

EXECUTIVE SUMMARY

1. INTRODUCTION AND BACKGROUND

1. The UNFCCC secretariat has launched a project in 2007 to review existing and planned investment and financial flows in a concerted effort to develop an effective international response, with particular focus on the needs of developing countries. This work was mandated by COP 12 and is to result in inputs to COP 13 (December 2007), for its deliberations on the fourth review of the financial mechanism, and to the fourth workshop on dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention (August 2007).

2. This technical background paper reviews and analyses existing and projected investment flows and financing relevant to the development of an effective and appropriate international response to climate change, with particular focus on the needs of developing countries. It provides an assessment of the investment and financial flows that will be necessary in 2030 to meet worldwide requirements for mitigating and adapting to climate change under different scenarios of social and economic development, especially as they impact the well-being of developing countries. In particular it provides:

- Information on current investment and financial flows in as much detail as is available;
- Projection of investment and financial flows by major sources to address adaptation and mitigation needs in 2030, including:
 - Projections of future investment and financial flows under a reference scenario;
 - Projections of future investment and financial flows under a greenhouse gas (GHG) emissions mitigation scenario;
- A summary of priorities identified by Parties not included in Annex I to the Convention (Non-Annex I Parties) as part of the UNFCCC process;
- An analysis of the potential role of different sources of investment and financing and their future potential.

3. The paper draws on existing work and analysis wherever possible. Existing work used for the analysis includes the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), the World Energy Outlook (WEO) of the International Energy Agency (IEA), the Stern Review and other published literature.

4. To ensure that this analysis is beneficial to the UNFCCC process, the secretariat has collaborated with a number of international financial institutions (IFIs), United Nations agencies, intergovernmental organizations (IGOs) and non-governmental organizations (NGOs), other relevant agencies, and representatives of the private sector and civil society. These organizations and representatives were invited to share their experiences and views on existing and planned investment flows and finance schemes in the context of consultations. Four consultative meetings with such stakeholders have been held.

2. KEY FINDINGS

5. *The additional estimated amount of investment and financial flows needed in 2030 to address climate change is large compared with the funding currently available under the Convention and its Kyoto Protocol, but small in relation to estimated global gross domestic product (GDP) (0.3–0.5 per cent) and global investment (1.1–1.7 per cent) in 2030.*

6. In many sectors the lifetime of capital stock can be thirty years or more. The fact that total *investment in new physical assets is projected to triple between 2000 and 2030* provides a window of opportunity to direct the financial and investment flows into new facilities that are more climate friendly and resilient. The investment decisions that are taken today will affect the world's emission profile in the future.

7. *When considering means to enhance investment and financial flows to address climate change in the future, it is important to focus on the role of private-sector investments as they constitute the largest share of investment and financial flows (86 per cent).* Although Official Development Assistance (ODA) funds are currently less than 1 per cent of investment globally, ODA represents a larger share of the total investments in some countries such as in Least Developed Countries (LDCs) (6 per cent).

8. Particular attention will need to be given to *developing countries*, because although they currently

account for only 20–25 per cent of global investments, their expected rapid economic growth means that they will require *a large share of investment and financial flows*.

9. With *appropriate policies and/or incentives*, a substantial part of the additional investment and financial flows needed could be covered by the currently available sources. However, *improvement in, and an optimal combination of, mechanisms*, such as the carbon markets, the financial mechanism of the Convention, ODA, national policies and, in some cases, *new and additional resources*, will be needed to mobilize the necessary investment and financial flows to address climate change.

10. *The carbon market*, which is already playing an important role in shifting private investment flows, would have to be significantly expanded to address needs for additional investment and financial flows. *National policies* can assist in shifting investments and financial flows made by private and public investors into more climate-friendly alternatives and optimize the use of available funds by spreading the risk across private and public investors. *Additional external funding for climate change mitigation and adaptation will be needed*, particularly for sectors in developing countries that depend on government investment and financial flows.

11. If the funding available under the *financial mechanism* of the Convention remains at its current level and continues to rely mainly on voluntary contributions, it will not be sufficient to address the future financial flows estimated to be needed for mitigation and adaptation.

12. Several *other options* for generating additional funds have been suggested. Some of these options, such as the expansion of the carbon market and the auction of allowances for emissions, could generate revenues commensurate with the additional needs.

2.1. MITIGATION

13. It is estimated that global additional investment and financial flows of USD 200–210 billion will be necessary in 2030 to return global greenhouse gas (GHG) emissions to current levels. In particular:

- *For energy supply*, investment and financial flows of about USD 67 billion would be reduced owing to investment in energy efficiency and biofuel of about USD 158 billion. About USD 148 billion out of USD 432 billion of projected annual investment in power sector is predicted to be shifted to renewables,

carbon dioxide (CO₂) capture and storage (CCS), nuclear energy and hydropower. Investment in fossil fuel supply is expected to continue to grow, but at a reduced rate. Currently most of the power sector investment is made by government-owned or private, usually regulated, electric utilities, and is made domestically in most regions;

- *For industry*, additional investment and financial flows are estimated at about USD 36 billion. More than half of the additional investment is for energy efficiency, one third for installation of CCS and the rest for reduction of non-CO₂ gases, such as N₂O and other GHG high global warming potential;
- *For buildings*, additional investment and financial flows amount to about USD 51 billion. Currently commercial and residential energy efficiency investment comes from building owners and is financed domestically;
- *For transportation*, additional investment and financial flows amount to about USD 88 billion. Efficiency improvements for vehicles and increased use of biofuels are likely to require government policies, but the investment would come mostly from the private sector;
- *For waste*, additional investment and financial flows are estimated at about USD 1 billion. Capture and use of methane from landfills and wastewater treatment could reduce emissions by about 50 per cent in 2030 mainly in Parties not included in Annex I to the Convention (Non-Annex I Parties);
- *For agriculture*, additional investment and financial flows are estimated at about USD 35 billion. Non-CO₂ emissions from agriculture production could be reduced by about 10 per cent at cost of USD 20 billion in 2030. With a concerted international effort and an annual investment of about USD 15 billion agroforestry could be expanded at a rate of about 19 million ha per year by 2030;
- *For forestry*, additional investment and financial flows are estimated at about USD 21 billion. An indicative estimate of the cost of reducing deforestation and forest degradation in non-Annex I Parties to zero in 2030 is USD 12 billion. The estimated investment and financial flows in 2030 to increased GHG removals by sinks through sustainable forest management is USD 8 billion and the estimated investment and financial flows needed for afforestation and reforestation is USD 0.1–0.5 billion;
- *For technology research and development (R&D) and deployment*, additional investment and financial flows are estimated at about USD 35–45 billion. Government spending on energy R&D worldwide has stagnated, while private sector spending has fallen.

Government budgets for energy R&D and support for technology deployment need to double, increased expenditures in 2030 are expected at USD 10 and 30 billion respectively.

14. Investment and financial flows for mitigation in developing countries are likely to be particularly cost effective. While *investment flows in non-Annex I Parties are estimated at about 46 per cent* of the total needed in 2030, the *emission reductions achieved by the countries amount to 68 per cent* of global emission reductions.

15. The *entities that make the investment decisions are different in each sector, and the policy and/or financial incentives needed will vary* accordingly. For example:

- Increased energy efficiency is best achieved through appropriate policies or regulations (the investments are internal and often incremental, and have short payback periods, but adoption is hampered by recognized barriers);
- Shifting investment in the power sector to CCS and low GHG emitting generation technologies will need both policies and, more importantly, financial incentives which make these technologies economically more attractive than high GHG emitting technologies. This requires national or international policy frameworks, such as carbon markets and higher feed-in tariffs;
- Financial incentives will be needed to achieve significant reductions in emissions through reduced deforestation and forest management.

16. Currently most of the investment in mitigation measures is domestic; however, ODA plays an important role in Africa and the LDCs. *With appropriate policies and/or incentives, a substantial part of the additional investment and financial flows needed could be covered by the currently available sources. However, there will be a need for new and additional external sources of funds dedicated to mitigation.*

17. The *Global Environment Facility (GEF), as an operating entity of the financial mechanism of the Convention*, has allocated over USD 3.3 billion to projects addressing climate change since its inception (1991), with further co-financing of USD 14 billion. Most of the funding has been for renewable energy and energy efficiency projects. The GEF share of total multilateral and bilateral funding between 1997 and 2005 is 1.6 per cent. The next replenishment of the GEF trust fund should be concluded at the end of 2009.

18. The *carbon market* and policies to promote renewables are already playing an important role in shifting investment flows. This is indicative of how quickly investment flows can respond to changes in policies and incentives.

19. It is estimated that the clean development mechanism (CDM) project activities in the pipeline in 2006 will generate investment of about USD 25 billion, of which approximately 50 per cent represents capital invested in unilateral projects by host country project proponents. Renewable energy and energy efficiency projects account for 90 per cent of the overall investment.

20. The supply of Kyoto units will be abundant compared with to the level of compliance demand for the period 2008–2012. The voluntary market could represent about 15 per cent of the total carbon market.

21. The low estimate of compliance demand by Parties included in Annex I to the Convention (Annex I Parties) in 2030 is a market of USD 5–25 billion per year, which is basically a continuation of the current flow of projects. The high estimate of compliance demand is a market of USD 100 billion per year; to meet this demand, a large fraction of the potential emission reductions, from all existing and some new categories of projects, would need to earn emission reduction credits.

22. All Parties need to adopt *climate change policies*. International coordination of policies in an appropriate forum is often effective. Areas where international coordination would be beneficial include:

- Technology R&D and deployment;
- Energy efficiency standards for internationally traded appliances and equipment.

23. Funding from external sources will play an important role in helping developing countries formulate and implement national policies.

2.2. ADAPTATION

24. The global cost of adaptation to climate change is difficult to estimate, largely because climate change adaptation measures will be widespread and heterogeneous. More analysis of the costs of adaptation at the sectoral and regional levels is required to support the development of an effective and appropriate international response to the adverse impacts of climate change.

Nevertheless it is clear that a large amount of new and additional investment and financial flows will be needed to address climate change adaptation.

25. Estimated overall *additional investment and financial flows needed for adaptation in 2030* amount to several tens of billion United States dollars. In particular:

- About USD 14 billion in investment and financial flows are estimated to be needed for *agriculture, forestry and fisheries* (AFF):
 - About USD 11 billion is estimated to be needed for production and processing, most of which is expected to be financed by domestic private sources;
 - About USD 3 billion is estimated to be needed for research and development (R&D) and extension activities. Based on current trends, it can be expected that public sources of funding will need to cover a large part of this additional need.
- The additional investment needed in *water supply infrastructure* in 2030 is estimated at USD 11 billion, 85 per cent of which will be needed in non-Annex I Parties. About 90 per cent of the cost for all aspects of water resource use is currently covered by public domestic funding sources and 10 per cent by external public funding sources and this trends in unlikely to change significantly by 2030;
- The costs of treating the increased cases of *diarrhoeal disease, malnutrition and malaria* due to climate change are estimated at USD 5 billion in 2030. This additional need for financial flows will occur solely in developing countries and corresponds to the current annual ODA for health. The additional cost is likely to be borne mainly by the families of those affected. Where private individuals cannot cope with the additional cost of treatment, additional public financing will be necessary;
- The investment needed in 2030 for *beach nourishment and dykes*, is estimated to be about USD 11 billion. About half of the global investment would be needed in non-Annex I Parties. Efforts to protect *coastal areas* from coastal storms and sea level rise are typically undertaken by governments. The necessary public resources for coastal zone adaptation are likely to be available in developed and some developing countries. However, deltaic regions, particularly the large coastal deltas in Asia and Africa as well as the small island developing States, may have significant problems in raising the required investment and financial flows to respond to sea level rise;

- The additional investment needed to adapt *new infrastructure* vulnerable to climate change is estimated at USD 8–130 billion, which is less than 0.5 per cent of global investment in 2030. The extra cost is likely to be met in the same manner as the overall infrastructure cost.

26. The change in investment and financial flows for adaptation that will need to occur in developed and developing countries varies by sector. *A significant share of the additional investment and financial flows will be needed in non-Annex I Parties (USD 28–67 billion).*

27. *Private sources* of funding can be expected to cover a portion of the adaptation costs in sectors (such as *AFF and infrastructure*) with privately owned physical assets, in developed countries, in particular. However, public resources will be needed to implement policies or regulations to encourage the investment of private resources in adaptation measures especially in developing countries. Public domestic resources will also be needed to cover adaptation costs related to climate change impacts on public infrastructure.

28. *For all sectors, additional external public funding is likely to be needed for adaptation measures.* Such additional funding will be needed in particular for sectors and countries that are already highly dependent on external support, for example in the health sector in least developed countries, or for coastal infrastructure in developing countries that are highly vulnerable to sea level rise. *Current mechanisms and sources of financing are limited and it is likely that new sources of funding will be required.*

29. *The funds that are managed by the GEF that are available for adaptation projects, including the Strategic Priority on Adaptation (SPA) of the GEF Trust Fund, the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF), amount to over USD 275 million.* Since 2005 the GEF has provided USD 110 million for adaptation projects.

30. *The level of funding for the Adaptation Fund* under the Kyoto Protocol depends on the quantity of certified emission reductions (CERs) issued and their price. Assuming annual sales of 300–450 million CERs and a market price of USD 24, the Adaptation Fund would receive USD 80–300 million per year for the period 2008–2012. Funding for the Adaptation Fund post 2012 depends on the continuation

of the CDM and the level of demand in the carbon market. Assuming a share of proceeds for adaptation of 2 per cent continues to apply post 2012, the level of funding could be USD 100–500 million per year in 2030 for a low demand by Annex I Parties for credits from non-Annex I Parties, and USD 1–5 billion per year for a high demand. This will still be less than the amount likely to be needed.

31. *Bilateral contribution* for adaptation is estimated to have been in the order of USD 100 million per year between 2000 and 2003.

32. *National policies* may also play an important role in ensuring that the use of resources for adaptation purposes, both public and private, is optimized. In particular, there is a need for:

- Domestic policies that provide incentives for private investors to adapt new physical assets to the potential impacts of climate change;
- National policies that integrate climate change adaptation in key line ministries;
- Local government adaptation policies in key sectors.

33. Although the additional investment and financial flows needed for adaptation described above are significant, *the value of the climate change impacts that those expenditures would avoid could be larger*. This study does not estimate the total value of impacts avoided by adaptation to climate change, so it does not determine whether benefits of avoided damage exceed the adaptation costs. Existing estimates of the future damage caused by climate change vary substantially; however, available studies yield three important common findings:

- Damages increase with the magnitude of climate change. The more that climate changes, typically measured as the increase in global mean temperature, the greater the damage;
- Investment needs for adaptation would almost certainly increase substantially in the latter decades of the twenty-first century. They will be particularly high if no mitigation measures are implemented;
- On average, developing countries suffer more damage as a percentage of their GDP than developed countries, which implies that damages and benefits are not distributed evenly.