "Technology Needs Assessment".

4.2.3 Policy and Investment Platform

Once the mitigation and adaptation strategies are prepared, each will comprise a number of prioritised individual initiatives and actions that need to be pursued in order to realise the objectives of the ITCP. A huge array of financial and public policy instruments is available for regional authorities to realise the prioritised mitigation and adaptation measures in the different sectors (see Chapter 2). Identifying an appropriate mix of policy and financial instruments for each market/sector is a challenging task, and the Policy and Investment Framework (PIF) helps local authorities through this process. The PIF also supports regional authorities in accessing new sources of finance for climate change through a number of project development platforms (see Chapter 8), helping them to prepare project proposals in line with the eligibility criteria and procedural requirements of each source of funding.

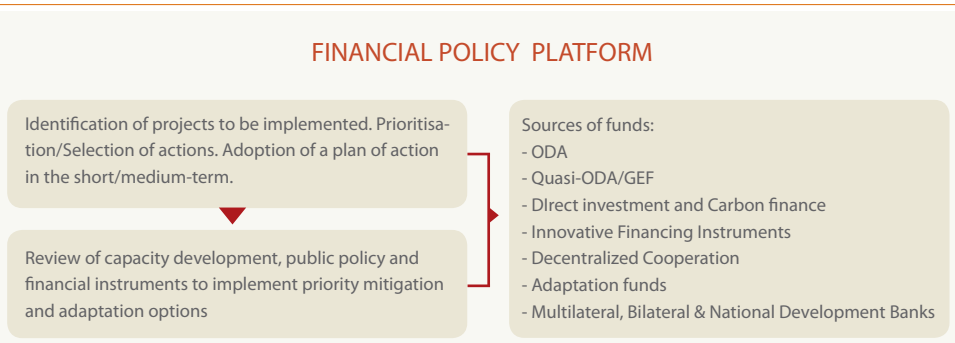


Figure 22: Financial Policy Platform

Chapter 8 further describes the proposed methodology to help regional authorities choose and design the most appropriate policies and financing schemes to implement priority climate change management options. For project proponents, detailed information on these options is given in the methodological handbook "Climate Change Policy and Investment".

Conclusion

Climate change represents a dramatic increase in uncertainty and requires new decision-making methods to cope with it. To encourage long-term thinking, an option for regional and local governments is to prepare integrated climate plans. The objective of the integrated climate plans is to assess the potential physical and socio-economic impact of climate change in a given territory, prioritise required adaptation and mitigation and develop policy and financing roadmaps to implement them. Part II of this publication provides further details on a possible approach to prepare these Integrated Territorial Climate Plans.

PART II:

PREPARING AN INTEGRATED TERRITORIAL CLIMATE PLAN 2

Chapter 5

Establishing a Partnership Framework for Integrated Climate Change Planning at the Regional Level

Decisions about land-use and land reform; spatial planning; agricultural policy; energy market reform; energy security and forest conservation, which are often treated as being independent of climate policy, can significantly influence emissions. Furthermore, development efforts in water resources management, health, urban planning, infrastructure and energy supply and use, may significantly impact the ability to adapt to climate change. Thus, the ability of regional authorities to meet climate change mitigation and adaptation objectives is closely linked to their capacity to implement long-term development efforts in an integrated manner.

However, as mentioned in Chapter 3, regional and local governments often face a number of challenges in managing their development. These include lack of authority, gaps in knowledge sharing, uncertain mandates and insufficient financial and technical capacities. Furthermore, national development plans are normally articulated along sectoral lines, which the decentralised authorities are then obliged to aggregate and translate into an achievable series of actions that reflect local-level realities. Translating sectoral policies into territorial actions involves taking into account a diverse set of interests and needs of the various sectors and constituencies. Just like national governments, regional governments usually assume multiple roles. Regional governments implement national policies; regulate and plan; make policies and also implement them; they invest in infrastructure and promote the local economy but are also responsible for social welfare. They must continually balance national interests and numerous local financial and socio-economic needs. This results in stress and conflicts as divergent interests clash and competition arises among the various sectors and the different stakeholders operating within the region. Climate change is very likely to intensify such conflicts, adding another layer of complexity to the process of formulating and implementing regional development activities.

Regional authorities need assistance to better understand the development risks and opportunities that are linked to climate change mitigation and adaptation within the region. Such knowledge is crucial in designing climate-friendly policies and direct investments, or conversely, in developing climate change strategies with strong development benefits.

To support regional authorities in this process, UNDP has developed and adapted a menu of tools for the preparation of Integrated Territorial Climate Plans (ITCPs). Through its past field experience in regional development efforts and integrated climate change planning, UNDP has identified several prerequisites which are key to the success of regional level intervention. Among one of the most important is the active participation of all stakeholders in the regional planning process. This includes public and private sectors, CBOs and international partners (multilateral and bilateral aid agencies, decentralised cooperation, international NGOs, Foundations, etc.) and involves all levels (national, regional and local). Such partnerships help to address some of the challenges that regions have traditionally faced when preparing development plans. The absence of an open dialogue among these various representatives on internalising climate change risk management priorities and responsibilities may result in ITCPs not being put into practice, may create/exacerbate conflicts between different actors and sectors, or create/worsen the problems faced by the region.

Section 5.1 explores in detail the potential trade-offs inherent in incorporating climate change into development policies and how institutionalising a multi-stakeholder partnership can be a crucial step for effective decision-making. Section 5.2 identifies methods for developing such partnerships in the ITCP process.

5.1 Why is there a need for all stakeholders to be actively engaged in the ITCP?

5.1.1 Effectively addressing trade-offs among different sectors

Climate-related policies will affect different sectors in different ways. For example, the need for adaptation could provoke significant restructuring in economic sectors that are particularly weather-dependent (e.g. agriculture, forestry, renewable energy, water, fisheries and tourism) or which are specifically exposed to climate change (e.g. ports, industrial infrastructure and urban settlements in coastal areas, floodplains and mountains). Regional authorities will need to weigh the climate benefits and other development advantages of a certain policy decision in each affected sector and make trade-offs.

Furthermore, existing sectoral trade-offs at the national level are likely to be magnified at the regional level, where competition will occur around concrete issues. The energy and water sectors are good illustrations of why an extremely efficient inter-sectoral dialogue is needed to understand and resolve the potential trade-offs inherent in climate policy.

Water and energy are the two most fundamental ingredients of modern civilisation and the tension between the two is rising: water restrictions are hampering solutions for generating more energy, and energy problems, particularly rising prices, are curtailing efforts to supply more clean water. In a changing climate, the tensions are more pronounced. For example, an increase in average temperature of even 1.5 degrees Fahrenheit across the Southwestern United States could compromise the Colorado River's ability to meet the water demands of Nevada and six other states, as well as that of the Hoover Dam, in turn affecting the dam's capacity to generate power[42]. Similarly in Uruguay, cities must choose whether they want the water in their reservoirs to be used for drinking or for electricity.

Thus, any action to manage climate change and its impact must involve all the inter-linked sectors in assessing the different implications of the available options, and in arriving at a policy that integrates energy and water solutions and innovative technologies that help to boost one resource without draining the other. Weighing the benefits and costs of the different options requires a strategic approach. The regional authority must mobilise all concerned sectoral interests to explore these challenges systematically and to agree on success criteria. There should be a structured dialogue among participating players to gather the information needed, exchange views and design comprehensive and coordinated strategies. Addressing the potential inconsistencies among development priorities and in adaptation and/or mitigation to climate change, requires a shift from a sectoral perspective to an holistic and integrated approach to climate policies.

5.1.2 Ensuring policy consistency between regional and national levels and between regional and local levels

The involvement of representatives from different levels of governance is critical in the preparation of an achievable ITCP. This is because any proposed action at the regional level must be in line with national policies. If a region decides to alter farming systems to adapt to climate change, it will need to ensure that national legislation does not prevent the flow of required inputs, such as seeds and fertilisers, and that it will not negatively affect national food policies, the market and local diets. Similarly, if a regional authority decides to pursue decentralised power production, national laws on power generation and distribution must be supportive. Conversely, it is critical for national policy-makers to fully understand the policy implementation issues faced at the regional and local levels. Thus, involving national level decision-makers in assessing options and developing solutions will be central to ensuring that national policies support the implementation of decisions at the local level.

[42] Catch 22: Water vs. Energy by Michael Webber in Scientific American Earth 3.0 (Volume 18, Number 4, 2008)

Introducing governance for climate change mitigation and adaptation at the regional level highlights some of the ongoing difficulties encountered in managing regional development in many developing countries. Climate change management is a powerful lens on the progress of decentralisation because it mobilises a wide range of sectoral interests and affects the source of subsistence, income and wealth of different actors.

Although many countries have initiated decentralisation from central to regional governments, in practice it has often meant handing down development tasks and responsibilities without a commensurate transfer of fiscal authority and/or the provision of human resources to carry out these responsibilities. Moreover, there has been a tendency in many countries for expertise and direct investments to be concentrated predominantly in the capital, other major cities or influential regions. Limited in their capacity to provide business incentives, it is often a challenge for other regions to attract direct investment to complement public resources and to foster balanced development throughout the country. In the absence of adequate financial resources, policy implementation efforts at the regional level will tend to focus on what is perceived as urgent or politically non-negotiable. This leaves little for long-term and less-visible, though equally important, concerns such as climate change.

As mentioned previously, national policies are a collection of objectives often articulated sector by sector. They may not take into account potential conflicts among sectors and certainly not those that could arise at the regional level. In addition, there are times when national priorities are not clearly conveyed, taking the form of general statements of intent with little operational guidance. This provides only limited information upon which the regional authorities can act and thus ensure a strong consistency between national and regional policies. Occasionally, nationally-formulated policies conflict with regional interests.

“Introducing governance for climate change mitigation and adaptation at the regional level highlights some of the ongoing difficulties encountered in managing regional development in many developing countries”

5.1.3 Effectively addressing trade-offs among different regions

Situations may arise where regional dialogue will be necessary to ensure that ITCP actions can be implemented by appropriately addressing potential conflicts. Natural assets (for example, water resources, drainage basins, coastlines and forests) are often shared among different regions. Natural, economic and/or social boundaries do not always coincide with officially designated regional divisions and/or administrations, and dialogue may be necessary at the sub-national level (two or more regions from the same country sharing resources)[43] or at the international level (two or more countries sharing resources). Regional authorities will face particular challenges in this regard because the ITCP could impact neighbouring regions differently. These impacts could go beyond the obvious economic ones, touching upon socio-cultural issues.

The shared water resources and competing interests between Alabama, Georgia and Florida in the United States illustrates this point[44]. A decision to reduce water flow from reservoirs in Georgia into the Apalachicola River, which runs through Florida from the Georgia-Alabama border, resulted in a conflict over the management of water resources. Florida was affected by the restricted flow as it threatened certain endangered species. Alabama also objected, as the reduced flow could potentially shut down a nuclear power plant using enormous quantities of water to cool its reactors. Georgia also needed to maintain a minimum water level since river levels the previous year had dropped so low that the drought-stricken state was within a few weeks of shutting down its own nuclear plants. The discussion on how to resolve this conflict continues.

On the other hand, recognising the need to protect shared resources can foster cooperation. A case in point on an international scale is the Lempa River Basin and the resulting Trifinio Plan designed for the shared management of this Basin by El Salvador, Honduras and Guatemala (See Box 6).

[43] The Regions FERLO in Senegal is the result of a formal Alliance of 5 Administrative Regions (Saint Louis, Matama, Bakel, Louga and Tambacounda) who have agreed to join their efforts to deal with environment and development issues for they share the same sylvo-agro-pastoralism context and therefore problems.

[44] Ibid.

Box 6: The Lempa River Basin and Trifinio Plan

The TrifinioPlan was a success because the governments of the three riparian nations worked closely to jointly address environmental, social and economic damages. The importance of a bottom-up approach in the establishment of the inter-regional process was noted by a 2004 UNEP report. The three states are highly interdependent: 56 percent of the basin is in El Salvador, 30 percent in Honduras, and 14 percent in Guatemala. However, El Salvador is much more dependent on the river than its neighbours as the basin covers 49 percent of the country. Hydroelectric dams on the Lempa generate 37 percent of El Salvador's electricity, and the river provides 72 percent of the country's surface water and supports its agricultural sector, which has the lowest natural distribution of fresh water in Central America. In addition, 90 percent of El Salvador's surface area in the river basin lies downstream from Guatemala and Honduras, and is highly subject to damage from upstream activities such as soil erosion, pollution, and solid waste dumping. Honduras and Guatemala possess a wider variety of water resources, and are therefore less interested in maintaining the basin's water quality.

The Trifinio Plan played a major role in building confidence between the countries, as it provided a platform for high-level dialogue while strengthening cooperation among border communities. In addition to increasing coordination and communication between the three governments, the Trifinio Plan led to a higher level of integration among the local border authorities and communities. While local communities are already linked economically and socially, the Trifinio Plan deepened their ties and formalised their existing relationships. Today, many social services are provided to the people of the Trifinio region regardless of their nationality. The Trifinio Plan has successfully addressed deforestation in the region as well: since the Plan's inception, more than six million fruit trees and coffee-shading plants have been planted, as well as 4,900 hectares of forest species to be used for firewood, lumber, and river basin protection. The Plan's reforestation programmes provided technical assistance to 2,000 peasant families in the region and enlisted local manpower to create forest nurseries, promote forest protection, improve training and maintenance, and develop supervision and control programmes.

Source: Lopez, A. 2004

5.1.4 Selecting measures which are seen as effective by all constituencies

The ITCP will affect all stakeholders - the public sector, the private sector, NGOs and the general public. However, it will affect them in different ways, insofar as it offers new opportunities, requires the shouldering of a greater fiscal burden or adopting new and different business and behavioural practices. The effectiveness of the proposed measures under the ITCP will be greatly enhanced if those affected are included from the beginning in assessing options and devising measures. For instance, one of the expected results of the ITCP is to attract and drive private investment into lower-carbon and climate-resilient measures. There are several policy instruments available to regional authorities to motivate this change, ranging from standards and labels to tax-free investment options. The chosen public policy instrument is likely to be more successful if it is identified in consultation with the private sector. Similarly, project investors are likely to get easier access to conventional finance for their climate change investment projects if the banking sector is intimately associated with the preparation of the ITCP.

The private sector is likely to be the driver for major future funding of climate-related activities. Globally, public-private partnerships (PPPs) are an increasingly popular tool used by governments to fund large-scale infrastructure projects. One potentially effective type of PPP is the BOT project (Build, Operate, and Transfer) in the power generation sector. While PPPs have assisted governments in accessing new financial capital and expertise to invest in cleaner power generating capacity, there have been significant difficulties in practice. Care needs to be taken in evaluating their costs, benefits and risks to governments and consumers. Depending on the overall investment environment, private partners can require a range of guarantees from governments to reduce their investment risks over the life of the projects (take-or-pay guarantees where governments commit to purchase a minimum level of production, guarantees to cover currency exchange risks, fuel supply price guarantees, political risk guarantees to protect against government regulatory change, etc). A cooperative governance model between public authorities and the private sector can contribute to the creation of an enabling environment, through the joint identification of the barriers to investments in the green economy and the policy choices for their removal.

Box 7: Working closely with the local private sector can enable the establishment of Public-Private Partnerships and/or the creation of an enabling environment for investments

Source: IPCC, AR4, WG 3

Because different constituencies bring additional skills, perspectives and knowledge, response strategies can be tailored to the communities' needs and to maximise impact. Mitigation and adaptation activities rely not only on industrial compliance but also on the public, so that political decisions are supported and the use of appropriate building architecture and insulation, energy-efficient appliances and/or modes of transport, sometimes at extra financial cost, are adopted. National or regional incentives, which introduce legislation and financial incentives to promote such changes, are most effective when public concerns are incorporated into their design, making these activities attractive for voluntary compliance. Experience from India demonstrates that the public is receptive to new initiatives if their concerns are expressed and, of equal importance, are willing to share the financial burden of such endeavours (See Box 8). Opinion surveys show that the public at large increasingly believe that climate change is a serious problem, with 62% in a recent EU survey viewing climate change as the most serious problem currently facing the world as a whole. Awareness, however, must be matched with equally acceptable behavioural changes.

The local government in the Uttar Pradesh province of India wanted to develop the use of energy-efficient and renewable energy devices in its rural areas but the demand was relatively low. By involving local communities in a development dialogue, it was possible to assess their needs. The communities indicated that improvement in water and electricity supply was a priority and also requested that ways be explored for the optimum use of dung. Appropriate technologies were selected and introduced according to the concerns expressed (e.g. solar drinking water, biogas plants, etc.). Moreover, although the technologies were provided at a subsidised rate, many of the households were willing to meet up to 40% of the total cost for certain "in demand" technologies.

Box 8: Adopting energy-efficiency and renewable energy in India through community participation

Source: Ranganathan, M.P. 2003

5.1.5 Avoiding dispersion and fragmentation of efforts

Another challenge for regional authorities will be to avoid the fragmentation of climate change actions undertaken within the region by diverse actors (national and sub-national institutions, private sector initiatives, bilateral and multilateral organisations, decentralised cooperation, foundations, NGOs, etc). While a multiplicity of initiatives can be a source of innovation, it can also stretch the management capacity of sub-national governments. Overlaps, redundancies, competing views and a lack of synergies between stand-alone activities become increasingly apparent at the sub-national level, particularly in the case of national or foreign-led development initiatives. It is not unusual for some regional governments to have to coordinate the actions of many different aid agencies.

In addition to the large transaction costs associated with managing multiple partners, in the absence of a common strategic framework, most climate activities to date have been implemented in the form of stand-alone projects, which are difficult to scaleup to the level required to reduce vulnerability to climate change in all communities and economic sectors. Moreover, project-based activities are difficult to mainstream into ongoing planning and development processes.

The capacity to plan for adaptation and mitigation and identify where synergies with development may arise, must be built within the government where clearly formulated plans can identify potential projects. To achieve this, regional authorities will need an institutional mechanism that enables a shift from a central- or donor-perspective to a partnering approach and the alignment of activities with the ITCP.

Box 9: Aid Fragmentation in Senegalese Regions

Senegal is West Africa's biggest recipient of official development assistance (ODA) (US$839 million in 2005) after Ghana. The country received US$92 of aid per capita in 2004, the highest in the region. Increasing aid effectiveness is high on the agenda, given the large ODA flows to the country and relatively low-absorption capacity of the government. If such enhanced coordination is undertaken at the national and local levels, regions become the missing link in this regard, as they face increasing foreign-aid initiatives.

Bilateral and multilateral cooperation, such as USAID, France, Canada, Germany, the World Bank, European Union, UNDP and UNCDF, separately developed their own local governance and development programmes. Besides the traditional ODA actors, decentralised cooperation and migrants, through their remittances, became increasingly active. In 2003, the region of Tambacounda received US$26 million. In the past ten years, the Senegalese sub-national entities received US$63 million from decentralised cooperation. Among them, French decentralised cooperation increased by 65%, over the period 1994-1999 to 1999-2004, with an annual average of US$3.2 million.

With regard to local governance support, the region of Matam received US$1.4 million from decentralised cooperation, which corresponds to the total funds given by the central government to the 442 Senegalese sub-national entities for 2007. Matam also signed agreements with 14 decentralised cooperation entities, while ten years ago it only had one (Nord Pas de Calais, France). The region of Saint Louis has 22 decentralised cooperation agreements, while the region of Dakar has 28.

While the funding amount becomes more and more important, intervention at the regional level remains fragmented, dispersed, lacking in alignment - often due to a lack of coordination with the Senegalese regional authorities.

To hinder such a phenomenon, the five regions of the agro-pastoral area of Ferlo (Saint Louis, Matama, Bakel, Louga and Tambacounda) decided in 2007 to develop a common sustainable development strategy, as they share the same ecological and economical constraints, and asked their partners from decentralised cooperation to unite their efforts and align them to this policy. Thus, French and Italian sub-national entities (Nord-Pas-de-Calais, Rhône-Alpes, Piémont, Midi-Pyrénées, Isère, Drôme, Ardèche, etc) answered positively to this request by, not only coordinating themselves, but by joining an initiative launched by UN agencies and regional associations in the area of climate change.

5.2 Establishing a Participatory Governance Structure for the Preparation of a Regional ITCP

The last 40 years of field experience in development work have demonstrated that the traditional ways of working on development and governance suffer from top-down control, sectoral fragmentation, a tendency to concentrate only on immediate, short-term priorities, without resolving potential conflicts among various stakeholders. Experience also indicates that a participatory approach built into the planning process can address some of these issues. Developing an inclusive governance structure is not a panacea, but it is a powerful first step for more effective governance with lasting impacts.

There is no single method for effectively engaging key stakeholders in the development of the ITCP, as the context will vary from place to place and system to system, depending upon the structure of institutions, existing capacities, and the scope of vulnerability to climate change at the regional level. Therefore, the partnership and governance framework needs to be designed according to specific regional characteristics. Nevertheless, lessons learned from existing experiences of working with sub-national planning provide some core principles, which can ensure the effective participation of important stakeholders.The following is a possible three-pronged organisational structure that involves all stakeholders in the preparation of the ITCP:

Component 1: Establishing a governance framework: A generic option would be to establish a Steering Committee composed of regional, elected officials who will guide and be responsible for the oversight of the preparation and implementation of the planning exercise. This Steering Committee could additionally be supported by a Project Team and a Technical Committee.

Component 2: Involving key institutional and economic stakeholders: This could be achieved through the establishment of a Regional Climate Change Coordination Committee (RCCCC). It will act as an open forum to facilitate dialogue and coordination among stakeholders. It will promote the co-development process of the ITCP between regional authorities and national/international socio-economic stakeholders.

Component 3: Setting up thematic and area-based working groups: The Project Team would identify the key players and stakeholders within the region (in addition to those who may already participate in the above Committees) and establish working groups to leverage their expertise and obtain their views. The working groups should assess how climate change would affect different stakeholders, and put forward priorities, risks, concerns, potential conflicts and trade-offs. Creating a 'methodological support group' can also prove useful for coordinating all sectoral groups (e.g., to choose a common set of climate assumptions to be used by all sectoral groups). This group could be managed by researchers from the academic community.

Figure 23 summarises the key objectives and functions of these different groups. The detailed breakdown and description of these functions is provided in the UNDP methodological handbook *"Developing an Integrated Territorial Climate Change Plan: A Partnership Policy Framework"* prepared by Solving Efeso (to be released end-2009). The following sections discuss some possible issues to be taken into consideration when establishing these organisational structures.

5.2.1 Establishing the ITCP Steering Committee.

When implementing a regional climate change initiative, it is important to avoid any duplication that may overburden regional and local government administration officials and result in competing roles, counterproductive measures, and an inefficient use of resources. Existing structures for administration and for coordination mechanisms should be used and strengthened as much as possible.Therefore, the first step would be to clearly identify "who does what." The Steering Committee should request the active participation of elected officials in charge of key sectors with respect to climate change planning (energy supply, agriculture, water management, transportation, housing, land planning, disaster risk management, education, finance, economy, health, etc.). The involvement of all key sectors will facilitate the review of possible trade-offs and synergies across sectors in addressing climate change.

The composition of the ITCP Steering Committee may mirror the composition of the Inter-Ministerial Climate Change Coordination Committee at the national level. The Inter-Ministerial Climate Change Coordination Committee typically advises the national government on the formulation of the country's climate change policies and assist with the country's negotiations in the international climate change arena. It provides technical expertise and maintains a database of best practices to provide advice to key national stakeholders or to regional governments. The "mirroring" between the national and regional level ensures policy consistency and facilitates counterpart communication and coordination between the two levels.

The ITCP Steering Committee will be the core decision-making body. It will be in charge of defining the key objectives of the planning exercise as well as the tools and criteria to be used to support decision-making. It will oversee the entire planning process and prepare decisions to be made by the Regional Assembly. It will act as the interface between the administrative departments working in the ITCP, local governments, and the assembly of elected officials. One of the members of the ITCP Steering Committee could be appointed as the "champion" of the initiative. S/he will fulfill the crucial task of creating and maintaining the political momentum for the development and implementation of the ITCP.

When a formal institutional framework does not exist at the regional level, existing administrative bodies should be encouraged to establish an ad hoc collaborative platform to lead the climate change planning exercise. This ad hoc collaborative platform will provide the institutional foundation for the establishment of the ITCP Steering Committee. Although the initial process may require guidance from external motivators, once a shared interest or common goal is identified, it should be far easier for the partnership to function. Box 10 provides an example from Lebanon of the successful cooperation established by several communities to achieve a common goal in the absence of a formal institutional framework at the regional level.

Box 10: Enhancing the cooperation platform among municipal governments in Lebanon

The UNDP ART Gold Initiative supports participatory territorial planning for sustainable development. The UNDP ART Gold Lebanon Programme is implemented in four of the poorest areas of the country. The socio-economic challenges of these four areas were compounded by the effects of the July 2006 conflict. Using a local development methodology, the Programme supports the Lebanese national government and local communities to achieve the MDGs. A key objective of the Programme is to enhance regional networks and partnerships, which are extremely weak in the targeted areas.

The Programme sought to build and strengthen the relational and social capital of the target territories. The first step consisted of establishing 297 municipal working groups and encouraging them to work together through the establishment of a regional working group in each of the four areas. Once the municipalities perceived the comparative advantages of enhanced coordination with respect to certain sectors, the regional working groups requested training for participatory strategic planning and decided to establish 22 thematic/focus groups based on the main priorities identified at the municipal level.

In the South Lebanon Area, which encompasses two governorates: South Lebanon (133 municipalities) and Nabatiyeh (119 municipalities), the regional working group established 170 municipal working groups. It identified environment as one of the strategic priorities in the region, encouraging the municipalities to work closely in this field. The working group in Tyre developed a pilot project in 2008 to increase energy efficiency and the use of renewable energy sources through five main activities:

- Water solar heating in Tyre's public hospital
- Training on end-use efficiency
- Preliminary overview of electrical network analysis
- Water pumping using photovoltaic technology to convert light into electricity
- Preliminary study of the generation of electrical energy through wind power.

The ITCP Steering Committee will be assisted by an ITCP Project Team and, possibly, a Technical Committee. The ITCP Team - the operational arm of the ITCP process - will consist of civil servants already working in the administration for planning and development issues. They would be responsible for organising working groups, following up with each stakeholder/player and preparing the ITCP document.The Team will be led by a Project Team Manager.

A Technical Committee, including the heads of all technical departments, may also be established to assist in technical assessments and data collection and to provide expertise, unless this is already embodied within the Project Team.

> "When implementing a regional climate change initiative, it is important to avoid any duplication that may overburden regional and local government administration officials"

5.2.2 The Regional Climate Change Coordination Committee (RCCCC)

The Regional Climate Change Coordination Committee (RCCCC) would be an informal structure created to bring together all the socio-economic stakeholders and decision-makers within the region. It could be comprised of representatives from the ITCP Team, the civil society, community leaders, tradeunions, public bodies, economic stakeholders, financial institutions, the insurance sector, technical experts and concerned NGOs and aid partners. It will provide recommendations as to the feasibility of actions proposed in the ITCP and the best possible solutions.

As mentioned in section 5.1.4, the effectiveness of the proposed measures under the ITCP will be greatly enhanced if those affected are included from the beginning in assessing options and devising measures. The RCCCC will enable regional authorities to involve private sector, non-governmental organisations and international partners right from the start of the process in the formulation of the ITCP. It will ensure that their expertise is leveraged and voices heard. The RCCCC will be the pivotal instrument to encourage the co-development of the ITCP between regional authorities and the civil society.

It is important to note that although key members may overlap among the different bodies, the task of each remains distinctive. The consultative role of the RCCCC will need to be clearly distinguished from the policy formulation and approval role of the Steering Committee and of the sub-national authorities themselves. This will ensure that this co-development can take place while fully respecting the integrity of the regional legislative processes. This distinction should be clarified at the very beginning so that each actor can refer to clear terms of reference outlining their responsibilities and the activities they must carry out in each committee.

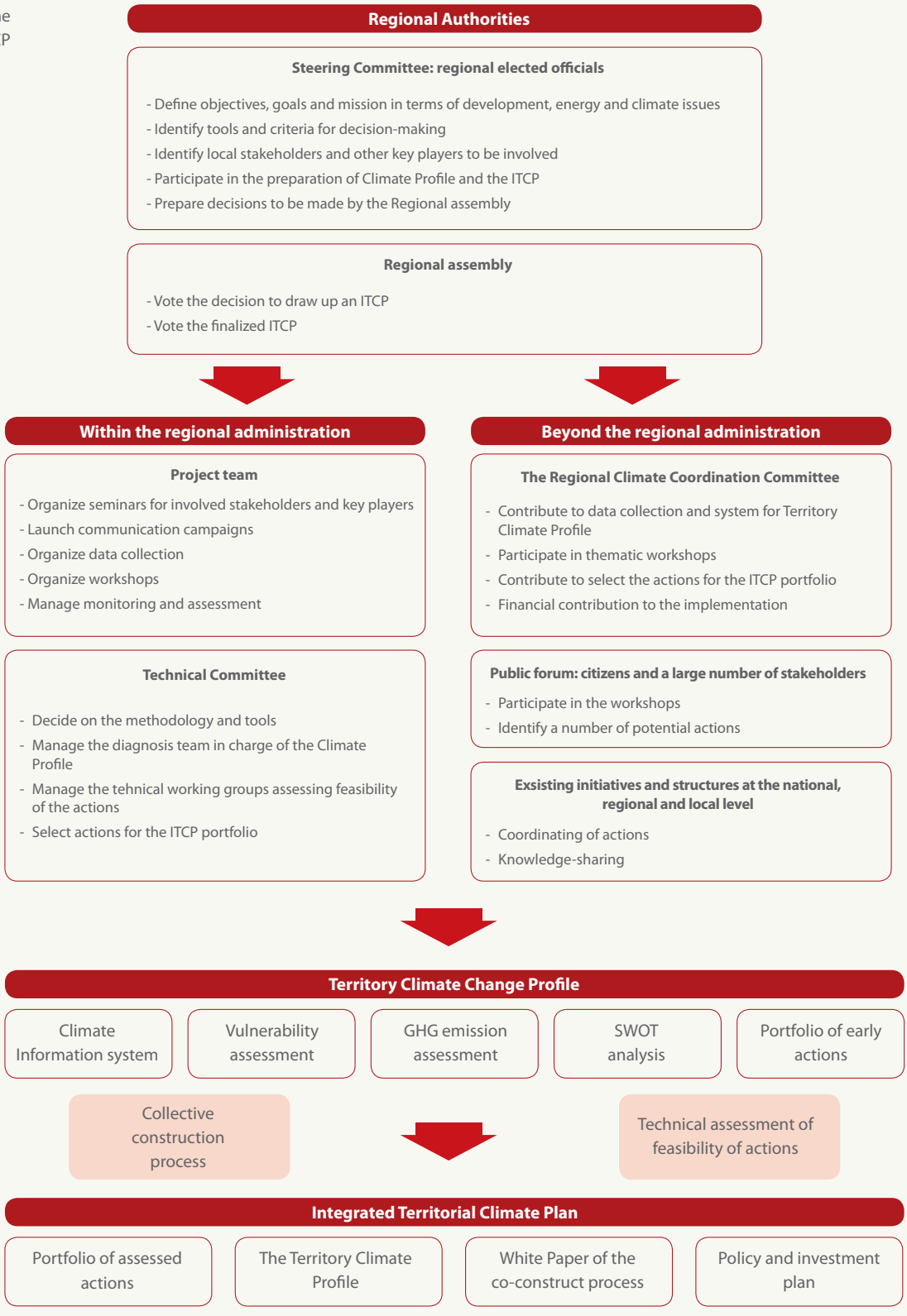
5.2.3 Thematic and stakeholder working groups.

Working groups (WGs), focussed on key climate change related issues or areas, can empower local authorities and foster multi-stakeholder governance. The focus of these groups should be defined according to the main issues identified at the regional level: either thematic (health, gender equality), geographic (municipal, district, coastal zones) or sectoral (buildings, transport, agriculture). However, to promote an integrated approach for climate change issues, adaptation and mitigation must be considered jointly by the groups.

The groups are not new institutions; they are organised, focussed and systematic forums conducted by existing representatives from:

- Central and local public bodies and services (such as the local technicians of offices administered directly by the Ministry of Agriculture or Environment, which liaise with the central authorities to support local development actions);
- Civil society - Community Based Organisations (CBOs), local youth or women's associations, church co-operatives of local private sector organisations, specific locally-organised lobbies and other community groups or citizens themselves;
- Business and banking community;
- Academic community;
- International bodies active in the country (who liaise with their head offices to improve the harmonisation of international NGOs, decentralised cooperation, the private multi-national private sector, the bilateral or multilateral interventions in the area).

Figure 23: An illustrative Partnership Framework for the Co-Development of an ITCP



Working groups can also promote policy dialogue between non-elected (prefects, governors) and elected officials (mayors and administrators), as well as public, private and associative social actors. They can also voice the concerns of those normally excluded from decision-making processes.

One proven instrument of effective community participation, that allows different stakeholders and actors to work together to learn more about their neighbourhood, identify the main challenges, risks and needs, indicate possible solutions and act together to implement identified solutions is a "Community Map of Risks, Needs and Resources".

Care should be taken to ensure the map clearly articulates and incorporates the different views of the various constituencies and trade-offs between the needs/interests of some, vis-a-vis those of others. The risks involved in favouring the views/needs of a certain segment of the population should also be highlighted.

5.2.4 Building a clear implementation framework to avoid fragmentation and duplication of effort.

As mentioned earlier, most climate activities to date have been implemented as stand-alone projects, which are difficult to scale up to the level required to reduce emissions and vulnerability to climate change in all communities and economic sectors. In addition to an assessment of the potential physical and socio-economic impacts of climate change in the region and the identification of priority adaptation and mitigation actions, an ITCP should include a detailed implementation, monitoring and evaluation plan clearly outlining the division of responsibility among key players. This type of preparatory work should reduce the risk of fragmentation and increase the impact of different but complementary actions.

Box 11: Cooperation through carrying out different tasks at different levels and by different organisations

Roles, responsibilities and tasks can be clearly defined in ITCP formulation depending upon the level of governance or the organisation/institution. Below is an indicative, but not exhaustive, list of what different players in the ITCP may do.

The country's regional and national governments develop the institutional structure for the participatory formulation of the ITCP (regional and national inter-ministerial coordination committees, thematic and local working groups). Concerned authorities can thus establish an order of priority and select tools to coordinate and harmonise the contributions of different local, national and international actors;

Regions, provinces and municipalities of partner countries (individually or through national and international associations such as UCLG, FOGAR, NRG4SD, Climate Group, AER, CPMR and others) can:

- help the country's regional and municipal WGs define their own strategies and plans for territorial development
- work with them to include cooperation projects within the framework of agreed strategies and plans
- share some of their best practices from their own mitigation/adaptation activities.

The private sector (through business associations at the policy-making level and individually at the investment level), foundations and non-governmental organisations can also participate from the outset in the formulation process, share their expertise and ensure a conducive framework for follow-up implementation.

The United Nations and other development organisations can work with national and regional governments to:

- promote regional development and democratic decentralisation;
- facilitate the flow of information about best practices as well as assist in developing North-South, South-South, North-North partnerships among Regions, etc; and
- assist in the identification and accessing of different national and international sources of environmental finance to support the implementation of the ITCP (ODA, direct investment, innovative financing mechanisms).

By actively involving the national level and international partners in its regional plans, the Tangiers region in Morocco was able to avoid stand-alone projects and solicit funding for those activities considered priorities for its own development.

Box 12: Coordinated Regional Development in the Tangiers-Tetouan Region (Morocco)

In the framework of the ART-Gold Programme in Morocco, in 2007 the Tangiers-Tetouan Region established its Strategic Guidelines for the coordination and support of international cooperation for regional development. The objective was to present the international cooperation community with the development priorities of four areas of the Region, to enable the cooperating actors to align their activities to regional needs. The first plans were designed at the sub-regional level, through working groups established in each of the four Provinces and the two Prefectures of Tangiers-Tetouan. In order to avoid duplication and to strengthen the existing structures and bodies, particular attention was paid to ensuring the work was jointly undertaken with the local development work of the National Initiative for Human Development. After a six-month planning phase at the sub-regional level, 70 regional stakeholders incorporated the recommendations and guidelines of the six plans to produce a regional version. Eight partners from the international development community (Canadian Programme for Local Governance, Spanish bilateral Agency AECI, Andalusian Solidarity Fund, Catalan Cooperation Agency, Region Provence Alpes Côte d'Azur and four NGOs) actively participated in the production of these guidelines and 25 international partners supported the process.

The regional guidelines were endorsed by the Central State in April 2008 and presented to the international community. Several international partners currently support the implementation of the projects identified by the Strategic Guidelines according to their respective interests and expertise. For instance, the establishment of the Fahs-Anjra Provincial Environment Observatory, which is developing a Geographic Information System of JbelMoussa, one of the principal natural resources of the Region.

Conclusion

The translation of national policies into territorial actions in climate change may require taking into account and balancing a diverse set of interests and needs among various sectors and constituencies. Thus, the active participation by all stakeholders, including public and private sectors, CBOs and international partners, at all levels (national, regional and local), will be a pre-condition for the successful preparation and implementation of an integrated climate plan. Strengthening participation not only means identifying all the possible stakeholders in climate change and ensuring their participation in the process, but also clarifying their individual roles and tasks. Thus a clear institutional framework and an implementation plan are a crucial part of an effective multi-partnership. Furthermore, multi-partnership should not be limited to the preparatory stages of an ITCP but should extend to the implementation phase. Based on the portfolio of actions selected, co-implementers should be identified and tasked with carrying out different activities, which may be required to achieve the ultimate objective.

Chapter 6

Climate Change Mitigation: Objectives, Challenges and Priorities for Local Development

As developing countries are primarily concerned with development issues, such as energy access and economic growth, reducing greenhouse gas emissions would not appear to be one of their top priorities. After all, their emissions are small and mitigation is considered more the responsibility of developed countries due to their historical production of emissions.

However, mitigation policies can, in reality, contribute to the achievement of local development goals. This should increase the interest of territorial authorities in mobilising the existing potential for action if the barriers that limit them can be overcome.

6.1 Objectives: Combining Local Development Mitigation

Developing countries can, in fact, formulate win/win strategies that result in policies which meet local priorities and protect the environment. The new financing mechanisms designed to help reduce GHG emissions (mitigation policies) described in Chapter 3 can result in:

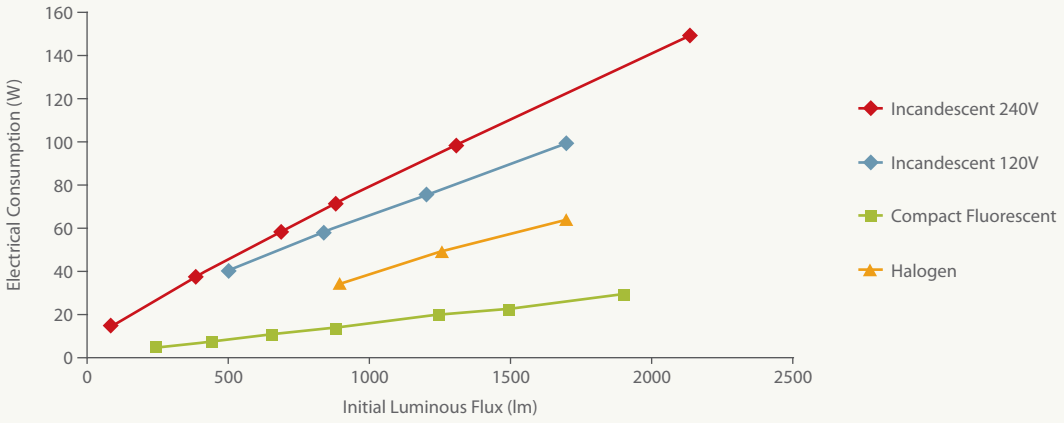
- increased access to and affordability of energy services;
- reduced national reliance on oil imports and exposure to fluctuations of oil prices;
- creation of economic activities and employment;
- reduced local pollution and health hazards.

6.1.1 Increasing energy access

Socio-economic development is linked to the type of energy services provided, not just the amount of energy supplied. People need clean, efficient and safe lighting or warm homes without the risk of indoor air pollution or fires. These services can be provided using local renewable energy sources rather than fossil fuels. The amount of energy used can also be reduced using efficient materials or appliances and consequently reduces energy bills.

The potential of energy efficiency is perfectly illustrated with the compact fluorescent lamp (CFL). It uses less power and has a longer lifespan compared to general-service incandescent lamps and produces the same amount of visible light. In the United States, a CFL can save over US$30 in electricity costs over the lamp's lifetime compared to an incandescent lamp, and save 2000 times its own weight in greenhouse gases. (See Figure 24).

Figure 24: Electricity saving potential of CFLs compared to incandescent lamps



The use of renewable energy and energy-efficient options, such as biomass generators, solar-powered lanterns and cooking stoves, compact fluorescent lamps, and combustion of fatal gases, can provide the same (or better) energy services while using less fossil fuels and emitting less GHGs.

These options are suitable for rural, sparsely-distributed areas, where access to modern energy services is a constant problem. These small-scale, distributed technology options, usually off-grid, can reach inaccessible and remote parts of countries where income is lower and volume of demand is lower[45].

A preliminary analysis by UNDP estimated that it would cost approximately US$10 billion/pa to deliver basic energy services to poor people "beyond the grid". This is less than one quarter of the US$858 billion the World Bank estimated would be required to provide universal electricity access by 2030, based mainly on the grid option[46].

Energy efficiency solutions can help reduce individual consumption in urban centres in developing countries, where energy consumption per capita is significant, thus freeing the energy capacity to supply other areas of the country or a growing urban population. Providing the rural population with efficient equipment (lighting, cooking, etc) can open access to a number of services with a minimal consumption that is easier to cover with decentralised local renewable energy solutions.

45 Financing for a Sustainable World – UNDP - Background paper for the 2008 Accra High Level Forum on Aid Effectiveness - 2008

46 Financing for a Sustainable World – UNDP - Background paper for the 2008 Accra High Level Forum on Aid Effectiveness - 2008

Box 13: Contribution of renewable energy and energy efficiency to energy access: Examples

There are a number of examples showing how renewable energy and energy efficiency can contribute to energy access.

Photovoltaic

- Between 1999 and 2005, the "Yeelen Kura"programme in the Koutiala region of Mali provided energy to 1,500 families by setting up PV equipment. 3,000 new families were expecting to be connected between 2006 and 2008.
- In Morocco, between 2002 and 2007, 24,800 families were provided with energy through photovoltaic systems installed by the company Temasol on behalf of the National Electricity Company. The objective is to extend this system to 58,500 families (400,000 people) by 2012.

Hydropower

- In the Madagascar region of Sava, 95% of the population is without electricity. The construction of a 6MW hydropower plant on the Sokoho River provided electricity to 26 isolated villages, including 16,000 homes (80,000 people) as well as markets, schools and healthcare centres.
- In Nepal 4.7 million people have no electricity. Beginning in 1996, Nepal's Micro-hydro Scheme programme supported the installation of 10 MW of electricity in 40 districts, supplying renewable electricity to more than 100,000 households. By 2011, the Micro-hydro Scheme programme is expected to supply 25 MW of electricity and mechanical power to over 250,000 households. The maximum market potential for micro-hydro schemes in Nepal is estimated at close to 150 MW, bringing energy to 7.5 million people in 1.5 million households.

Energy Efficiency

- In Senegal, the country's first CDM project will distribute 1.5 million compact fluorescent lamps to rural populations for an approximate cost of US$7 million. This project is part of the country's rural electrification programme that should make energy accessible and affordable for 365,000 families in five years, bringing the electrification rate from 16% in 2008 to 50% in 2012. The energy efficiency measures included in the programme make optimal use of the country's limited supply capacity and extend access to modern lighting.

Source: EDF, UN Energy 2008, World Bank 2008

6.1.2 Increasing the affordability of energy services

The cost of most renewable energy technologies has been decreasing over the past few years and, with the continuing progress in research and development, is likely to decrease further. Many options are ready to be launched now and compete favourably with traditional centralised fossil-fuel solutions, thus attracting consumers with the possibility of reduced energy bills.

In addition, clean energy options often take less time to implement than traditional energy projects. Renewable energy and energy efficiency solutions often lead to small-scale projects and rely on more simple technologies. All the phases of the investment, from preliminary studies to finding financing, obtaining permits and construction, can be done more quickly, ensuring faster access to energy.

Increasing energy productivity (the output level achieved from the energy consumed[47]) is also an opportunity that should be explored. The McKinsey Global Institute has estimated that we could halve the projected global

[47] The case for Investing in Energy Productivity – McKinsey Global Institute – February 2008

energy demand growth to 2020 by capturing these opportunities. Annual investments of US$170 billion over the next 13 years (with 57% in developing countries) would result in the capture of energy productivity among all end users. Economically, this would have an average internal rate of return (IRR) of 17%, collectively generating US$900 billion in annual energy savings by 2020.

6.1.3 Increasing the energy security of oil importing developing countries by reducing their degree of reliance on oil imports.

According to the World Bank, higher oil prices are causing many net oil-importing Sub-Saharan African countries to lose economic ground, costing them a cumulative loss of over 3% of gross domestic product (GDP) and increasing poverty in those areas by as much as 4-6%.

By using renewable energy sources and energy efficient technologies to increase local power production and reduce the demand for energy, oil-importing developing countries can reduce their exposure to political turbulence, disruptions of supply and oil market price fluctuations. They can also alleviate the impact that increased fuel prices have on poverty, be it directly or indirectly.

Box 14: Impact of Fuel Price Increases on Poverty

A recent study by the IMF has shown that the welfare effect of higher fuel prices on household real incomes will depend both on the *direct effect* of higher prices for petroleum products consumed by households and on the *indirect effect* on the prices for other goods and services consumed by households that use petroleum products as intermediate inputs.

Often, and particularly for poorer households, the bulk of petroleum is consumed indirectly through household consumption of other goods and services that use petroleum products as inputs. For example, a recent analysis for Senegal combining household survey data and an input-output model found the indirect effect of fuel price increases on household real income was nearly 3.5 times larger than the direct effect. It also showed that fuel price increases are progressive, mainly due to the indirect impact, and that the overall impact of fuel price increases is more than 50% higher for urban than for rural households. Similar impacts were found with country case studies for Bolivia, Ghana, Jordan, Mali, and Sri Lanka, (D. Coady and others, "The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka", IMF Working Paper No. 06/247).

Source: Food and Fuel Prices - Recent Developments Macroeconomic Impact, and Policy Responses - International Monetary Fund, June 30, 2008

6.1.4 Creating local economic activity and employment

Clean energy options can create more local economic activity and employment than traditional fossil-fuel options. An estimated 2.3 million people worldwide currently work either directly in renewable energy and energy efficiency projects or indirectly in supplier industries. Many of these jobs are linked to the installation and maintenance of the equipment and are necessarily local. A 2004 report found that renewable energy creates more jobs per megawatt (MW) of power installed, per unit of energy produced, and per dollar of investment, than the fossil fuel energy-based sector[48].

[48] Kammen, D. K. (2004). Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate? RAEL Report, Berkeley

- In Denmark, policies promoting wind energy have created 23,000 jobs since the beginning of the 1980s. The world's leading manufacturers of both wind turbines and blades, Vestas and LM Glasfiber, are Danish, as well as another big international player, Siemens Wind Power[49].
- In Uruguay, the "Mesa Solar" programme, which promotes the local construction and installation of simple solar water-heating devices, has involved the Confederation of Small Businesses (Asociacion Nacional de Micro y Pequenas Empresas) which is using this opportunity to create local micro-companies and local jobs.

Box 15: Examples of Economic Development through Clean Energy Options

[49] Denmark's wind energy is good for jobs – Embassy of Denmark, Athens - 11 July 2008

6.1.5 Reducing local environmental and health hazards

Traditional fossil fuel-based energy production and consumption technologies can generate significant local environmental and health hazards, which can be reduced when cleaner options are implemented. In China, for example, the sulfur dioxide produced from coal combustion is estimated to contribute to about 400,000 premature deaths a year. Waste management can also generate significant problems for surrounding populations. Capturing methane from landfills to use in electricity generation is one example of the type of project that can contribute to both local well-being and global warming mitigation.

Challenges

The involvement of sub-national authorities in climate change mitigation has been growing in the past few years, but mostly in developed countries. However, even when successful initiatives have been developed, the actions need to be integrated into a comprehensive long-term strategy that re-writes the development path of the region, rather than producing a wide array of small, dispersed and fragmented projects. Only a few regions have started moving towards ambitious integrated planning frameworks that focus on economic development and the transformation of territories. Regions as diverse as Sao Paulo (Brazil), Pais Vasco (Spain), Scotland (UK), Bavaria (Germany), Cape Town (South Africa) have started preparing climate change strategies and action plans, but this practice needs to become widespread.

Box 16: Example of an Integrated Regional Climate Change Strategy: Sao Paolo State (Brazil)

The draft Integrated Regional Climate Change Strategy for the State of Sao Paulo was prepared in October 2008, and is currently being considered.

The text suggests the following objectives for the State policy:

- To ensure social and economic development compatible with protecting the climate system
- To foster the Clean Development Mechanism
- To establish transition mechanisms that create behavioural changes
- To carry out actions to increase the share of renewable sources in the energy matrices within and outside the State
- To promote effective actions for adaptation to climate change, specifically targeted at protecting more vulnerable populations
- To promote environmental education, public information and awareness of all aspects of global climate change
- To stimulate research and the dissemination of scientific knowledge regarding the protection of the climate system

Adaptation objectives:

- To prevent and avoid the irregular occupation of vulnerable areas, like coastal regions, hillsides and valley-floor zones
- To attenuate the effects of disasters of climatic origin, preventing and reducing the impacts especially in more vulnerable areas
- To adapt agricultural and extractive methodologies to new climate standards and ensure the supply of water by diversifying production

Mitigation objectives:

- To promote sustainable transport while minimising fuel consumption from the transport of people and goods
- To propose and foster measures that favour sustainable standards of production, trade and consumption
- To reduce deforestation and slash-and-burn
- To minimise the consumption of fossil fuels and fugitive emissions of methane from mineral extraction
- To promote renewable energies, notably solar and bioenergy
- To adapt the profile and purchasing power of the state public authorities at all levels
- To support sustainable transport by introducing cycle paths
- To ensure the management of water resources

Source: Sao Paolo State Government, 2008

Many regions still have a limited understanding of climate change and its associated risks and opportunities. They will therefore need technical assistance and advisory services to begin developing strategies and action plans for low-carbon technologies. Additionally, few policy-makers and stakeholders are aware of the potential benefits of low carbon strategies in key sectors, and this needs to be demonstrated locally for low-carbon investments to be considered.

Information and assessments on regional emissions and their sources, a critical element for decision-makers, are rare, as are human and financial resources.

Transforming strategies into operational projects requires financing. Expertise may be required to promote a better working knowledge of the financial instruments available, how to select the correct type and how to access them.

Finally, the myth that climate change is only an environmental issue must be dispelled. Climate change is affected by, and affects all aspects of the economy. An over-arching policy strategy must be developed, which incorporates multiple sectoral approaches, policies and programmes, to successfully achieve any attempt at low-carbon development.

“Information and assessments on regional emissions and their sources, a critical element for decision-makers, are rare, as are human and financial resources”

6.2 Developing Territorial Mitigation Opportunities

If the barriers described above can be overcome, regions and municipalities have the opportunity to become major players in climate change mitigation, by reinforcing, intensifying, and sometimes preceding national policies. As demonstrated in Chapter 2, they have the advantage of being at the local level, where the investments will need to be made, and of having the flexibility to be innovative.

The precise areas of responsibility of specific authorities are different in each country. However, most regions will be able to influence three types of GHG emissions, each through different types of interventions.

6.2.1 Reducing emissions related to the equipment and services operated directly by regions

The procurement, maintenance and management choices made by public authorities can cause the emissions related to equipment and services to vary significantly. Depending on local circumstances, this can include emissions from public office buildings, education and healthcare centres, waste collection and treatment, energy production and distribution, and public transportation.

Box 17: Example of GHG emissions reduction from Buildings and Vehicles Managed by the Woking Borough Council (Surrey, England)

Results

- 51% reduction in energy consumption from city-owned buildings between 1991 and 2005
- 30% increase in energy efficiency of council housing between 1996 and 2005
- £5.4 million saved in municipal energy and water bills since 1990
- Opportunities to develop projects with private developers and local authorities outside the Borough and abroad
- Affordable energy services for residents resulting in reduced fuel poverty

Actions undertaken

- Energy-efficient lighting system for municipal buildings in 1991. This scheme generated energy savings of 60-70%.
- Building an Energy Management System. The Council was overspending its budget in 1990-91, but the projects resulted in savings of £164,000 in the first year. The Woking Council implemented projects using a range of low-carbon technologies, including solar photovoltaic, combined heat and power and fuel cells.
- In the Transport sector, the Council has a fleet of liquefied natural gas vehicles and is replacing existing vehicles with alternative-fuel vehicles when transport contracts come up for renewal.
- Woking Council has calculated its "environmental footprint" in connection with the development of land and has published a Climate Neutral Development Good Practice Guide to advise developers.

Key success factors

- Creation of the "Recycling Fund": The Council estimated it would need £1.25 million to achieve its objectives, but this was too much to be allocated up front. So the "Recycling Fund" was created i.e. money allocated to projects would be put in a separate bank account, and any money saved on energy bills would be re-used for the next year's investment.

Source: Woking Borough Council, 2008-2013. http://www.woking.gov.uk/environment/climate/Greeninitiatives/climatechangestrategy

Box 18: Example - Landfill Methane Recovery, Bilbao (Spain)

Objectives:

- Implementing the consistent control of solid urban waste by artificially evacuating the gases generated by waste fermentation inside the landfills.

Action undertaken:

- In 1984, a plan was implemented in order to evaluate the potential of the biogas generated in the landfill located in Artigas
- Six wells were constructed and torching was introduced to burn the produced biogas.
- After 1988, a feasibility study was conducted to evaluate all the possible functions of biogas: selling it to nearby factories, using it in an incinerator for hospital wastes, directly transforming it into electricity, etc. The latter option was found to be the most interesting from a technical and cost-effective point of view.
- To realise this project, the municipality of Bilbao and the Basque Energy Entity (EVE) decided to create the company Sociedad Bio Artigas S.A., involved with project construction and capitalisation

Results:

- 36 extraction wells and 12 pipes were constructed.
- The installation was completed with two turbines producing 450 kW of electricity each.

Budget:

- The overall amount of investment totals €961,500. Since the plan was launched, average revenues have reached €300,480 per annum, thanks to electricity sales. €60,100 of this covers the exploitation fees, including facility maintenance and insurance.
- These investments were financed by subsidies from the European Commission (DG TREN) through its programme THERMIE, the Spanish Ministry of Industry and Energy and the Basque Government.

Source: Energie Cites, www.energie-cites.org/db/bilbao_140_en.pdf

6.2.2 Reducing emissions in regionally regulated areas.

Regional decisions taken on spatial planning and energy-efficiency regulations in buildings can influence emissions.

Transport planning at the regional level, including increasing coordination/connections between different transport systems can also influence local transportation modes and encourage a shift towards less carbon-intensive options.

Box 19: Example of Transportation Implementation Plan, Vancouver City (British Columbia, Canada) and Brittany Region (France)

Vancouver City

Objectives:

- To implement a comprehensive plan for ensuring that Vancouver's city centre remains a thriving commercial centre and a pleasant place to visit.
- To facilitate increased travel downtown without increasing road capacity on existing bridges and roads.
- To promote transit, walking and cycling while minimising congestion.

Actions undertaken:

- The Council approved the Downtown Transportation Plan (DTP) in July 2002.
- The DTP made 80 recommendations to achieve a more balanced downtown transportation system by providing greater transportation choices.
- Implementation of several measures within the Downtown Transportation Plan such as: the implementation of peak-hour bus lanes, the extension of bus lanes, and the introduction of a downtown community shuttle service and the construction of bike lanes.

Results:

- Eighteen projects (22%) from the DTP Implementation Plan have been initiated. Seventeen should be completed within the next three years.
- The use of motor vehicles as a mode of transportation, was reduced from 49% in 1999 to 30% in 2004.
- In 1999 walking and biking represented 15% of the transportation mode, and is now 3% walking and 27% biking.

Key success factors:

Council approval of the downtown Transportation Plan was preceded by an extensive technical analysis and public consultation with both residential and business communities

http://vancouver.ca/dtp/

Brittany Region

Objective:

To promote train transportation to reduce car traffic and GHG emissions

Actions undertaken:

Brittany successfully developed a regional train transportation system by renovating railway stations and renewing 85% of the engines and of the carriages, for a cost of US$200 million.

Results:

Train transportation increased by 50% from 17,000 users per day in 2001 to 26,000 users per day in 2008.

Key success factors:

This achievement was attributable to the formulation of an integrated policy addressing all aspects of rail transportation:

- Regularity: late trains are the exception and consumers' satisfaction is the key focus of the regional train policy;
- Speed: new equipment has reduced transport time by 15-25%;
- Comfort: comfort standards on regional trains are based on national high speed train standards
- Affordability: special fares for young people and the unemployed.

http://www.bretagne.fr/internet/jcms/j_6/accueil

6.2.3 Indirectly influencing other emissions

Regional authorities can indirectly influence emissions by influencing the investments and behaviour of local actors through communication, information, education, or incentives.

Even when other barriers exist, providing information is often critical. To bring effective results, all levels of information are important: from general communication campaigns to individual guidance related to project development. Public acceptance and support of policies and investment projects will only be assured if there is a wide understanding of the issue of climate change and the possible benefits of low-carbon technologies. Public awareness can be raised through national communication campaigns, but to be truly effective, sustained dissemination efforts at a more local level towards specific audiences, such as students, teachers, the private sector and home-owners will also be necessary. Information gaps are especially prejudicial for energy efficiency, as many energy efficiency options with negative (or low) cost are not implemented simply due to a lack of awareness of the benefits and an understanding of the implementation solutions.

Box 20: Example of an Awareness-Raising Initiative - Aerial Infrared Thermography in Dunkerque, Nord Pas de Calais, France

Objectives:

- To raise the awareness of individual and professional consumers on the extent of the thermal loss in their own buildings in order to encourage them to invest in better insulation

Actions undertaken :

- Realisation of an aerial infrared thermography of all buildings situated in the main urban zone of Dunkerque's agglomeration
- Publication of a map showing the extent of heat loss from the roofs of each building
- Communication of the results through posters in professional shows, town hall and websites
- Establishing Energy Information Centres, staffed by advisors providing comments on the results and free technical advice on possible solutions

Results :

- "Thermal maps" of the 18 cities of Dunkerque's agglomeration were prepared.
- More than 5,000 people were informed

Budget:

- €197,098 (€0.94 per inhabitant)
- Financing partners: public (Regional Council of Nord Pas de Calais, French Agency for Environment and Energy Management- ADEME), private (EDF, Gaz de France, DALKIA)

Key success factors:

- A strong partnership between the Regional Council of Nord Pas de Calais, ADEME and the energy suppliers.
- The large distribution of the thermography results
- Monitoring and follow-up of demands by advisors, with home visits to identify the needs and provide advice on implementing solutions.

http://www.dunkerquegrandlittoral.org/actualite/docshtml/pdf/thermohabi.pdf

> By demonstrating commitment to the development of low-carbon technologies on their territories, local authorities can give investors and financiers confidence on the potential scale of the market in the long-term

The involvement of many regions in education and professional training also provides the opportunity to include climate change in the curriculum at all levels.

In some cases, regions can also provide technical assistance and practical advice to investors. There are many examples where Energy Information Centres are designed to assist individual consumers through the process of selecting technologies and contractors in order to implement energy efficiency or renewable energy projects in their homes. These Centres are often co-financed by regions and have generally been very successful.

Regions can also contribute to creating an enabling environment for private sector investments in low-carbon technologies by adapting regulations that may hinder such investments or, if available, by adjusting their fiscal policies or subsidy policies. Establishing a favourable environment in which projects can be developed and succeed is a pre-condition for low-carbon local development. By reducing the costs, risks, uncertainty and implementation time attached to the investments, projects become more attractive to potential project developers and financiers.

By demonstrating commitment to the development of low-carbon technologies on their territories, local authorities can give investors and financiers confidence on the potential scale of the market in the long-term. In the wind sector, for example, developers face high costs when establishing projects in a country or region that has little wind experience. They need to become familiar with the country's regulatory system and sometimes wait until initial regulatory imperfections are corrected. In addition, they need to assess the local technical environment and find and/or train contractors. Most developers, thus, only invest in wind power if they can make it pay over the long-term with several projects. In the same way, in a small market or region it may not be worthwhile for carbon brokers and buyers to invest their resources in 'stand-alone' projects. However, having a clear and supportive policy framework, as well as multiple project and programme opportunities, turns this into an attractive investment climate for carbon finance.

6.2.4 Attracting local "green" industries and services

Finally, some regions may also wish to implement policies to encourage companies in their territory to provide the technologies, products and services necessary to achieve lower emissions. Authorities responsible for economic development or research and development may be best suited to work on this second aspect. Attracting green industries and services may, however, be easier for larger territories with bigger markets and a better business environment in terms of infrastructure, research and development or a skilled workforce.

When Spain began promoting wind energy, the benefits in terms of jobs were a strong argument to balance the rejection of projects for environmental or visual reasons. Very quickly, most Spanish autonomous communities mandated that wind turbines installed on Spanish soil should be manufactured locally. This mandate is still effective in several Spanish regions such as Castile and León, Galicia and Valencia, which require local assembly and manufacture of turbines and components before development authorisations are granted. These policies were one of the drivers in the creation of Gamesa Corporación Tecnológica S.A., the world's third largest producer of wind turbines.

Box 21: Example of a policy promoting the localisation of low carbon industries - Wind Energy in Spanish Regions

Conclusion

Mitigation policies can have a positive impact, not only on the environment but also on development. Low-carbon development is a growing area of interest for public authorities, notably at the regional level where a significant potential for action remains untapped. Through the equipment and services that they operate directly, the regulations and planning principles that they set up, their influence over local constituents and their economic development policies, regional authorities are often well positioned to integrate mitigation concerns in their existing activities.

These authorities are also becoming increasingly involved in adaptation policies and measures as will be described in the next chapter.

However, there are a number of barriers to the preparation of the long-term integrated cross-sectoral and participatory strategies described in Chapter 4 and their transformation into effective investments and policies.

The global programme "Towards Lower Carbon and Climate Change Resilient Territories", currently being set up by UNDP, with UNEP and regional associations, builds on the potential described in this chapter to help territorial authorities substantially increase the number of low-carbon local development initiatives and investments and to transform the development path of their territories. The practical steps involved are described in Chapters 4 and 8.

Chapter 7

Climate Change Adaptation: Objectives, Challenges and Priorities for Local Development

7. 1 The Urgency of Adaptation to Climate Change

7.1.1 Anticipated climate change impacts

Even if the world immediately stopped emitting greenhouse gases altogether, the effects of climate change are now unavoidable, thereby making adaptation in many parts of the world a necessity.

According to the latest IPCC findings, the world is already facing an inevitable increase in average temperatures by 0.5°C to 1°C until approximately 2035, after which temperatures are likely to gradually increase and approach a 2°C increase (relative to 1990 levels) by 2050. When and how hot the world will become depends firstly on how much greenhouse gas is emitted to the atmosphere during the 21st century and secondly on how sensitive the world's climate will be to these increased concentrations of gas.

Figure 25 schematises the four potential future emissions scenarios as highlighted by the IPCC. They range from high-emission scenarios, assuming a business-as-usual fossil-intensive economy (A1), to low-emission scenarios, based on an inclusive economy, emphasising new energy technologies (B1)(Wolfson, R 2008). Figure 26 depicts the projected change in global surface temperature for the 21st century based on these different scenarios (Alley, R.C. 2005).

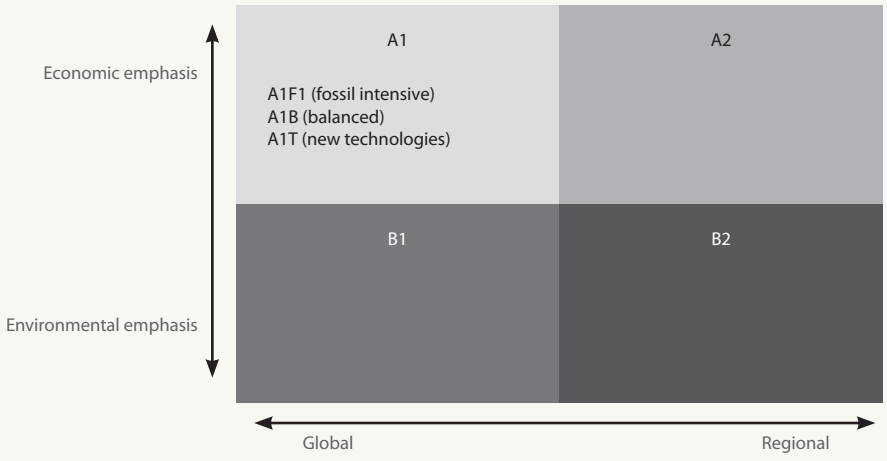
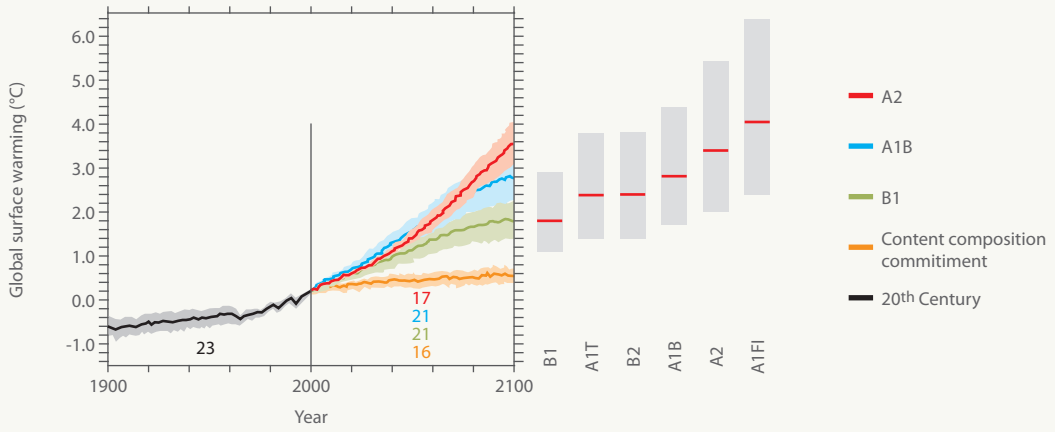


Figure 25: IPCC Emission Scenarios

Source: Wolfson, R Energy, Environment and Climate, 1st Ed, W.W. Norton&Company, inc. NY, 2008.

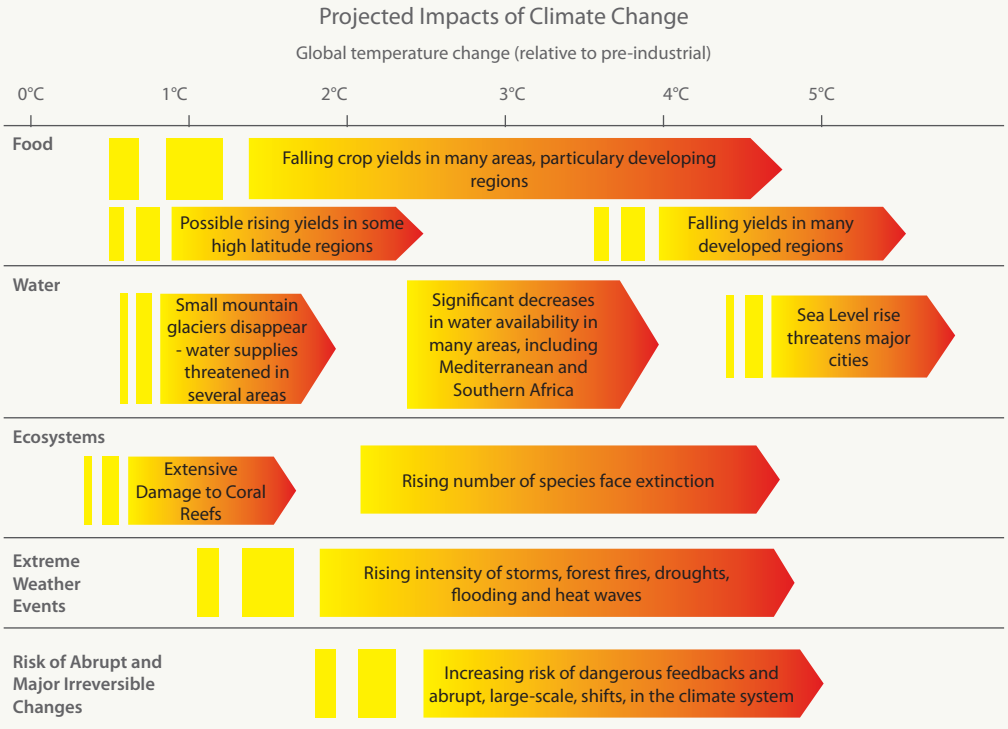
Figure 26: Projected change in global temperature



Source: Alley et al., 2005

If emissions continue to rise at the rate of the past 30 years (A1F1), the world should be prepared for a 4°C increase in warming. The last time the world experienced temperature increases of this magnitude was 55 million years ago, after the so-called Palaeocene-Eocene Thermal Maximum event. During this period, tropical forests sprang up in ice-free polar regions and sea levels rose to 100 metres higher than today's. Desert stretched from southern Africa into Europe (New Scientist, March 2009). This period occurred under very different conditions (in terms of CO_2, the position of the continents, the earth's orbit), and care must be taken when extrapolating future climate change impacts from past conditions. However, it is clear that the impacts of a 4°C increase in world temperature could be devastating.

Figure 27: Projected Impacts of Climate Change



Source: Stern (2006)

As summarised in Figure 27, significant changes in the typology, frequency, intensity, duration and distribution of climate-induced hazards can be expected even under relatively modest scenarios of climate change. According to the recent Stern Review, a warming of 2°C is likely to result in the extinction of 15-40% of all species, a 3°C or 4°C change will result in millions of people being displaced due to flooding, while a warming of 4°C or more is likely to seriously affect global food production.

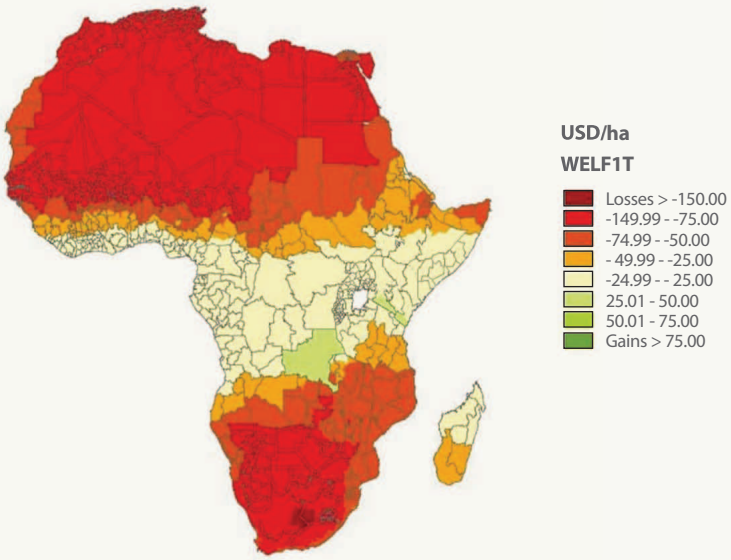


Figure 28: Change in net revenues per hectare by Regions (Provinces/Districts) from a moderate change in temperature/ precipitation

Source: Kurukulasuriya and Mendelsohn, African Journal of Agriculture and Resource Economics (2008)

What is also clear is that the economic and human development impacts of climate change are expected to be inequitable, with the poorest of the poor, including those living in tropical regions and island states, being affected the most (IPCC 2007). Regions in Africa, Asia and the Pacific are already experiencing effects that are similar in type (if not in scale and magnitude) to those likely to manifest as a result of increased warming.

A recent economic analysis of the implications of climate change on African agriculture indicates a significant economic loss at the regional level, particularly in cases where dryland agricultural practices are the norm. Estimates of economic losses range from US$25/hectare to more than US$150/hectare. In the context of an average value of dryland agricultural productivity of US$120-$150, in countries such as Niger, Zimbabwe, and Ethiopia, losses of this magnitude will be dramatic for local development. Certain provinces and districts in West and Southern Africa are likely to lose more than 40-60% of expected revenues from agriculture.

In other parts of the world, such as the deltas of South Asia, regions are likely to become increasingly affected by floods in the coming decades, and then by widespread drying following the melting of the Himalayan glaciers.

Thus, climate change could negate decades of progress and undermine the hard-won development gains made in many regions of the world. Furthermore, at the local level, it could increase the likelihood of conflicts between regions and become a major human security issue. Access to natural resources is already a frequent source of tension between people and political entities. Climate change will compound pressures on land and water resources and could trigger intra-state and even interstate tensions (see Figure 7 - Climate Change Hotspots).

Box 22: Impacts of Climate Change on the Sustainable Development of the Cordillera Blanca Region in the Northern Andes in Peru

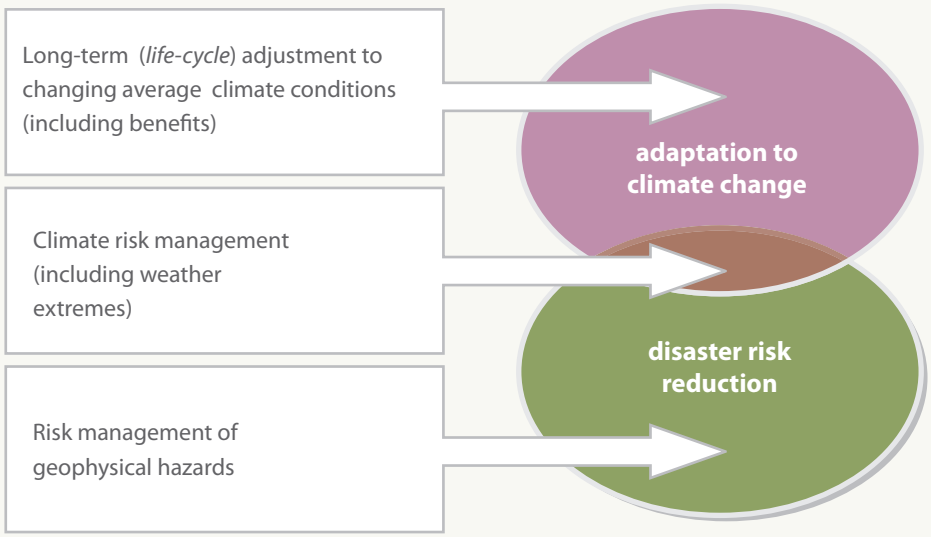
The Region has been experiencing rapid growth over the past few years thanks to large investment into irrigated agriculture and a power-intensive mining industry. The impact of rapidly melting glaciers in the Andean region and its impact on hydropower generation (among other things) could call into question the future of these industries and the sustainable development of the Region. One of the rivers nourished by the Cordillera Blanca is the Rio Santa, which generates hydroelectric power for two major urban areas (Chimbote and Trujillo). The problem is that up to 40% of the dry season discharge from the Rio Santa originates in melting ice that is not being replenished. Glacial melting thus threatens to erode the viability of hydropower, agricultural and mining investments. Compensating for the loss of glacial flows in the medium-term will require billions of dollars of investment in the construction of tunnels beneath the Andes. Compensating for power losses will require investments in thermal power generation, estimated by the World Bank at US$1.5 billion.

7.1.2 Managing climate change challenges on development

a) Conducting long-term planning exercises

In addition to affecting the distribution, nature, and severity of climate-related hazards (i.e. potentially damaging physical events) across the globe, climate change may result in the emergence of "new" types of hazards that were previously absent or rare, such as glacial lake outbursts and the collapse of dams resulting from elevated temperatures and increased snow and ice melt. There are also likely to be changes in risk factors (i.e. the probability of harmful consequences). Hence, adaptation efforts will need to be closely linked with strategies for disaster risk management (DRM). DRM strategies, policies and measures, will be a good starting place to address new and

Figure 29: Overlap between Disaster Risk Management (DRR) and Climate Change Adaptation



Source: Adapted from Siegel, 2009

more intense and frequent weather-related risks. For example, integrating the findings of climate change risk assessments into planning processes for disaster risk reduction and management, and enhancing existing early warning systems and emergency plans, are all relevant for both adaptation to climate change as well as DRM.

However, adaptation is not simply about better risk reduction or coping with a stochastic climate. The extent of vulnerability to climate change is a function of changing risks as well as the levels of *exposure, sensitivity,* and *adaptive capacity* to new and emerging hazards. Given the fundamental shifts in economies and ecosystem boundaries that will result from climate change, upgrading existing or new disaster risk reduction measures alone, while necessary, will not be sufficient. For example, the consequences of the polar ward migration of fish species and a collapse of fisheries because of warmer sea temperatures will have catastrophic consequences for local fish communities in Africa (see Figure 29), but will not take the form of sudden natural disasters addressed by existing DRM systems. Adaptation to climate change will require a fundamental rethink of socio-economic development strategies and of ecosystems management.

As discussed in Chapter 4, a major adaptation challenge confronting decision-makers is how to deal with the inherent levels of uncertainty regarding the changing conditions and their associated impacts. Making medium- to long-term decisions today, under conditions of imperfect information, is perhaps one of the greatest challenges. Effective climate change adaptation will require long-term, orientated planning approaches at the national, regional and local levels. Simply reacting to changes in the short-term or medium-term, without attention to changes that will occur and remain over the long-term, will result in poor investment decisions; the costs of which could exceed the direct local costs of warming. The vast Cordillera Blanca Region in the northern Andes in Peru is a case in point[50].

Efficient climate change risk reduction will require conducting prospective exercises over a period of 50 years. The objective of these prospective exercises will not be to predict the future but to identify development strategies, policies and measures robust enough to cope with a range of possible future climatic and other changing socio-economic conditions. In other words, the key objective of these long-term planning efforts will be to identify the appropriate mix of responses that address gaps for managing current and expected climate-induced challenges and opportunities. In addition, this exercise will help to ensure that the adaptation introduced today does not become the mal-adaptation of tomorrow.

Conducting such a prospective exercise is not an easy task at the national level. Such an exercise is even more challenging at the sub-national level. Key data on climate, biophysical (land, water, etc.) and socio-economic elements need to be analysed in an integrated framework in order to design optimal management responses, strategies and policies. Most countries have established, functional Meteorological Services and many have started to develop baseline climate information databanks to facilitate such an exercise. However, these databanks are often not sound enough to support a long-term planning exercise.

Although a number of barriers will need to be removed to conduct a theoretically-ideal prospective exercise, it is important to keep in mind, as noted in Chapter 4, that precise, detailed and certain impact assessment is not a requirement for the implementation of adaptation policies. Sometimes a simple assessment can prove sufficient to identify that some development strategies are more robust than others to changes in climate conditions. Similarly, many adaptation strategies able to cope with these uncertainties can be identified and implemented. A relatively simple prospective exercise can first be conducted with existing data and available skills and later further deepened as additional information, financial resources and expertise becomes available.

The National Communications (NCs) developed under the UN Framework Convention on Climate Change (UNFCCC) have begun laying the foundations for prospective exercises to address climate change in a large number of countries. This expertise could be leveraged by the regions to prepare their ITCPs. A key issue for decision-makers trying to reduce climate change risks at the sub-national level, will be to identify appropriate prospective tools to meet the unique requirements and capacity of their territory.

> “Adaptation is not simply about better risk reduction or coping with a stochastic climate. The extent of vulnerability to climate change is a function of changing risks as well as the levels of exposure, sensitivity, and adaptive capacity to new and emerging hazards”

[50] Source: Human Development Report 2007/2008: Fighting climate change: Human solidarity in a divided world, UNDP, New York

"Experience has shown that it is counterproductive to create stand-alone institutions charged with responsibility for climate change risk management"

b) Mainstreaming adaptation into policy and investment decision-making

Market forces alone are unlikely to lead to efficient adaptation because of remaining uncertainties in the timing and magnitude of climate change, the 'public good' characteristic of a number of adaptation options and the long-term nature of adaptation benefits compared to clear and present adaptation costs. To promote early and planned action, governments will need to:

- provide appropriate information on future climate change;
- set performance standards and establish codes;
- propose criteria to select priority adaptation policies for implementation; these criteria can include cost-benefit ratio but also robustness and flexibility criteria.
- incorporate adaptation concerns into national development policies and public investment plans; and
- design and implement long-term policies to protect climate sensitive ecosystem services and public goods (water supply, coastal protection, regional political cooperation, etc).

As discussed in Chapter 5, climate change is a multi-sectoral issue. Promoting increased resilience to the impacts of climate change is closely intertwined with development choices and actions that cover a variety of sectors, such as energy, agriculture, health, water resources and infrastructure. In particular, it is essential to consider both synergies and trade-offs between adaptation and mitigation activities, including possible negative and positive side effects. Focusing too much on isolated adaptation goals, without considering side effects (e.g. cross-sectoral effects) and linkages with other goals, could also lead to missed opportunities. Strong coordinating mechanisms at the national and sub-national levels are therefore required. Such mechanisms are most effective when they are well-integrated into the local organisational and administrative culture, and nested in decentralised systems, where the governance and accountability is geared to respond to the adaptation needs of the poorest and most vulnerable.

Experience has shown that it is counterproductive to create stand-alone institutions charged with responsibility for climate change risk management. Climate change cannot be the sole responsibility of any single institution, or professional practice. Instead, it is important to strengthen existing systems of governance, including those at the regional level that can promote "bottom-up" effective adaptation. Line ministries responsible for the provision and management of public goods, food production and water management, need to be fully accountable for maximising the efficiency of public goods and services, while minimising the fiscal burden from climatic losses. Fundamentally, the persuasive nature of climate change requires a behavioural shift and the mainstreaming of adaptation into development and investment decision-making processes at all levels of society in the coming decades.

However, most traditional development planning tools have not been designed to incorporate climate information. Currently available tools have typically focused on short-term threats in two or three key sectors, with less emphasis on the resilience of long-lived investment in the context of climate uncertainty. In addition to conducting long-term prospective exercises, decision-makers at the sub-national level might need to reconsider their planning tools and processes to incorporate climate change considerations.

c) Financing adaptation action

There is little doubt that development will be more costly under climate change. While there are many difficulties and limitations in estimating the exact cost of adapting to climate change under various emissions and temperature increase scenarios, all the available indicative estimates suggest that adaptation costs in developing countries will be in the order of tens of billions.

In addition to improving the way development is done, through mainstreaming adaptation into development and investment decision-making exercises and adopting a long-term perspective, effective adaptation will require changing the way development is done. The net costs of achieving sustainable development will be higher because of (a) the measures that must be introduced to manage the additional risks and challenges brought about by climate change; (b) the opportunity costs as scarce resources are redirected or lost; and (c) the costs of managing the uncertainty that is inherent with climate change.

As mentioned in Chapter 2, the amounts needed to adapt to climate change far exceed what is currently available from a variety of funding sources. Decision-makers will need to prioritise adaptation action, reduce the risks of mal-adaption, "right-size" structural risk reduction measures, and promote adaptation initiatives, which not only reduce climate risks but also generate development co-benefits and develop new financing mechanisms for adaptation.

For example, the risk of over-sizing/under-sizing adaptation efforts is particularly high in the area of flood control, in the context of long-term climate uncertainty. As an alternative to costly structural flood control solutions, insurance-related instruments such as flood indices, that compensate affected victims in the event of a flood, are emerging as important candidates for supporting risk reduction, compensation and adaptation to climate-related and other disasters in developing countries, in the context of long-term climate uncertainty.

Furthermore, such risk-transfer initiatives, when designed appropriately, could not only help those at risk in coping with shocks but also create conditions that enable poor people to engage in economic activities that can yield higher profits and therefore lift them out of poverty. This is true across geographic scales and applies from the micro/individual level to the national and regional levels. For example, there is enormous potential for insurance mechanisms, in the context of transboundary basins, to support development in crucial sectors, such as agriculture, hydropower, and infrastructure, where risk-financing instruments can help not only improve response and recovery, in case of shocks, but also facilitate access to credit for investments that would otherwise be deemed too risky, as well as provide tools to promote integrated water resources management.

However, insurance, in any shape or form, only covers 3% of the total population in developing countries. Hence, a major challenge for decision-makers, at the regional levels, will be to develop a policy and institutional environment conducive for the development and deployment of innovative adaptation financing mechanisms, such as weather derivatives, to support development in crucial sectors, such as agriculture, hydropower, and infrastructure, in the context of long-term climate uncertainty. The selection of potential public policy and financing instruments to implement the priority adaptation action, identified through the prospective exercise, will be a key component of the ITCP.

"While there are many difficulties and limitations in estimating the exact cost of adapting to climate change under various emissions and temperature increase scenarios, all the available indicative estimates suggest that adaptation costs in developing countries will be in the order of tens of billions"

7.2 Prioritising Adaptation Efforts at the Regional Level

In line with the above, a key task of regional authorities in the coming decade will be to ensure that an enabling environment is in place, consisting of the right policies and appropriately capacitated institutions, that can work to reduce the costs associated with poor investment decisions under changing and uncertain climate futures, and protect vulnerable groups from new and more frequent extreme natural events. To achieve this objective, regional authorities will need to:

1. Assess the physical and socio-economic implications of climate change;
2. Develop longer-term planning frameworks - moving from ad-hoc, short-term, stand-alone, and distinct responses, to deliberate, longer-term adjustments of climate change risks into development;
3. Mainstream adaptation into regional development planning and disaster reduction processes - moving beyond the business-as-usual planning and management processes, where climate change considerations are considered in the margins;
4. Identify win-win/no-regrets/urgent adaptation actions and adaptive capacity development needs.

The development of comprehensive climate change strategies, reflecting local development priorities and integrated with the overall national development strategies, should be the starting point to empower regional actors to efficiently manage these transformation exercises.

7.2.1 Formulating a Territorial Climate Change Profile and Strategy

Rather than preparing a stand-alone regional adaptation plan, UNDP recommends the preparation of an Integrated Climate Change Profile and Strategy to identify and address synergies and trade-offs between mitigation and adaptation actions. As described in Chapter 4, the formulation of the ICCPS includes six steps (see Box 23):

Box 23: Formulation of a Territorial Climate Change Profile and Strategy

Climate Change Profile

Step 1: Analysis of local development issues, priorities and existing policies at the regional level

Step 2: Assessment of current and changing socio-economic conditions

Step 3: Assessment of current vulnerability, risks, present energy service coverage and GHG emissions

Step 4: Assessment of future climate risks, adaptive capacity needs and future BAU GHG emissions

Climate Change Strategy

Step 5: Review of potential options, cost-benefit analyses

Step 6: Elaboration of a medium- to long-term strategy

While these steps are likely to be generic across regions, the selection of the individual tools and methodologies will need to be tailored to the unique requirements of each region. As indicated in Chapter 4, the selection of the appropriate tools to assess future conditions will depend on available data, existing technical capacity, possible partnerships with global Centres of Excellence and the specific objectives of the ITCP. To conduct prospective exercises, regions could construct relatively simple storylines in some cases, or use global climate models to develop climate projections and identify climate analogues in others. Figure 30 shows the possible key steps in characterising future climatic conditions, using global climate models to develop climate projections and identify climate analogues in others.

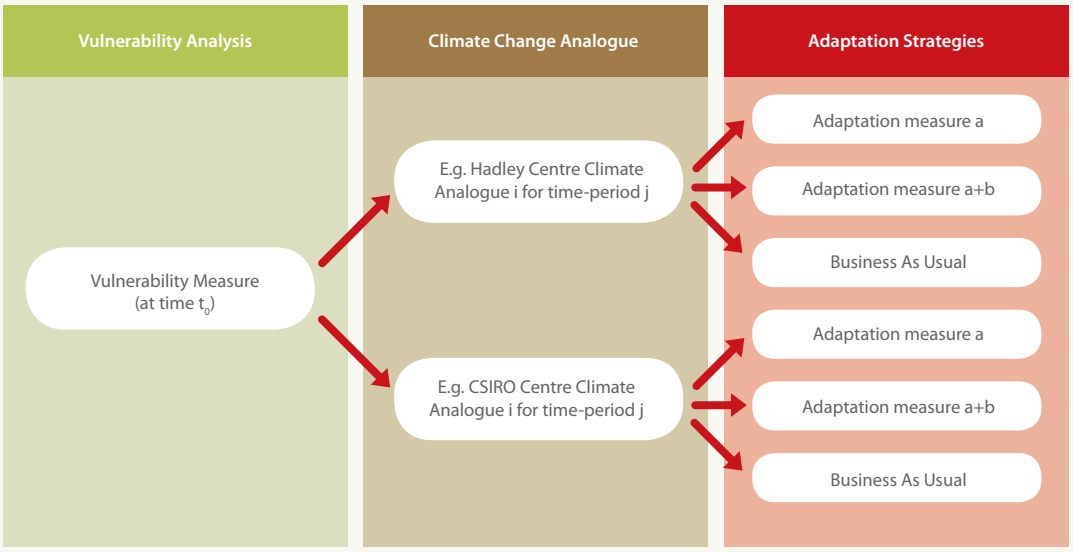


FIgure 30: Key steps in assessing adaptation options

Source: Kurukulasuriya and Mendelsohn, African Journal of Agriculture and Resource Economics (2008)

The identification of adaptation strategies requires an analysis of the underlying vulnerabilities (green column) followed by a systematic analysis of the implications of alternative climate change analogues (brown column) on key factors, such as income from crop production, etc (red column). Figure 30 follows the approach proposed by Hallegatte et al. (2007, Climatic Change) for the analysis of the implications of alternative climate change analogues. It assesses the consequences if a region implements adaptation measures developed using the Hadley Centre analogue and compares them to those expected if the climate evolves as projected by the CSIRO Centre instead. It allows regions to assess the vulnerability of each adaptation measure to incorrect climate projections. The pursuit of each of these steps in a systematic and integrated way will permit an evaluation of the likely net-benefit of a range of adaptation options.

The approach outlined in this example is not a trivial exercise. It requires specialised training in climate change science, economics, hydrology, and other disciplines, which often can only be brought together in the context of a multidisciplinary team. It also requires time and resources for the analytical work to be completed rigorously with adequate vetting and verification. Whenever possible, regions should seek partnership arrangements with international or national centres of excellence in climatology, or with other regions that have already completed their Climate Profile, when conducting such an exercise.

7.2.2 Identification of no-regrets, urgent and life-cycle adaptation action

Adaptation actions will need to take place across all sectors over a long period of time. As such, it should be thought of as a collection of options to be deployed in tandem. To optimise the use of scarce resources, a key objective of the adaptation component of the ITCP will be to assist decision-makers in identifying three types of priority actions in highly vulnerable sectors:

- No-regrets adaptation measures: This category includes measures which, when designed appropriately, do not only reduce climate change risks but also create conditions that enable net economic benefits across different sectors. They should be implemented as part of the sustainable development strategy of a region, even in the absence of climate change concerns;
- Urgent adaptation measures: Irrespective of their immediate costs, this category includes time-critical adaptation measures that cannot be postponed, either because of the clear and present risks posed by climate change or the long implementation time required for these measures.
- Life-cycle risk reduction measures: This category includes measures that will address deficits in policies and practices to address both current and future climate-related risks, as well as avoid or reduce the likelihood of mal-adaptation costs associated with climate change uncertainty;

Table 7: Examples of win-win/no regrets/urgent measures

Measure/Sector	Agriculture	Water	Housing	Disaster Risk	Energy
No regrets adaptation	Promotion of risk transfer mechanisms such as insurance	Water pricing schemes and standards to encourage the efficiency of water consumption and distribution	Better insulation of buildings	Improved weather forecasting. Develop institutional capacity for all phases of disaster risk management	Improved energy-efficiency standards and labels for domestic appliances
Urgent adaptation	New cultivars and changes in farming systems to increase their resilience to drought	Development of allocation and dispute resolution mechanisms to manage shared water resources	Greening of urban areas and revised urban development	Strengthen the evidence base on risk factors and risk levels to support risk management decision-making Development of preparedness measures for new disasters	Diversification of sources of energy
Life-cycle adaptation	Promotion of agricultural and non-agricultural diversification (eg avoiding mal-adaptation risk of mono-culture in a changing climate)	Incorporation of information on the potential impact of climate change on water supply and demand into water resource planning (eg avoiding investment in water consuming activities in future water-thirsty areas)	New building codes and spatial planning (eg avoiding settlement in flood-prone areas in the future)	Upgraded disaster preparedness and response procedures and measures (eg avoiding over-sizing/under-sizing of risk reduction infrastructure)	Incorporation of information on the potential impact of climate change on water demand and supply as well as projected development of key sectors into energy planning (eg avoiding lost investment due to reduced water availability for hydro-electricity)

A number of no-regrets adaptation measures will require the identification and removal of policy barriers that have stalled such efforts in the past, despite their net economic benefits. Regional governments will also need to develop new sources of funding to provide the required financial incentives for the implementation of urgent adaptation measures with net additional costs.

While Table 7 presents a sample of the potential responses that need to be viewed in the context of local conditions and constraints, it is important to understand that adaptation to climate change sits alongside a development continuum (McGray et al 2009). That is, there is a seamless interface between addressing (a) the underlying drivers of vulnerability and enhancing the response capacity to address policies and measures in the context of *current climate* and; (b) managing and planning for expected *emerging climate change related* challenges and opportunities. This linkage requires overcoming current *deficits* in policies and measures to address vulnerability. It also entails establishing systemic mechanisms to enable informed choices and decisions to be made throughout the development lifecycle, in order to avoid potential *mal-adaptation* costs. In this context, adaptation requires an approach to climate change risk management that is anchored on key determinants, including governance, institutions, capacity, finance and knowledge. The likelihood of successfully managing climate change, therefore, depends on the weakest, key underlying determinants of adaptive capacity at the national and sub-national level.

7.2.3 Using maps to communicate climate change impacts and adaptation measures

Given the multi-sectoral nature and complexity of adaptation issues, it is critical to communicate the results of the prospective exercise and of the possible adaptation options in a manner directly accessible by key regional stakeholders.

A number of tools are available at a relatively low cost to support decision-making for adaptation. Of these, maps depicting vulnerability to climate-related risks are often used to raise awareness and develop consensus, as well as to assist with planning and budgetary allocations. Cartography is one of the oldest and most effective mechanisms for analysis and communication of geographical information. It is easier to communicate complex information visually with maps than by tables or lists, as maps make full use of a person's natural capacity to make spatial distinctions of colours, forms and relation.

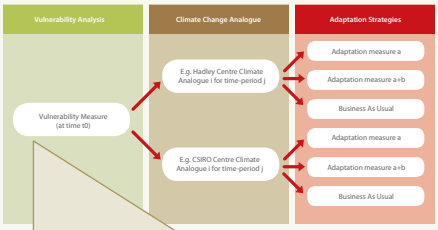
The maps are produced with the combined input of technical specialists (on land use, climatology, economics, etc) as well as key stakeholder involvement to ground-truth and validate. Underlying each map is an integrated analysis of a complex set of data from numerous domains (including natural, economic and social sciences). If systems for analysing and depicting climate change-related risks can be established at the national and/or sub-national level, and the necessary technical capacities developed, they could be a valuable provider of policy-relevant information for local communities, the private sector, as well as regional and national government.

Based on the methodology for the formulation of an ITCP described in section 7.2.2, the maps in Figures 31, 32 and 33 provide an example of how vulnerability mapping can be used to communicate the impacts of climate change on food security risk in Africa. The example is based on an analysis conducted on the impacts of climate change on African agriculture (Kurukulasuriya et al, 2006). The maps are used only for exposition purposes.

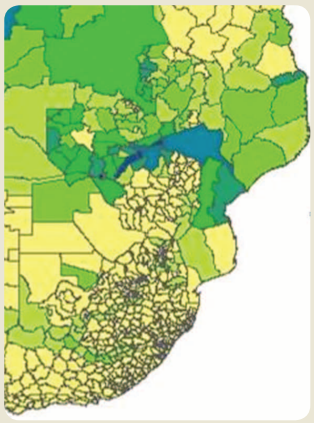
Conclusion

Responding to the threat of climate change so that it does not undermine human development gains must be a paramount objective of regional authorities. It will require concerted action on an unprecedented scale. In addition to technological, economic and human capacities, national and sub-national leadership will be required. Systematic action will be required across all levels of long-term development planning and cross-sectoral implementation (regional, national, sub-national and local) in order to remove barriers and obstacles to adaptation. Financing for adaptation will need to be mobilised, including an increase and a reorientation of Oversees Development Assistance (ODA). Chapter 8 will further detail the range of public policy and financial instruments available to regional decision-makers to mobilise the required financing for adaptation and for implementing priority adaptation actions.

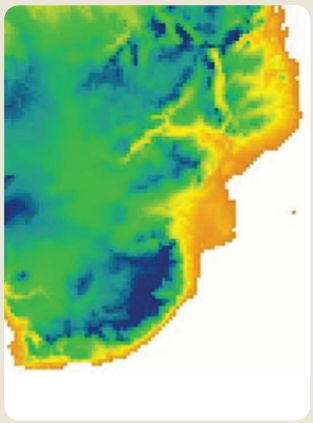
Figure 31: Key data for Vulnerability Analysis



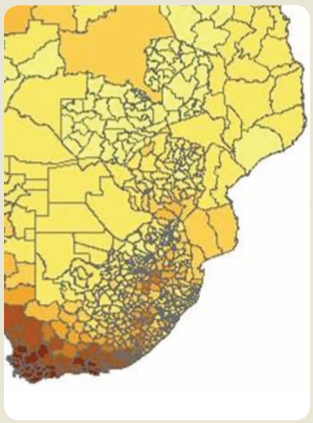
Examples of key data



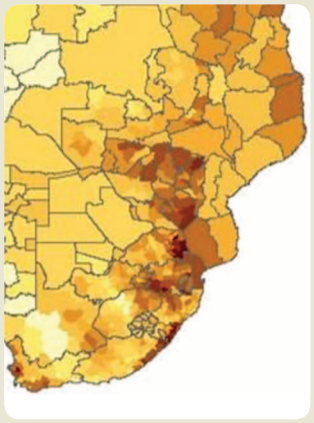
Streamflow



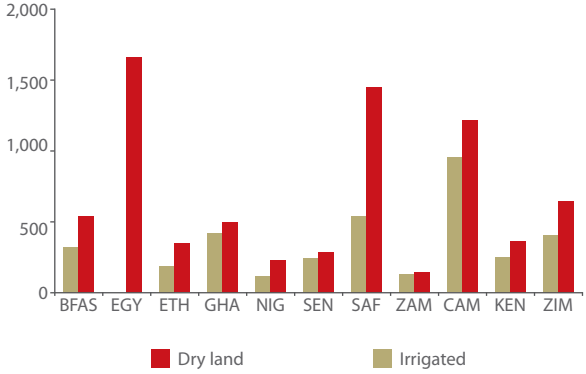
Elevation



Irrigation



Cropland



Crop productivity

Other data requirements:

- Institutional Factors
- Household characteristics
- Soil data
- Population density
- Many others!

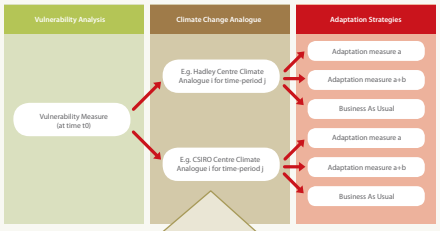
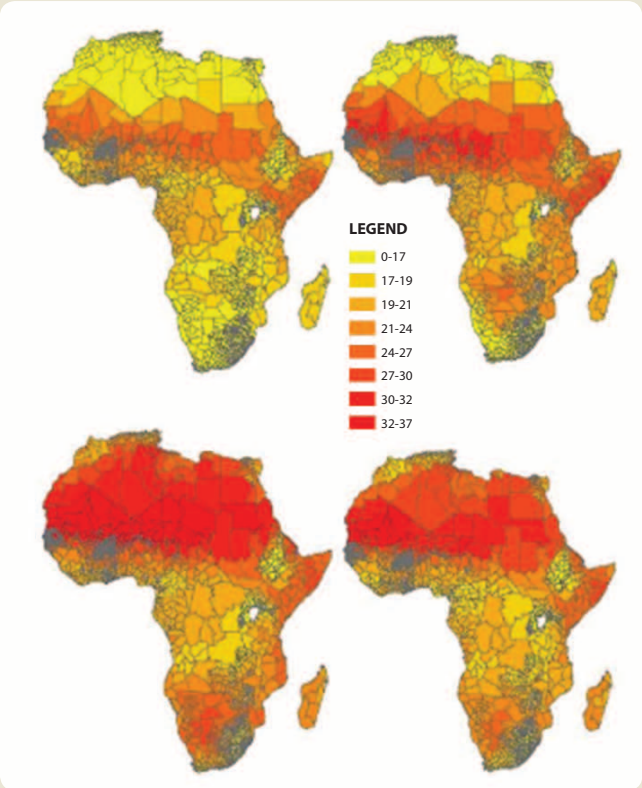
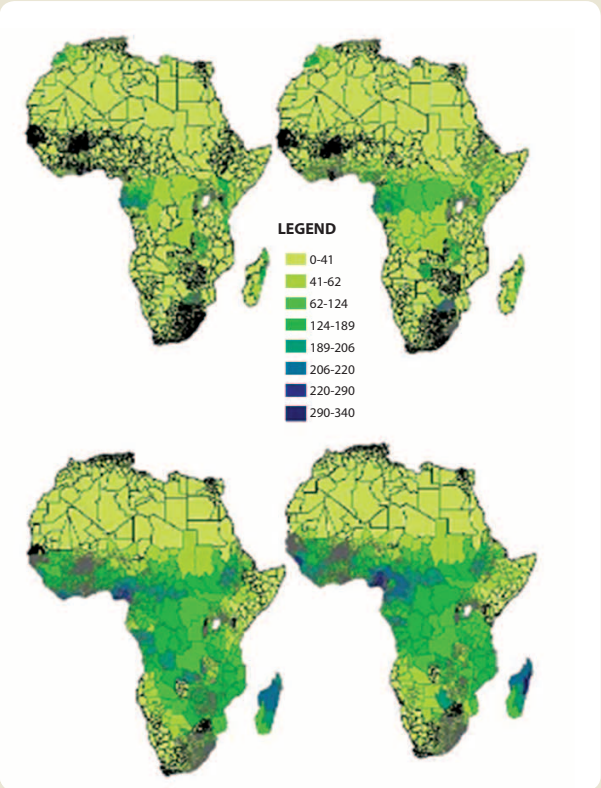


Figure 32: Climate Analogues

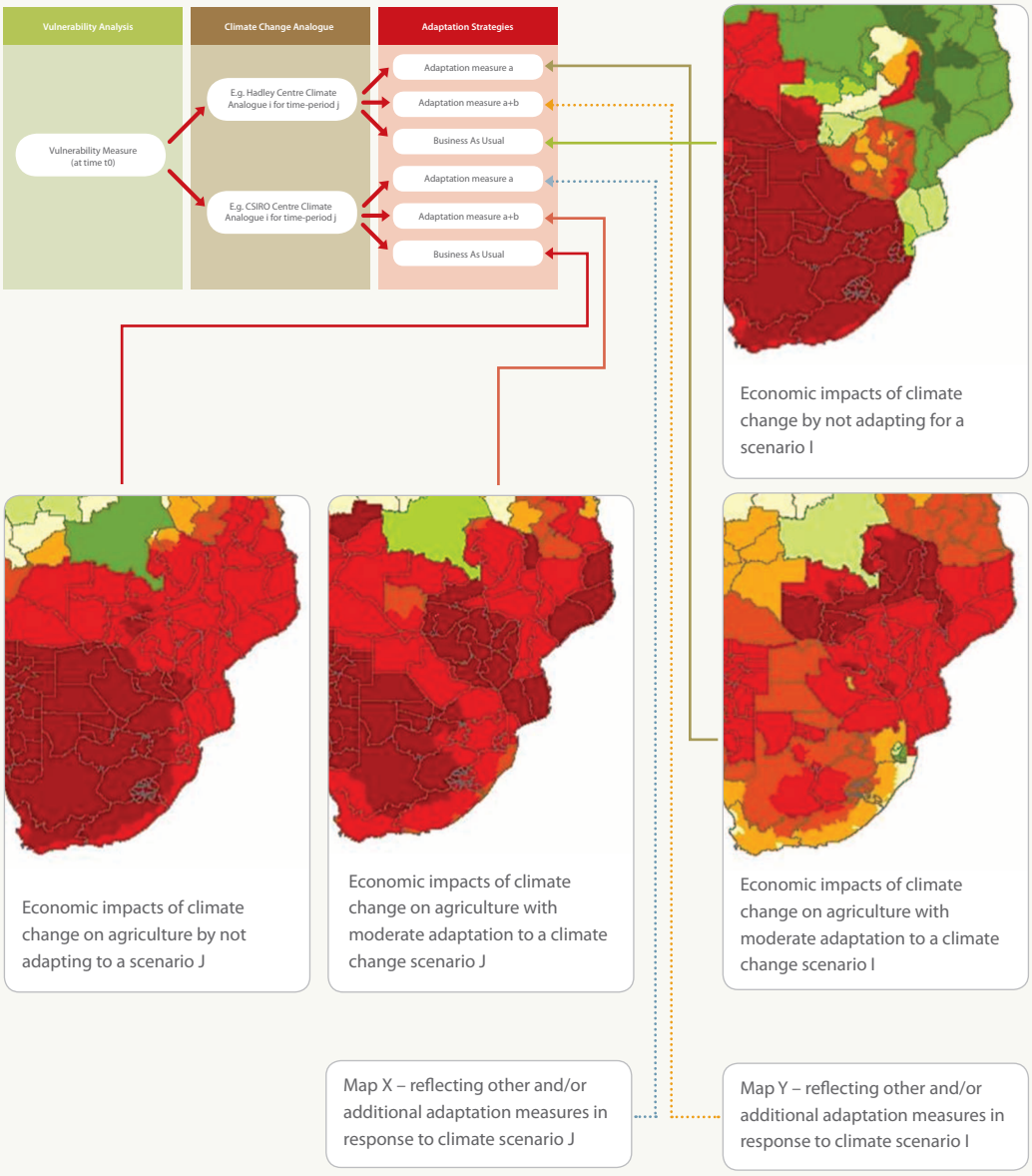
Long-run Climate Analogues at District Level from multiple sources (HADLEY, CSIRO, PCM, etc)





The maps above depict seasonal long-term climate from a single GCM for districts (and some provinces) in Africa. For analytical purposes, similar information is required from multiple GCMs to account for different underlying assumptions about emissions scenarios and future population and economic growth.

Figure 33: Adaptation Profiles



Chapter 8

Policy and Financing Solutions to Implement Priority Mitigation and Adaptation Actions

The Integrated Territorial Climate Profile and Strategy (described in Chapter 4) articulates the medium- to long-term strategy of regional authorities in carrying out priority mitigation and adaptation activities and recommends the technological options that can be pursued. The next step is to translate these technological options into a mix of optimal policy instruments and a set of coherent projects. The Policy and Investment Framework (PIF) is designed to help regional authorities through this step. The first part of this chapter (section 8.1) shows that when it comes to translating the strategy into action, regional authorities are faced with a wide array of choices that can be confusing. The second part of the chapter (section 8.2) describes how the PIF can be used to navigate this process. The example of promoting wind power technologies is used throughout the chapter for simplicity and to provide a unified thread, but the analysis can be extended to other mitigation and adaptation technologies.

8.1 The Need for an Appropriate Mix of Policies and Financing Instruments

8.1.1 A confusing array of markets, policy options and financial instruments

Establishing a policy environment conducive for the development and successful implementation of mitigation and adaptation projects is a pre-condition for realising climate change management goals. By reducing the costs, risks, uncertainty and implementation time attached to the investments, these projects become more attractive to potential project developers and financiers. A huge array of public policy and financial instruments are available to regional authorities to achieve priority mitigation and adaptation measures in the different sectors. However, it can be challenging to identify a policy mix appropriate to the unique requirements of a region.

Because there is a fragmentation of providers and consumers in clean energy solutions, there is no single market for clean energy services. Instead, the "market" consists of hundreds of providers, thousands of intermediaries and millions of consumers. As a result, no single best solution for promoting clean energy development exists. Instead, policy-makers need to consider the unique workings of individual markets in their own region to overcome any market barriers. In most cases, multiple, complementary, regulatory measures and financial incentives will need to be designed for each targeted market.

For example, wind energy is a rapidly growing technology. Experience shows that good wind resources on their own are not sufficient to ensure the strong and widespread development of wind energy and reduce its costs. Even fair pricing is not sufficient. Only countries that have set up an adequate enabling environment, long-term and stable comprehensive public policies with strong political commitment, and adequate access to financing, have succeeded in tapping into wind power as a major energy source. Policies in such countries/regions have not only focused on reducing costs and improving revenues to increase profitability, but also on reducing risks. As such, pre-conditions for the development of successful projects in the wind sector may require a wide array of supportive activities, including the preparation of wind assessments; standards for wind turbines; model contracts; skills development of local technicians; information and communication; reviews for permitting and licensing regulations or modifications of charges to connect to the grid; and financial incentives in the form of feed-in tariffs[51], tax breaks or Tradable Renewable Energy Certificates (TREC).

[51] Feed-in laws give wind energy producers guaranteed access to the grid and utility companies are obligated to buy electricity produced by wind energy at minimum published prices, which are generally higher than electricity market prices.

Ultimately, identifying the most applicable and required policy measures to promote wind energy will depend on the national specificities and economic culture of each region (type of economy, level of competition and maturity in the electricity market, number of existing wind farms, national industry objectives, level of technical expertise, financial options, etc.).

Reflecting this diversity of market conditions, Figure 34 lists some of the main regulatory measures used in OECD countries to promote renewable energy technologies.

Figure 34: A Review of Public Policies to promote Renewable Energies in OECD Countries and Economies in Transition

Country	Feed-in tariff	Renewable portfolio standard	Capital subsidies, grants, or rebates	Investment or other tax credits	Sales tax, energy tax, excise tax, or VAT reduction	Tradable renewable energy certificates	Energy production payments or tax credits	Net metering	Public Investment, loans, or financing	Public competitive bidding
Developed and transition countries										
Australia		√	√			√			√	
Austria	√		√	√		√			√	
Belgium		√	√		√	√		√		
Canada	(*)	(*)	√	√	√			(*)	√	(*)
Croatia	√			√					√	
Cyprus	√		√							
Czech Republic	√		√	√	√	√		√		
Denmark	√				√	√		√	√	√
Estonia	√				√					
Finland			√		√	√	√			
France	√		√	√	√	√			√	√
Germany	√		√	√	√				√	
Greece	√		√	√						
Hungary	√				√	√			√	
Ireland	√		√	√		√				√
Italy	√	√	√	√		√		√		
Israel	√									
Japan	(*)	√	√			√		√	√	
Korea	√		√	√	√				√	
Latvia	√								√	√
Lithuania	√		√	√					√	
Luxembourg	√		√	√						
Malta	√				√					
Netherlands	√		√	√		√	√			
New Zealand			√						√	
Norway			√	√		√				√
Poland		√	√		√				√	√
Portugal	√		√	√	√					
Romania					√					
Russia			√			√				
Slovak Republic	√			√					√	
Slovenia	√								√	
Spain	√		√	√					√	
Sweden		√	√	√	√	√	√			
Switzerland	√									
United Kingdom		√	√		√	√				
United States	(*)	(*)	√	√	(*)	(*)	√	(*)	(*)	(*)

Source: Renewable Energy Policy Network for the 21st Century. (2008).

Not only can a vast array of different public policy instruments be used, but an even wider range of climate change financial instruments is also available. As mentioned in Chapter 2, the past few years have witnessed the extremely rapid development of new sources of funding for clean energy and climate change management, to further encourage a shift in public and private investmentsfrom traditional energy supply sources and technologies to more sustainable climate-friendly alternatives. As an illustration, and in accordance with the classification adopted in Chapter 2, Table 8 summarises the different sources of funds for wind power.

Table 8: Sources of Funds for Wind Power Development

	International Schemes	National and Sub-National Schemes
Public Funds	Official Development Assistance (Bilateral/ Multilateral Funds) Decentralised Cooperation (regional, municipal, etc.)	Export Credits Rebates & Subsidies Tax credits & Tax Free Bonds Low interest loans
Private Funds	Non-Governmental Organisations Global Philanthropic Foundations Corporate Social Responsibility (MNCs)	National Philanthropic Foundations Corporate Social Responsibility (National corporations)
Market-based mechanisms	Carbon Finance (CDM, JI, voluntary) Green equity funds Tradable Renewable Energy Certificates	Tradable Renewable Energy Certificates Green equity funds
Innovative instruments	Green Investment Schemes (recycling of proceeds from the sale of AAus, etc.)	Green Investment schemes (levy on CDM proceeds, carbon taxes on domestic travel, etc.)

UNEP (2008) identified over 50 different bilateral and multilateral funding sources accessible to developing countries and regions for climate change management. Moreover, this diversity is outmatched by the existence of numerous and varied market-based instruments, with close to 60 different markets for carbon cap-and-trade instruments alone. In addition, the price of several of the different carbon currencies traded on these markets (CERs, VERs, ERUs, etc.) can vary by a ratio of 1:10 depending on the delivery conditions and its attributes (multiple development benefits, etc.). Regarding new innovative sources of finance, the imagination of international and national fiscal experts remains the only constraint to the proliferation of different schemes. This wide diversity is positive inasmuch as it offers plenty of choices that can be adapted to the unique conditions of each market. The downside, however, is that it can lead to confusion.

8.1.2 The need to sequence financial instruments

As mentioned in Chapter 2, a key issue with a number of the new market-based instruments for climate change, such as carbon cap-and-trade mechanisms and weather derivatives, is their acute regional and technological unevenness, with the bulk of funds going to a few large emerging economies. As a pre-condition to capitalise on these new market-based financing opportunities, countries and regions will need to establish an enabling policy environment and supportive institutional apparatus for direct investment. Public resources will often be required to establish such a positive environment, attractive to potential investors.

The case of the carbon market is illustrative. Carbon finance provides an additional revenue stream and does not replace the need for traditional finance for underlying investment projects. To secure this traditional finance and access carbon resources under the CDM/ JI schemes, countries and regions need to have the requisite carbon institutional infrastructure to support certification of greenhouse gas emission reductions, including a functioning DNA[52] and legislation on CER ownership. Therefore, in the absence of public resources (domestic public finance, ODA, etc.) to foster the enabling conditions, countries will be unable to access carbon finance.

As a consequence, countries and regions will often need to access and sequence different sources of funds (domestic public resources, ODA, private investment finance and carbon finance) to attract and drive direct investment towards lower-carbon and climate-resilient technologies and practices. For example, public resources might be needed upfront for putting into place the policies and institutions required to create and regulate markets. Subsequently, flows of private investment finance (to cover the underlying costs of infrastructure) and carbon finance (to cover the additional costs inherent in securing environmental objectives) can follow in this supportive environment.

Figure 35 further illustrates this idea. In this example, public finance is first mobilised to remove barriers to direct investment in climate-friendly technologies. By reducing the associated risks, it is easier for individual investors to secure traditional finance for the underlying projects and access additional finance from emerging carbon markets to increase the profitability of climate-friendly technologies.

52 Designated National Authority: Approval body for projects under the Clean Development Mechanism

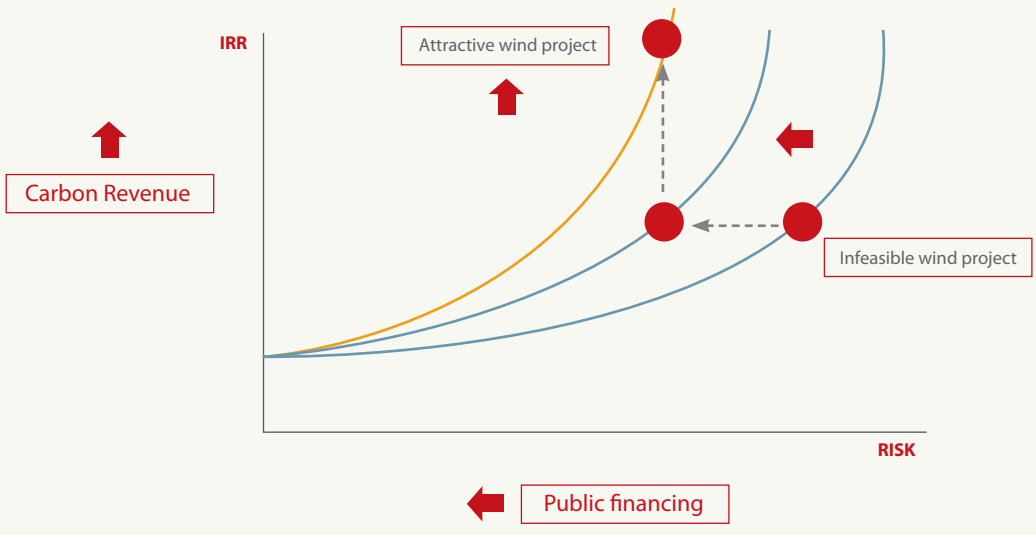


Figure 35: Sequencing Public Finance (ODA, domestic resources, etc) and Carbon Finance

Similarly, to realise the full potential of market-based instruments, such as insurance or weather derivatives for adaptation measures, countries and regions will need to establish a supportive infrastructure. For example, this could mean strengthening the hydro-meteorological infrastructure to enable insurance companies to better assess flood or crop failure risks and calculate required insurance premiums.

8.1.3 The need to combine different financial instruments

In addition to sequencing different funding sources, it might also prove necessary to combine different financial instruments to provide an attractive return to direct investors. Continuing with our wind energy project, electricity market prices and carbon revenues are often insufficient to provide an adequate return for wind power investors in developing countries and to compete with coal-fired power plants. Figure 36 illustrates a case where the return from the sale of power and from carbon finance is not enough for a wind energy project to reach the investment threshold of a company. Carbon finance will need to be supplemented by an additional revenue stream to tip the profitability scale in favour of greater investment in wind energy. Various supplementary financial instruments can be used to achieve this objective (soft loans, feed-in tariffs, etc.). As shown in Figure 36, a wind power plant that may not be economically feasible (left bar) can be brought closer to the critical threshold where investment becomes attractive, by combining several financial instruments such as CDM and the feed-in tariff.

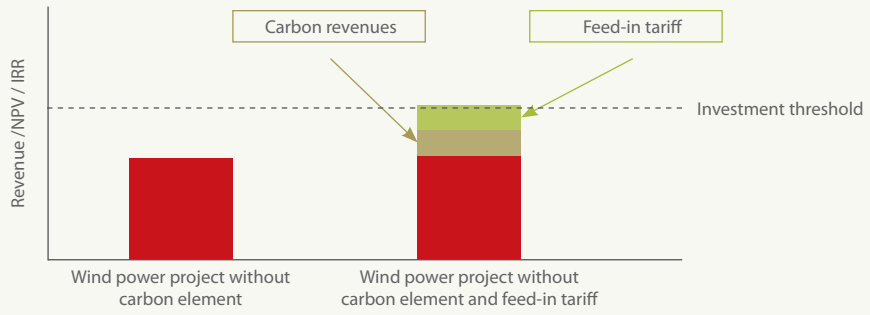


FIgure 36: Combining Carbon Revenues and Feed-In Tariffs for Wind Energy

Box 24 provides an illustration of how different instruments can boost the profitability of renewable energy projects.

Box 24: An analysis of different financing scenarios combining commercial and soft loans/feed-in tariffs/CDM revenues for a 25.5 MW wind farm in Iran

An example from a wind power project (with excellent wind resources) in Iran helps illustrate the impact of different instruments on the underlying profitability of a renewable energy project. Variations of the finance plan in terms of loan parameters, equity, feed-in tariffs and carbon revenues enable us to construct the following seven financing scenarios.

Scenario 1: 1/3 investor equity + commercial loans + electricity base tariffs (project implemented on pure commercial terms);

Scenario 2: 1/3 investor equity + 50%- 50% blended commercial and soft loans + electricity base tariffs (soft loan scenario)

Scenario 3: 1/3 investor equity + commercial loans + base tariffs + CDM revenues ("additional" CDM revenues scenario);

Scenario 4: 1/3 investor equity + commercial loans + feed-in tariffs with a premium of US$ 2.0 cents (pure feed-in tariffs scenario);

Scenario 5: 1/3 investor equity + 50%- 50% blended commercial and soft loans + feed-in tariffs with a premium of US$ 2.0 cents (pure feed-in tariffs scenario);

Scenario 6: 1/3 investor equity + 50%- 50% blended commercial and soft loans + feed-in-tariffs + CDM revenues (feed-in tariffs and CDM revenues + soft loan scenario).

Scenario 7: 1/3 investor equity + Commercial loans + feed-in tariffs + CDM revenues (Feed-in tariffs/CDM revenues scenario).

Scenarios	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Key parameters:							
GEF/public money (%)	0	0	0	0	0	0	0
Equity from Investor	35%	35%	35%	35%	35%	35%	35%
Soft loan with low interest rate	0	0	0	0	0	0	0
Commercial loan	65%	0	65%	65%	0	0	65%
Blended commercial & soft loan	0	65%	0	0%	65%	65%	0
Premium from feed-in tariffs ($c/kw)	0	0	0	2.0	2.0	2.0	2.0
CERs (US $/tCO2)	0	0	10	0	0	10	10
Key results:							
Pre-tax IRR and ROI (%)	3.5%	8.2%	8.1%	22.1%	26.3%	31.9%	27.6%
After-tax IRR and ROI (%)	2.8%	6.9%	6.8%	18.4%	21.4%	25.6%	22.6%
NPV (US$)	(6,685,841)	(5,101,722)	(4,681, 236)	(628,936)	590,836	2,237,556	1,017,785
Payback period (yr)	13.8	13.8	10.7	7.4	7.4	6.4	6.4
Benefit-Cost Ratio	0.22	0.41	0.45	0.93	1.07	1.26	1.12
Debt service coverage	1.13	1.46	1.45	2.08	2.69	3.11	2.41

The results indicate that excellent wind resources were not enough to promote wind energy development on a commercial basis in Iran in 2007. From the analysis of success stories in different business sectors, B. Chabot (2005) suggests a "fundamental golden rule" to be used by investors in search of a robust growth in a competitive expanding market: "The profitability index of successful investment projects should be at least 0.3". This translates into a minimum cost-benefit ratio of 1:3. In the above simulation, only Scenario 6 that combined feed-in tariffs, soft loans, and carbon credits comes close to this cost-benefit ratio of 1:3. According to the fundamental golden rule suggested by B. Chabot, all other scenarios would fail to attract private investment to the wind energy sector in Iran.

Source: Y. Glemarec, 2007

8.2 Using the Policy and Investment Framework (PIF) to define the optimal mix and access sources of climate change finance

Based on the above analysis, the main challenges facing decision-makers at the local, regional and national levels to promote mitigation and adaptation actions can be summarised as follows:

1. To understand the specific workings of individual sectors/markets in order to design an appropriate mix of policy measures for priority mitigation and adaptation measures (identified in the Territorial Climate Change Profile), including combining different financial instruments;
2. To translate the policy measures into a coherent set of projects which will include:
    - identifying and sequencing (a) projects that lead to policy change and institutional strengthening, and (b) individual investment projects
    - matching each project with the most appropriate available sources of funding (e.g., ODA, market-based mechanisms such as CDM, etc.)
    - developing the required documentation and meeting due diligence requirements that are unique to each source of funds
3. When the chosen policy mix leads to increased pressure on certain actors, such as public budgets or individual consumers, to reduce these pressures by developing innovative financing instruments.

To help regional/ provincial authorities determine how best to implement their priority mitigation and adaptation actions, UNDP has designed a Policy and InvestmentFramework (PIF). The PIF helps local decision makers to (a) define for the relevant sector/market the most applicable policy measures; (b) identify how individual capacity development and investment projects can be financed; (c) access funding from the appropriate sources (ODA, quasi-ODA, market based instruments) by providing technical assistance for the development of project documents and conducting due diligence, and finally, (d) identify other innovative instruments that can be used to defray the cost of mitigation and adaptation actions in line with local circumstances. Using the approach of the PIF will ensure that, at the regional level, the financing strategy is coordinated with all policies and instruments working in harmony.

8.2.1. Finding an optimal mix of policy measures

The PIF reviews the pros and cons of various policy options for 36 key adaptation and mitigation options and provides user-friendly guidance on how to identify a possible mix appropriate for the unique requirements of a given region. This guidance will be regularly updated and expanded in line with user demand.

Figure 37 illustrates how the PIF can be used to assess the optimal mix of policy measures for wind power. The top left box lists some of the supportive policies required to successfully launch wind energy development, irrespective of the specific market penetration policies and possible financial instruments for a given locality. The top right box provides a decision-making matrix for market-access policies, as a function of the unique specificities of each individual market. The top row indicates the key local characteristics that need to be taken into account in determining the best market access policy to pursue – feed-in tariff, quota or tender. The bottom box provides a summary of the pros and cons of different financing options.

In wind power, depending on the level of pressure on public and private expenditure and the social acceptability of different types of decisions, some instruments may be more appropriate than others.

The CDM has no impact on national public revenues or spending but has high transaction costs for project developers and is still highly concentrated geographically. Market access policies such as feed-in tariffs with cost

recovery (through increased electricity prices) have no direct impact on public spending but assume some level of social acceptability of electricity price increases, however small. Low-interest loans require some public money but have a multiplier effect. For a government, they can be less expensive than tax credits or direct subsidies. However, they can be more difficult to implement as they rely on the motivation and expertise of local financial institutions. Tax credits reduce public revenues. In some countries this can be more acceptable politically than increasing public spending.

In assessing and selecting the optimal mix of policy measures and financing options, it is critical to include all concerned constituents – national government, regional government, municipal government, citizens' groups, and the private sector – as early as possible. Each constituency will represent a different perspective and it will be important to find and agree on common ground. For instance, if the envisaged policy mix is feed-in tariffs and carbon finance, it will be important to obtain the views of the private sector on whether this constitutes an attractive investment environment, at a very early stage in the planning process.

Figure 37: Selecting the appropriate policy mix for wind energy

"Support" Policies

In addition to the market access policies, other types of measures could be classified more as "support" policies.

- Adapted Permitting and Licensing
- Easy and Cheap Grid Access
- Mandatory Technical Standards and Testing
- Wind Resource Assessments
- Education and Training/Awareness

+

	Strong free market philosophy	Competitive electricity market	Significant number of existing wind farms	National industry objectives	Strong regional policies	High level of government expertise
Yes	Quota or Tender	Quota or Tender or Feed-In with cost-sharing mechanism	Any	Feed-In	Depending on local circumstances	Any
No (or limited)	Feed-In or Tender	Feed-In or Tender	Feed-In	Any	Any	Feed-In

All policies should be designed in a way that makes them easy to understand and to use for wind energy developers. They should be kept as simple and stable as possible. Geographic distribution of projects is also an issue that needs to be given consideration, whatever the type of policy.

Financing Instruments			
Option	Type	Conditions	Advantages
Feed-In tariff	Private National	Enough commitment from public authorities to convince investors the policy will last.	Guaranteed long term revenues for the investor Production based => incentive for efficiency
Low Interest Loans	Private National	Motivated banking institutions to promote the instrument	Especially useful in countries which do not have an established practice of project financing and where local banks do not offer long-term financing to match the long pay-back period of wind energy
Tradable Renewable Energy Certificates	Private National or International	Existence of a large enough market and obligations to give some stability to prices. Quota obligation needs to be well designed and enforced.	Production based =>incentive for efficiency Competition between producers could theoretically lower costs
CDM	Private International	Transaction costs make it worthwhile only for large projects	Diversifying revenue base for projects Hedging against local currency risk (CDM revenues in hard currency)

Source: Virginie Schwarz, 2008

This analytical work will enable the regional authority to design specific roadmaps describing the activities that will need to be implemented by regional stakeholders to reach the desired objectives for each priority mitigation and adaptation option identified in the territorial climate strategy.

Table 9: An illustrative roadmap for wind energy

		2010-2015	2015-2025	2025-2050
PUBLIC AUTHORITIES (National, regional or local depending on the institutional setup) and REGULATORS	**Control & Regulatory Instruments**	- Review permitting & licensing procedures to offer simple, clear, predictable rules for wind projects - Review grid connection and usage rules (with grid operators)	- Adopt targets for share of wind energy in electricity - Set mandatory Feed-in tariffs or quotas (RPS…) - Adopt environmental integration regulations to increase acceptance without hindering the development of wind energy - Control new grid connection operators to develop the grid in anticipation of future wind development	- Increase national/regional targets - Decrease tariffs as wind energy becomes more competitive - Update regulations as technology and impacts evolve - Monitor grid development
	Financial Incentives & Market Instruments	- Support demonstration programmes - Create a favorable environment for CDM projects	- Offer tax credits, subsidies, soft loans where necessary - Promote CDM projects	- Stimulate the availability of financing matching the characteristics of wind energy projects - Stimulate regulated and voluntary carbon markets
	Information & Training	- Conduct wind resource assessments - Organise information campaigns on wind energy	- Make wind resource assessments available to developers - Create standards and labels for turbines and set up testing facilities - Develop technical training programmes	- Expand and update information - Enforce standards and promote labels - Make disclosure of the carbon content of electricity mandatory
DEVELOPERS			- Avoid environmentally and socially sensitive areas and adopt "good neighbour" practices	- Adopt best technologies to minimise impacts
INVESTORS / FINANCIAL INSTITUTIONS		- Train staff on wind energy	- Develop financial products adapted to the specificities of wind energy (long-term pay-back, small projects)	
UTILITIES AND GRID OPERATORS		- Train staff on wind energy - Review grid connection and usage rules (with regulators)	- Launch commercial offers promoting wind energy - Adopt internal wind energy generation/ purchase objectives - Develop standard power purchase contratcs - Ensure fair and transparent access to and use of the grid - Include future wind developments for grid planning - Develop new technologies on smart flexible grids, electricity storage and management of intermittent sources	- Maintain "green" offers and adjust them to customer requirements - Tighten objectives - Incentivise staff on wind results - Offer fair & simple power purchase contracts - Ensure fair and transparent access to and use of the grid - Continue to develop the grid to connect new wind farms - Integrate in the grid new technologies allowing easier management of intermittent generation sources
CONTRACTORS		- Train on installation and maintenance of wind farms		- Update training on new technologies
SUPPLIERS & MANUFACTURORS		- Train installers	- Pursue research to decrease costs and environmental impacts and improve the management of intermittency - Provide technical support to installers	- Promote new technologies and make them available in as many countries as possible - Provide technical support to installers

Source: Virginie Schwarz, 2009

These roadmaps will not only detail the activities that need to be implemented by the public authorities but also those involving other key stakeholders such as electric utilities, customers or financial institutions. The long-term strategy detailed in the roadmap will serve as a basis and reference for the implementation of individual investment projects. An illustrative roadmap for wind energy is given in Table 9 for a country at the very early stages of developing wind energy.

8.2.2 Translating policy measures into a coherent set of projects

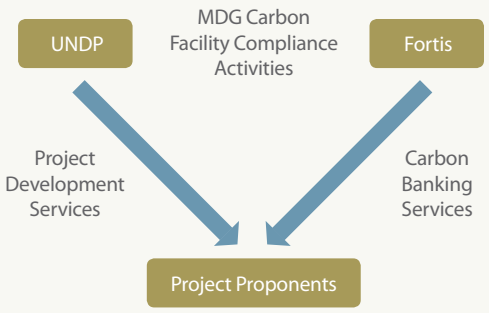
Once the policy measures (support policies, market-access policies, and financing options) for each priority mitigation and adaptation action have been identified, the next step is to translate this into individual projects that specify the steps/activities/resources needed to carry out required policy change, institutional strengthening and investments. Regional authorities will be able to finance these projects through different sources. The PIF will help them match projects with the most appropriate source of finance, as well as sequence the projects. Through the PIF, regional authorities will be provided with technical assistance to develop project documents and meet the due diligence requirements of the different funding sources.

Box 25: MDG Carbon Facility

Leveraging Carbon Finance for Sustainable Development

UNDP's MDG Carbon Facility is an innovative financing mechanism designed to direct increased financial flows from the growing international market in carbon credits toward projects in developing countries that contribute directly to meeting the Millennium Development Goals (MDGs). The MDG Carbon Facility's compliance activities represent collaboration between UNDP and an international financial services provider, Fortis Bank, offering a "one-stop-shop" package of development and commercialisation services to emission reduction projects.

UNDP and Fortis' roles in the MDG Carbon Facility



MDG Carbon Facility's services to Project Proponents

- Performing in-depth due diligence to assess the carbon, technical, legal and financial viability of proposed carbon projects
- Assistance with preparing key project-related documentation, including the Project Design Document (PDD), financial models and legal contracts
- Guidance to navigate each stage of the CDM / JI project cycle
- Arranging project validation, project registration and preliminary verification of emission reductions
- Preparation and oversight of a monitoring plan to track project emission reductions
- Providing direct access to Fortis Bank's carbon trading desk, including purchase and marketing of the project's credits

For example, in wind power, regional authorities may need assistance with accessing (a) ODA for designing and implementing support policies, (b) international carbon markets for CDM/ JI projects, and possibly (c) domestic carbon markets. One of the key roles of development agencies in a partnership with regions could be to help them in developing the required project documents and undertaking the due diligence of projects. UNDP has developed a number of dedicated platforms to provide such technical assistance, particularly to redress the current geographical imbalance in accessing existing financial resources. Box 25 describes the MDG Carbon Facility, one of these platforms. The MDG Carbon Facility is UNDP's dedicated platform providing a one-stop-shop project development package for project investors to access CDM/JI resources in under-represented carbon markets.

In most markets, these project development platforms build on upstream policy development and institutional work, supported by development agencies in nascent markets. For example, the MDG Carbon Facility forms part of UNDP's comprehensive, three-step approach to capacity development in carbon finance (Figure 38). On a country-by-country basis, this approach commences with barrier removal to direct investment in lower-carbon technologies, then addresses the establishment of efficient host-country procedures for CDM and JI, and finally culminates in the development of pioneer emission-reduction projects by the Facility. Once a carbon market is firmly established, attracting private-sector investment and developing project technologies that deliver longer-term development benefits, the MDG Carbon Facility will exit that market, having accomplished its market transformation objectives.

Figure 38: UNDP's Approach to Leveraging Carbon Finance

8.2.3 Sharing experiences with Innovative Instruments

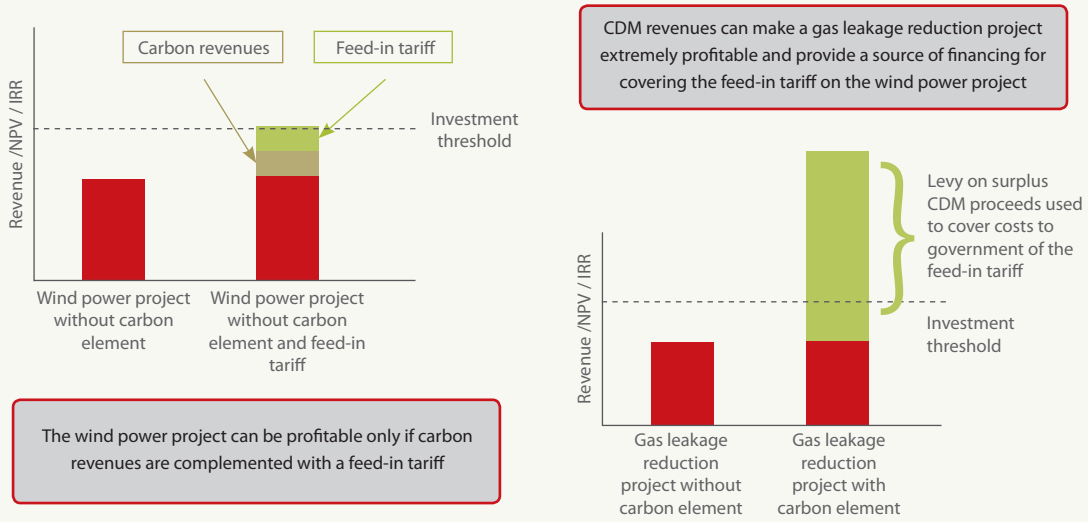
Budget constraints can prove a major barrier to realising mitigation and adaptation actions. A large variety of innovative financing instruments could be considered by regional authorities to reduce the pressure of climate change action on public budgets. A number of regions have developed such innovative instruments. For example, the Basque Autonomous Region has established a water tax to penalise excessive consumption of this resource. The money collected is used for paying water costs and to improve the state of the rivers and the environment. Since it only penalises excessive consumption, this tax is progressive and has a limited impact on the purchasing power of individual households. In addition, 5% of the proceeds of this tax are used to assist development projects in low-income countries, promoting decentralised cooperation and knowledge-sharing for sustainable water resource management.

In the field of mitigation, the city of Bron (France) offers an excellent example of an innovative approach to increase energy efficiency and reduce GHG emissions, without increasing public spending. In fact, Bron's initiative is likely to prove cost-negative. The objective of the city was to upgrade the heating systems of a number of public buildings (kindergartens, elementary schools, gymnasiums, etc.). This was achieved by signing a contract with an Energy Service Company (ESCO) under which the latter guaranteed a 26% energy saving. If energy savings were less than forecasted, the company was responsibility for the excess cost. If savings were more, the gain was shared between the company (1/3 of the difference) and the city of Bron (2/3 of the difference with 1/3 being reinvested for energy savings). During the first winter, the total energy saving was 30%. The renovation also reduced CO_2 emissions by 60%.

In the financial simulation in Box 24, only scenario 6, that combined feed-in tariffs, soft loans and carbon credits came close to a cost-benefit ratio of 1:3, more likely to attract private investment to the wind energy sector. Such a scenario would place a burden on public budgets because, under the feed-in law, utility companies would be obligated to buy electricity produced by wind energy at prices higher than electricity market prices. One way of off-setting this burden could be to established a green investment scheme to tax surplus profits on highly profitable CDM projects (such as an oil and gas project or a HFC23 project) and to channel part of these resources to fund the premium of the feed-in tariff (see Figure 39).

The end-result would still be to encourage lower-carbon energy development with no additional burden to the public purse. Another option for financing the green investment scheme could be to use a debt-swap, wherein public resources freed-up by the reduced debt-service burden would be used to fund the feed-in tariff.

Figure 39: Example of a Green Investment Scheme



Hundreds of similar examples can be highlighted. Despite the tremendous opportunity to adapt and replicate these experiences throughout the world, information and knowledge on these innovative instruments is not widely shared across regions. A number of inventories to showcase innovative financing initiatives at the regional level are currently being undertaken by different organisations.

One of the most promising paths for scaling up action to meet the climate change challenge in the coming years is to promote greater knowledge-sharing and partnerships on innovative financing instruments among regions, both from developing and developed countries. A key objective of decentralised cooperation could be to promote such a knowledge-transfer from one region to others through direct partnerships, enabling beneficiary regions to replicate the most appropriate experiences, and to generate additional indigenous sources of financing for climate change action.

Conclusion

A huge array of public policy and financial instruments is available to help regional authorities successfully implement mitigation and adaptation measures in different sectors. Not only can a wide array of possible public policy instruments be used, but an even greater variety of financial instruments is also available. A key challenge for decision-makers will be to identify the most appropriate set of public policy and financing instruments to implement their territorial climate strategy. The UNDP Climate Change Policy and Investment Framework is one of the tools available to decision-makers to conduct this task.

A typical outline of an integrated territorial climate plan (ITCP), including a climate change profile (physical and socio-economic assessment of climate change impact), a climate change strategy (identification of priority adaptation and mitigation activities) and a climate change action plan (identification of possible public policy and financing instruments to implement priority activities) is presented in Annex I.

ANNEX

INDICATIVE TABLE OF CONTENTS OF AN
INTEGRATED TERRITORIAL CLIMATE PLAN

Annex

Indicative Table of Contents of an Integrated Territorial Climate Plan

Introduction (objectives of the ITCP, process followed and methodologies adopted, etc.)

Part A: Climate Profile

1. Description of the regional context
   - 1.1 General economic and demographic data on which analyses and scenarios will be built
   - 1.2 Regional development issues and priorities
   - 1.3 Identification of main local stakeholders
   - 1.4 Past and on-going climate change and related risk management actions
2. Vulnerability Assessment
   - 2.1 Assessment of existing climate and socio-economic vulnerabilities
   - 2.2 Projection of possible climate changes at relevant spatial and temporal scales
   - 2.3 Simulation of the physical and economic impacts in the most vulnerable sectors (agriculture, water, coastal-zone management, health, tourism, etc.)
   - 2.4 Assessment of impacts on most vulnerable groups
3. GHG emissions and energy needs
   - 3.1 Assessment of existing GHG emissions by sector (transport, buildings, industry, waste, agriculture and forest) and sub-sector and energy demand/supply
   - 3.2 Assessment of energy needs by 2020/2050 and expected GHG emissions by 2020/2050 under a business-as-usual scenario

Part B: Climate Change Strategy

1. List of selection criteria adopted and key sectors identified for low-carbon development and adaptation policies and measures
2. Description of main opportunities identified in each sector
3. Estimated costs and benefits (environmental, social and economic: GHG emission reductions, job creation, energy access, local pollution reductions) of the different options and comparison of these options
4. Assessment of adaptive capacity and feasibility of implementing the options
5. Description of potential synergies and trade-offs identified between priority adaptation and mitigation measures
6. List of prioritised mitigation and adaptation options (no regrets/low regrets, negative cost, no cost, low cost, higher-cost options; short-term, medium-term, long-term, political and social acceptance, regulatory needs, capacity and financial requirements, irreversibility)

Part C: Climate Change Action Plan

1. Review of existing climate change policy/financial instruments and institutional implementation arrangements
2. Survey of public opinion, including business community (optional)
3. For each priority option, description of matching policy/financing instruments to attract and drive direct investment towards lower-carbon/climate resilient activities (optionally in the form of sectoral 2010-2020 roadmaps)
4. Detailed first portfolio of no-regrets actions identified in the early stages of the process and already under implementation by the time the IRCCAP is finalised.
5. List of projects adopted (public policies and investments) and integrated policy and investment action plan
6. Implementation and M&E Arrangements (governance, indicators, etc.)

Standard Annexes of an ITCP:

Present and Future Vulnerability Maps

List of proposals from co-construction process, public forums, white papers

Project Summaries listed by size and types of financing

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United Nations Development Programme
Environment & Energy Group, BDP
304 East 45th Street, 9th Floor
New York, NY 10017 USA
www.undp.org