

INVESTMENT AND FINANCIAL FLOWS

TO ADDRESS
CLIMATE CHANGE
AN UPDATE

UNFCCC

United Nations Framework Convention on Climate Change

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FOREWORD



In the current period of financial crisis and economic uncertainty, it is more important than ever that decision-makers are aware of the costs of action – and of inaction – on climate change. In 2007, the Secretariat undertook an analysis of the costs of confronting the challenge, published in the report *Investment and Financial Flows to Address Climate Change*. One of the key findings was that extra monies would be needed – around tens of billions of United States dollars for adaptation and 200 – 210 billion United States dollars for mitigation in 2030. This need is not so enormously large when seen as a proportion of total investments.

The report was presented to Parties in Bali, where they decided to launch a comprehensive process to reach an agreed outcome on climate change by the time of the Copenhagen conference. In order to support the negotiations on the provision of financial resources and investment as part of this process, Parties requested the Secretariat to prepare an update of the 2007 report, taking into account the Bali Action Plan. This publication presents the results of that work. It moves forward the discussion on climate change financing from the broad outline of investment and financial needs provided in the previous report to a clear picture of the options, tools and mechanisms that must be put to use if we are to finance an effective response to climate change.

This considers how enhanced financial flows and resources for adaptation, mitigation and technology cooperation could be generated, managed and delivered. It is crucial that an overall financial architecture under the Convention for this purpose can ensure the efficient and effective management and supervision of the many investment mechanisms that will be required. We must ensure coordination and coherence with other bilateral and multilateral financial flows. It will be important, too, to engage the private sector with a view to generating additional resources for climate-friendly and climate-resilient investment.

The current global financial and economic crises must not over shadow our need for forging a response to the climate change challenge that is all encompassing. On this there is much cause for optimism. The initiatives being undertaken to reform financial institutions and governance in response to the financial crisis present opportunities to shift governments' investments on to a more efficient, lower greenhouse gas-emitting and more climate-resilient path of economic recovery.

I would like to thank all the experts and institutions who provided invaluable comments, inputs and data. I would also like to express my deepest gratitude to the Governments of Denmark, Germany, Norway and the Netherlands, whose generous contributions allowed this update to be carried out.

A handwritten signature in black ink, consisting of a stylized 'Y' followed by a horizontal line and a diagonal stroke.

Yvo de Boer, *Executive Secretary*

United Nations Framework Convention on Climate Change
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TABLE OF CONTENTS

	Paragraphs	Page
I. EXECUTIVE SUMMARY	1 – 46	012
I-A. Adaptation	6 – 15	012
I-B. Mitigation	16 – 32	014
I-C. Overall financial framework	33 – 43	020
I-D. Putting the climate change challenge into perspective	44 – 46	022
II. INTRODUCTION	47 – 73	023
II-A. Mandate	47	023
II-B. Background	48 – 52	023
II-C. Scope of the paper	53 – 58	023
II-D. Review of the 2007 report	59 – 73	024
III. ENHANCED FINANCIAL RESOURCES AND INVESTMENT FOR ADAPTATION, INCLUDING FOR TECHNOLOGY COOPERATION	74 – 216	028
III-A. Introduction	74 – 83	028
III-B. Update of estimated investment and financial flows needed for adaptation	84 – 95	030
III-C. Characterizing financing needs: adaptation, development and technology	96 – 123	032
III-D. National policies	124 – 152	037
III-E. Options, tools and mechanisms for mobilizing financial resources for adaptation	153 – 179	040
III-F. Delivery mechanisms	180 – 210	046
III-G. Summary	211 – 216	052
IV. ENHANCED FINANCIAL RESOURCES AND INVESTMENT FOR MITIGATION, INCLUDING FOR TECHNOLOGY COOPERATION	217 – 384	054
IV-A. Introduction	217 – 223	054
IV-B. Updated emissions scenarios and estimates of investment needs	224 – 233	055
IV-C. Financing for mitigation technology development and transfer	234 – 259	057
IV-D. Private finance	260 – 298	062
IV-E. Public finance	299 – 319	068
IV-F. National policies	320 – 336	074
IV-G. Delivery issues for international funding for mitigation	337 – 366	076
IV-H. Summary	367 – 384	082

TABLE OF CONTENTS

	Paragraphs	Page
V. PROVISION OF FINANCIAL RESOURCES AND INVESTMENT TO SUPPORT ACTION ON ADAPTATION, MITIGATION AND TECHNOLOGY COOPERATION	385 – 450	086
V-A. Mobilization of financial resources and investment	388 – 400	086
V-B. Delivery of financial resources and investment	401 – 428	092
V-C. Institutional arrangements for mobilizing, managing and delivering financial resources and investment	429 – 448	096
V-D. Overall financial framework	449 – 450	101
VI. SUMMARY AND CONCLUSIONS	451 – 475	102
VI-A. Updated estimates of the investment and financial flows needed to address climate change	452 – 453	102
VI-B. Means to optimize, shift and scale-up investment and financial flows	454 – 462	102
VI-C. Possible new and additional sources of international funding	463 – 466	103
VI-D. Delivery of enhanced financial resources and investments	467 – 469	104
VI-E. Institutional arrangements for an effective response to climate change	470 – 472	104
VI-F. The present financial crisis and the future financial architecture for addressing climate change	473 – 475	105
ANNEX LIST OF REFERENCES		106

LIST OF TABLES

Table	Page
Table I-1. Possible options, tools and mechanisms available to enhance adaptation actions	14
Table I-2. Possible options, tools and mechanisms available to enhance mitigation actions	18
Table I-3. Summary of proposals for increased financial resources (billions of United States dollars)	21
Table II-4. Additional investment and financial flows needed for mitigation in 2030, by sector	25
Table II-5. Additional investment and financial flows needed for adaptation in 2030, by sector	26
Table III-6. Estimates of adaptation investment needs in 2015 from the 2007/2008 Human Development Report	30
Table III-7. Projects identified in national adaptation programmes of action, by sector	31
Table III-8. Examples of adaptation actions according to type and nature of additionality	35
Table III-9. Examples of adaptation actions according to context	36
Table III-10. Options, tools and mechanisms for mobilizing financial resources from public funding for adaptation	41
Table III-11. Overview of current and pledged financial resources for adaptation (millions of United States dollars)	41
Table III-12. Potential financial resources for adaptation (millions of United States dollars)	44
Table III-13. Possible levels of funding for adaptation actions based on adaptation type and additionality	48
Table III-14. Possible sources of funding for adaptation actions based on adaptation type and additionality	51
Table III-15. Possible options, tools and mechanisms available to enhance adaptation actions	52
Table IV-16. Greenhouse gas emission reductions and additional investment and financial flows in 2030 under the mitigation scenario	55
Table IV-17. Additional financing needs by stage of technological maturity	59
Table IV-18. Support under the Convention and its Kyoto Protocol for mitigation technologies	60
Table IV-19. Global new investment in clean energy, 2004 – 2007 (billions of United States dollars)	63
Table IV-20. Estimates of the potential demand for emission reduction credits in 2020	67
Table IV-21. Estimates of current public financing for innovation of mitigation technologies (billions of United States dollars)	69
Table IV-22. Possible public finance mechanisms for financing mitigation technologies	73
Table IV-23. Examples of national policy and action to mobilize climate-friendly investment and financial flows	75
Table IV-24. Comparison of approaches to scale up mitigation efforts in developing countries	76
Table IV-25. Analysis of proposals by Parties to raise public finances for mitigation	79
Table IV-26. National and multilateral initiatives with public finance for activities related to reducing emissions from deforestation and forest degradation	81
Table IV-27. Possible options, tools and mechanisms available to enhance mitigation actions	84
Table V-28. Funding available under the Convention and its Kyoto Protocol (millions of United States dollars)	88
Table V-29. New bilateral and multilateral climate-related funding initiatives	89
Table V-30. Potential financial resources for adaptation, mitigation and technology cooperation (billions of United States dollars)	91

LIST OF FIGURES

Figure	Page
Figure I-1. The role of the public and private sectors in financing technology development	16
Figure I-2. Marginal abatement cost curves for developing countries in 2020	17
Figure I-3. Possible elements of a financial framework to address climate change	20
Figure IV-4. The learning curve of technology development	57
Figure IV-5. The role of the public and private sectors in financing technology development	59
Figure IV-6. Marginal cost curves for the developing countries in 2020	67
Figure IV-7. Chain of financing through a development finance institution	71
Figure V-8. Possible key elements for enhanced financial support under the convention	87
Figure V-9. Current institutional arrangements to provide financial resources and investments under the Convention and its Kyoto Protocol	97
Figure V-10. Institutional arrangements reflecting the Group of 77 and China proposal to provide overall financial resources under the Convention	99
Figure V-11. Possible overall financial framework under the Convention	101

ACRONYMS AND ABBREVIATIONS

AAU	assigned amount unit (equal to one metric tonne of carbon dioxide equivalent)	GFDRR	Global Facility for Disaster Reduction and Recovery
AF	Adaptation Fund	GHG	greenhouse gas
AOSIS	Alliance of Small Island States	GICI	German International Climate Initiative
AWG-KP	Ad Hoc Working Group on Further Commitments under the Kyoto Protocol	GIS	geographic information systems
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention	GLOF	glacier lake outburst flood
BAPS	Beyond the Alternative Policy Scenario	GNP	gross national product
BAU	business as usual	HDR	Human Development Report
CCS	carbon dioxide capture and storage	IATAL	international air travel adaptation levy
CDM	clean development mechanism	IEA	International Energy Agency
CEO	chief executive officer	IFCI	International Forest Carbon Initiative
CER	certified emission reduction (equal to one metric tonne of carbon dioxide equivalent)	IMERS	International Maritime Emission Reduction Scheme
CFIs	commercial finance institutions	IPCC	Intergovernmental Panel on Climate Change
CGIAR	Consultative Group on International Agricultural Research	IPCC AR4	Fourth Assessment Report of the IPCC
CIFs	Climate Investment Funds	JI	joint implementation
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	JISC	Joint Implementation Supervisory Committee
CO ₂	carbon dioxide	LDCF	Least Developed Countries Fund
CO ₂ eq	carbon dioxide equivalent	LDCs	least developed countries
COP	Conference of the Parties	LEG	Least Developed Countries Expert Group
CTF	Clean Technology Fund	LULUCF	land use, land-use change, and forestry
DFIs	development finance institutions	M&A	mergers and acquisitions
DRR	disaster risk reduction	MAC	marginal abatement cost
ECAs	export credit agencies	MDB	multilateral development bank
EE	energy efficiency	MDG	Millennium Development Goal
EGTT	Expert Group on Technology Transfer	MRV	measurable, reportable and verifiable
ERU	emission reduction unit (equal to one metric tonne of carbon dioxide equivalent)	NAMAa	nationally appropriate mitigation actions
ESCO	energy service company	NAPAs	national adaptation programmes of action
ETF-IW	Environmental Transformation Fund – International Window	NGO	non-governmental organization
ETS	emissions trading scheme	ODA	official development assistance
EU	European Union	OECD	Organisation for Economic Co-operation and Development
EUA	European Union allowances	PIF	project identification form
EUR	euro	PoA	programme of activities
FDI	foreign direct investment	PPCR	Pilot Programme for Climate Resilience
FI	financial institution	PV	photovoltaic
G8	Group of Eight	R&D	research & development
GCCA	Global Climate Change Alliance	RAF	resource allocation framework
GDP	gross domestic product	RBM	results-based management framework
GEF	Global Environment Facility	RD&D	research, development and deployment
GEICs	Global energy innovation centres	RE	renewable energy
		REDD	reducing emissions from deforestation in developing countries
		SCCF	Special Climate Change Fund
		SCF	Strategic Climate Fund
		SD-PAMs	Sustainable development policies and measures
		SIDS	small island developing States

ACRONYMS AND ABBREVIATIONS

SNLT	sectoral no-lose target
SoP	share of proceeds
SPA	strategic priority on adaptation
TNA	technology needs assessment
TNCs	trans-national corporations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP SEFI	United Nations Environment Programme Sustainable Energy Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Collaborative Programme on Reduced Emissions from Deforestation and Degradation
US EPA	United States Environmental Protection Agency
USD	United States dollar
WBCSD	World Business Council on Sustainable Development
WCCF	World Climate Change Fund
WEO	World Energy Outlook
WRI	World Resources Institute

I. EXECUTIVE SUMMARY

1. This report provides an update to the 2007 UNFCCC report on investment and financial flows to address climate change.¹ The update was prepared to feed into negotiations on a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012.

2. The 2007 report estimated that the additional 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. It found that a significant share of the additional investment and financial flows for both mitigation and adaptation will be needed in developing countries. Although, in accordance with Article 3, paragraph 1, of the Convention, developed countries Parties should take the lead in combating climate change and the adverse effects thereof, it is increasingly important to determine how they can support developing country Parties in adapting to, as well as mitigating, climate changes.

3. This update moves the discussion on financing forward, and focuses on options, tools and mechanisms to enhance financing for mitigation, adaptation and technology cooperation for an effective response to climate change. It also presents relevant new information available on the investment and financial flows needed.

4. The basic structure of the analysis has not changed significantly from that presented in the 2007 report. In sum, even with the global financial crises, the three broad strategies for providing the additional investment and financial flows needed to address climate change remain unchanged:

- (a) Shift investments and financial flows to more climate-friendly and -resilient alternatives;
- (b) Scale-up international private and public investments and financial flows;
- (c) Optimize the allocation of the funds available.

5. To support enhanced action on the provision of financial resources and investment for developing countries, four broad means can be considered and influenced by Parties:

- (a) Private finance;
- (b) Public finance;
- (c) National policies;
- (d) The Convention itself.

I-A. ADAPTATION

6. Estimates of financial flows and investment needs for adaptation have not changed from the 2007 report, and remain in the tens of billions, possibly hundreds of billions, of United States dollars per year.

7. An increased effort to calculate adaptation needs through regional or national bottom-up assessments, as opposed to global top-down estimates, is evident. But regardless of the number of financial assessments, their precision can be improved only through a better understanding of adaptation and how it is additional to a development baseline.

8. Adaptation actions can be grouped into three broad categories:

- (a) Actions that climate-proof socio-economic activities by integrating future climate risk;
- (b) Actions that expand the adaptive capacity of socio-economic activities to deal with future and not only current climate risks;
- (c) Actions that are purely aimed at adapting to impacts of climate change and would not otherwise be initiated.

9. Examples for each category include capacity-building, research and assessments, disaster risk reduction and risk management, and specific interventions. The adaptation component to be funded could either constitute the whole action (category C) or part of the socio-economic activity (Categories A and B).

10. Although the current and pledged levels of resources dedicated to adaptation are well below what is projected to be needed in the future, proposed options have the potential to mobilize the resources required within an adequate time frame. Most of the proposed options for scaling up resources for adaptation involve the use of public funding, for example through levies on market instruments and commodities or services.

11. As well as being used to mobilize new and additional sources, public funding both domestic and international is expected to play a larger role itself in financing adaptation actions. This is because the benefits generated by adaptation actions often have the characteristics of public goods. For example, the benefits of coastal protection will typically be enjoyed by all the residents of the community at risk. The private sector, too, already invests significantly in many vulnerable sectors. Ensuring that private-sector investments help to reduce vulnerability and exposure to climate risks and contribute to effective adaptation can channel a large source of funding towards climate-resilient outcomes. In addition, the private sector can be engaged in developing and implementing financial risk management mechanisms, including insurance, that encourage more adaptive behaviour.

12. National policies are key to strategic adaptation planning. They can help to create an enabling environment that ensures scaled-up financial resources are optimised, used to support integration of adaptation in sectoral and development planning, and shifted towards those activities that hold the greatest promise for reducing vulnerability.

13. Irrespective of how resources are mobilized, designing an appropriate delivery mechanism with the right institutional and operational arrangements is paramount. With this in place, adaptation funding can be directed not only to those who are most vulnerable, but also to those who will receive the greatest benefit from it, in terms of reduced vulnerability and enhanced adaptive capacity.

14. Political agreement is needed on issues related to: sources of financial support for adaptation actions; principles underlining institutional arrangements for providing financial support to adaptation; and the categorization of adaptation activities to facilitate mobilization and allocation of resources. Agreement is also required on how resources can be more effectively accessed and disbursed, including through the possible provision of programmatic or even budget support, rather than the project-based support that currently predominates.

15. **TABLE I-1** below summarizes possible options, tools and mechanisms available to shift, scale-up and optimize the provision of financial resources to enhance adaptation actions in developing countries. They are elaborated in more detail in the report.

¹ UNFCCC secretariat. 2007. Investment and Financial Flows to Address Climate Change. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf.

Table I-1. Possible options, tools and mechanisms available to enhance adaptation actions

Funding sources		
	Private finance	Public finance
Scale up	Scale up investments and financial risk-management tools, including insurance	Scale up financial flows and investments
Shift	Shift investments towards climate-resilient activities	Shift resource mobilization from budgetary allocations/voluntary contributions to automated contributions through levies on market instruments/commodities
Optimize	Optimize public private partnerships for investments and financial risk management mechanisms to reduce vulnerability and enhance adaptive capacity for the economy and society at large	

I-B. MITIGATION

16. The 2007 report estimated that additional investment and financial flows of USD 200 – 210 billion would be necessary to reduce carbon dioxide equivalent (CO₂ eq) emissions by 25 per cent below 2000 levels in 2030.

17. New emissions scenarios and estimates of emission reductions required in 2030, from the International Energy Agency (IEA) and others, are virtually the same as those presented in the 2007 report. However, the estimates of additional investment and financial flows needed are significantly higher, mainly due to higher projected capital costs, especially in the energy sector.

18. This increases the scale of the challenge to generate additional investment and financial flows. It will require profound shifts in energy demand and supply, clear carbon price signals, appropriate fiscal incentives and well-targeted regulation. In this light, the strategies presented in the 2007 report to scale up, shift and optimize investment and financial flows to mitigate climate change assume even greater significance.

19. Developed country Parties should take the lead in combating climate change in accordance with Article 3, paragraph 1, of the Convention. However, according to the Bali Action Plan, attaining the global greenhouse gas (GHG) emission reductions that are needed to achieve the ultimate objective of the Convention requires a comprehensive response by all countries and developing countries will need support in responding to this challenge, following the principle of common but differentiated responsibilities. Therefore it is important to determine the most effective form of support for developing countries.

20. Mitigating climate change will require technological and behavioural change on several fronts. Any future agreement to enhance mitigation action needs to encompass a variety of funding sources and delivery mechanisms that address GHG emissions from all sectors in all countries, and also foster development and transfer of mitigation technology.

Provision	
National policies	Convention
Scale up efforts in national strategic planning for adaptation and in the integration of adaptation into sectoral and development planning	Scale up tools and mechanisms to mobilize new and additional resources in an adequate, predictable and equitable manner, e.g. through levies on market instruments and commodities
Shift from short-term project-based planning to long-term policy planning to identify and implement all possible adaptation actions, including economic diversification	Shift disbursement of financial resources to a more upstream level from project to programmes and/or budgets, taking into account national priorities and circumstances
Optimize the integration of adaptation and development-related financial resources Optimize enabling environments to enhance adaptation action, including through: <ul style="list-style-type: none"> - Legal frameworks; - Institutional arrangements; - Sectoral management; - Information tools 	Use Convention funds to leverage/catalyse additional funds Optimize the categorization of adaptation actions to enhance mobilization and allocation of financial flows Optimize delivery mechanisms for financial flows, including: <ul style="list-style-type: none"> - Institutional arrangements; - Access, e.g. via vulnerability metrics; - Monitoring and reporting, e.g. via measuring, reporting on and verifying support provided and adaptation action implemented

21. In order for a technology to realize its mitigation potential, the type and source of funding invested in its development must be appropriate to its stage of maturity. **FIGURE I-1** below shows in a stylized fashion the typical pattern of involvement of public- and private-sector finance at different stages of technology development. An acceleration of technology development in all sectors will require increased public funding for research and development (R&D) and demonstration to leverage private finance. Policies to promote technologies that are nearly at the commercial stage, and policies that mandate or reward emission reductions, are also needed.

22. Many mitigation technologies are available at the commercial or near-commercial stages in all relevant sectors. In developed countries, adoption of near-commercial technologies could be accelerated by mitigation policies, such as emissions trading and standards, that help the countries to meet their national emissions limitation commitments. In developing countries, public resources and national policies could provide the risk-adjusted returns desired by the private sector to invest in the mitigation options and thus accelerate their implementation. Technology transfer assistance may also be required in these countries.

23. Transfer of mitigation technologies often faces many barriers, such as a lack of capacity to operate and maintain the technology and absence of institutional structures or regulations that inhibit adoption. These barriers differ by technology and country. International mechanisms and funding for capacity-building and creation of enabling environments may be needed to accelerate adoption of near commercial mitigation technologies in developing countries.

24. Technology development and transfer will increase the potential for, and reduce the cost of, mitigation over time. Policies and incentives for mitigation are necessary, but may not be sufficient for creating incentives for technological innovation. Accelerating technology innovation also will require increased funding for R&D and demonstration and policies to promote near-commercial technologies. Technology innovation depends on public funding and other policies owing to the investment risks involved and the public good nature of research. The participation of developing countries in R&D and demonstration, which is currently concentrated in a few industrialized countries, needs to be enhanced.

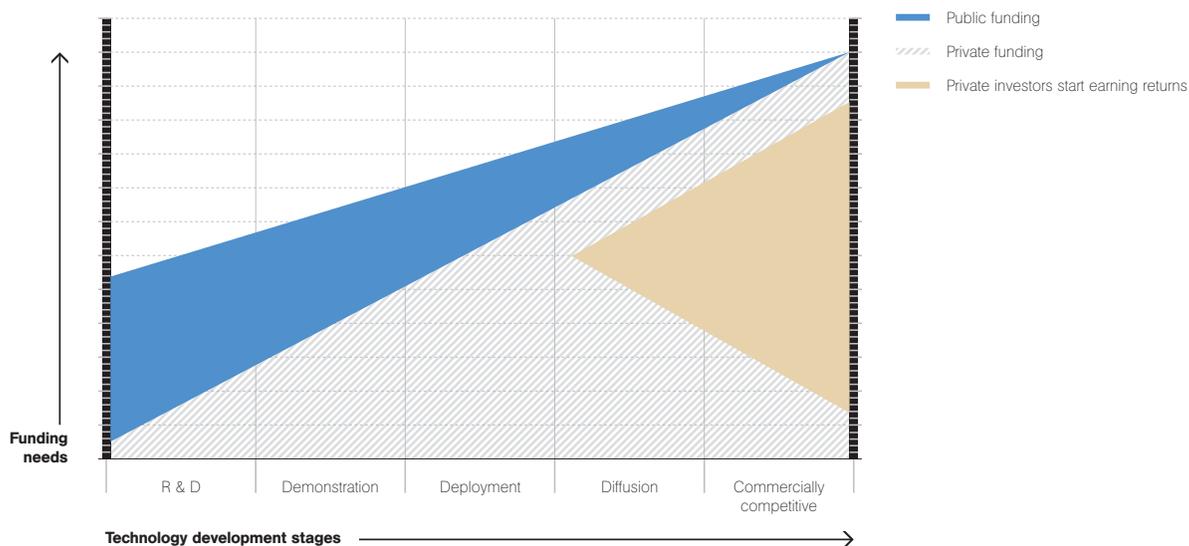
25. Private-sector resources, suitably guided by international and national public-sector finance, could make an important contribution to mitigating climate change in developing countries. The carbon market and private investment in clean energy have grown rapidly over the last few years. This highlights the importance of improving policy frameworks to attract private finance from domestic and international sources and divert the flow from conventional technologies to climate-relevant alternatives.

26. New estimates presented in this update project the size of the demand for emissions reduction credits in 2020 to be 0.5 – 1.7 Gt CO₂ eq per year. More stringent developed country commitments could increase the demand for credits further. However, the demand is ultimately determined by the national policies implemented by developed countries to meet their commitments.

27. The estimated mitigation potential in 2020 in developing countries is approximately 7 Gt CO₂ eq. This estimate takes into account technologies currently eligible under the clean development mechanism (CDM), reducing emissions from deforestation and forest degradation in developing countries (REDD), and carbon dioxide capture and storage (CCS). As shown in [FIGURE I-2](#), most of this potential is available at a cost of less than USD 25 per t CO₂ eq. The projected emission reduction potential in developing countries appears to be larger than the estimated demand for emission reduction credits in 2020 by developed countries.

28. The demand for emissions reduction credits from developing countries could increase significantly by 2020. To satisfy the higher demand, emission reduction crediting mechanisms would need to be scaled up and optimized to ensure cost-effective delivery. Many proposals to expand the supply of offsets, including programmatic CDM, sectoral CDM, and sectoral no-lose targets, have been put forward with this objective.

Figure I-1. The roles of the public and private sectors in financing technology development



Abbreviation: R&D = research and development.

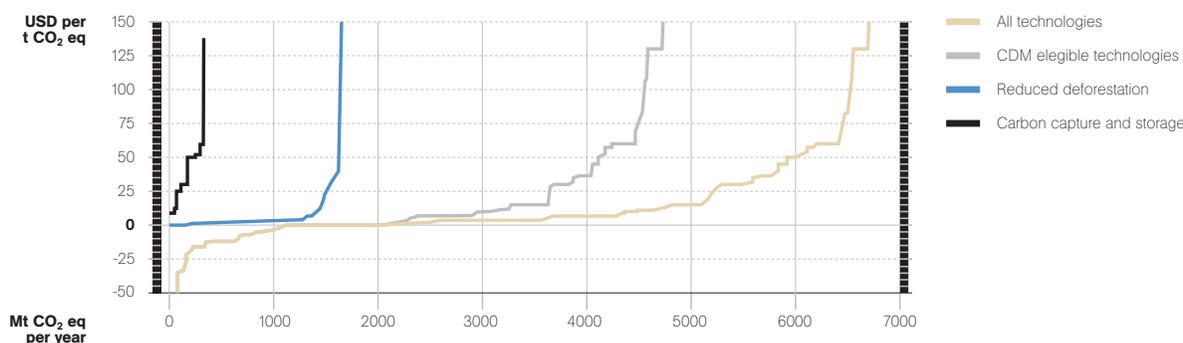
29. The demand for offsets is related to the commitments undertaken by Parties. Even with expanded crediting mechanisms, the total mitigation potential available in developing countries cannot be fully realized. Further, many mitigation opportunities are not effectively captured by the crediting mechanisms. For example, the CDM finances only a small share of demand-side energy efficiency opportunities that have negative or very low cost but face non-price barriers. There are also mitigation opportunities, such as CCS or solar photovoltaic (PV), that have costs higher than the price of emission reduction credits. Finally, the carbon market might not achieve desired results in countries that have difficult investment conditions.

30. Crediting mechanisms would thus be supplemental to other financing mechanisms that support mitigation actions. In accordance with the Bali Action Plan, the action and support would need to be measurable, reportable and verifiable. They could include direct financial support for some mitigation measures, such as solar energy projects in least developed countries (LDCs), and financial support for national policies, such as implementation of efficiency standards.

31. International public finance can help to realize the available mitigation potential. First, it can support implementation of national policies with mitigation benefits in developing countries. Second, it can be used to fund mitigation opportunities whose cost is substantially higher or lower than the market price of emission reduction credits. Third, it can be used to leverage private finance in countries or for mitigation opportunities where the risk-return profile is not attractive to private investors even with the carbon market incentive. Finally, it can be used to fund research, development and early deployment of technologies that will open up new and potentially cheaper mitigation opportunities in the future.

32. TABLE I-2 below summarizes possible options, tools and mechanisms available to shift, scale-up and optimize the provision of financial resources and investments to enhance mitigation actions in developing countries. They are elaborated in more detail in the report.

Figure I-2. Marginal abatement cost curves for developing countries in 2020



Abbreviation: CDM = clean development mechanism.

Table I-2. Possible options, tools and mechanisms available to enhance mitigation actions

		Funding sources
		Private finance
Scale up	Mitigation measures	More stringent targets for domestic and international carbon markets Mitigation measures mandated or encouraged by national policies
	Technology development	Support all stages, especially technologies nearly commercially viable
Shift	Mitigation measures	Shift from GHG-emitting to non-emitting technologies, especially in power sector, and from purely project to more comprehensive approaches
	Technology development	
Optimize	Mitigation measures	Use mix of market and non-market policies to attract private funds to the most cost-effective measures
	Technology development	

Abbreviations: GHG = greenhouse gas, R&D = research and development, RD&D = research, development and deployment.

		Provision	
	Public finance	National policies	Convention
	Support mitigation measures not well addressed by carbon market because they face non-price barriers or need more financial support than is provided by the market price Scale up public finance support, especially in countries where private finance/carbon market is less successful	For facilitating measures that face non-price barriers, such as energy efficiency measures especially for buildings For facilitating measures that need more financial support than provided by the market price	Raise additional financial resources and agree on their distribution Agree on means of providing private and public support for mitigation measures in developing countries Support technology transfer to developing countries
	Finance RD&D when private sector not willing to invest (owing to high risk, long development times or 'public good' character) Early deployment support (e.g. if infrastructure crucial)	Domestic carbon markets and other policies that create demand for technologies at the deployment and diffusion stages	Agree on means to increase support for all stages of technology innovation in developed and developing countries Send long-term signal (important for private-sector innovation)
		Domestic carbon markets and other policies that induce a shift to low-emitting technologies Reform subsidies for fossil fuels and agriculture that increase emissions	Agree on support for changes to national policies in developing countries Agree on which actions need to be measured, reported and verified
	Shift support for R&D from GHG-emitting to non-emitting technologies		Joint R&D efforts
	Use public funds to optimize risk-return profile of mitigation measures in order to attract and leverage private funds, e.g. through public-private partnerships	Optimize national policies to achieve the most cost-effective emissions reductions Promote development of a robust financial sector to facilitate optimal financing mix, ensure coherence among different crediting mechanisms	Use Convention funds to leverage additional funds and finance implementation of national policies Agree on conditions for interplay between different finance mechanisms
	Use public funds to leverage private funds		Agree on mechanisms to facilitate developing country contributions to technology development

I-C. OVERALL FINANCIAL FRAMEWORK

33. Mobilization of financial resources, their delivery and institutional arrangements for mobilization and delivery are key elements to be addressed in the design of an overall financial framework to support action on mitigation, adaptation and technology cooperation (see FIGURE I-3).

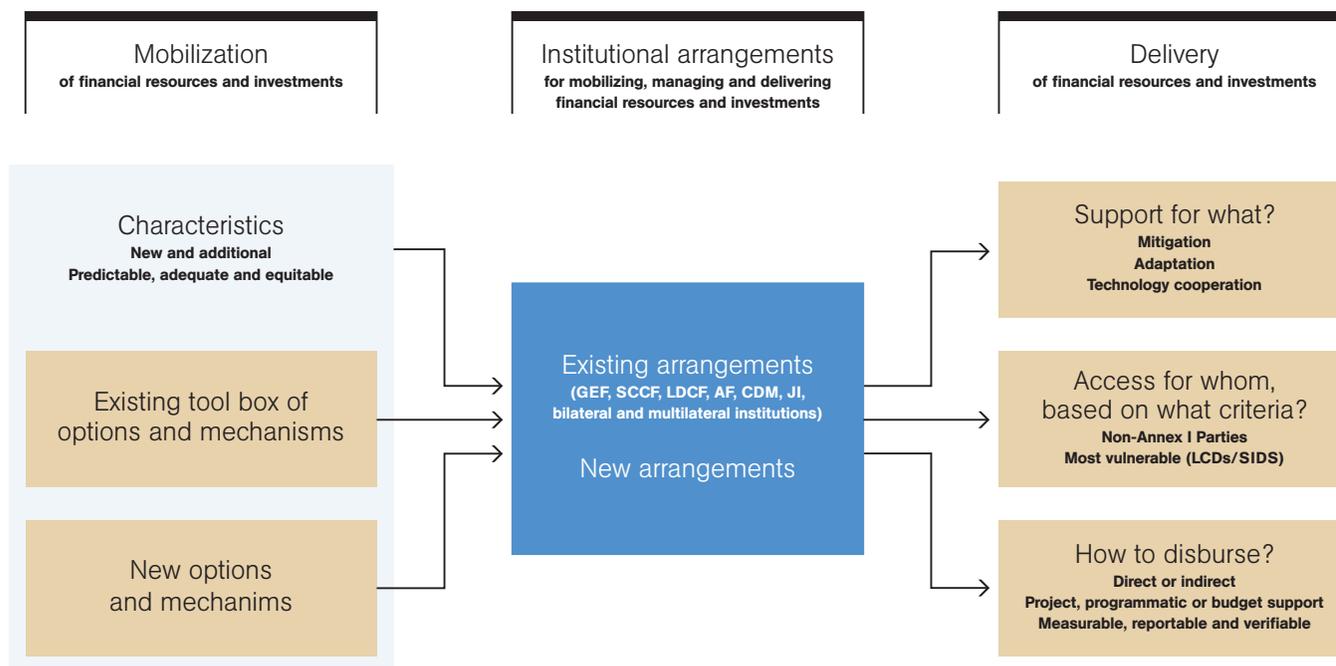
1. MOBILIZING SCALED-UP FINANCIAL RESOURCES AND INVESTMENTS

34. At present, adaptation, mitigation and technology cooperation activities under the Convention are funded under the Convention’s financial mechanism by the Global Environment Facility (GEF) Trust Fund, the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF) and the Adaptation Fund. The first three are operated by the GEF, and rely on voluntary contributions from developed countries. The Adaptation Fund is operated by its own Board and is funded by a 2 per cent levy on the CDM.

35. Parties have tabled many proposals to increase the financial resources available for adaptation, mitigation and technology cooperation. Some proposals generate larger, more stable or more predictable amounts of revenue than others. Some proposals would be under the Convention, others would be outside it. Some proposals would generate funds internationally, while for others the funds would flow through government budgets. The proposals are summarized in TABLE I-3.

36. Parties could agree on a combination of proposals, which together could generate several billions of United States dollars per year of relatively stable and predictable funding. Parties would also need to agree on an allocation of the available funds between adaptation, mitigation and technology cooperation.

Figure I-3. Possible elements of a financial framework to address climate change



Abbreviations: AF = Adaptation Fund, CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation, LDCF = Least Developed Countries Fund, LDCs = least developed countries, SCCF = Special Climate Change Fund, SIDS = small island developing States.

Table I-3. Summary of proposals for increased financial resources (billions of United States dollars)

Proposal	Source of funding	Purpose	Notes	Nominal annual level of funding
Increasing the scale of existing mechanisms				
European Union	Continue 2 per cent levy on SoP from CDM	A	Ranging from low to high demand in 2020	0.2 – 0.68
Bangladesh, Pakistan	3 – 5 per cent levy on SoP from CDM	A	Ranging from low to high demand in 2020	0.3 – 1.7
Many Parties	CDM and other crediting mechanism	M	In 2020	10 – 34
Defined budgetary contributions from developed countries				
Group of 77 and China	0.5 – 1 per cent of GNP of Annex I Parties ^a	A, M	Calculated for 2007 GDP	201 – 402
Contributions raised through market-based mechanisms and taxation				
Mexico	Contributions based on GDP, GHG and population and possibly auctioning permits in developed countries	A, M	Initial phase	10
Norway	Auctioning of AAUs, for example 2 per cent	A	Annually	15 – 25
Switzerland	2 USD per t CO ₂ with a basic tax exemption of 1.5 t CO ₂ eq per inhabitant	A	Annually	18.4
Republic of Korea	Crediting NAMAs	M		Uncertain
Colombia, LDCs	2 per cent levy on SoP from joint implementation and emissions trading	A	Annually, after 2012	0.03 – 2.25
LDCs	Levy on international air travel (IATAL)	A, M	Annually	4 – 10
LDCs	Levy on bunker fuels (IMERS)	A	Annually	4 – 15
Tuvalu	Auction of allowances for international aviation and marine emissions	A, M	Annually	28

Sources: FCCC/AWGLCA/2008/16, FCCC/TP/2008/6, Müller B. 2008. *International Adaptation Funding. The Need For An Innovative and Strategic Approach*. Oxford: Oxford Institute for Energy Studies, and UNFCCC secretariat. 2007. *Investment and Financial Flows to Address Climate Change*. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf.
Abbreviations: A = adaptation, AAU = assigned amount unit, CDM = clean development mechanism, GDP = gross domestic product, GHG = greenhouse gas, GNP = gross national product; IATAL = International Air Travel Adaptation Levy, IMERS = International Maritime Emission Reduction Scheme, LDCs = least developed countries, M = mitigation, NAMAs = nationally appropriate mitigation actions, SoP = share of proceeds.

^a Owing to a lack of information on GNP, potential funding was calculated using GDP.

2. DELIVERING FINANCIAL RESOURCES AND INVESTMENTS

37. Efficient and effective delivery of financial resources and investment is central to the success of global efforts to address climate change. It includes aspects of allocation, access and disbursement. Consideration also needs to be given to how the delivery of financial support is measured, reported and verified.

38. Effective disbursement will require decisions on the types of activity to be funded. Funds could be disbursed for specific purposes, applied for by Parties or other organizations, for example a REDD project. Alternatively, funds could be disbursed to Parties on the basis of national plans, such as an adaptation plan or a mitigation plan.

39. The Bali Action Plan foresees consideration of enhanced mitigation action by developing countries that should be nationally appropriate and be undertaken in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner. Some Parties have suggested that the provision of support for – and the implementation of – adaptation actions should also be measurable, reportable and verifiable. The operational interpretation of “measurable, reportable and verifiable” is still under discussion.

3. INSTITUTIONAL ARRANGEMENTS FOR MOBILIZING, MANAGING AND DELIVERING FINANCIAL RESOURCES AND INVESTMENTS

40. Putting in place institutional arrangements to mobilize, manage and deliver the funds on the scale needed will be a challenge. Parties have submitted many proposals for institutional arrangements to manage the funds. They range from a single umbrella body that coordinates the activities of three (or more) specialist bodies to a number of specialist bodies all reporting directly to the Conference of the Parties (COP). The proposals also vary in terms of how rigidly the proposed allocation of funds is specified.

41. The specifics to be agreed upon include the number of bodies, the mandate of each body, the reporting relationships, the membership of each body, the powers of each body and the rules of procedure of each body. Institutional arrangements also need to clarify where different sources of funds are channelled and how the amount available to each body is determined.

42. For an overall financial framework under the Convention to mobilize, manage and deliver enhanced financial flows and resources for adaptation, mitigation and technology cooperation, institutional arrangements need:

- (a) To ensure the efficient and effective management and supervision of the various investment mechanisms and multiple funds;
- (b) To ensure coordination and coherence with other bilateral and multilateral financial flows consistent with Article 11, paragraph 5, of the Convention;
- (c) To enable the engagement of the private sector with a view to leveraging additional resources for climate-friendly and climate-resilient investments.

43. In order for Parties to agree on an overall financial framework, a number of questions could be addressed, including:

- (a) What should be the principles underlying an overall financial framework?
- (b) How can existing institutional arrangements, be improved and proliferation of institutions and funds be avoided in the context of an overall financial framework?
- (c) What new institutions should be established to provide new and additional financial resources and investment?

- (d) How should financial support for adaptation and mitigation provided through different bilateral, regional and multilateral channels be deployed in a way that is measurable, reportable and verifiable?

I-D. PUTTING THE CLIMATE CHANGE CHALLENGE INTO PERSPECTIVE

44. Last year's report showed that the investments required to address climate change are substantial, but small in relation to the overall investment and financial flows of the global economy. This update finds that the estimates of the scale of the investment and financial flows needed to address climate change have not changed significantly. Parties have tabled proposals that together could generate many billions of United States dollars per year of relatively stable and predictable funding.

45. This year's report set out to analyse the options, tools and mechanisms that are needed to optimize, shift and scale up the necessary funds to address climate change. The analysis presents a diverse set of elements, including different private and public funding sources and delivery mechanisms as well as national policies; together, they constitute the required funding 'tool box'. Importantly, most of these elements have been proposed by Parties and thus can be negotiated, starting at the fourteenth session of the COP with the aim of concluding on an overall financial framework to effectively address climate change at COP 15 in December 2009.

46. The financial crisis and the growing economic crisis resulting from it have not been analysed in this report. In relation to the long-term nature of climate change and the action required to address it, the financial and economic crises are short-term issues. In fact, responses to the crises can help efforts to combat climate change, such as government measures to stimulate economic recovery could be used to shift investment and financial flows into more efficient, low GHG-emitting technologies and infrastructure.

II. INTRODUCTION

II-A. MANDATE

47. The Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA), at its second session, requested the secretariat, subject to the availability of financial resources, to prepare and make available for consideration at its fourth session an update of the 2007 report, taking into account paragraph 1 of the Bali Action Plan.²

II-B. BACKGROUND

48. Responding to the challenge of climate change, the COP at its thirteenth session launched a comprehensive process under the Bali Action Plan to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision at COP 15, by addressing, inter alia:

- (a) A shared vision for long-term cooperative action;
- (b) Enhanced national/international action on mitigation of climate change;
- (c) Enhanced action on adaptation;
- (d) Enhanced action on technology development and transfer to support action on mitigation and adaptation;
- (e) Enhanced action on the provision of financial resources and investment to support action on mitigation and adaptation and technology cooperation.

49. The need for enhanced action on the provision of financial resources and investment was identified in the 2007 report. In the report, the secretariat reviewed existing and planned investment and financial flows, with a particular focus on the needs of developing countries.

50. To clarify and deepen understanding of paragraph 1 (e) of the Bali Action Plan on enhanced action on the provision of financial resources and investment, a workshop on “Investment and financial flows to address climate change” was held during the second session of the AWG-LCA.³ The debate covered the following possible areas of focus:

- (a) Scaling up financing;
- (b) Optimizing financing;
- (c) Creating enabling environments and appropriate incentives;
- (d) Governance of financial resources under the Convention.

51. During the workshop and in subsequent discussions, Parties agreed on the need for predictable and sustainable financial resources for mitigation, adaptation and technology cooperation to address climate change in developing countries. In relation to the sources of funding, many Parties noted that some financing requirements can be met through funds under the Convention and market mechanisms, whereas others could be met through enabling policies that influence private-sector investments. A number of Parties suggested that new funds with specific purposes would have to be established for enhanced action on climate change by developing countries.

52. Many Parties commented on issues related to governance of financial resources under the Convention. Several Parties proposed principles that could apply to financial resources collected or disbursed under the Convention, including equity, common but differentiated responsibility, the polluter-pays principle, adequacy, predictability, sustainability, new and additional funding, grant funding, simplified access, and priority access for the most vulnerable countries. In addition, Parties made specific proposals on how they envision enhanced action on the provision of financial resources and investment.

II-C. SCOPE OF THE UPDATE

53. Building on the 2007 report, which outlined investment and financial needs to address climate change, this update seeks to move the discussion forward to options, tools and mechanisms for enhanced financing for mitigation, adaptation and technology cooperation, to enable an effective response to climate change. It uses the elements of the Bali Action Plan, the areas of focus identified during the sessions of the AWG-LCA, and the ideas and proposals submitted by Parties and observer organizations to the secretariat on the elements contained in paragraph 1 of the Bali Action Plan to frame the discussion.

² FCCC/AWGLCA/2008/8, paragraph 28 (c).

³ A report of the workshop is available in document FCCC/AWGLCA/2008/11, paragraphs 54 – 63. Presentations are available at http://unfccc.int/meetings/ad_hoc_working_groups/lca/items/4416.php.

54. Taking into account paragraph 1 of the Bali Action Plan, the report is structured as follows. The remainder of this chapter reviews the overall findings of the 2007 report. CHAPTERS III and IV analyse financing for adaptation (para. 1 (c) of the Bali Action Plan) and mitigation (para. 1 (b) of the Bali Action Plan) respectively. Financing for technology development and transfer (para. 1 (d) of the Bali Action Plan) is covered in both chapters as a cross-cutting issue. Both chapters first review findings from the 2007 report; they then provide an update on the financial needs that were identified and discuss options, tools and mechanisms for generating and delivering the necessary financial resources.

55. CHAPTER V discusses issues related to the overall financial architecture under which enhanced investment and financial flows would be mobilized, managed and delivered (para. 1 (e) of the Bali Action Plan). Based on the analysis in the previous chapters, CHAPTER VI presents conclusions on how enhanced investment and financial flows could contribute to an effective response to climate change as part of a shared vision (para. 1 (a) of the Bali Action Plan). More specific links to the various sub-elements of the Bali Action Plan are highlighted in the different chapters.

56. The update, in analysing options, tools and mechanisms for enhanced financing for adaptation, mitigation and technology cooperation, focuses on the funding and investment needs of developing countries in line with the sub-elements of paragraph 1 (e) of the Bali Action Plan:

- (a) Improved access to adequate, predictable and sustainable financial resources and financial and technical support, and the provision of new and additional resources, including official and concessional funding for developing country Parties;
- (b) Positive incentives for developing country Parties for the enhanced implementation of national mitigation strategies and adaptation action;
- (c) Innovative means of funding to assist developing country Parties that are particularly vulnerable to the adverse impacts of climate change in meeting the cost of adaptation;
- (d) Means to incentivize the implementation of adaptation actions on the basis of sustainable development policies;
- (e) Mobilization of public- and private-sector funding and investment, including facilitation of climate-friendly investment choices;

(f) Financial and technical support for capacity-building in the assessment of the costs of adaptation in developing countries, in particular the most vulnerable ones, to aid in determining their financial needs.

57. Acknowledging that mitigation potentials and adaptation needs vary with national circumstance and that lessons regarding the most effective mix of policies are still being learned, the adaptation and mitigation chapters consider separately the potential of public and private financing as well as the role of national policies in scaling up resources and optimising their use, including by shifting investments from carbon – intensive technologies into climate-friendly alternatives.

58. The update is based on publicly available information that has been released since publication of the 2007 report. Data and analysis by research organizations, experts and institutes have been drawn upon. Further, the assessment of options, tools and mechanisms is enriched by information submitted by Parties and other observer organizations as part of the work of the AWG-LCA and by proposals to expand the market based mechanism submitted to the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol. The work is based on published information and has not undertaken any assessment or analysis, specifically of proposals on financial architecture and related issues.

II-D. REVIEW OF THE 2007 REPORT

1. KEY FINDINGS ON INVESTMENT AND FINANCIAL FLOWS NEEDED FOR ADAPTATION AND MITIGATION IN 2030

59. The 2007 report presented an estimate of the investment and financial flows needed to reduce global CO₂ eq emissions by 25 per cent below 2000 levels by 2030 under a “mitigation scenario”.⁴ Under this scenario, energy-related CO₂ emissions would return to current levels by 2030 while other GHG emissions would be reduced and CO₂ removals increased substantially.

60. To achieve this reduction, the report estimated that investment and financial flows of USD 200 – 210 billion will be necessary globally in 2030 (see TABLE II-4), in addition to the amount expected to be available under a business as usual scenario. Over half of the additional global investment and financial flows would be needed in developing countries. About 68 per cent of the global emission reductions was projected to occur in developing countries where mitigation opportunities are projected to

be less costly owing to the rapid economic growth of large developing countries, the relatively inefficient energy use, and the prevalence of lowcost mitigation opportunities in the forestry sector.

61. The additional annual investment and financial flows needed for adaptation in 2030 were estimated for five sectors (see TABLE II-5 below). Estimating the cost of adaptation to climate change with precision is difficult, largely because adaptation measures will be widespread and heterogeneous. Estimated needs amount to several tens, possibly hundreds, of billions of United States dollars, with a significant share needed in developing countries.

62. According to the 2007 report, additional financial resources are likely to be needed for adaptation measures because the current amount of funding for adaptation appears to be significantly lower than potential investment needs. National policies play an important role in ensuring that the use of financial resources, both public and private, is optimized.

63. The 2007 report stressed that the investment and financial flows calculated are not estimates of the cost of mitigating or adapting to climate change. Operating and maintenance costs are not included, nor are offsetting savings, such as reduced energy costs. The Organisation for Economic Co-operation and Development (OECD) is currently working on various global integrated assessment modelling frameworks that explicitly incorporate the costs of mitigation, the costs of adaptation and the residual damages from climate change to inform policy makers of appropriate policy mixes of adaptation and mitigation investments (OECD, 2008a).

⁴ Under the "mitigation scenario" presented in the 2007 report, global 2030 emissions would be reduced from 61.52 Gt CO₂ eq under a "reference scenario" to 29.11 Gt CO₂ eq, which is 25 per cent below the 2000 emissions of 38.90 Gt CO₂ eq.

Table II-4. Additional investment and financial flows needed for mitigation in 2030, by sector

Sector	Areas/mitigation measures considered	Global cost (2005 USD billion)	Proportion needed in developing countries (%)
Fossil fuel supply	Lower production due to reduced demand and greater use of biofuels	-59	54
Power supply	Lower fossil-fired generation capacity More renewables Carbon dioxide capture and storage Nuclear energy Hydropower	-7	49
Industry	Greater energy efficiency Carbon dioxide capture and storage Reduced emissions of non-CO ₂ gases	36	54
Buildings	Greater energy efficiency	51	28
Transportation	More fuel-efficient vehicles Greater use of biofuels	88	40
Waste	Capture and use of methane from landfills and wastewater plants	1	64
Agriculture	Reduced methane emissions from crops and livestock	35	37
Forestry	Reduced deforestation and forest degradation Sustainable forest management	21	99
Technology research, development and deployment	Double the amount that is currently spent in this area	35 – 45	
Total net additional investment		200 – 210	

Table II-5. Additional investment and financial flows needed for adaptation in 2030, by sector

Sector	Areas/adaptation measures considered	Global cost (2005 USD billion)	Proportion needed in developing countries (%)
Agriculture, forestry and fisheries	Production and processing, research and development, extension activities	14	50
Water supply	Water supply infrastructure	11	80
Human health	Treating increased cases of diarrhoeal disease, malnutrition and malaria	5	100
Coastal zones	Beach nourishment and dykes	11	45
Infrastructure	New infrastructure	8 – 130	25

2. KEY FACTORS AND OPTIONS DETERMINING FUTURE INVESTMENT AND FINANCIAL FLOWS

64. Shifting to more climate-friendly and climate-resilient facilities will take time, because the lifetime of capital stock can be 30 years or more. The fact that global investment in new physical assets is projected to triple between 2000 and 2030 provides a window of opportunity to direct the investment and financial flows into new facilities that are more climate-friendly and -resilient than traditional equivalents.

65. Although the estimated additional amount of investment and financial flows needed to address climate change is large, it is small (1.1 – 1.7 per cent) in relation to the estimated total global investment in 2030. Most of the additional investment and financing needed for climate change mitigation and adaptation is expected to be financed by corporations, although this may require government policies and incentives. For example, changing the mix of types of electricity generation plants that utilities build may require government policies.

66. In addition to corporate investment, however, an improvement in, and an optimal combination of, mechanisms such as the carbon market, the financial mechanism of the Convention, official development assistance (ODA), national policies and, in some cases, new and additional resources, will be needed to address climate change. Several options for generating additional funds were proposed in the report, some of which could generate revenues commensurate with the estimated needs.

67. The changes to investment and financial flows needed to address climate change fall into three categories:

- (a) Shift investments and financial flows made by private and public investors to more sustainable, climate-friendly alternatives, for example by redirecting investments from traditional energy supply sources and technologies to low GHG emitting ones;
- (b) Scale up international private and public capital dedicated to investments and financial flows in mitigation or adaptation activities or technologies, for example by expanding the carbon market, by increasing contributions from Parties included in Annex II to the Convention (Annex II Parties) or by identifying new sources of funding;
- (c) Optimize the allocation of the funds available by spreading the risk across private and public investors, for example by providing incentives for private investment in the early deployment of new technologies or by improving the capacity of the insurance market.

(A) SHIFT INVESTMENTS AND FINANCIAL FLOWS

68. Substantial shifts in investment patterns will be required to mitigate and adapt to climate change. This is particularly important for the power supply sector, where investment must be shifted from fossil-fired generation to renewables, CCS, nuclear energy and hydropower. Adaptation in the infrastructure and agriculture, forestry and fisheries sectors will also require a shift in public- and private-sector investment patterns and associated production activities.

69. Shifting private-sector investments may require financial incentives or other arrangements to enable the investors to earn a comparable risk-adjusted return. The carbon market and policies to promote renewables are already playing an important role in shifting investment flows. For public investment, the challenge is to shift more funds into less carbon-intensive, more climate-proof measures without sacrificing development priorities.

(B) SCALE UP FUNDING

70. A significant increase in investment and financial flows is needed to mitigate and adapt to climate change. To increase private investment and finance, expansion of the international carbon market or provision of other incentives to invest more in specific sectors, particularly in developing countries, will be needed. Although the carbon market has stimulated a large amount of investment in cleaner technologies in a very short period, its scale would need to be increased considerably to finance the additional investment needed for mitigation.

71. The capacity of national governments, in developing countries in particular, to provide additional investment and financing is limited. The amount of funding for the climate change focal area in the GEF Trust Fund and in the LDCF and the SCCF is small relative to the amount needed. However, these funds have demonstrated the ability to catalyse larger investments from elsewhere through co-financing. Revenue generated for the Adaptation Fund is projected to be insufficient to meet the estimated needs for adaptation.

(C) OPTIMIZE THE ALLOCATION OF THE FUNDS

72. In addition to shifting and scaling up funding, the allocation of available resources needs to be optimized. How the available funds are allocated among different projects depends on three major factors:

- (a) The sources of investment, as public and private investors differ in their preference for risk and return over time;
- (b) The technology or project into which the investment is going, as opportunities vary in the risks they present, both generally (technology risk) and specifically (project risk);
- (c) The host country of the investment, as countries vary in their attractiveness to investors (country risk).

73. The large number of different sources of capital, with varying preferences for risk and return, creates opportunities to bring different sources of capital together to cover the cost of a single investment. For example, funding from the public sector that focuses more on social returns could attract private investors to activities that generate both social and financial returns.

III. ENHANCED FINANCIAL RESOURCES AND INVESTMENT FOR ADAPTATION, INCLUDING FOR TECHNOLOGY COOPERATION

III-A. INTRODUCTION

74. The adverse effects of climate change will be experienced in all countries across many groups and economic sectors. These effects are likely to add to the challenge of sustainable development, by increasing risks to human health, inundating low-lying areas, increasing the severity and frequency of extreme weather events, altering water supplies, changing crop yields and ecosystems, and in other ways. In particular, those impacts will affect (and, as the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) has shown, are already affecting) developing countries owing to their lesser adaptive capacity. As concluded by the 2007 report, the investment and financial flows needed for development in the midst of growing populations and a changing climate will be substantial. It is important to be aware of how adaptation to climate change will affect these needs.

75. At the thirteenth session of the COP, in Bali, Parties envisioned enhanced action on the provision of financial resources and investment to support action on, inter alia, adaptation as one important component of an effort to enable the full, effective, and sustained implementation of the Convention through long-term cooperative action now, up to, and beyond 2012. In particular, specific references to adaptation in paragraph 1 (e) of the Bali Action Plan are:

- (a) Positive incentives for developing country Parties for the enhanced implementation of adaptation action;
- (b) Innovative means of funding to assist developing country Parties that are particularly vulnerable to the adverse impacts of climate change in meeting the cost of adaptation;
- (c) Means to incentivize the implementation of adaptation actions on the basis of sustainable development policies;

- (d) Financial and technical support for capacity-building in the assessment of the costs of adaptation in developing countries, in particular the most vulnerable ones, to aid in determining their financial needs.

76. In terms of the adaptation actions to be financially supported, Parties in Bali decided to consider vulnerability and financial needs assessments, prioritization of actions, capacity-building and response strategies, integration of adaptation actions into sectoral and national planning, specific projects and programmes, risk management and disaster risk reduction strategies and economic diversification. Adaptation actions should take into account the urgent and immediate needs of developing countries, particularly the LDCs, small island developing States (SIDS) and African countries facing drought, desertification, and floods.⁵

77. During the workshops on “Investment and financial flows to address climate change” and “Advancing adaptation through finance and technology, including national adaptation programmes of action” at the second session of the AWG-LCA,⁶ many Parties noted that according to estimates, the financial resources required for adaptation are much greater than those currently available under the Convention and that additional funding is needed. To reduce the uncertainty in the estimates, many Parties pointed to the urgent need to develop economic valuation or assessment tools to enable the actual costs of adaptation to be determined. Such estimates will provide not only better information on the total costs of adaptation, but also information on adaptation needs by sector and on types and sizes of adaptation projects and programmes.

78. This chapter on enhanced financial resources and investment for adaptation seeks to address the components of the Bali Action Plan relevant to adaptation financing. The chapter is organized as follows: an update of estimated investment and financial flows needed for adaptation is provided in [CHAPTER III-B](#). The different financing needs for adaptation are characterized in [CHAPTER III-C](#). [CHAPTER III-D](#) discusses the importance of national policies in ensuring strategic planning, an enabling environment and the engagement of the private sector. An analysis of current and potential options, tools and mechanisms to mobilize new and additional financial resources is provided in [CHAPTER III-E](#) and [CHAPTER III-F](#) elaborates on delivery mechanisms for financial resources. The chapter concludes with a discussion of how to effectively provide the necessary financial flows. First however, the key findings of the 2007 report for adaptation are reviewed.

KEY FINDINGS ON INVESTMENT AND FINANCIAL FLOWS NEEDED FOR ADAPTATION IN 2030

79. The 2007 report called for substantive new and additional investment and financial flows for adaptation on the basis of an assessment of the likely amounts required in 2030. In particular, the report estimated the additional investment and financial flows for five sectors identified by the Working Group II contribution to the IPCC AR4: agriculture, forestry and fisheries; water supply; human health; coastal zones; and infrastructure.

80. While the report recognized the link between economic and population growth, human development and adaptation, the analysis focused on the additional need for adaptation over and above the investment and financial flows required to address needs related to expected economic and population growth. Estimated overall additional investment and financial flows needed for adaptation in 2030 amounted to several tens, and possibly hundreds, of billions of United States dollars, with a significant share needed in developing countries.

81. Although the estimated additional investment and financial flows needed for adaptation are significant, the value of the adverse impacts that those expenditures could avoid may be larger. While the report did not estimate the total value of adverse effects avoided by adaptation, or the ancillary development benefits beyond those of avoided damage, and thus could not determine whether the benefits of avoided damage do indeed exceed the cost of adaptation, it discussed three common findings of a number of studies that support this belief:

- (a) Damages increase with the magnitude of climate change. The more the climate changes, typically measured as the increase in global mean temperature, the greater the damage;
- (b) Investment needs for adaptation will almost certainly increase substantially in the latter decades of the twenty-first century. The increase will be even greater if no mitigation measures are implemented;
- (c) 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.

82. The report expected private sources of funding to cover a portion of the adaptation costs in sectors with privately owned physical assets such as agriculture, forestry and fisheries and infrastructure. This applies to developed countries in particular. Public resources will be needed to implement policies or regulations to encourage the investment of private resources, especially in developing countries. Public resources will also be needed to cover costs related to adapting to impacts of climate change on public infrastructure.

83. For all sectors, the report concluded that additional external public funding is likely to be needed, as the current level of support channelled explicitly for adaptation purposes appears to be significantly lower than the level of investment required. Additional funding will be needed in particular for sectors and countries that are already highly dependent on external support, such as the health sector in LDCs or coastal infrastructure in developing countries that are highly vulnerable to sea level rise. The report also suggested that national policies play an important role in ensuring that the use of financial resources, both public and private, is optimized and shifted towards more climate-resilient activities.

⁵ Decision 1/CP.13, paragraph 1 (c).

⁶ <http://unfccc.int/meetings/ad_hoc_working_groups/lca/items/4416.php>.

III-B. UPDATE OF ESTIMATED INVESTMENT AND FINANCIAL FLOWS NEEDED FOR ADAPTATION

84. The estimates of adaptation costs in the 2007 report were of the same order of magnitude as those developed by the World Bank (2006) and Oxfam International (Raworth, 2007). The World Bank estimated that adaptation will cost USD 10 – 40 billion in 2030, and Oxfam International estimated it will be more than USD 50 billion annually.

85. Since publication of the 2007 report, the 2007/2008 *Human Development Report* (HDR) of the United Nations Development Programme (UNDP) has projected that annual adaptation investment needs will be USD 86 billion by 2015, as shown in [TABLE III-6](#).

86. While earlier studies focused on estimating adaptation costs at a global level, distinguishing at the most between developed and developing countries, a number of studies are ongoing that are likely to develop more information on adaptation needs and costs at regional and even national levels.

87. For example, UNDP has initiated a USD 7 million programme to increase the capacity of up to 20 countries to develop policy options to address climate change.⁷ One key output of the project is an assessment of required investment and financial flows for adaptation and mitigation options identified for key sectors in each country. Adaptation sectors include agriculture, water resources, human health, forestry and tourism. UNDP has developed a draft user's guidebook to assess investment and financial flows to address climate change, which is being piloted in participating countries.

88. The World Bank, together with the Governments of the Netherlands and the United Kingdom of Great Britain and Northern Ireland, is undertaking a study on the economics of adaptation. The study seeks to assist decision makers in developing countries to better understand and assess the risks posed by climate change and to better cost, prioritize, and sequence adaptation strategies that are integrated into their development plans and budgets, in a context of high uncertainty, competing needs and potentially high future costs. Using six countries as cases, the study will first examine countries' vulnerability to impacts of climate change. It will then analyse adaptive capacity and the adaptation deficit (the degree to which each country is not well adapted to current climate). Next, adaptation costs will be estimated and extrapolated to estimate costs at the national level and for all developing countries.

89. The methods used in the Stern Review on the economics of climate change (Stern, 2007) are being applied to a number of regions and countries in a project called the Regional Economics of Climate Change Studies. These studies will estimate total costs (damages) of climate change as well as the costs of mitigation and adaptation. Examples include:

- (a) The United Nations Economic Commission for Latin America and the Caribbean is undertaking a project examining the economic impacts of climate change and exploring ways for Caribbean economies to adapt. The project seeks to determine the costs of adaptation through an assessment of the physical impacts of climate change on livelihoods, the environment and the economy using macroeconomic models;

Table III-6. Estimates of adaptation investment needs in 2015 from the 2007/2008 Human Development Report

Category	Costs in 2015 (USD billion)
Climate proofing development	44
Adapting poverty reduction to climate change	40
Strengthening disaster response	2
Total	86

Source: United Nations Development Programme. 2007. *Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World*. Available at: <<http://hdr.undp.org/en/reports/global/hdr2007-2008/>>. Chapter 4.

(b) The Asian Development Bank, as part of a regional review of the economics of climate change in South-East Asia, is evaluating the economic costs and benefits of unilateral and regional adaptation actions for six countries: Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam.

90. Developing a comprehensive and reliable estimate of total adaptation costs remains difficult, as the OECD concluded in a recent assessment (Agrawala and Fankhauser, 2008). The assessment noted that the literature on adaptation tends to focus on infrastructure projects, thus overlooking low-cost “soft” measures such as policies and regulations.

91. In addition, in most cases the estimates do not have a direct attribution to specific adaptation activities, nor are the benefits of adaptation investments articulated. There are also issues of double counting between sectors, and extrapolating costs to the global level from a very limited (and often very local) evidence base. Furthermore, many sectors and adaptations have not been included in the estimates. A further uncertainty arises

from the uncertainty surrounding future climate change impacts, particularly those that may cause large, and irreversible changes in the climate or biophysical systems. Further, many of these estimates do not address the question of systemic (multi-sectoral) risk. As a result it is difficult to say whether this implies that the estimates are too high or too low.

92. As of March 2009, national adaptation programmes of action (NAPAs), which provide project level information on adaptation costs, identified through bottom up assessment have been completed by 39 LDCs. In total, these countries have identified about 440 “urgent and immediate” adaptation projects, of which 392 have been costed.⁸ The total cost of these projects is over USD 800 million with an average project cost of approximately USD 2 million (excluding a single USD 700 million project). **TABLE III-7** illustrates the sectoral breakdown of NAPA projects.

⁷ As of March 2009, the following nineteen countries participate in the Capacity development for policy makers project: Algeria, Bangladesh, Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, Gambia, Honduras, Liberia, Namibia, Nicaragua, Niger, Nepal, Paraguay, Peru, St. Lucia, Togo and Turkmenistan.

⁸ A listing of NAPA projects and project profiles grouped by country and according to main sectors is available at: <http://unfccc.int/4583.php>.

Table III-7. Projects identified in national adaptation programmes of action, by sector

Sector	Number	Total cost (USD)
Agriculture/livestock/fisheries	104	269,692,234
Water resources	57	140,960,970
Forestry	33	53,494,730
Coastal zone/marine ecosystems	35	97,421,300
Health	31	40,043,000
Cross-sectoral	29	748,227,240
Terrestrial ecosystems/biodiversity	21	24,908,592
Early warning and forecasting	15	37,423,063
Energy	15	27,964,120
Fisheries	15	36,875,500
Infrastructure/settlements	15	16,381,631
Education	10	9,005,000
Disaster management	8	12,953,597
Tourism	3	1,750,000
Insurance	1	225,000
Total	392	1,517,100,977

93. The largest total requests are in the agriculture/livestock/fisheries, water resources and coastal zone/marine ecosystems sectors. Agriculture, water and coastal zones were also estimated in the 2007 report to be the three sectors that are particularly vulnerable and will require the most investment for adaptation. The largest sector by project cost is “Cross-sectoral”, but this includes a USD 700 million project (a multi-purpose, large-scale water development project in the Genale-Dawa Basin, proposed by Ethiopia to achieve food security).

94. It is difficult to compare the estimates of adaptation projects in NAPAs with the global estimates of adaptation costs such as those given in the 2007 report, for several reasons. First, the NAPAs are not intended to address medium to long-term adaptation, but to identify urgent and immediate adaptation needs. So far, fewer than 40 countries have completed NAPAs and it can be challenging to extrapolate these to the rest of the developing world. Second, the total investment needs per project may not represent annual investment needs but cumulative needs. And third, it can be difficult to determine the extent to which climate change is a factor or a justification for investments.

95. In conclusion, estimating the financial needs for adaptation and thus determining how many new and additional public- and private-sector resources need to be mobilized remains difficult. There is a need to improve the characterization of adaptation demand, not only in order to estimate the needs and resource requirements but also to enhance delivery of resources.

III-C. CHARACTERIZING FINANCING NEEDS: ADAPTATION, DEVELOPMENT AND TECHNOLOGY

96. Adaptation actions are intended to reduce vulnerability and enhance adaptive capacity to climate change risks. In the context of adaptation finance, the nature and scope of adaptation actions need to be carefully considered, as financing requirements and modes of financing depend on the purpose of the actions.

97. It has been argued that the most effective approach to reducing vulnerability and enhancing adaptive capacity is integration or mainstreaming; that is, reflecting or incorporating climate change concerns in the socio-economic decisions. Although integration is an effective approach for putting adaptation into practice, the financing of adaptation needs to reflect the fact that adaptation is responding to the additional burden posed by climate change; quite distinct from the aggregate flow of resources towards overall socio-economic development goals.

98. While the stage-wise approach⁹ to adaptation support under the Convention is well established, it may be helpful to develop a typology of adaptation actions, which could be further refined by sector. A better characterization of (1) the nature of the additional burden, (2) the nature of the adaptation action and (3) the context of the adaptation action (including the target sector) might facilitate the deployment and delivery of resources for adaptation. These three dimensions are described in PARAGRAPHS 99 – 123 below using NAPA projects as illustrative examples.

1. NATURE OF THE ADAPTATION ADDITIONALITY

99. Adaptation to climate change is typically considered additional to a certain development baseline. Considering the nature of this additionality offers a means for grouping adaptation actions into three broad categories:

- (a) Actions that climate-proof socio-economic activities by integrating future climate risk;
- (b) Actions that expand the adaptive capacity of socio-economic activities to deal with future and not only current climate risks;
- (c) Actions that are purely aimed at adapting to impacts of climate change and would not otherwise be initiated.

(A) CLIMATE-PROOFING SOCIO-ECONOMIC ACTIVITIES

100. There is a wide range of activities, such as activities in infrastructure (e.g. airports, sanitation and transport), public health or education, that primarily seek to achieve social and economic developmental goals. In many cases, climate change poses a risk to such activities, or may reduce the benefits. For example, sea level rise may threaten the longevity of a new bridge built in a coastal region. Climate-proofing such activities, that is, taking climate change risks into consideration in their planning, design and implementation, can be considered an adaptation action. While the activity itself (building the bridge) would fall into a development baseline, making the necessary changes to enhance the bridge’s resilience to climate change can be considered the adaptation additionality, which helps to secure or enhance the developmental benefit.

101. Activities in this category are usually the target of national resources, and in terms of multilateral sources, of ODA and lending from multilateral development banks (MDBs). NAPA project examples include typical developmental activities, such as coastal drinking water provision (Bangladesh), diversifying agriculture production (Cape Verde), indigenous forest regeneration (Zambia) and protection of fish diversity (Mauritania). Consideration of climate change resulted in associated changes to these projects. To the extent that developmental goals include environmental objectives such as biodiversity or sustainable land management, some of the projects supported under the GEF Strategic Priority on Adaptation (SPA) also fall in this category, for example adaptation using agro-biodiversity resources (Yemen) or adaptation in mountain forest ecosystems (Armenia).

(B) EXPANDING ADAPTIVE CAPACITY TO DEAL WITH FUTURE AND NOT ONLY CURRENT RISKS

102. Many socio-economic activities are undertaken in climate-sensitive sectors where they generate dual benefits – development and either reduced vulnerability or increased adaptive capacity to climate change. For example, developing and implementing a crop insurance scheme not only achieves developmental objectives (livelihood security), but also helps in addressing current climate risks. Therefore, if socio-economic activities in climate-sensitive sectors are further modified, strengthened or expanded they could also build the necessary capacity to deal with risks from future climate change.

103. The majority of the projects assessed in NAPAs fall in this category. Examples may be found in most of the socio-economic sectors that are climate-sensitive or directly climate-linked. In the water resource management area, projects identified include the management of flash floods (Bangladesh), stabilization of river dynamics (Burundi), river rehabilitation (Cambodia) and irrigation conservation (Mauritania). Other examples include strengthening of early warning (Zambia), coastal management (Cape Verde), cultivation of drought areas (Mauritania), promoting household integrated farming (Cambodia), addressing crop salinization (Bangladesh) and improved seasonal weather and climate forecasting (Bhutan and Burundi).

(C) DIRECTLY ADDRESSING OBSERVED IMPACTS FROM CLIMATE CHANGE

104. Other activities have the primary objective of addressing distinct risks posed by climate change. In many cases, these are adaptations to observed impacts such as glacier lake outburst floods, sea level rise, and the incursion and excursion of species. While the attribution of local impacts to global climate change is challenging, scientific knowledge regarding observed changes in sectors and systems and their linkage to climate change is improving. Indeed, this was one of the important contributions of the IPCC AR4 Working Group II.

105. One NAPA project under implementation in Bhutan involves lowering water levels in the Thorthormi Lake. Meltwater from glaciers (which are presumed to be melting because of rising air temperatures) is rapidly enlarging the lake and threatens to create a glacier lake outburst flood of 53 million m³. Bhutan seeks to spend USD 3.2 million to build a channel to divert water and to stabilize channel side slopes. Another example is a project proposed by Bangladesh that would develop salt-tolerant fisheries to adapt to increased salinization of coastal areas.

2. TYPE OF ACTION

106. The second dimension along which adaptation may be classified is regarding the type of action. Several kinds of action may be identified with technology as a cross-cutting issue:

- (a) Capacity-building;
- (b) Research and assessments;
- (c) Disaster risk reduction and risk management;
- (d) Specific interventions (e.g. infrastructure or economic diversification).

107. *Capacity-building.* Developing countries need to enhance their capacity to assess their vulnerabilities to climate change (including the current climate) and to act to reduce those vulnerabilities, including understanding climate and climate change risks. Enhancing capacity to understand risks includes building effective monitoring systems to identify long-term trends in climate and to identify immediate problems such as onset of drought. Capacity is also needed to carry out vulnerability and adaptation assessments at national, regional and local scales.

⁹ At its first session in 1995 the COP agreed that the provision of financial support for adaptation in developing countries should follow a three-stage approach. Stage I and II encompass planning, developing policy options and capacity building for adaptation, while Stage III envisions actual measures to facilitate adequate adaptation (decision 11/CP.1).

108. The second area where capacity-building is required is in reducing risks from climate change or in otherwise adapting. This may require institutions to support the adaptation process. Government and civil society must have systems and know-how to incorporate climate change risks into the planning and management of climate-sensitive resources. Capabilities for disseminating information are critical, as is the capacity to empower stakeholders to act on information about climate change risks.

109. *Research and assessments.* A key component of being able to address adaptation is research and assessment. Research is needed to understand vulnerabilities to climate change and how adaptation can reduce these risks. Assessment may involve so-called top-down analyses, which typically use outputs of climate models (such as General Circulation Models or downscaled applications). The climate model output is combined with models of biophysical impacts such as coastal inundation, crop yields or water run-off. The modelling can also assess implications for society through, for example, application of models of agriculture markets or water management. Another approach to research and assessment involves what are often referred to as bottom-up analyses. These approaches tend to be made at the community level or on a similarly small geographical scale. They often involve close interaction with stakeholders and can focus on such topics as implications of climate change for livelihoods. Bottom-up assessments can also address particular outcomes such as floods or crop failures and may involve analysis of climate variability and extreme events, as well as climate change.

110. *Disaster risk reduction and risk management.* The management and reduction of climate-related risks and impacts includes a variety of activities, including structural and non-structural measures to avoid (prevention) or limit (reduction and preparedness) adverse effects of climate-related hazards. Risk management measures can include early warning systems, which are essential for minimizing adverse impacts. Risks can also be managed through risk-sharing instruments and mechanisms such as insurance.¹⁰ In addition to accelerating economic and social recovery following a disaster, insurance, if properly designed, can provide incentives to countries to adopt adaptation measures.

111. *Specific interventions.* Specific interventions directly address an observed or projected impact. For example, infrastructure may need to be redesigned to withstand an intensification of monsoon rainfall. A coastal development project, for example, should account for future sea level rise and a change in intensity of coastal storms.

112. **TABLE III-8** gives a cross-tabulation of the two dimensions for categorizing adaptation actions discussed in **SUBCHAPTERS III-B.1** and **III-B.2** above – that is, the nature of the adaptation additionality and the type of adaptation action. Although the categories are not mutually exclusive, cross-tabulating them offers a useful way of identifying patterns among the large number of adaptation actions. Categorization is also useful as a means to identify relevant stakeholders and define intervention boundaries. The examples presented in **TABLE III-8** are taken from NAPAs from several countries.

113. *Adaptation technologies as a cross-cutting issue.* Technology plays an important role in reducing vulnerability to climate change and enabling adaptation and features in many types of adaptation action. Technologies can be distinguished between hard technologies, such as drought-resistant crop varieties, seawalls and irrigation technologies, and soft technologies, such as crop rotation patterns. Many technologies have both hard and soft characteristics, and successful adaptation action would typically combine both.

114. Within these two broad categories (hard and soft), technologies have been further classified as traditional, modern, high technology or future technology. Traditional (indigenous) technologies that have been applied to adapt to weather hazards include technologies to build floating vegetable gardens, traditional housing designs and dykes. Examples of modern technologies include improved designs (e.g. of sanitation systems, housing and commercial buildings), technologies to produce new varieties of crop (e.g. hybrid corn) and new water-use technologies (e.g. drip irrigation).

115. High technology includes some of the more recently developed technologies resulting from scientific advances in recent decades, including in information and communications technology, earth observation systems and geographic information systems (GIS), and genetic modification. Future technologies are those that have yet to be invented or developed; examples include a malaria vaccine, various forms of geo-engineering to reduce climate impacts, and crops that need little or no water.

116. Many technologies for adaptation may be already readily available in developing countries, and the most-needed technologies in some cases may not be very capital-intensive.

117. While technological adaptation measures are important in reducing vulnerability to climate change, they do have their limitations. Three issues need to be considered here (Klein *et al.*, 2007):

(a) Technological adaptation measures may be only partially effective if they do not address non-climate factors that contribute to vulnerability to climate change. For example, the technological improvement of a water supply system to ensure the availability of water during dry spells will be of limited benefit to people who do not have access to this water. The inequitable distribution of water rights or the price of the water may be more important causes of vulnerability to drought than deficient water supply technology;

(b) Technological adaptation measures may be ineffective if they are not suited to local conditions. For example, new drought-resistant crop varieties may indeed be very resistant to drought, but their acceptance in a community also depends on their costs and availability, ease of preparation and flavour, as well as local storage constraints and the community's access to fertilizer and other inputs;

(c) Technological adaptation measures may turn out to be maladaptive if they are implemented without recognition of relevant social and environmental processes. For example, new coastal infrastructure could disturb the offshore sediment balance, resulting in erosion in adjacent coastal areas.

¹⁰ For more information on mechanisms to manage financial risks from direct impacts of climate change in developing countries see FCCC/TP/2008/9.

Table III-8. Examples of adaptation actions according to type and nature of additionality

Additionality	Type			
	Capacity-building	Research and assessments	DRR and risk management	Specific interventions
Climate-proofing socio-economic activities	Develop and apply guidelines to climate-proof development (Uganda)	Research on micro hydropower production (Burundi)	Raise flood shelters to adapt to sea level rise (Bangladesh)	Increase water supplies to combat increasing drought (Comoros)
Expanding adaptive capacity to deal with future and not only current risks	Increase awareness of malaria prevention and treatment (Cambodia)	Research on drought-, flood- and saline-tolerant crop varieties (Bangladesh)	Strengthen early warning systems (Zambia)	Plant vegetation to reduce risks from storms (Cambodia)
Directly addressing observed impacts from climate change	Increase awareness of decision makers and communities about climate change impacts (Burundi)	Improve understanding of groundwater resources in the light of persistent drought (Mauritania)	Zoning for increased hazards from GLOFs (Bhutan)	Lowering of water levels in the Thorthormi Lake to reduce risk of a future GLOF (Bhutan)

Abbreviations: DRR = disaster risk reduction, GLOF = glacier lake outburst flood.
Note: Examples taken from national adaptation programmes of action.

3. CONTEXT OF ADAPTATION ACTION

118. In order to examine the integration of adaptation into wider socio-economic activities, it is important to look at the actual decision-making contexts in which adaptation is being undertaken. Three different kinds of decision-making context are typically observed: at the project level; at a sectoral or programmatic level; and at a policy or planning level. These contexts often (but not always) coincide with the level of decision-making, for example, policies or plans are made at the national level and decision-making on specific projects may occur at the local level.

(A) PROJECT-LEVEL INTEGRATION

119. When integrating adaptation into a particular development project, there are two main considerations: the extent to which expected benefits of the project may be at risk from climate change, and the extent to which the project could assist in climate change adaptation by enhancing adaptive capacity or by reducing vulnerability. Mainstreaming adaptation at the project level can be achieved with standard tools and methodologies, including risk and vulnerability assessment and detailed, accurate climate change projections at the appropriate scale.

(B) SECTORAL OR PROGRAMMATIC INTEGRATION

120. At the sectoral or programmatic level, the objective is to institutionalize the climate change response as part of the standard practice for the sector or programme. This includes operational issues such as water resource management or forest management, as well as

programmes such as health or disease surveillance. Given the links between related sectors (e.g. the water sector and agriculture), another essential level of integration is cross-sectoral. Addressing adaptation sector by sector can result in inconsistent, even contradictory programmes. For example, programmes designed to increase the use of irrigation in Ethiopia resulted in a health risk because the additional standing water became a breeding ground for disease-carrying insects.¹¹

(C) POLICY OR PLANNING INTEGRATION

121. Integration in the policy or planning context usually takes place at the national level. It includes interventions aimed at creating an enabling environment for adaptation actions across different sectors, the provision of information and the creation of appropriate legal or regulatory structures that promote adaptation. In addition, some forms of adaptation are best integrated into regional policies and plans, for example managing the complex climate-related risks that threaten integrated geographical systems such as watersheds or coastal zones.

122. TABLE III-9 provides some examples for each of the three contexts in which integration of adaptation may be undertaken.

123. Given the close links between adaptation and development and the various contexts for integration of adaptation, it becomes apparent that action at the national level is paramount for providing incentives to the public and private sectors to mobilize, optimize and shift financial resources towards activities aimed at reducing vulnerability and enhancing adaptive capacity.

Table III-9. Examples of adaptation actions according to context

Context	Adaptation action	Examples
Project level	Retrofitting and renewals	Retrofitting or climate-proofing the existing infrastructure such as roads and highways, houses, public buildings and communication systems
Sector level	Resource management	Managing resources such as water or forests to enhance adaptation, reduce damage from climate change and also facilitate efficient use of resources
Policy level	Land-use planning, resource pricing	Defining and revising coastal zones regulation; water pricing approaches

III-D. NATIONAL POLICIES

124. National policies provide an overarching strategic framework for adaptation and an enabling environment in which society, the public and the private sector are provided with incentives and regulation to engage in adaptation actions.

1. STRATEGIC PLANNING FOR ADAPTATION

125. Impacts of climate change are already being observed, and scenarios and projections suggest a significantly faster emergence of further impacts than was initially expected. In this light, the need arises to take adaptation more seriously and to approach it in a more long-term and strategic way. The Bali Action Plan recognized the need to consider the integration of adaptation actions to climate change into national and sectoral development planning.¹²

126. Developing countries are already integrating adaptation into their national and sectoral plans, driven in the most part by the objective of securing sustainable livelihoods and alleviating poverty (these adaptation actions would fall into additionality CATEGORIES (A) and (B) mentioned in PARAGRAPH 99. For example, India, primarily driven by the objective of sustainable development and poverty alleviation, has taken many policy decisions that reduce risk and enhance adaptive capacity in key climate-sensitive sectors, namely agriculture, water resources, health and sanitation, coastal zones, forests and disaster risk reduction, with an estimated budget of USD 14 billion for 2006 – 2007, which constituted 11 per cent of the overall government expenditure.¹³

127. Institutional arrangements and organization are key to successful strategic planning for adaptation. A commitment to addressing adaptation is needed from the highest levels. In Mexico for example, adaptation is carried out by the Ministry of Public Finance and Credit under the direction of the Office of the President.¹⁴

128. The NAPA process has given rise to institutional strengthening at the national level and strengthened the ability of LDCs to respond to adaptation concerns in general. In some cases a steering committee or a technical subcommittee of the national climate change committee has been established to manage the NAPA process (LEG, 2007).

129. Following the identification of urgent and immediate needs, some LDCs are now addressing medium- and long-term adaptation needs through strategic planning. For example, Bangladesh has recently been formulating its next steps beyond the preparation of the NAPA. Its National Adaptation Strategy and Action Plan (NASAP)¹⁵ proposes taking climate risks into consideration in development activities and suggests how this might be managed from an administrative and technical perspective. Likewise, Parties have been calling for the institution of national adaptation plans, which would be geared towards the preparation, implementation and evaluation of medium- and long-term adaptation strategies. Such plans seek to enable countries to access, enhance the effectiveness of, and prioritise the use of, resources for adaptation. Implementation of strategic plans such as these requires an enabling environment to be created.

2. ENABLING ENVIRONMENT

130. National policy frameworks play a crucial role in enabling adaptation interventions and attracting financial flows and investments. Thus, national policies (including sectoral, cross-sectoral and subnational policies) will be instrumental in mobilizing financial resources and directing them into priority adaptation measures.

131. An enabling environment could be seen as a combination of policy measures, legislative initiatives and institutional arrangements that create incentives and conditions for adaptation measures. In more concrete terms, an enabling environment encompasses laws, institutions, policies, management tools, technical infrastructure, and information that together create conditions conducive to effective adaptation action. Therefore, sectoral policies and national development plans are instrumental in creating such an enabling environment for adaptation to climate change.

¹¹ FCCC/SBSTA/2007/7.

¹² Decision 1/CP.13, paragraph 1(c) (i).

¹³ <http://unfccc.int/files/meetings/dialogue/application/pdf/india_-_adaptation.pdf>.

¹⁴ FCCC/SBSTA/2007/15, paragraph 47.

¹⁵ Available at: <<http://www.sdnbd.org/moef.pdf>>.

132. Effective and sustainable national and sectoral policy development requires a multi-stakeholder process of reviewing and adjusting complex components of policy frameworks, including:

- (a) Legal frameworks – the system of laws, regulations, enforcement and compliance tools – such as building codes;
- (b) Institutional arrangements (including assigning clear responsibilities and inter-agency ties);
- (c) Sectoral management – a set of policies that guide the implementation of national and subnational laws, as well as management plans to implement such policies – such as integrated coastal zones management;
- (d) Information tools – identifying information needs, creating systems to generate this information and mechanisms to disseminate and use it in decision-making – such as hazard maps.

133. Existing laws can allow for or encourage adaptation to changing climate conditions, or they may prohibit or discourage it. Thus, examining legal frameworks and the incentives or impediments they create for adaptation is an important step in strategic adaptation to climate change. For example, national governments could incorporate climate change and adaptation requirements into existing environmental impact assessments. New provisions for the impact assessments could be established that would require assessment of the vulnerability of activities or investments to climate change impacts as well as the effects of these activities or investments on the country's vulnerability to climate change.

134. Sectoral analysis performed to date points to several examples of public policies that create enabling conditions for adaptation. For example, in the water sector, a fair and flexible system of water abstraction permits facilitates adaptation; market mechanisms for water sharing (e.g. trading of water abstraction rights or water contracts) provide flexibility and opportunity in water access and facilitate adaptation to increasing scarcity of water resources. Wetland management, flood plains regulations and zoning can reduce vulnerability to floods.

135. There are many examples of policies that affect adaptation in coastal zones. Policies that allow or even encourage building in hazardous coastal areas clearly impede adaptation. Thus, governments wishing to enable adaptation in these areas need to review legal provisions pertaining to land-use management and building codes.

136. Land-use management provisions may provide the foundation for policy approaches that regulate the location and pattern of various forms of construction and development, and facilitate disaster prevention and response. The primary task of land-use management in the context of risk reduction and adaptation is to guide critical development away from hazardous areas. Several current practices, among them territorial zoning and development restrictions, contribute to this effort. Structural adaptation of coastal areas, which involves the construction of seawalls, jetties, groins, levees and other structures designed to hold back the sea, is no longer considered to be the preferred option, except for cases when important cities and strategic areas need to be protected. Non-structural measures, which mostly involve land-use planning, construction standards and insurance, are the preferred alternative of many hazard management specialists. Institutions to enable such approaches and land-use planning in general would need to be created or strengthened in many countries.

137. Building codes provide standards for construction, and address safety issues and quality requirements for various types of construction. It is already expected that new homes in coastal areas will need to be designed and built to withstand higher loads and more extreme conditions, requiring greater maintenance and upkeep. Strict building codes and their enforcement has been identified as one of the features of a resilient community. Presently, poor state and local regulation of building codes is limiting successful risk management and adaptation to climate change (Levina *et al.*, 2007).

138. Policy indicators are one possible way of ensuring that adaptation issues are consistently being considered in public policy and investment decisions. Indicators could be designed to reflect interactions between a sector and climate change impacts. This includes positive and negative impacts of sectoral activity on the climate vulnerability and, conversely, the impacts of climate change on the sectoral activity. The indicators could also be designed to reflect economic links between the sector and climate change impacts, including cost and benefits of adaptation measures to the sector and the economy at large.

3. PRIVATE SECTOR

139. So far, the involvement of the private sector in adaptation has been smaller than its involvement in mitigation. It is assumed that, eventually, the private sector will implement adaptation to preserve its assets, as climate change impacts will result in increasing costs and reduced income. For example, in their July 2008 *CEO Climate Policy Recommendations to G8 Leaders*, the World Business Council for Sustainable Development and the World Economic Forum recognized that “adaptation to climate change is a critical challenge for all countries, particularly for poor countries that will be hit hardest and earliest, and for all business sectors....The international business community is starting to develop products and services that can help with adaptation....In partnership with governments, international business can do much more in this space, particularly if the economic case for adaptation activities or markets for adaptation products is further developed” (2008, p.15).

140. At this early stage of involvement, it could be helpful to develop guidelines for businesses on how to integrate climate change concerns into their routine risk assessment and strategic decision-making. In many cases, rules and regulations, for example requiring vulnerability and adaptation assessments as part of an environmental impact assessment, will be needed to require or encourage adaptation by the private sector.

141. The private sector can provide financial resources for adaptation through investments, financial risk management, the commercial provision of capital and the philanthropic provision of resources through private foundations.

142. Private investments may play an important role in adaptation to climate change. All privately owned assets (e.g. buildings and agriculture land) and business practices (e.g. insurance, water management and agriculture practices) that are sensitive to climate change will have to be adapted to climate change. In terms of scale, the gross fixed capital formation¹⁶ of these investments in 2007 was USD 12.25 trillion. Even though many investments in climate-sensitive sectors come from private sources, it is unlikely that adaptation to climate change is a significant consideration.

143. In a recent study, Deutsche Bank identified future investment opportunities in adaptation in water resources, agriculture and environmental services. In agriculture, investment may be needed for developing irrigation equipment and technologies as well as fertilizers.

Provision of clean water is another opportunity, requiring investment in water purification and treatment technologies such as desalination, and wastewater treatment technologies. Environmental services such as weather derivatives are also a possible area for investment (DB Advisors, 2008).

144. Besides potential climate change impacts, baseline changes in the water and agriculture sectors will be very important for investors, as global water production is projected to increase by about 15 per cent over the next 20 years and cereal food production is projected to increase by about 25 per cent in the same period (DB Advisors, 2008). Other sectors such as human health are also likely to present investment opportunities (and risks) from climate change.

145. However, the private sector will only provide investments for a specific rate of economic return. Below that rate, public investments remain essential. Furthermore, many of the investment opportunities are likely to occur in developed countries – in developing countries the public sector will remain paramount.

146. Financial risk management tools such as insurance schemes could provide an incentive for initiatives to reduce vulnerability before an event occurs, as well as provide economic relief after an event occurs. Any such insurance mechanism would need to reflect actual risks associated with specific locations and activities. It is possible to think of various types of insurance that could address climate change risks: insurance for investments (where the insured clients would be the private sector or governmental enterprises); insurance for property (clients: private or state property owners); and insurance for large-scale catastrophes (clients: national governments, private citizens or business owners). The size of the premiums will inform insurance consumers of the relative risk. Changes in premiums to reflect different as well as changing risks will provide incentives to the insured to reduce their risks.

147. The suite of financial risk management tools includes: commodity price hedging; economic shock funds; commodity price insurance; alternative risk transfer; hedge funds; alternative risk financing; structured risk financing mechanisms; effective use of developed captive insurance; credit and political risk coverage; hybrid insurance products; and catastrophe bonds.

¹⁶ <<http://unstats.un.org>>.

148. However, fewer than 5 per cent of households and businesses in developing countries have insurance coverage for catastrophe risks.¹⁷ Instead, such risks are dealt with by a mix of social networks and informal post-event credit. The absence of insurance stunts development because smallholders cannot risk investing in fixed capital or concentrating on profitable activities and crops for fear of losing them, and falling into debt. Thus, a critical task for the public sector will be to support the private sector in creating financial risk sharing and management approaches and mechanisms that can be accessed by people in developing countries, especially LDCs, SIDS and countries in Africa, and help to reduce their vulnerability to the impacts of climate change.

149. Regarding the provision of capital for adaptation actions, market finance (including venture capital, commercial loans and revolving credits) could become a viable option in the future. In many instances, adaptation actions are already being undertaken by private actors, whether individuals or firms. However, at this point, in contrast with financing for mitigation, the public sector is expected to be the main source of funding for adaptation. Public funds for adaptation are important, because the benefits generated by adaptation actions often have the characteristics of public goods. For example, the benefits of coastal protection will typically be enjoyed by all the residents of the community at risk. Similarly, improved climate change projections and vulnerability assessments take the form of knowledge products, which are well recognized as public goods.

150. To address an insufficiency of funds for developing and maintaining infrastructure, many governments are trying to involve private entities in sectoral management. Public-private partnerships may bring in financial resources as well as management practices that improve efficiency.

151. The creation of microfinancing structures, as has happened in some developing countries, could also be developed through public-private partnerships. Microfinancing structures in developing countries would allow local communities, civil society groups and municipalities to implement adaptation actions themselves, by providing them with access to small-scale grants and loans (lack of access to financing being the largest obstacle to development and innovation). ODA funding could be used to assist the private sector in setting up such microfinancing services (Levina, 2007).

152. While developing countries are undertaking activities to create the right enabling environments and mobilize resources from their domestic budgets and through public-private partnership to enhance action to respond to the adverse effects of climate change, the Convention and the Bali Action Plan foresee developed countries assisting developing countries in meeting costs of adaptation by mobilizing financial resources. This is discussed in the [NEXT CHAPTER](#).

III-E. OPTIONS, TOOLS AND MECHANISMS FOR MOBILIZING FINANCIAL RESOURCES FOR ADAPTATION

153. Several options, tools and mechanisms exist to mobilize the necessary financial resources; some are already in use while others have been proposed by Parties and observer organizations, including under the AWG-LCA process (see [TABLE III-10](#)). Their details are discussed below.

1. CURRENT FUNDING FOR ADAPTATION

154. Historically, most of the funding for climate change adaptation has been provided through GEF operated funds. However, the funding provided through adaptation related bilateral and multilateral initiatives are expected to surpass the resource levels provided under the Convention. For an overview of the levels and sources of existing resources for adaptation (including pledged contributions), see [TABLE III-11](#).

(A) FINANCING UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

155. According to Article 4, paragraph 3, of the Convention, developed country Parties shall provide new and additional financial resources to assist developing country Parties in implementing the Convention, including their obligations towards adaptation. Article 4, paragraph 8, specifically, calls on Parties to give full consideration to what actions are necessary under the Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change. Financial assistance under the Convention is provided through its financial mechanism, for which GEF is an operating entity, and the Adaptation Fund.

¹⁷ FCCC/TP/2008/9, paragraph 8.

Table III-10. Options, tools and mechanisms for mobilizing financial resources from public funding for adaptation

Public funding source	Voluntary contributions		Contributions through levies on market instruments or commodities		
	Multilateral	Bilateral	Defined contributions	International	National
Current	Convention funds operated by the Global Environment Facility (GEF Trust Fund, SCCF and LDCF) PPCR GFDRR	Official development assistance, including: – Cool Earth Partnership – GCCA – GICI – UNDP-Spain MDG Achievement Fund		Adaptation Fund through CDM levy	European Union emissions trading scheme
Proposed			Fixed percentage of GNP or based on criteria such as GDP, greenhouse gas emissions and population	Expansion of CDM levy to 3 – 5 per cent Share of proceeds from JI and emissions trading Levy on auctioning AAUs Levies on international air travel and bunker fuels	Share from global carbon tax

Abbreviations: AAU = assigned amount unit, CDM = clean development mechanism, GCCA = Global Climate Change Alliance, GDP = gross domestic product, GICI = German International Climate Initiative, GFDRR = Global Facility for Disaster Reduction and Recovery, GNP = gross national product, JI = joint implementation, LDCF = Least Developed Countries Fund, MDG = Millennium Development Goal, PPCR = Pilot Programme for Climate Resilience, SCCF = Special Climate Change Fund.

Table III-11. Overview of current and pledged financial resources for adaptation (millions of United States dollars)

	Estimated level of funding	Period	Nominal annual level of funding
Funding under the Convention			
SPA	50	GEF 3 – GEF 4	
LDCF	172	As of 21 October 2008	NA
SCCF	91	As of 21 October 2008	NA
Adaptation Fund	400 – 1,500	2008 – 2012	80 – 300
	91	As of 31 October 2008	
Multilateral initiatives			
PPCR	240	2009 – 2012	60
GFDRR	11	2007 – 2008	5.5
Bilateral initiatives			
Cool Earth Partnership (Japan) ^a	1,000	2008 – 2012	200
International Climate Initiative (Germany) ^b	200	2008 – 2012	40
GCCA (European Commission) ^c	84	2008 – 2010	28
UNDP-Spain MDG Achievement Fund	22	2008 – 2011	5.5

Source: Porter G, Bird N, Kaur N and Peskett L, 2008. *New Finance for Climate Change and the Environment*. The Heinrich Boll Foundation and WWF, World Bank, 2008. *Trustee Report Financial Status of the CIF*. CTF/TFC.1/Inf.2.

Abbreviations: GCCA = Global Climate Change Alliance, GEF = Global Environment Facility, GFDRR = Global Facility for Disaster Reduction and Recovery, LDCF = Least Developed Countries Fund, MDG = Millennium Development Goal, PPCR = Pilot Programme for Climate Resilience, SCCF = Special Climate Change Fund, SPA = Strategic Priority on Adaptation.

^a Of the overall USD 10 billion under the Cool Earth Partnership, Japan is earmarking up to USD 2 billion for adaptation to climate change and improved access to clean energy.

^b It is assumed that the distribution among adaptation and clean energy is equal.

^c <<http://www.oecd.org/dataoecd/38/61/40633487.pdf>>.

^c <http://ec.europa.eu/development/policies/9interventionareas/environment/climate/climate_en.cfm>.

156. While most of the resources under the climate change focal area of the GEF Trust Fund are allocated to mitigation (see CHAPTER IV below), USD 50 million was allocated in 2003 to a SPA (*Strategic Priority on Adaptation*) to pilot adaptation actions in developing countries. As at 9 October 2008, the full amount had been allocated to 22 projects (GEF, 2008a). At its 2008 November meeting, the GEF Council requested the Office of Evaluation to conduct an independent evaluation of the SPA and agreed to consider future activities, if any, on adaptation under the GEF Trust Fund based on the recommendations of the independent evaluation of the SPA and the evolving guidance to the GEF from the Convention (Chairs of the GEF Council, 2008).

157. In addition, the Parties established two special funds under the Convention to provide support to adaptation: the SCCF and the LDCF, which are operated by the GEF. Parts of the SCCF finance adaptation activities related to climate change that are complementary to those funded by the GEF Trust Fund. As at 21 October 2008, 15 projects had been approved to receive funding from the SCCF, totalling USD 67.52 million (GEF, 2008b).

158. The LDCF was established to support the LDC work programme created under decision 5/CP.7, including the preparation and implementation of NAPAs, which addresses the urgent and immediate adaptation needs of LDC Parties. As at 21 October 2008, 38 LDCs had completed their NAPAs and 24 had officially submitted NAPA implementation projects to the GEF through project identification forms (PIFs) for approval (GEF, 2008b). Among those PIFs, 19¹⁸ have been approved as being consistent with the LDCF eligibility criteria (GEF, 2008b).

159. The *Adaptation Fund* under the Kyoto Protocol was established to finance adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol, primarily from the proceeds of the two per cent levy on transactions under the CDM although it may also be complemented with other sources of funding. Assuming annual sales of 300 – 450 million certified emission reductions (CERs) and a market price of EUR 17.5 per CER (range of EUR 10 – 25), the Adaptation Fund would receive USD 80 – 300 million per year in 2008 – 2012. As at 31 October 2008, 4,085,352 CERs had been issued in the Adaptation Fund account from the CDM registry. Assuming a market price of EUR 17.5 for a CER, that would currently equal USD 91.3 million available for the Adaptation Fund.

(B) FINANCING THROUGH OTHER MULTILATERAL AND BILATERAL SOURCES

160. According to Article 11, paragraph 5, of the Convention, developed country Parties may also provide, and developing country Parties avail themselves of, financial resources related to the implementation of the Convention through bilateral, regional and other multilateral channels.

161. In 2007, ODA for all purposes totalled USD 103.7 billion.¹⁹ A rough analysis by the OECD of the categories of ODA-funded activities suggested that more than 60 per cent of overall ODA could be relevant to adaptive capacity and adaptation (Levina, 2007).

162. The Declaration on Integrating Climate Change Adaptation into Development Cooperation²⁰ of OECD and further work has provided guidance for the development agencies on how to consider climate change in their operations and thus facilitate mainstreaming.

163. Specific support for adaptation is provided by bilateral donors and MDBs. Among these, the World Bank has the largest resources, providing loans and grants of almost the same amount as those provided by the Asian Development Bank, by the African Development Bank, and by the European Bank for Reconstruction and Development and the Inter-American Development Bank combined.²¹ The greater part of MDB lending is for infrastructure projects that are likely to be adversely affected by climate change. Only a small portion of lending relevant to adaptation is used directly by adaptation projects, most of which have so far focused on analytical work, capacity-building and impact assessments.²²

164. The most significant MDB effort in adaptation is the World Bank's *Pilot Programme for Climate Resilience* (PPCR) as part of its Climate Investment Funds (CIFs), which are being set up jointly with the regional development banks. The PPCR seeks to mobilize new and additional financing for activities and investments that demonstrate how financial and other incentives can be scaled up to support adaptation. It also aims at complementing other multilateral financial entities, such as the GEF and the Adaptation Fund, and bilateral sources of financing (World Bank, 2008a). Of the pledged USD 6.34 billion, USD 240 million have so far been allocated to the PPCR (World Bank, 2008b). All funds and programmes under the CIFs have a sunset clause, that is, they have a limited duration, in order not to prejudice deliberations under the Convention regarding the future of the climate change regime.

165. Given the commonalities between adaptation and disaster risk reduction, the *Global Facility for Disaster Reduction and Recovery* (GFDRR), which is managed by the World Bank, can be considered another avenue for financial resources. The GFDRR provides technical and financial assistance to high-risk, low- and middle-income countries in mainstreaming disaster reduction in national development strategies and plans to achieve the Millennium Development Goals. Between 2007 and 2008, USD 11.1 million was provided for 20 adaptation projects, including a drought adaptation plan for Morocco and analyses of future climate change risks and adaptation measures in Bangladesh, East Africa and the Caribbean.²³

166. In addition, new bilateral initiatives with a strong focus on adaptation have been established. The *Cool Earth Partnership* launched by Japan is intended to provide up to USD 2 billion, out of a total of USD 10 billion, in assistance for adaptation to climate change and improved access to clean energy. The UNDP-Spain Millennium Development Goals Achievement Fund, with an estimated level of funding of USD 143 million, includes funding for environment and climate change, of which an estimated USD 22 million has been allocated to adaptation. This funding will support interventions that improve environmental management and service delivery at the local and national levels; activities that will increase access to new financing mechanisms; and efforts to enhance adaptive capacity.

167. As part of the *German International Climate Initiative*, Germany will provide up to USD 40 million annually to support adaptation. These resources are generated through auctioning nearly 10 per cent of Germany's allowances from the European Union emissions trading scheme (EU ETS) for the period 2008 – 2012. The European Commission's *Global Climate Change Alliance* (GCCA) also draws on proceeds from the EU ETS. It is expected to provide USD 84 million from 2008 to 2010. The overall objective of the GCCA is to help the developing countries that are most vulnerable to climate change, in particular LDCs and SIDS, to increase their capabilities to cope with the effects of climate change. The United Kingdom is providing USD 110 million in support of Bangladesh's climate change strategy, referred to in [PARAGRAPH 129](#) above.

2. PROPOSED FINANCING FOR ADAPTATION

168. In their views and submissions on the Bali Action Plan,²⁴ Parties and observer organizations have made a number of observations and proposals regarding the generation of resources for adaptation. Proposals cover all possible sources: voluntary contributions, mandatory contributions and levies on market instruments or commodities. [TABLE III-12](#) below presents an overview of the potential resources for adaptation that could be raised from the mechanisms proposed.

169. Many of the Parties and organizations share the following observations on adaptation financing:

- (a) The need for scaled-up resources for adaptation has been widely acknowledged. The IPCC AR4 has highlighted the need for more urgent action on adaptation;
- (b) It is important to achieve this in a manner consistent with the Convention and its underlying principles;
- (c) Pure market mechanisms may have limitations in the context of adaptation, and innovative approaches will be needed, including leveraging market mechanisms;
- (d) There are close links between adaptation and sustainable development strategies. Adaptation actions and assistance for adaptation can therefore be funded through a range of mechanisms and options, going beyond the Convention to national, bilateral and multilateral routes, involving the public and private sectors.

¹⁸ Bangladesh, Benin, Bhutan, Burkina Faso, Cambodia, Cape Verde, Democratic Republic of the Congo, Djibouti, Eritrea, Gambia, Haiti, Malawi, Mauritania, Niger, Samoa, Sierra Leone, Sudan, Tuvalu and Zambia.

¹⁹ <http://www.oecd.org/topic/0,3373,en_2649_34447_1_1_1_1_37413,00.html>.

²⁰ <<http://www.oecd.org/dataoecd/44/29/36426943.pdf>>.

²¹ FCCC/SBI/2008/INF.4, paragraph 19.

²² FCCC/SBI/2008/INF.4, paragraph 21.

²³ Details are available at <<http://gfdrr.org/index.cfm?Page=Climate%20Change%20Adaptation&ItemID=34>>.

²⁴ Submissions from Parties and intergovernmental organizations are assembled in document FCCC/AWGLCA/2008/16/Rev.1, which also provides document symbols of all submissions. Submissions from NGOs can be found at <<http://unfccc.int/3689.php>>.

Table III-12. Potential financial resources for adaptation (billions of United States dollars)

Proposal	Source of funding	Notes	Nominal annual level of funding
Group of 77 and China	0.25 – 0.5 per cent of GNP ^a of Annex I Parties	Calculated for 2007 GDP	100.5 – 201
Switzerland	2 USD per t CO ₂ with a basic tax exemption of 1.5 t CO ₂ eq per inhabitant	Annually	18.4
Norway	Auctioning of AAUs, for example 2 per cent	Annually	15 – 25
Mexico	Contributions based on GDP, GHG and population and possibly auctioning permits in developed countries	Initial phase	0.2
European Union	Continue 2 per cent levy on SoP from CDM	Ranging from low to high demand in 2020	0.2 – 0.68
Bangladesh, Pakistan	3 – 5 per cent levy on SoP from CDM	Ranging from low to high demand in 2020	
Colombia, LDCs	2 per cent levy on SoP from joint implementation and emissions trading	Annually, after 2012	0.03 – 2.25
LDCs	Levy on international air travel (IATAL)	Annually	4 – 10
LDCs	Levy on bunker fuels (IMERS)	Annually	4 – 15

Sources: FCCC/AWGLCA/2008/16, FCCC/TP/2008/6, Müller B. 2008. *International Adaptation Funding. The Need For An Innovative and Strategic Approach*. Oxford: Oxford Institute for Energy Studies, and UNFCCC secretariat, 2007. *Investment and Financial Flows to Address Climate Change*. Available at: <http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf>. Abbreviations: AAU = assigned amount unit, CDM = clean development mechanism, GDP = gross domestic product, GHG = greenhouse gas, GNP = gross national product, IATAL = International Air Travel Adaptation Levy, IMERS = International Maritime Emission Reduction Scheme, LDCs = least developed countries, NAMAs = nationally appropriate mitigation actions, SoP = share of proceeds.

^a Owing to a lack of information on GNP, potential funding was calculated using GDP.

(A) FINANCING UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

170. In contrast to current financing under the Convention and its Kyoto Protocol, which is based on voluntary or market-based contributions, many Parties have proposed mandatory or defined contributions. The Group of 77 and China have suggested that the level of new funding be set at 0.5 to 1 per cent of the gross national product²⁵ of Annex I Parties. According to the United Nations Statistics Division,²⁶ the combined GDP of Annex I Parties in 2007 was USD 40,217 billion. According to this figure, 0.5 to 1 per cent would equal USD 201 – 402 billion.

171. The Group of 77 and China proposed that the decision regarding the allocation of resources between adaptation and mitigation be deferred, but underlined that the allocation would need to take into account the historical imbalances in, and the urgency of, funding for adaptation. Assuming that available resources would be split equitably between adaptation and mitigation, available funding for adaptation under this proposal could range from USD 100.5 to 201 billion annually.

172. Mexico has proposed a mechanism for generating resources, including for adaptation, through defined contributions by all countries, set according to GHG emissions, population and GDP. Resources would be fed into a World Climate Change Fund (WCCF), which would also be open to receive market-based contributions, for example through auctioning permits in domestic cap and trade systems. In its initial phase, Mexico expects that the WCCF should mobilize no less than 10 billion USD per year. Assuming a levy of 2 per cent, resources for adaptation would amount to USD 200 million annually, with the possibility of increasing over time.

173. Many Parties have proposed that resources be generated through market-based operations, at either the national or the international level. A proposal for generation at the national level was made by Switzerland, which recommended that a global carbon tax of 2 USD per t CO₂ be levied on all fossil fuel emissions, leading to a burden of about 0.5 US cents per litre of liquid fuel. The proposal envisages a basic tax exemption of 1.5 t CO₂ eq per inhabitant, to take into account the principle of common but differentiated responsibilities. Of the total revenue collected, USD 18.4 billion would be allocated annually to a Multilateral Adaptation Fund.

174. At the international level, proposals include retaining the existing 2 per cent levy on CDM (European Union (EU)) and possibly expanding it to 3 – 5 per cent (Bangladesh and Pakistan). Revenue from that levy depends on the continuation of the CDM and the level of demand in the carbon market. If the levy on CDM were retained as is, the level of funding could be USD 200 – 680 million per year. If the CDM levy were expanded to 3 – 5 per cent, the level of funding in 2020 could range from USD 300 million per year (assuming a 3 per cent levy and low demand for credits) to USD 1.7 billion per year (assuming a 5 per cent levy and high demand).

175. Other Parties, including Colombia and LDCs, have suggested that a similar levy be applied on proceeds from joint implementation (JI) and emissions trading. This could be implemented by levying a share of proceeds on the first time that an assigned amount unit (AAU), removal unit or emission reduction unit is transferred from the issuing Party to another Party. Assuming that JI and emissions trading continue after 2012 with an annual worth of 30 – 45 per cent of the revenue generated by CDM projects annually, an extension of the share of proceeds could generate between USD 30 million and USD 2.25 billion per year.²⁷

176. Norway has proposed to auction emission quotas, that is, AAUs, in an emission trading system as a possible source of revenue. A small percentage of AAUs could be auctioned directly or through a tax on issuance of the allowances, while a tax on transactions creates inefficiencies and should therefore not be an option. For example, a two per cent auctioning of the asset would generate an annual income of USD 15 to 25 billion.

177. Lastly, Parties, including the LDCs, have proposed a levy on aviation and bunker fuel. Variations on this proposal have existed for some time. For example, Müller and Hepburn (2006) envisaged an international air travel adaptation levy as a means to raise an estimated USD 4 – 10 billion annually to support adaptation in developing countries. In early 2007, the International Maritime Emission Reduction Scheme was initiated. Under this scheme, a “maritime greenhouse gas fund” would be established under the auspices of the International Maritime Organization. The fund would derive revenue from an upstream fuel levy, and an estimated USD 2 billion of the annual revenue would be spent on adaptation in developing countries. Like other levies on carbon commodities, the value of the fuel levy would depend on the long-term emission reduction goal and carbon price. This is projected to be USD 30 per

tonne of maritime fuel in 2012 (equivalent to 5 per cent of a fuel price of USD 600 tonne), which would generate approximately USD 4 billion for adaptation in developing countries. This is estimated to reach USD 15 billion in 2020, assuming a carbon price of USD 60 per t CO₂ (Müller, 2008).

(B) FINANCING THROUGH OTHER MULTILATERAL AND BILATERAL SOURCES

178. Besides financing under the Convention and its Kyoto Protocol, a number of Annex I Parties have proposed that bilateral and multilateral ODA has a role to play in financing adaptation, in line with the provision of Article 11, paragraph 5, of the Convention. Building on its International Climate Initiative (see PARAGRAPH 167 above), Germany has suggested that with up to 100 per cent auctioning of EU ETS allowances from 2013 onwards, some billion USD per year could be generated in Germany alone.

179. In comparing TABLES III-11 and III-12, it becomes apparent that potential resources for adaptation are significantly larger – by two to three orders of magnitude – than current available resources. Once the question of the level of available funding has been addressed, consideration of delivery mechanisms for scaled up funding becomes important, including two issues associated with resources – access and disbursement. Access to resources needs to be based on the underlying objective for which resources are being mobilized, that is, the reduction of vulnerability and enhancement of adaptation to climate change.

²⁵ Gross national product (GNP) is understood as the “value of all (final) goods and services produced in a country in one year, plus income earned by its citizens abroad, minus income earned by foreigners in the country”. In contrast, GDP is defined as the “value of all final goods and services produced in a country in one year”. As the difference between GDP and GNP can be neglected and comprehensive figures for GNP are not readily available, the calculation for the level of funding that this proposal would raise was made using GDP.

²⁶ <<http://unstats.un.org>>.

²⁷ More details can be found in the technical paper FCCC/TP/2008/6.

III-F. DELIVERY MECHANISMS

180. Appropriate institutional and operational arrangements to efficiently and effectively deliver funds where they are most needed will be central to the success of global adaptation efforts. Many Parties and observer organizations have made submissions or presentations under the AWG-LCA, in which they outline their proposals on how adaptation funding can be delivered through specific institutional and operational arrangements in a future climate regime. This section reviews existing as well as proposed delivery mechanisms for adaptation funding, including questions of institutional arrangements, access, disbursement, and monitoring and reporting.

1. INSTITUTIONAL ARRANGEMENTS

(A) CURRENT INSTITUTIONAL ARRANGEMENTS

181. Article 11 of the Convention provides for a financial mechanism that shall function under the guidance of and be accountable to the Conference of the Parties, which shall decide on its policies, programme priorities and eligibility criteria related to this Convention. Its operation shall be entrusted to one or more existing international entities. Article 11, paragraph 2, further calls for the financial mechanism to have an equitable and balanced representation of all Parties within a transparent system of governance.

182. The financial mechanism of the Convention is currently operated by the GEF, which manages the GEF Trust Fund, the SCCF and the LDCF, and the Adaptation Fund Board, which as the operating entity manages and supervises the Adaptation Fund under the Kyoto Protocol. Other existing sources for adaptation funding include bilateral and multilateral donors, including the World Bank.

183. In accordance with Article 11 of the Convention, the GEF functions under the guidance of, and is accountable to, the COP. The COP issues guidance related to adaptation priorities for funding, eligibility criteria and policies, and disbursement criteria in the form of decisions. An Adaptation Fund Board was created in 2007 by decision 1/CMP.3 to operate the Adaptation Fund. As the operating entity of the Adaptation Fund, the Board is fully accountable to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). On an interim basis and subject to review every three years, the GEF was invited to serve as secretariat to the Board and the World Bank was invited to serve as trustee to the fund. With regard to multilateral and bilateral funding institutions, institutional arrangements vary considerably.

(B) PROPOSED INSTITUTIONAL ARRANGEMENTS

184. Parties have suggested a need for adaptation funding to be structured and governed under an umbrella financial mechanism of the Convention. Parties have recommended that the financial architecture of a future post-2012 climate agreement facilitates collaboration and synergy between activities under the Convention and related national and international efforts in climate change adaptation. For example, the European Union has proposed a Framework for Action on Adaptation to serve as a guide for the financial mechanism operating within the context of the Convention but also to be considered by bilateral and multilateral organizations in their adaptation and resilience-building activities.

185. While some Parties have called for making use of and improving existing institutions, such as the Adaptation Fund or the GEF in order to avoid a proliferation of institutions, others have suggested the creation of new institutions, such as an Adaptation Fund under the Convention. Some Parties, including Australia, the European Union and New Zealand, see an opportunity for the climate change community to take on board many of the lessons that have been learned in the development community and recognized in the Paris Declaration on Aid Effectiveness²⁸ and the recent Accra Agenda for Action.²⁹

186. The Alliance of Small Island States (AOSIS) and the Group of 77 and China have proposed that an Adaptation Fund under the Convention would be established under the COP. It would be overseen by a board appointed by the COP, which would have an equitable and balanced representation of all Parties within a transparent and efficient system of governance. The board would be advised by an expert group or committee, a possible consultative/ advisory group of all relevant stakeholders and an independent assessment panel.

2. ACCESS TO FINANCIAL RESOURCES

(A) CURRENT ACCESS TO FINANCIAL RESOURCES

187. A project is only eligible for funds from the SPA under the GEF Trust Fund if it generates global environmental benefits. To determine the amount of funding to be provided from the SPA, a project is assessed in terms of the expected benefits of its activities. The incremental costs associated with increasing resilience receive funding from the SPA, and the costs associated with generating global environmental benefits are funded from other programmes under the GEF climate change focal area or from other focal areas (e.g. biodiversity and land degradation) (GEF, 2005). The remaining costs (of national/local benefit) are borne either by the recipient country or other bilateral and multilateral donors.

188. According to the GEF, a project can access funding under the LDCF and SCCF when climate change affects one of the core sectors of development, such as agriculture, water, health or infrastructure (GEF, 2008a). In contrast to the SPA, there is no requirement to generate global environmental benefits under the LDCF and the SCCF. The GEF has instead applied the concept of additional costs of adaptation, which are defined by decision 3/CP.11 to be the costs imposed on vulnerable countries to meet their immediate adaptation needs, and are understood to be the additional costs imposed by climate change to make development climate-resilient (GEF, 2006).

189. Recognizing that an ex ante calculation of the additional cost of adaptation is complex, the GEF has developed a sliding scale for LDCF and SCCF funding, which serves as a proxy for estimating the additional costs. On this sliding scale, smaller projects receive proportionally more GEF funding than bigger projects since they are assumed to have a higher adaptation component (GEF, 2006). The scale provides an indication of the possible maximum amount of GEF funding for any given project size, and its application is optional. Countries opting to request a higher proportion of adaptation funding than foreseen under the sliding scale need to justify the costs in detail (GEF, 2006).

190. The Adaptation Fund will assist developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation and thus finance adaptation projects and programmes. By its decision 5/CMP.2 in 2006, the CMP agreed to a set of principles for the functioning of the Adaptation Fund. These principles emphasize, inter alia: balanced and equitable access to the Fund; funding on full adaptation cost basis; accountability in management, operation and use of funds; short and efficient project development and approval cycles and expedited processing of eligible activities; and the need for projects to be country driven, taking into account existing national planning exercises and development activities. In line with decision 1/CMP.3, eligible countries are expected to access the Adaptation Fund directly or to go through an in-country executing entity that meets agreed due diligence standards for financial management or through an implementing entity recognized by the Adaptation Fund Board.

191. In terms of other bilateral and multilateral adaptation initiatives, the PPCR will provide support, including grant and concessional finance, to five to 10 countries for integrating climate resilience into their development planning and financing (World Bank, 2008a).

²⁸ <http://www.oecd.org/document/18/0,2340,en_2649_3236398_35401554_1_1_1_1,00.html>.

²⁹ <<http://siteresources.worldbank.org/ACCRAEXT/Resources/4700790-1217425866038/AAA-4-SEPTEMBER-FINAL-16h00.pdf>>.

(B) PROPOSED ACCESS TO FINANCIAL RESOURCES

192. PARAGRAPHS 187 – 191 above summarized existing channels open to countries to access financial resources for adaptation. This section discusses ideas and proposals to broaden such access in future.

193. To assist in determining the amount of funding that can be accessed, a scheme was proposed, in CHAPTER III-C above, for grouping adaptation actions into three categories, based on the type of benefits (i.e. development and adaptation benefits), that the actions are expected to achieve. While domestic public and private resources and ODA, where applicable, are intended to produce development benefits, additional adaptation resources are required to produce adaptation benefits. Based on this categorization, the adaptation component to be funded could either constitute the whole action (category C) or part of the socio-economic activity (categories A and B) (see TABLE III-13).

194. Together with experience gained from the application by the GEF of the sliding-scale to determine the level of adaptation funding, such a categorization could assist Parties in enhancing access to adaptation funding.

195. In terms of access procedures, the Group of 77 and China has called for streamlined and efficient project development and approval cycles, with expedited processing of eligible activities. They have also expressed a preference for direct access rather than access through implementing agencies, which would be similar to the process that is being introduced under the Adaptation Fund of the Kyoto Protocol.

196. On the question of who is eligible to receive funds (including priority needs), a number of submissions highlight the importance of giving priority to LDCs and SIDS. While the Bali Action Plan indicates that the most vulnerable countries include LDCs, SIDS and countries in Africa affected by drought, desertification and floods, other developing countries may be equally vulnerable. There have been suggestions by some countries, including Australia, Bangladesh and Turkey, to decide eligibility for receiving funds on the basis of a vulnerability index or indicators reflecting a country's circumstances, respective capabilities, level of associated risk and physical impacts.

Table III-13. Possible levels of funding for adaptation actions based on adaptation type and additionality

Additionality	Intervention			
	Capacity-building	Research and assessments	DRR and risk management	Specific projects
Climate-proofing socio-economic activities	Full cost	Full cost	Negotiated co-financing depending on sector and project, or full costs of marginal adjustments to account for climate change	Negotiated co-financing depending on sector and project, or full costs of marginal adjustments to account for climate change
Expanding adaptive capacity to deal with future and not only current risks	Full cost or negotiated co-financing	Full cost or negotiated co-financing	Negotiated co-financing depending on sector and project	Negotiated co-financing depending on sector and project
Directly addressing observed impacts from climate change	Full cost	Full cost	Full cost	Full cost

Abbreviation: DRR = disaster risk reduction.

197. The European Union proposes giving priority to the “poorest and most vulnerable”. Creating the means for the poorest and most vulnerable communities and marginalized populations to access adaptation funds will be a challenge, not only at the national level, but also for the operational elements of adaptation funding at the global level. In the past, several barriers have prevented the most vulnerable communities from accessing funds from global sources, including a lack of information about funding opportunities, the complexity of programme design and implementation, and the need for compliance with administrative and financial management requirements (ActionAid, 2007).

198. In view of the fact that many adaptation activities will need to take place at the community and individual level, it will be essential that communities, local governance institutions and civil society organizations (e.g. village-level organizations, municipalities and non-governmental organizations (NGOs)) have easy and direct access to adaptation funding. Suitable institutional arrangements will be needed at the national level to fund planning, implementation and monitoring of such activities. Rather than a single, centralized national institution, a network of new and existing (development-related) institutions is likely to be most effective. This network of institutions could also build capacity among recipients of funding by building a directory of, and providing advice on, best practices in adaptation.

3. DISBURSEMENT OF FINANCIAL RESOURCES

(A) CURRENT DISBURSEMENT OF FINANCIAL RESOURCES

199. Disbursement of funding can take the form of either project support, as is currently practised under the SPA, the LDCF and the SCCF, or programmatic support, as envisaged for the Adaptation Fund, or even budget support, as planned for the PPCR. According to the strategic priorities, policies and guidelines of the Adaptation Fund³⁰ adopted by the CMP at its fourth session, the Adaptation Fund Board, in assessing project and programme proposals, shall give particular attention to, inter alia, programmatic approaches to adaptation and the level of urgency and risks of delay for proposed projects and programmes. The PPCR will put an emphasis on budget support, sector-wide approaches and coordinated investment programmes across key sectors (World Bank, 2008a).

(B) PROPOSED DISBURSEMENT OF FINANCIAL RESOURCES

200. Project-based support is valuable for piloting adaptation actions in countries and sectors. But it is suitable to only a limited extent for delivering the scaled up financial resources required, as it tends to circumvent government plans and systems of accountability, impose high transaction costs, rely heavily on expensive foreign technical assistance and consultants, and result in little capacity retention (IDD and Associates, 2006).

201. Hence, the European Union has called for a shift from a project-based approach when dealing with proposals for adaptation funding to a programmatic approach, where appropriate, in order to make best use of the full range of means of implementation for adaptation actions available and to allow for implementation at scale. Likewise, the Group of 77 and China has proposed that support be provided to programmatic adaptation efforts and strategic plans by developing country governments, in alignment with their broader development strategies.

202. A broader budget support approach to disbursing funding has been introduced for ODA through the Paris Declaration on Aid Effectiveness. The general characteristics of budget support are that it is channelled directly to partner governments using their own allocation, procurement and accounting systems, and that it is not linked to specific project activities.

203. It has the potential for greater country ownership, as funds can be integrated into development spending in a climate-resilient manner, rather than being earmarked for climate-specific projects. Experiences with ODA delivery in recent years have shown that budget support can have positive systemic effects on capacity, and it can reinforce the effectiveness of technical assistance. Bringing more discretionary resources within the scope of the national planning and budgeting processes strengthens their coherence and quality, and encourages those involved to address policy and efficiency issues more effectively (IDD and Associates, 2006; National Audit Office, 2008).

204. Budget support in the context of adaptation funding, could consist of defined yearly allocations to general or sectoral budgets of developing countries to enable strategic planning for adaptation and facilitate the implementation of the envisioned national adaptation plans.

³⁰ Contained in document FCCC/KP/CMP/2008/11/Add.2, annex IV.

4. MONITORING AND REPORTING

(A) CURRENT MONITORING AND REPORTING

205. The GEF has developed a results-based management framework (RBM) – a management strategy focusing on the performance and achievement of adaptation projects – for the LDCF and the SCCF (GEF, 2008c). The RBM undertakes monitoring and reporting at three levels: programme level (LDCF/SCCF adaptation programmes); funding areas (sectors/areas of intervention); and project level. Indicators for monitoring performance include the share of projects that are implemented successfully with satisfactory outcomes and the levels of co-financing programmed.

206. The GEF will develop an adaptation assessment tracking tool to provide useful, generic indicators for all adaptation projects, regardless of sector, and measure the overall success of a project in the light of the LDCF/SCCF goals (i.e. to reduce vulnerability and enhance adaptation). For example, the following indicators will be used to measure the success of projects in the agriculture sector: yields or productivity sustained under climate change induced stress (e.g. tonnes/ha); access among farmers to relevant climate information or extension services (e.g. number of people/communities covered); and mainstreaming of adaptation within agricultural policies and development plans (e.g. number of mainstreamed documents) (GEF, 2008c).

(B) PROPOSED MONITORING AND REPORTING

207. As the scale of adaptation activity is increased, procedures for regularly monitoring, evaluating and reporting on funded adaptation activities will be needed, along with the flexibility for project proponents to respond to evaluations by revising and updating plans, practices and programmes. The proposed national adaptation plans could be useful in this regard.

208. Although the concept of “measurable, reportable and verifiable” is only mentioned in the Bali Action Plan in the context of mitigation actions, Parties have suggested that the concept also be applied to financial support for adaptation action. Gambia, on behalf of the LDCs, has suggested that the provision of support for adaptation actions, as well as their implementation, should be measurable, reportable and verifiable. In order to measure, report on and verify the provision of support, clear targets and timelines would be needed. Addressing the implementation of adaptation actions would be more

difficult, as it raises questions of how to measure, report and verify outputs and outcomes. Unlike in mitigation, with its CO₂ equivalence, adaptation lacks a common metric. However, a number of indicators to measure progress have been suggested, including indicators to measure adaptive capacity as well as indicators to measure result-oriented and process-oriented adaptation activities (Levina, 2007).

5. INTEGRATION OF FINANCIAL RESOURCES

209. As the categorization in [CHAPTER III-C](#) above has shown, adaptation and development are closely interlinked. As such, delivery of adaptation resources needs to be integrated into other development flows, whether from domestic public resources, the private sector or ODA, in order to enhance effectiveness and efficiency. Integrating adaptation into national development plans will be more cost-effective if available resources for development and adaptation can be pooled, and if existing development processes and mechanisms can be strengthened. A failure to recognize and reinforce this important relationship could result in funding mechanisms that create redundancies or leave gaps in critical adaptation and development activities (McGray et al., 2007).

210. Given that many developing countries are not well adapted to current climate risks thus experiencing a persistent ‘adaptation deficit’, adaptation resources available through the UNFCCC process could catalyze the necessary financial resources – either from domestic sources or from ODA – for achieving development benefits (‘base flows’), which if adequately secured lead to adaptation benefits. Although it is often argued that it is not the responsibility of the multilateral process alone to mobilize the base flows (since there are clear developmental benefits, these are actions that countries ought to be taking anyway), the contribution towards enabling or incentivizing this flow may be relevant. An example of how various sources of funding can be combined to support adaptation is depicted in [TABLE III-14](#).

Table III-14. Possible sources of funding for adaptation actions based on adaptation type and additionality

Additionality	Intervention			
	Capacity-building	Research and assessments	DRR and risk management	Specific projects
Climate-proofing socio-economic activities	Convention funds	Convention funds	Domestic public resources, ODA (e.g. GFDRR), Convention funds, financial risk management mechanisms	Domestic public resources, private sector resources, ODA, Convention funds
Expanding adaptive capacity to deal with future and not only current risks	Domestic public resources, ODA, Convention funds	Domestic public resources, ODA, Convention funds	Domestic public resources, ODA (e.g. GFDRR), Convention funds, financial risk management mechanisms	Domestic public resources, private sector resources, ODA, Convention funds
Directly addressing observed impacts from climate change	Convention funds	Convention funds	Convention funds, financial risk management mechanisms	Convention funds

Abbreviation: DRR = disaster risk reduction, GFDRR = Global Facility for Disaster Reduction and Recovery, ODA = Official development assistance.

III-G. SUMMARY

211. There are no new empirical data or analyses yet available (although some work is under way) that allow a meaningful update of the estimates of financial flows and investment needs for adaptation that were given in the 2007 report. The estimates are still in the range of tens of billions of United States dollars needed in 2030. Estimates for individual sectors might be expected to become more precise.

212. Regardless of the number of financial assessments, their precision can only be improved through a better understanding of adaptation and how it is additional to a development baseline. This chapter has proposed a categorization of adaptation actions according to the nature of additionality, the type of action and the context of integration. Such categorization is important for the effective mobilization and allocation of resources.

213. National policies play an important role in strategic adaptation planning. They can also help to create an enabling environment that will ensure that scaled up financial resources are optimized and integrated into sectoral and development planning, and are channelled into activities that are the most promising in terms of reducing vulnerability. Many of the sectors that are particularly vulnerable to climate change are heavily invested in by the private sector. Ensuring that private-sector investments help to reduce vulnerability and exposure and contribute to effective adaptation would steer a large source of funding towards appropriate outcomes. At the same time, the private sector, through its ability to mobilize capital, can be further engaged in developing and implementing financial risk management mechanisms, including insurance, which can not only ensure economic recovery but also, if properly designed, lead towards more adaptive behaviour.

Table III-15. Possible options, tools and mechanisms available to enhance adaptation actions

Funding sources		
	Private finance	Public finance
Scale up	Scale up investments and financial risk-management tools, including insurance	Scale up financial flows and investments
Shift	Shift investments towards climate-resilient activities	Shift resource mobilization from budgetary allocations/voluntary contributions to automated contributions through levies on market instruments/commodities
Optimize	Optimize public private partnerships for investments and financial risk management mechanisms to reduce vulnerability and enhance adaptive capacity for the economy and society at large	

214. Given the additional burden that climate change is placing on national resources to achieve sustainable development, and in the context of Article 4, paragraphs 3 and 8, of the Convention, assistance needs to be provided to developing countries in meeting costs of adaptation. While the current and pledged level of resources for funds dedicated to adaptation are well below what is projected to be needed, this chapter has shown that the options, tools and mechanisms proposed by Parties and others have the potential to address the shortfall. Regardless of how the resources are mobilized, be it voluntarily, mandatory or through levies on market instruments, they will require an appropriate delivery mechanism with the right institutional and operational arrangements so that adaptation funding can be directed to those who are most vulnerable and those that can benefit most from it, that is receiving the largest benefit in terms of reducing vulnerability and enhancing adaptive capacity.

215. Political agreement may be needed on questions related to:

- (a) Which options could be considered to generate new and additional resources for adaptation;
- (b) Which principles should underline institutional arrangements on providing financial support to adaptation;
- (c) How to categorize adaptation activities to facilitate mobilization and allocation of resources;
- (d) How to facilitate access, including through the possibility of applying vulnerability indicators/indices;
- (e) How to effectively disburse funding for adaptation, including through the possibility of providing programmatic rather than project-based support in order to enhance action on adaptation.

216. **TABLE III-15** summarizes possible options, tools and mechanisms available to shift, scale-up and optimise the provision of financial resources to enhance adaptation actions in developing countries.

Provision	
National policies	Convention
Scale up efforts in national strategic planning for adaptation and in the integration of adaptation into sectoral and development planning	Scale up tools and mechanisms to mobilize new and additional resources in an adequate, predictable and equitable manner, e.g. through levies on market instruments and commodities
Shift from short-term project-based planning to long-term policy planning to identify and implement all possible adaptation actions, including economic diversification	Shift disbursement of financial resources to a more upstream level from project to programmes and/or budgets, taking into account national priorities and circumstances
Optimize the integration of adaptation and development-related financial resources Optimize enabling environments to enhance adaptation action, including through: <ul style="list-style-type: none"> - Legal frameworks; - Institutional arrangements; - Sectoral management; - Information tools 	Use Convention funds to leverage/catalyse additional funds Optimize the categorization of adaptation actions to enhance mobilization and allocation of financial flows Optimize delivery mechanisms for financial flows, including: <ul style="list-style-type: none"> - Institutional arrangements; - Access, e.g. via vulnerability metrics; - Monitoring and reporting, e.g. via measuring, reporting on and verifying support provided and adaptation action implemented

IV. ENHANCED FINANCIAL RESOURCES AND INVESTMENT FOR MITIGATION, INCLUDING FOR TECHNOLOGY COOPERATION

IV-A. INTRODUCTION

217. Given the large number of human activities – among them, agriculture, deforestation, land-use changes, industrial production, energy generation and end use – that generate GHG emissions, mitigating climate change will require changes in terms of doing things differently or doing them better on multiple fronts. Reorienting these activities will mostly involve technological change; that is, development and deployment of technologies that reduce (or capture) these emissions while still offering the services that humans desire. Behavioural change is also an integral part of a response to address climate change.

218. The Bali Action Plan envisions enhanced action on the provision of financial resources and investment to support action on mitigation and technology development and transfer as one important component to enable the full, effective, and sustained implementation of the Convention through long-term cooperative action now, up to, and beyond 2012.

219. It calls for measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country Parties. The Bali Action Plan also calls for nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner. Parties agreed to consider various approaches, including opportunities for using markets, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries.

220. As highlighted in the 2007 report, global additional investment and financial flows of USD 200 – 210 billion will be necessary in 2030 to reduce global GHG emissions by 25 per cent below 2000 levels. Almost half of the additional global investment and financial flows would be needed in developing countries. The entities that make the investment decisions are different in each sector, and the policy and/or financial incentives needed will vary. Therefore, any future agreement to enhance mitigation action would need to encompass a variety of funding sources and delivery mechanisms. The effectiveness and efficiency of these sources and mechanisms will hinge on their ability:

- (a) To address GHG emissions from all sectors in all countries;
- (b) To foster innovation and diffusion of low-carbon technologies (OECD, 2008b).

221. The 2007 report recognized the role of private finance, public finance and national policies in addressing mitigation. It noted that the private sector is the main source of global investment and financial flows and that it will require appropriate policies or incentives to shift its investment into mitigation actions and technologies. Public finance is important in areas where the risk-return profile is such that the private sector is reluctant to invest. Enabling policies, which may require funding support in developing countries, play a crucial role in guiding investments to achieve meaningful emissions reductions.

222. This chapter focuses on the options, tools and mechanisms for generating the additional financing required for mitigation, while addressing the kinds of technological and behavioural changes needed. The financing will depend both on the nature and on the scale of the changes.

223. The chapter begins with a brief review of new information relating to emissions scenarios and estimated investment needs (CHAPTER IV-B). Financing technology development and transfer³¹ are discussed in much greater detail than in the 2007 report (CHAPTER IV-C). The next three sections discuss role of private finance, with a focus on carbon markets (CHAPTER IV-D), public finance (CHAPTER IV-E), and national policies (CHAPTER IV-F) in achieving mitigation goals. Delivery issues with regard to enhancing and supporting mitigation efforts in developing countries are discussed in CHAPTER IV-G.

IV-B. UPDATED EMISSIONS SCENARIOS AND ESTIMATES OF INVESTMENT NEEDS

1. EMISSIONS SCENARIOS AND INVESTMENT NEEDS PRESENTED IN THE 2007 REPORT

224. **TABLE IV-16** summarizes the emission reductions and investment and financial flows for 2030 presented in the 2007 report. The authors used a reference scenario consisting of the energy-related CO₂ emissions from the IEA *World Energy Outlook 2006* (WEO 2006). Reference Scenario, non-CO₂ emissions projections from the United States Environmental Protection Agency (US EPA, 2006) extrapolated to 2030, current CO₂ emissions due to land

use, land-use change and forestry, and industrial process CO₂ emissions projections from the World Business Council for Sustainable Development (WBCSD, 2002). Under this reference scenario, GHG emissions in 2030 total 61.52 Gt CO₂ eq. The projected investment in physical assets in 2030 estimated using the ENV-Linkage model of the OECD is used as the reference scenario for investment and financial flows.³²

³¹ In parallel with this work, the Expert Group on Technology Transfer, at the request of the COP, has prepared an interim report (FCCC/SB/2008/INF.7). The interim report identifies and analyses existing and potential new financing resources and relevant vehicles in supporting the development, deployment, diffusion and transfer of environmentally sound technologies in developing countries. This section of the update has benefited from the relevant information available in the interim report.

³² The OECD model projection was calibrated to the WEO Reference Scenario (UNFCCC, 2007).

Table IV-16. Greenhouse gas emission reductions and additional investment and financial flows in 2030 under the mitigation scenario

Sectors	Global		Non-Annex I Parties only			
	Emission reductions (Gt CO ₂ eq)	Annual investment and financial flows (2005 USD billion)	Emission reductions (Gt CO ₂ eq)	Annual investment and financial flows (2005 USD billion)	Share of global emission reduction (%)	Share of global investment and financial flows (%)
Fossil fuel supply ^a		-59		-32.5		54
Power generation, fossil-fired generation, transmission and distribution ^b		-155		-79		
Power generation, nuclear, renewables, hydropower and carbon dioxide capture and storage ^b	9.4	148.5	5.0	73.4	53	49
Industry ^c	3.8	35.6	2.3	19.1	60	54
Transport	2.1	87.9	0.9	35.5	42	40
Buildings ^c	0.6	50.8	0.3	14.0	48	28
Waste	0.7	0.9	0.5	0.6	64	64
Agriculture	2.7	35.0	0.4	13.0	14	37
Forestry	12.5 ^d	20.7 ^d	12.4	20.6	100	99
Technology research and development		35 to 45 ^e				
Total	31.7	200.5 to 210.5	21.7	64.7	68	
Reference scenario (total for all sectors)	61.52 ^f	3 179	35.6 ^g	1 656		

Source: UNFCCC secretariat, 2007. *Investment and Financial Flows to Address Climate Change*. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf

^a Global investment for fossil fuel supply in 2030 drops from USD 322 billion under the reference scenario to USD 263 billion under the mitigation scenario.

^b Total investment for power supply in 2030 declines from USD 439 billion under the reference scenario to USD 432 billion under the mitigation scenario. Investment for coal-, oil- and gas-fired generation and transmission and distribution would be reduced by USD 155 billion. The USD 148.5 billion reported in this table is the additional investment that would be needed for renewables, Carbon dioxide capture and storage, nuclear power and hydropower.

^c The emission reductions reported for the industry and buildings sectors reflect only the direct emission reductions for those sectors. The investment in electricity efficiency measures is included in the investment flows for the industry and buildings sectors, but the emission reductions due to those measures are reflected in lower emissions for the power sector.

^d In the forestry sector the additional global investment and financial flows needed under the mitigation scenario total about USD 21 billion, of which financial flows for emission reductions through reduced deforestation account for USD 12 billion (5.7 Gt CO₂ reduced) and flows for forest management account for USD 8 billion (6.5 Gt CO₂ avoided). Afforestation and reforestation accounts for the rest. Almost all forestry sector related investment and financial flows occur in developing countries. These results warrant caution due to huge uncertainty in assumptions.

^e Only global estimates are available in the 2007 report.

^f The figures are total emissions (Gt CO₂ eq) in 2030.

^g Includes emissions from global land use, land-use change and forestry of 5.8 Gt CO₂ eq, for which a regional desegregation is not available, so the total could be as low as 29.8 Gt CO₂ eq.

225. The mitigation scenario applied in the 2007 report consists of the energy-related CO₂ emissions of the IEA WEO 2006 Beyond the Alternative Policy Case scenario (BAPS scenario), the non-CO₂ emission reductions possible at a cost of less than USD 30 per t CO₂ eq as estimated by the US EPA, and potential increases in sinks due to agriculture and forestry practices and potential industrial process CO₂ emission reductions estimated by WBCSD. The estimated global emission reductions of 32 Gt CO₂ eq include reductions and sink enhancements of 21.7 Gt CO₂ eq in 2030 in developing countries. This estimated potential of 21.7 Gt CO₂ eq includes 12.4 Gt CO₂ eq of sequestration from reduced deforestation (5.75 Gt CO₂ eq), forest management (6.4 Gt CO₂ eq), and afforestation and reforestation (0.3 Gt CO₂ eq).

226. The estimated USD 200 – 210 billion of additional investment and financial flows cover only the initial capital cost of new physical assets. Costs for capacity-building or creating the enabling environment needed to implement new technologies are not included. The estimated emission reductions reflect the use of known technologies. While many of the technologies, such as wind and hydropower, are commercially competitive, or nearly so, in developed countries, others such as solar PV and fuel cells are not, and a few, such as CCS, are still at the demonstration stage.

2. UPDATED SCENARIOS FOR ENERGY-RELATED CARBON DIOXIDE EMISSIONS

227. The IEA has updated its scenarios for energy-related CO₂ emissions and investment needs in its *World Energy Outlook 2008* (WEO 2008).³³ However, the 2030 emissions under the WEO 2008 Reference Scenario are virtually identical to those under the WEO 2006 Reference Scenario.³⁴ The 2030 emissions under the WEO 2008 mitigation scenario – the “450 ppm scenario” – are virtually identical to those of the 2006 BAPS scenario.³⁵ As a result, the energy-related CO₂ emission reductions drawn from the WEO 2008 are only marginally (1.2 per cent) higher than those reported in the 2007 report based on WEO 2006.

228. In contrast, the estimate of the additional investment needed in 2030 has changed significantly between the 2007 report and WEO 2008. Under the new mitigation scenario, the total additional investment needed in 2030 to reduce energy-related CO₂ emissions is about 170 per cent higher than in the 2007 report. Since the emission reductions are only marginally higher, the increased investment needed is entirely due to higher capital costs for energy supply facilities.

229. This increases the scale of the challenge to generate additional investment and financial flows. It will require profound shifts in energy demand and supply, clear carbon price signals, appropriate fiscal incentives and well-targeted regulation (IEA, 2008). In this light, the strategies presented in the 2007 report to scale up, shift and optimize investment and financial flows to mitigate climate change assume even greater significance.

3. UPDATED BOTTOM-UP ESTIMATES OF MITIGATION POTENTIAL IN DEVELOPING COUNTRIES IN 2020

230. This section presents updated estimates of GHG emission reduction potential in developing countries in 2020 using marginal abatement cost (MAC) curves, and compares them with the results presented in the 2007 report.

231. According to this analysis, mitigation potential in developing countries is likely to exceed 7 Gt CO₂ eq in 2020. This mitigation potential comprises the contribution from CCS, REDD and the technologies currently eligible under the CDM. MAC curves also highlight that a large majority of the potential can be realized at a cost of less than USD 25 per t CO₂ eq. Details of this MAC curve analysis are presented in [PARAGRAPHS 288 – 294](#) below.

232. Another estimate based on marginal abatement costs for developing countries for the year 2020 gives an emission reduction potential of around 6.5 to 7.5 Gt CO₂ eq per year (Kainuma, 2008). A third report estimates the emission reduction potential for Brazil, China, India, Mexico, the Republic of Korea and South Africa for the year 2020 under an ambitious scenario as 5.8 Gt CO₂ eq (Höhne *et al.*, 2008).³⁶

233. Available information shows that significant mitigation potential exists until 2020 with known technologies. However, to achieve the necessary reductions in 2030, mitigation actions, including changes in behaviour, have to be scaled up considerably and new mitigation opportunities need to be identified and developed. To set the stage for discussing possible instruments for scaling up, shifting and optimizing investment and financial flows, the next section discusses the financial needs of technologies at different stages in the technology development and transfer process. The section also explores the role of private and public finance, including the role of enabling policies to foster the required additional investment and financial flows at different stages of technology development.

IV-C. FINANCING FOR MITIGATION TECHNOLOGY DEVELOPMENT AND TRANSFER

1. INTRODUCTION

234. The Bali Action Plan outlines the need for enhanced action on technology development and transfer to support action on mitigation through, inter alia, ways to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies, and cooperation on R&D of current, new and innovative technology. A better understanding of the role of public- and private-sector finances at each stage of the technology development cycle would enable the additional investments required to be allocated and deployed more effectively.

235. This section discusses the technology development process, the relevant actors involved, the financial resources needed for different stages of the process, the current mix of mitigation technologies with regard to technology development stages and sectors, and finally the transfer of technologies to developing countries.

2. STAGES IN TECHNOLOGY DEVELOPMENT

236. Technology development is a complex process characterized by adjustments to internal developments, such as research findings and performance results, and to external developments, such as changes in energy prices, national policies and other technologies, as well as interactions with numerous actors including investors and customers. In this paper technology development is categorized as five stages of increasing technological maturity: R&D, demonstration, early deployment, diffusion and commercially competitive.

237. A technology can be at different stages in different countries, because its level of development is determined by the barriers, including the cost relative to the incumbent technology that it faces. For example, as a result of differences in national energy policies and prices of fossil fuels, wind power could be at the early deployment stage in one country and the diffusion stage in another. The infrastructure and institutional setting for a technology in a given country also has an effect.

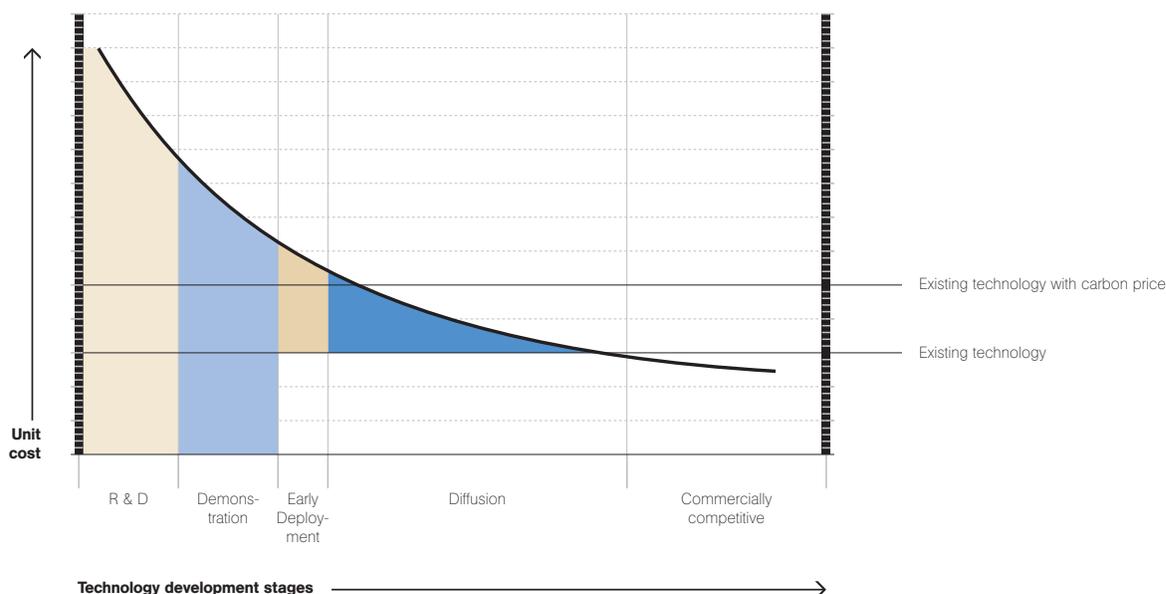
³³ We express sincere thanks to IEA for providing data and analysis undertaken for WEO 2008 emission scenarios and corresponding investments.

³⁴ The 2030 Reference Scenario emissions are 0.3 per cent higher than those for the 2006 Reference Scenario.

³⁵ The 2030 450 ppm scenario emissions are 0.2 per cent lower than those for the 2006 BAPS scenario.

³⁶ In the 2007 report, the emission reductions in the year 2020 for energy-related CO₂, industrial process CO₂ and non-CO₂ emissions in developing countries were estimated at 5.2 Gt CO₂ eq.

Figure IV-4. The learning curve of technology development



Abbreviation: R&D = research and development.

Note: The figure is adapted from document FCCC/SB/2008/INF.7 (the interim report of the Expert Group on Technology Transfer) but only explains the different stages of technology in relation to carbon prices.

238. **FIGURE IV-4** shows the relationship between the cost of a technology and the stages in the technology development process.³⁷ An increase in the number of installations of the technology reduces its cost and helps it to mature faster. A “carbon price” is used to distinguish the deployment and diffusion stages. Various policies, such as standards and emissions trading schemes, can be used to impose an implicit or explicit price on GHG emissions and so make technologies at the diffusion stage commercially competitive. Technologies at this stage might still face non-price barriers.

3. MITIGATION TECHNOLOGIES BY STAGES OF TECHNOLOGY MATURITY AND SECTOR

239. The interim report of Expert Group on Technology Transfer³⁸ identified 147 climate-relevant technologies in different sectors by collecting the technologies listed by numerous sources including the IPCC AR4, technology needs assessments (TNAs), CDM project design documents, and national and international research programmes. Each technology was classified by its stage of technological maturity based on literature and expert judgement. The analysis also indicates that most of the mitigation technologies are relatively mature – that is, at the deployment, diffusion or commercially competitive stages. This suggests that mechanisms to support mitigation efforts in developing countries that guide flows to accelerate adoption of the technologies could yield relatively quick results, both in terms of reducing the costs of the technologies through increased installations and in terms of emission reductions. The analysis highlights that a relatively small number of technologies are at the R&D and demonstration stages.

4. FINANCING BY STAGE OF TECHNOLOGY DEVELOPMENT

240. Defining the cost of technology development is difficult paucity of data. The shaded areas in **FIGURE IV-4** additional financing technology at each stage. The additional financing needed is the cost of activities at the R&D and demonstration stages plus the incremental costs for deployment and diffusion. As technologies at the deployment and diffusion stages usually provide energy services similar to those of existing technologies, customers would be willing to pay the equivalent cost. Hence only the incremental cost of the technology is included as the additional financing needed for technology development.

241. The EGTT interim report estimates that for the development of mitigation technologies (see **TABLE IV-17**), USD 140 – 230 billion per year is available. The analysis indicates that most of the finance (at least 90 per cent) comes from sources outside the Convention. The report also presents estimates of the additional financing needed to achieve the projected implementation of specified mitigation technologies, by stage of technological maturity, derived from various models and mitigation cost curves. The total finance needs are estimated to be between USD 300 billion and USD 1,000 billion annually, averaged over the period from the present to 2030. These numbers should be interpreted cautiously owing to uncertainties in assumptions. Most of the limited data available on current financing for technology development relate to public funding for energy technologies. Such estimates exclude many other climate-relevant technologies.

242. The investment estimates for technology demonstration, deployment and diffusion should not be interpreted as investment requirements over and above the incremental cost of mitigating emissions as discussed in **PARAGRAPHS 224 – 226** above, but as alternative estimates for use of a technology to the maximum potential. The mitigation cost estimates present aggregated cost of use of different mitigation technologies with model determined levels of technology use.

243. The estimates of the financing needed under the IEA mitigation scenarios exceed the level currently available for mitigation technologies at each stage of technology development. This reflects the cost of changing the mix of technologies quickly to address climate change. The EGTT report found that about one quarter of the extra financing for deployment and almost half of the extra financing for diffusion is estimated to be needed in developing countries. This reflects the projected development needs and increasing scale of implementation of technologies for mitigation. Since most of the extra financing for deployment and diffusion is in developed countries, measures to accelerate implementation of the technologies in these countries are likely to help in reducing the unit cost of the technology globally.

5. THE ROLE OF PUBLIC AND PRIVATE SECTORS IN FINANCING TECHNOLOGY DEVELOPMENT

244. The typical pattern of technology development is that the financing needs increase with each stage of technological maturity until the diffusion stage. However, as the need for capital increases, the investment tends to decline. Therefore, very different kinds of investors are involved, and different kinds of capital and risk management tools may be required, at each stage.

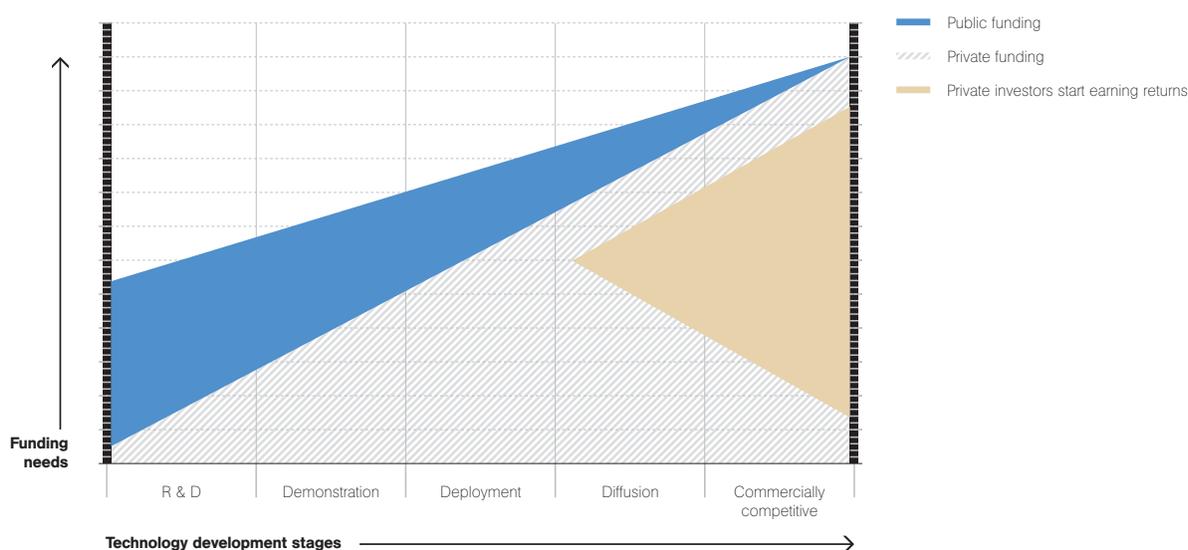
245. Technology development requires investment from both and private sectors. **FIGURE IV-5** shows in a stylized fashion how the involvement of public- and private-sector

finance changes with stages of technology development. Private financing is attracted by the potential profit from sales of the technology when it becomes commercially competitive. There will be minimal returns, if any, until the technology reaches technological maturity. That limits the possible private finance options to investments, such as venture capital and R&D funding, as the potential capital gains will only be realized several years in the future. Therefore, the public sector share of the financing is typically highest at the early stages of development.

³⁷ Shaded areas denote costs that make up the total financing required for developing the technology at each stage.

³⁸ FCCC/SB/2008/INF.7. See FOOTNOTE 31 above.

Figure IV-5. The roles of the public and private sectors in financing technology development



Abbreviation. R&D = research and development.

Table IV-17. Additional financing needs by stage of technological maturity

Stage of technological maturity	Annual additional financing needs up to 2030 (USD billion)	
	Developing countries	Global
Research and development		10 – 100
Demonstration		27 – 36
Deployment	6 – 41	25 – 163
Diffusion and commercially competitive	176 – 464	380 – 1,000 ^a

^a The International Energy Agency *Energy Technology Perspectives 2008 (Paris: OECD/IEA)* indicates that “the incremental investments in commercial technologies for the period 2010 to 2050 amount to an annual average of USD 1000 billion” for the 500 ppm CO₂ eq scenario.

246. Aside from the provision of financing, the public sector plays a critical role in fostering climate-relevant technology development by introducing policies that mandate or reward emission reductions. The large, long-term and risky nature of the financial commitments required for climate-relevant technologies often deters firms from investing. Thus governments form a key part of the technology development process by directly supporting basic research, encouraging the development of markets for climate-relevant technologies and products, reducing the risks to private-sector participants and, most importantly, creating an institutional environment that influences the behaviour and structure of the technology development system.

247. Private-sector firms, which may be the technology and product³⁹ developers or venture capital and private equity investors, also play critical roles. While public funding is concentrated in the early states of development, the private sector provides most of the funding for finding markets for climate-relevant technologies and products.

248. The combination of public and private financing for each stage depends on the technology. For a relatively inexpensive new technology that has a shorter development time and presents low investment risks, such as an efficient lighting technology, all of the funding might come from the research budget of a large corporation. A more expensive, risky technology with a long development time, such as CCS, might need substantial public funding at each stage of maturity.

6. FINANCING FOR TECHNOLOGY TRANSFER

249. The IPCC uses a comprehensive and widely applied definition of technology transfer that covers virtually all flows of knowledge and equipment within and between countries. The discussion in this report is limited to international flows of knowledge and equipment to developing countries. The knowledge or equipment may come from a developed or a developing country.

250. Funding for technology transfer is need for capacity-building, reforming subsidies that affect GHG emissions and creating enabling environments, some elements of national technology development plans, and investments for technology barrier removal.

251. **TABLE IV-18** provides insight into the support available for technology transfer under the Convention and its Kyoto Protocol and shows how many mitigation technologies have been identified by one or more TNAs, which provides an indication of the need for the technology in developing countries. It also shows the number of technologies that have been implemented with the support of GEF funding or through one or more CDM or joint implementation (JI) projects. Virtually none of the technologies at the R&D and demonstration stages has been identified in a TNA, funded by the GEF or used in a CDM or JI project.

Table IV-18. Support under the Convention and its Kyoto Protocol for mitigation technologies

Sectors	Total number of technologies	Deployment				
		Number technologies	Number of technologies covered by a			
			TNA ^a	GEF	CDM/ JI	
Agriculture	8	8	6	3	2	
Buildings	35	18	10	9	5	
Energy Supply	32	9	6	5	6	
Forestry	9	0	0	0	0	
Industry	17	4	1	0	4	
Transport	37	10	7	3	0	
Waste	9	2	1	0	1	

Abbreviations. TNAs = technology needs assessments; GEF = Global Environment Facility; CDM = clean development mechanism; JI = joint implementation
Note: ^a TNAs are prepared to identify technology needs of developing countries.

252. The highest share of technologies with GEF funding is at the diffusion stage and the CDM is stimulating adoption of technologies at the deployment and diffusion stages of technological maturity in developing countries.⁴⁰ These projects may increase the rate of technology transfer and consequently have a wider effect on technology adoption rates (Seres, 2007).

253. Proposed CDM and JI projects cover more technologies than the GEF in the industry, waste and energy supply sectors. The number of technologies covered by the CDM in the agriculture and forestry sectors is relatively low, which may be a reflection of the eligibility rules for the CDM. GEF funding supports more technologies in the building and transportation sectors than the CDM and JI, which may suggest the existence of non-price barriers in those sectors. Different mechanisms will be needed to stimulate adoption of those technologies.

7. SUMMARY

254. To make use of available technologies and to bring on new technologies, additional funding will be needed at all stages of technological maturity and across all sectors. The type and source of this financing must be appropriate for the stage of maturity.

255. Technologies at the deployment and diffusion stages may not be commercially competitive owing to price and/or non-price barriers. A price barrier simply means that the cost of the technology is higher than that of the existing

technology. That cost difference can generally be addressed by various policies such as provision of additional public funding (e.g. GEF funding) and putting a price on GHG emissions, which is the basis of emissions trading and mechanisms such as the CDM and JI. These approaches appear to work well in the energy supply and industry sectors.

256. However, even technologies that demonstrate favourable economics may not be deployed for a variety of other reasons such as market organization, lack of information and low availability of finance. Technologies in the negative cost segment of emission reduction cost curves generally face non-price barriers. The low penetration rates of the CDM in the buildings and transportation sectors suggest that several of the climate-relevant technologies in these sectors possibly face non-price barriers. Faster adoption of those technologies usually requires regulations, such as energy efficiency standards, or other policies as well as the capacity and infrastructure to implement the regulations or policies. When implementing such policies or regulations it is important to consider their impact on technology development as well.⁴¹

³⁹ Product refers to the complete engineered system, such as a car or a solar PV light, which is based on particular technologies and is manufactured for use by consumers (Sagar and Mathur, 2000).

⁴⁰ Stages are based on globally average conditions, so the use of a commercially competitive technology in a CDM project does not imply the project is not additional.

⁴¹ Porter and Van der Linde (1995) argued that environmental regulation of industries could also promote their competitiveness through accelerated innovation.

Diffusion				Commercially competitive			
Number technologies	Number of technologies covered by a			Number technologies	Number of technologies covered by a		
	TNA	GEF	CDM/ JI		TNA	GEF	CDM/JI
0	0	0	0	0	0	0	0
8	6	4	1	7	5	3	0
4	3	3	3	4	3	4	4
1	1	1	0	2	2	0	1
12	8	9	10	0	0	0	0
7	4	3	0	9	6	4	1
3	3	1	1	3	2	1	2

257. Present crediting mechanisms do not support technology at the R&D and demonstration stages. An acceleration of technology development in all sectors will require increased funding for R&D and demonstration, policies to promote near commercial technologies, and policies that mandate or reward emission reductions. Global energy R&D and demonstration, which is currently concentrated in a few developed countries, will need increased funding, and a shift in the mix of technologies funded. The involvement of developing countries in such efforts can be enhanced by providing financial support for innovation centres and through their participation in international research agreements.

258. In developing countries, implementation of technologies at the deployment and diffusion stages can be accelerated through the crediting mechanisms, financial support and other means, but may also require technology transfer assistance. Support for technology transfer is particularly needed to accelerate adoption of technologies that are close to being commercially competitive in developing countries.

259. In conclusion, the challenge is to push a large, constantly changing set of mitigation technologies in various sectors through the technology development cycle so that they become commercially competitive and to accelerate their adoption in developed and developing countries with widely varying national circumstances. The next three sections discuss how (1) private finance with a focus on carbon markets; (2) public finance; and (3) well-designed national policies can contribute to this goal.

IV-D. PRIVATE FINANCE

1. INTRODUCTION

260. The Bali Action Plan calls for enhanced national/international action on mitigation of climate change considering various approaches, including opportunities for using markets, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries. It also calls for enhanced action on the provision of financial resources and investment to support action on mitigation and technology cooperation including mobilization of public- and private-sector funding and investment and facilitation of climate-friendly investment choices.

261. The 2007 report found that the main source of funding for investment and financial flows to address climate change is likely to be the private sector. It also noted that the international carbon market has contributed to additional investment flows to developing countries.

262. This section provides new information on recent developments related to three components of private finance for mitigation: investment in clean energy, foreign direct investment (FDI) and the carbon market, including updated projections of the market in 2020. It highlights the possible share of private finance in supplying the incremental financial flows and investments for mitigation activities and the role of credit-based mechanisms in both shifting and scaling up private-sector flows.

2. PRIVATE-SECTOR FINANCE FOR CLEAN ENERGY

263. Broadly, private finance can be classified into two categories: domestic capital and foreign capital flows. Domestic capital may come from three principal sources: private investors, public capital markets and commercial banks. The capacity of these capital providers/markets, to some degree, is determined by the level of economic development of the country (Carmody and Ritchie, 2007). The ability to raise funds for clean energy on public capital markets in developing countries, for example, depends on the existence of such a market in the country. Private investment in clean energy assets that originates in another country would be categorized as FDI.

264. Private finance for clean energy is a small fraction of total private investment, but it is a rapidly growing segment. Between 2004 and 2007, investments in energy efficiency and renewables (known together as clean energy) increased from USD 33.2 billion to USD 148.4 billion, as shown in [TABLE IV-20](#). The new investment in clean energy in 2007 was equivalent to 9.6 per cent of global energy infrastructure investment and 1 per cent of global fixed asset investment (UNEP SEFI, 2008). The total is forecast to have declined slightly to USD 142 billion for 2008. The investment in clean energy is dominated by wind and solar power, biofuels and biomass and waste for the entire 2004 – 2007 period, although the relative shares fluctuate over time and vary according to the category of finance. The foreign and domestic components of the investment in clean energy assets are not available from the data. However, recent trends of FDI relevant to climate change mitigation are presented in [PARAGRAPH 274 – 276](#) below.

265. Developing countries receives an increasing share of the new investment in clean energy. Their share grew from 13 per cent (USD 1.8 billion) in 2004 to 23 per cent (USD 26 billion) in 2007. China, India and Brazil together accounted for most of this investment (82 per cent in 2007).⁴² This growth was driven by concern over energy supply constraints coupled with better policy frameworks and regulatory environments for clean energy in several countries, and sustained high oil prices.

266. The data in [TABLE IV-19](#) cover a mix of different types of investments across the financing spectrum, from R&D funding and venture capital for technology and early-stage companies through to public market financing for projects and mature companies, and asset financing for increasing installed generation capacity.

267. Venture capital and private equity investments, which support technologies at the deployment and diffusion stages, amounted to almost USD 10 billion in 2007. A major share of this funding was for solar technologies. Venture capital investors often hope to develop a technology up to these stages within three to five years and then recover their investment from the proceeds of an initial public offering.⁴³

268. Almost USD 10 billion of private funds and USD 7 billion of government funds were invested in R&D of mitigation technologies in 2007.

269. Asset financing accounts for most of the investment in clean energy, reaching USD 79.2 billion in 2007, largely composed of investments in wind power and biofuels. Asset finance typically includes a significant debt component that can come from a local or international bank, or local or foreign capital markets, on commercial terms or with credit enhancement structures offered by international financial institutions and export credit agencies (ECAs).

⁴² These figures exclude investment in RD&D and small-scale projects.

⁴³ The data in [TABLE IV-19](#) exclude private equity and venture capital buy-outs, existing public stock changing hands, acquisitions of projects and companies, and acquisitions and refinancing of assets.

Table IV-19. Global new investment in clean energy, 2004 – 2007 (billions of United States dollars)

Year	VC/PE	Public markets	Government/corporate R&D & demonstration	Asset finance	Small scale projects ^a
2004	1.7	0.7	10.3	12.4	8.2
2005	3.0	4.1	12.3	27.5	11.6
2006	7.3	10.5	14.3	48.0	12.5
2007	9.8	23.4	16.9	79.2 ^b	19.0

Source: UNEP SEFI, 2008.

Abbreviations: PE = private equity; R&D = research and development, VC = venture capital.

^a Small-scale projects relate mainly to financing of distributed or off-grid installations such as solar water heaters, biogas digesters, and micro wind turbines.

^b This figure differs from the estimate of "asset financing" in 2007 of USD 84.5 billion as it has been adjusted to exclude USD 5.7 billion of asset refinancing.

270. Investment raised through public markets has become the second largest component (USD 23.4 billion in 2007) as the sector has grown and investors have become aware of its potential. This form of finance, which is mainly raised from the sale of shares, is used for technologies for which there is a growing market. Small-scale projects are the third largest component reaching almost USD 20 billion in 2007.

271. Although private investment in clean energy is only a small part of total private investment, it is growing rapidly and already contributes a reasonable share of total energy infrastructure investment. Investment requirements in energy infrastructure under the WEO mitigation scenarios are about the same as those under the reference scenarios. The main challenge, then, is to shift the investment to low-carbon alternatives. The rapid growth of clean energy investment indicates that private investment will respond to mitigation opportunities given appropriate policies and/or incentives, such as through crediting mechanisms.

272. The 2007 report estimated that a little over half of the energy sector investment in 2030 would be needed in developing countries. As has been shown, although it is growing rapidly, the developing country share of clean energy investment is still well below half of the total, and concentrated in a few countries. Climate-relevant technologies are generally riskier investments and more costly than conventional technologies, as many are still operationally unproven. Projects in developing countries also entail country risk for foreign lenders and foreign exchange risk, usually for the borrower.

273. To attract the required additional investment, governments need to institute policies, laws, and regulations that offer the prospect of a growing market for mitigation technologies. The establishment of emission reduction commitments, for example, creates a bigger potential market for a technology and a higher potential return on private financing. Similarly, measures that reduce the net cost of financing research, such as tax credits, reduce the risks associated with new technologies, such as guaranteed purchases, or provide returns at earlier stages of technological maturity, such as feed-in tariffs and renewable energy obligations, could also help create favourable conditions for investment in clean energy technologies.

3. FOREIGN DIRECT INVESTMENT ⁴⁴

274. Foreign private capital flows can be broadly separated into two categories: portfolio investment and FDI. Portfolio investments are purchases of publicly traded shares and other financial instruments. Such investments rarely lead to construction of new physical facilities. FDI typically involves direct investment in unlisted corporate and project entities. FDI in projects often leads to construction of new facilities. The 2007 report noted that FDI represents 22 per cent of current global investments by private corporations.

275. The FDI relevant to climate change will typically be in the form of so-called greenfield investments, which are made by trans-national corporations (TNCs) to establish new facilities⁴⁵ abroad, or for the merger and acquisition (M&A) of existing facilities. During 2003 – 2007, there were more than 590 alternative/renewable energy and recycling projects by TNCs (of these 380 were in developed countries) out of a total of 54,000 greenfield investment projects (UNCTAD, 2008).⁴⁶

276. FDI tends to rise and fall with financial cycles and will flow to those countries where relatively strong enabling conditions for investment exist (UNCTAD 2006).⁴⁷ These include a stable political environment, a strong legal system, macroeconomic stability and availability of skilled labour. Although FDI is an important component of global private-sector investment, it is dominated by flows between developed countries, and the developing country inflow is concentrated in a few countries. Thus it may not be an important source of financial resources for many developing countries. Further, for FDI to make a substantial contribution to additional investment in mitigation technologies, attractive enabling conditions for investment as well as policies and incentives that encourage adoption of mitigation technologies will be needed.

4. DEVELOPMENTS RELATING TO CARBON MARKETS

277. The current state of, and future prospects for, the carbon market were discussed in the 2007 report. This update briefly reviews recent developments with respect to domestic emissions trading schemes in Parties included in Annex B to the Protocol and the Kyoto mechanisms – the CDM, JI, and international emissions trading. This section also reviews new projections for the international carbon market in 2020.

(A) DEVELOPMENTS RELATING TO DOMESTIC EMISSIONS
TRADING SCHEMES

278. Many Annex I Parties are implementing domestic emissions trading schemes to help meet their national commitments under the Kyoto Protocol. Recent developments relating to domestic emissions trading schemes include:

- (a) Phase II of the EU ETS started on 1 January 2008 with a more stringent emissions cap and coverage of additional sources. Norway, Iceland and Liechtenstein joined the scheme;
- (b) Domestic emissions trading schemes were launched in New Zealand and Switzerland;
- (c) Japan has announced plans to replace its voluntary emissions trading scheme with a mandatory scheme. Several regional schemes have also been announced;
- (d) Emissions trading schemes are under development in Australia and Canada and are expected to come into effect in 2010;
- (e) A regional emissions trading scheme was established in the province of Alberta (Canada) and at least three regional schemes involving states or provinces in Canada, Mexico and the United States of America are under development.

279. Both the volume of EU allowances (EUAs) traded and the value of the trades approximately doubled between 2006 and 2007 (World Bank, 2007). Since January 2007, the price of 2008 EUAs has fluctuated between EUR 15 and EUR 25.

(B) DEVELOPMENTS RELATING TO THE KYOTO MECHANISMS

280. The Kyoto mechanisms help Parties included in Annex B to the Kyoto Protocol to meet their national emissions limitation commitments. The CDM and JI continued to grow during 2008. The number of registered CDM projects rose to 1,231 by November 2008, which will generate an estimated 232 million CERs per year. The number of JI projects in November 2008 stood at 22, with an estimated annual volume of 7.26 million emission reduction units (ERUs). The total amount that has been, or is expected to be, invested in projects that entered the pipeline during 2007 is estimated at USD 45.9 billion for the CDM and USD 3.3 billion for JI projects.

281. In October 2008, all national registries were linked to the international transaction log. This implies that CERs can be moved from the CDM registry to national registries. It also implies that emissions trading under Article 17 of the Kyoto Protocol and international transfers of ERUs can begin. At present 34 Annex B Parties are eligible to participate in emissions trading under Article 17.

UPDATE OF KYOTO MARKET SUPPLY AND DEMAND FOR 2008 – 2012

282. Estimates of the demand for Kyoto units have not changed significantly from the 2007 report. The current estimate is about 2.4 billion t CO₂ eq for 2008 – 2012, well within the range of 2.0 – 4.2 billion t CO₂ eq (400 – 850 Mt CO₂ eq per year) reported in 2007. The current estimate assumes no demand from Canada.

283. Estimates of the supply of CERs to the end of 2012 range between 1.6 and 1.9 billion, about the same as in the 2007 report.⁴⁸ As at 31 May 2008, there were almost 3,500 projects in the CDM pipeline with projected emission reductions of about 2.6 billion t CO₂ eq by 2012.⁴⁹

284. There were more than 140 (Track 2⁵⁰) projects in the JI pipeline as at the end of May 2008, which could generate up to 265 million ERUs by 2012.⁵¹ Analysts now expect 250⁵² to 410⁵³ million ERUs to be issued, a little more than the 200 – 300 million (40 – 60 million per year) estimated in the 2007 report.

⁴⁴ We express sincere thanks to the United Nations Conference on Trade and Development for providing data and analysis on FDI.

⁴⁵ Or add to an existing facility.

⁴⁶ Most (495) of the projects were for renewable energy for electricity generation or industry. A TNC must own at least 10 per cent of the project.

⁴⁷ Inflows of FDI to developing countries were USD 267, 164 and 334 billion in 2000, 2002 and 2005 respectively.

⁴⁸ Select estimates are as follows. 1.6 billion CERs by 2012, within a range of 1.4 – 2.2 billion (Source. IDEA carbon 2008); 1.6 billion CERs by 2012 (UNEP/Risoe 2008); 1.7 billion CERs by 2012 (Société Générale, 2008); 1.9 billion CERs by 2012 (Point Carbon, 2008).

⁴⁹ UNEP/Risoe CDM Pipeline, as of 11 June 2008.

⁵⁰ Track 2 projects are those JI projects independently verified through Article 6 Supervisory Committee.

⁵¹ UNEP/Risoe JI Pipeline, as of 11 June 2008.

⁵² Société Générale, 16 July 2008 based on information provided by World Bank.

⁵³ Point Carbon, 2008.

UPDATED ESTIMATES OF THE DEMAND FOR EMISSION REDUCTION
CREDITS IN 2020⁵⁴

285. The demand for emission reduction credits after 2012 is difficult to estimate because it will be influenced by the outcome of the ongoing negotiations on the commitments taken by Parties. Acknowledging the assumptions involved, several analysts have produced new estimates of the international carbon market in 2020. These estimates range from 500 to 1,700 Mt CO₂ eq (see TABLE IV-20). The figure at the low end of the range is roughly the same as the size of the current market: 400 – 600 Mt CO₂ eq per year. The upper end of the range predicts a market two to three times larger. The low estimate is the same as the lowest estimate in the 2007 report, but the highest estimate is much lower than the highest estimate in the 2007 report.⁵⁵

286. The highest estimate is from a Point Carbon⁵⁶ analysis, which assumes commitments by all OECD countries and non-OECD EU member States as well as by the international marine and aviation sectors (Point Carbon, 2008). Under this scenario, the maximum potential demand for credits in 2020 could reach 1.7 billion t CO₂ eq. Demand from the United States would account for 54 per cent of this amount, while the EU share is 20 per cent.

287. These estimates do not discriminate between types of credits. They could be credits from current CDM projects, new CDM projects, extensions of the CDM, or new crediting mechanisms. Recent proposals in the United States, for instance, allow large quantities of international forestry credits as does the Australian emissions trading scheme proposal. At an average price of USD 20 per t CO₂ eq, the potential demand in 2020 would represent additional financial flows to developing countries of USD10 – 34 billion, compared with an estimated USD 8.4 billion in 2007.

UPDATE ON POTENTIAL SUPPLY FOR EMISSION REDUCTIONS IN 2020

288. The MAC curves for developing countries in 2020, discussed in PARAGRAPHS 230 – 231 above, are described in detail in this section. These are based on detailed country studies carried out between 1998 and 2006. For CO₂ emissions, the potential in 26 developing countries is included, based on bottom-up studies for these countries. For non-CO₂ emissions, five developing countries are included, and the rest of the potential is estimated on a regional basis. Most of these studies estimate the emission

reduction potential in 2010. That mitigation potential was extrapolated to 2020 by applying a general growth factor for CO₂ emissions by world region.⁵⁷

289. The original studies use different approaches with regard to cost assessment and baseline emissions, so the results are subject to uncertainty. Further, the potentials for the buildings sector and renewables such as biomass, wind power, hydro power and geothermal are likely to be under represented in the country studies.

290. The MAC curves for currently eligible CDM mitigation measures and for other measures with reduction potential – REDD and CCS – are combined in FIGURE IV-6. The total mitigation potential in developing countries is likely to exceed 7 Gt CO₂ eq per year in 2020, including REDD and CCS. As is evident from FIGURE IV-6, the majority of the potential is available at a cost of USD 25 per t CO₂ eq or less.

291. The curves show that the total emission reduction potential for CDM-eligible technologies in developing countries is about 4.8 Gt CO₂ eq in 2020. These cost curves do not include non-price barriers related to technology deployment or CDM regulations related to additionality. If these were taken into account, a ‘market potential’ for CDM projects, which could be substantially lower than the economic reduction potential shown, would be obtained (Bakker *et al.*, 2007). It should also be noted that oil prices between 1998 and 2006, when the underlying cost studies were conducted, were in the range of USD 20 – 40 per barrel.⁵⁸

⁵⁴ The secretariat expresses sincere thanks to the World Bank in providing data and analysis on carbon markets.

⁵⁵ The high end of the range in the 2007 report was influenced by estimates of the demand in 2015 and 2030 as well as the range for the model results analysed by Haites (2007).

⁵⁶ In addition to the international demand for credits, 7.7 billion allowances could be issued under domestic or regional schemes and an international agreement, leading to a total of 9.4 billion allowances and credits, close to four times today’s 2.5 billion units (EUAs, CERs and other units).

⁵⁷ No studies could be found for developing countries whose GHG emissions amount to approximately 20 per cent of total developing country GHG emissions. The estimates of potential were thus inflated by a factor of 1.25, assuming a proportionate potential.

⁵⁸ An analysis of the effect of high oil prices on European mitigation options shows that the impact on abatement cost of options that replace oil or natural gas could be substantial (Bakker *et al.*, 2008).

Table IV-20. Estimates of the potential demand for emission reduction credits in 2020

Source of estimate	Estimate potential demand
New Carbon Finance ^a	Two or three times the level of demand in 2008 (equating to 1,000 – 1,500 Mt CO ₂ eq)
IDEACarbon ^b	500 – 1,200 Mt CO ₂ eq
Point Carbon ^c	1,700 Mt CO ₂ eq
Barclays Capital ^d	600 – 1,100 Mt CO ₂ eq

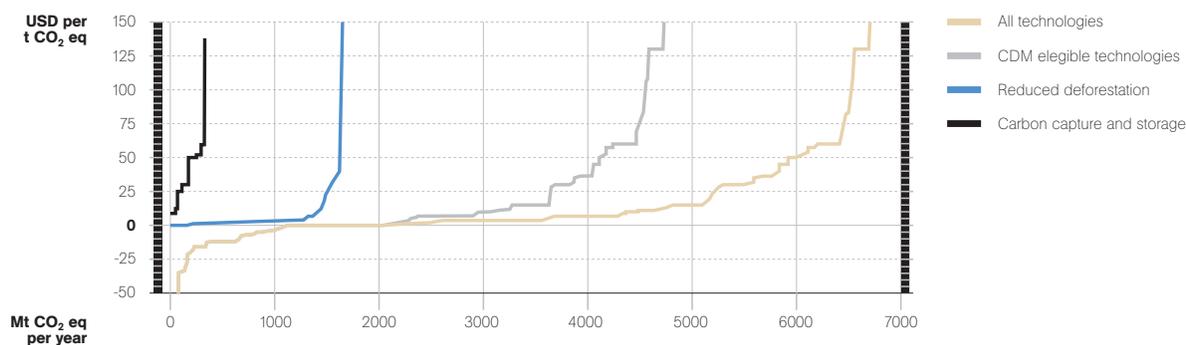
^a New Carbon Finance. 2008. "With an international agreement on climate change, the carbon market could be two to three times as large as today." Press release, 28 January 2008.

^b IDEACarbon. 2008. "The long-term potential of the carbon market." Press release, 29 February 2008.

^c Point Carbon. 2008. Carbon market transactions: dominated by financials?. *Carbon Market Analyst* (21 May 2008).

^d Barclays Capital. 2008. So long to the longs. *Monthly Carbon Standard* (June 2008). This is the (annualized) estimate of the maximum potential demand.

Figure IV-6. Marginal cost curves for the developing countries in 2020



Abbreviation: CDM = clean development mechanism.

292. Any estimate of the mitigation potential of REDD contains significant uncertainties. In this paper the method used to develop MAC curves for reduced deforestation is as follows. The forest areas where deforestation could be reduced were estimated. The potential for reducing deforestation is the difference between the CO₂ stock in existing forests in 2012 and the extrapolated CO₂ stock in forests in 2020. The cost of reducing deforestation is estimated as a combination of three components: (1) compensation for people living in forests to encourage them to protect them; (2) compensation for private forest property, as a payment to discourage alternative uses such as agriculture; and (3) funds for governments to monitor forests (Nepstad *et al.*, 2008).

293. The resulting technical mitigation potential of reducing deforestation estimated, through MAC curve analysis, for all developing countries between 2012 and 2020 is approximately 1,640 Mt CO₂ per year, mostly for less than 15 USD per t CO₂.⁵⁹ The 2007 report estimated the 2030 potential to be around 2,000 Mt CO₂ per year. Almost all analyses suggest that the marginal cost would be low relative to most other mitigation measures.

294. CCS is currently not eligible as a project activity under the CDM; as with REDD, Parties are discussing CCS as a potential source of supply of emission reductions.⁶⁰ However, the potential for CO₂ emission reduction through CCS in the power and industry sectors high after 2020 (albeit limited before then) (Zakkour *et al.*, 2008; Philibert *et al.*, 2007; Bakker *et al.*, 2007). The economic potential for CCS is considered in this paper for new fossil fuel-based power generation and point sources in industry and natural gas processing. The estimated mitigation potential in developing countries from all CCS applications in 2020 is about 350 Mt CO₂, mostly at costs over 25 USD per t CO₂ eq.⁶¹

5. SUMMARY

295. Private investment in clean energy continued to grow rapidly during 2007. While incentives created by the carbon market may play a role, other factors such as sustained high oil prices, concerns over energy supply constraints and better policy frameworks and regulatory environments too are likely drivers of growth. This highlights the importance of improving policy frameworks to attract and shift the flow of private finance from conventional to climate-relevant technologies.

296. Compliance demand for Kyoto units currently is estimated at about 2.4 billion t CO₂ eq for 2008 – 2012. Almost all of this demand is expected to be met by CERs (1.6 – 1.9 billion) and ERUs (0.25 – 0.41 billion). Crediting mechanisms have demonstrated their role in delivering additional financial resources to developing countries, a role that could be expanded by increasing the resource flows. The new estimates for the size of the international crediting mechanisms range from 0.5 to 1.7 Gt CO₂ eq per year in 2020. At an average price of USD 20 per credit, the potential demand could result in USD 10 – 34 billion additional financial flows to developing countries.

297. Scaling up the crediting mechanisms to generate additional investment and financial flows for mitigation in developing countries appears to be feasible. [PARAGRAPHS 339 – 343](#) describe proposals to expand market-based mechanisms for mitigation in developing countries.

298. Recent estimates indicate a mitigation potential of approximately 7 Gt CO₂ eq per year in developing countries by 2020, of which a large part would be available at a cost of USD 25 per t CO₂ eq or less. The potential supply of emission reductions in 2020 is thus much larger than the estimated demand by developed countries for credits from developing countries, and crediting mechanisms are expected to play a supplemental role. Therefore, realization of a large share of the potential emission reductions in developing countries would require measures in addition to an expanded crediting mechanism. This is particularly relevant in the context of paragraph 1 (b) (ii) of the Bali Action Plan, which calls for nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.

IV-E. PUBLIC FINANCE ⁶²

1. INTRODUCTION

299. Scaling up public funding for mitigation and shifting public-sector investments to more climate-friendly alternatives were identified by the 2007 report as essential for generating additional investment and financial flows to address climate change. The 2007 report also highlighted the role of public finance in optimizing the allocation of the available funds by spreading the risk across private and public investors, for example by providing incentives for private investment in the early

deployment of new technologies. The report underlined the challenge of shifting more public investment into less carbon-intensive, more climate-proof measures without sacrificing development priorities.

300. Broadly speaking, there are two main sources of public finance for mitigating climate change (Doornbosch and Knight, 2008). The first is defined contributions from national budgets. This broad category encompasses every type of funding that can be contributed from national commitments, including:

- (a) Direct funding from national budgets through a bilateral financing channel;
- (b) National budget contributions to multilateral funds;
- (c) Resources raised from capital markets backed by government guarantee;
- (d) A share of government taxes or revenues earmarked at the national level for a climate fund.

301. The second source of public finance are the funds collected internationally without going through national budgets. It includes international levies on emission reduction credits and auctioning of emission allowances at the national or international level.

2. CURRENT SOURCES OF INTERNATIONAL PUBLIC FINANCE FOR TECHNOLOGY DEVELOPMENT

302. Estimates of current sources of public finance for developing mitigation technologies are listed in TABLE IV-21. Consistent with the definition of technology development provided in PARAGRAPH 234 above, an attempt has been made to estimate the total financing from available estimates⁶³ for the R&D and demonstration stages and the incremental financing, in excess of the cost of the incumbent technology, for the technologies at deployment and diffusion stages. The data are subject to further revision.

⁵⁹ Assessment provided by ECN for this technical paper. Data provided by McKinsey estimated 2020 potential at 4.33 Gt CO₂ per year at a cost of less than EUR 100 per t CO₂.

⁶⁰ In 2006, by its decision 1/CMP.2, the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) launched a process with a view to deciding whether to include CCS in the CDM by the fourth session of the CMP, in December 2008. In the discussions on project-based mechanisms by the Ad Hoc Working Group on Further Commitments under the Kyoto Protocol (AWG-KP) at its sixth session part I, three options related were tabled: (1) CCS remains ineligible under the CDM; (2) Annex I Parties cannot use the CERs accruing from CCS activities; and (3) CCS is eligible under the CDM.

⁶¹ McKinsey estimates much smaller potential for CCS in 2020; 120 Mt CO₂ per year compared with about 300 Mt CO₂ per year.

⁶² The secretariat expresses sincere thanks to the United Nations Environment Programme Sustainable Energy Finance Initiative in providing an analysis on the role of public finance in addressing climate change mitigation.

⁶³ FCCC/SB/2008/INF.7.

Table IV-21. Estimates of current public financing for innovation of mitigation technologies (billions of United States dollars)

Stage of technological development at which financing is applied	Source	Estimated average annual investment
Sources outside the Convention		
Research and development, demonstration	Government funding	10
Sources under the Convention		
Deployment, diffusion	Financial mechanism under the Convention (Global Environment Facility Trust Fund, Special Climate Change Fund, Least Developed Countries Fund)	0.22 – 0.32
Deployment, diffusion	Kyoto flexibility mechanisms (clean development mechanism, joint implementation)	4.5 – 8.5
Sources outside the Convention		
Diffusion	Export credit agencies	1 – 2 ^a
Deployment, diffusion	Bilateral and multilateral sources	5 – 10 ^a
Deployment, diffusion	Philanthropic private sources (including non-governmental organizations, foundations and voluntary carbon market finance)	1
Total		22 – 32

^a The estimates apply only to low-carbon technologies and hence cover only a small fraction of the total activity of export credit agencies and bilateral and multilateral sources. The estimates are subject to revision.

303. TABLE IV-21 shows that Convention funding so far has been much lower than funding from sources outside the Convention. While R&D funding by governments is estimated at USD 10 billion and thus represents a significant share, these funds are mostly spent domestically by developed countries. Bilateral and multilateral sources outside the Convention have delivered financing of a similar magnitude but have targeted technologies at later stages in the technology development cycle.

304. As noted in PARAGRAPHS 254 – 258 above, financing for technology innovation will have to be increased significantly at all stages of the innovation process to stabilize concentrations of GHG emissions under the mitigation scenario. Public finance is particularly important at the earlier stages of the technology development process, and currently no international public finance is available for these stages. It is equally important that public finance is used to support the rapid uptake of clean technologies in the deployment and diffusion stages by leveraging the maximum amount of private finance possible. The next section discusses some instruments that can be used to leverage public finance support.

3. PUBLIC FINANCE INSTRUMENTS FOR MITIGATION TECHNOLOGIES

305. A large gap remains between the economic potential of mitigation technologies and their commercial realization. Often, a major cause of this gap is the lack of finance and delivery mechanisms adapted to national and local market conditions. Commercial realization is often blocked by a lack of financing, with investors and lenders unwilling or unable to bring down market barriers on their own.

306. Public finance can mobilize commercial financing suited to local market conditions through different channels, feed-in tariffs, loan guarantees, buydown interest rates, concessional loans, and so on. For example, public funds could be provided as grants⁶⁴ to a development finance institution (DFI) that provides funds to commercial financial institutions (CFIs) on softer terms and/or with greater risks than CFIs. The CFIs, in turn, provide financial products adapted to the local market for mitigation measures. This chain of financing is illustrated in FIGURE IV-7. The sequence in the chain will vary for different mechanisms, applications and circumstances. For example, DFIs could invest directly in projects, which is common for larger grid-connected renewable energy.

307. FIGURE IV-7 illustrates several features of the design and operation of effective public finance mechanisms:

- (a) The catalytic role that public funding (e.g. the GEF in the figure) plays by assuming extra risks and funding costs of programme operations, technical assistance and capacity-building;
- (b) The role that the DFI (e.g. the MDB in the figure) plays by providing a tailored public finance mechanism (guarantees in this case) to local finance institutions, and combining this with technical assistance to structure transactions, turn individual transactions into replicable financial products, create marketing relationships between the finance institutions and the energy service companies, and hence build energy efficiency finance into a commercially viable business line for the partner finance institutions;
- (c) The “branching” effects within the programme design; that is, the DFI works with multiple finance institutions (leasing corporations in this case), and each finance institution can offer a series of financial products to various energy efficiency market segments. The success of this work takes time and grows with experience;
- (d) The leveraging of the public monies along the chain of financing.

308. Effective mechanisms are able to catalyse commercial investment in climate mitigation measures and to build climate finance markets and the capacities of CFIs and other market actors – technology providers, utility companies, energy users and policymakers – to develop and implement mitigation measures on a market basis. To make best use of public funding, it is essential that public finance mechanisms should seek to: (1) leverage commercial investment; (2) indirectly build up the clean energy markets; and (3) respond to market segments and national conditions.

309. Design of appropriate public finance mechanisms must be matched with the financing, institutional and credit characteristics of the target market segment and the national market conditions, including the stage of development of the country’s macroeconomy, the financial system and the relevant industry.

310. The following steps may be considered in the design of public finance mechanisms that can be supported with new public monies to support enhanced mitigation action:

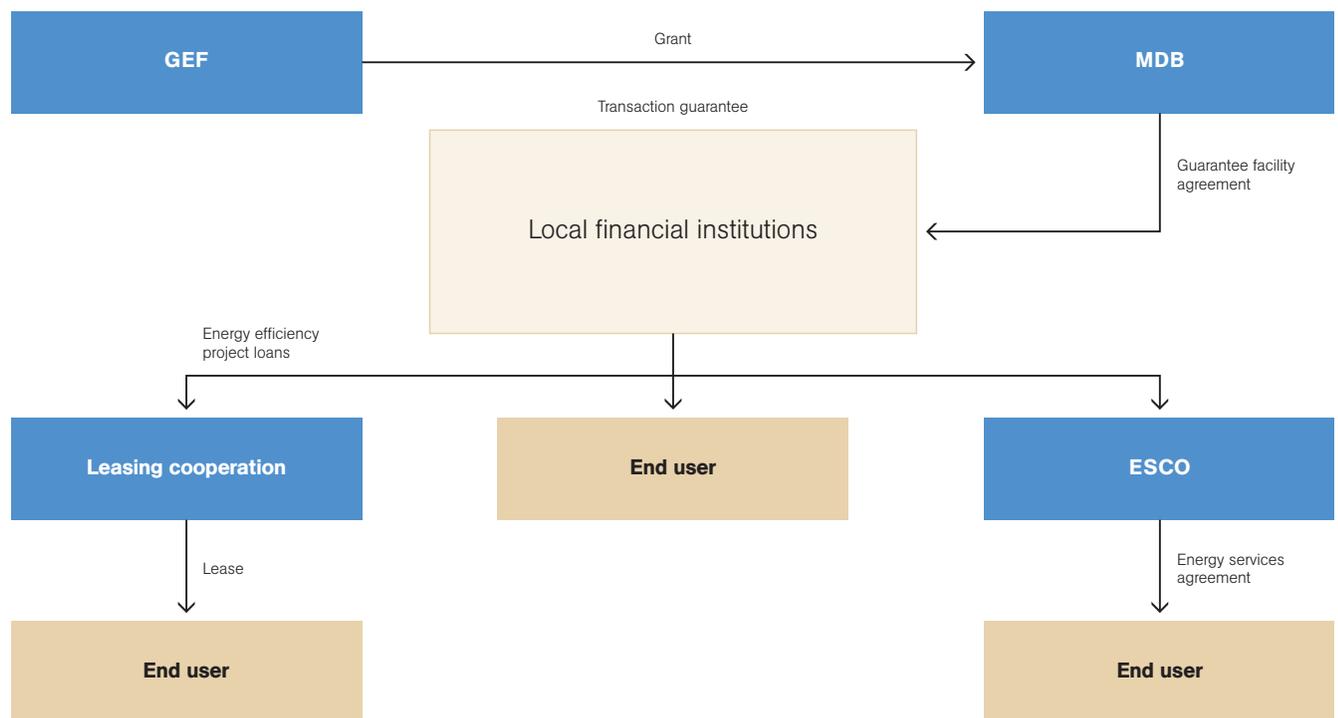
- (a) Identify and address clean energy market barriers and financial market conditions;
- (b) Select target market segments and seek applications and prioritize efforts where there are compelling project economics and where a financially and commercially attractive offer can be made to the target end users;
- (c) Build on existing capacities and engage partners at all levels in the chain of project development, marketing, delivery and financial intermediation;
- (d) Take a programmatic approach to project financing;
- (e) Leverage commercial finance and attract CFIs by addressing their lending criteria regarding deal and market size, credit structure, and transaction costs;
- (f) Undertake technical assistance programmes to build capacities and manage any gaps, roles or risks not addressed by the commercial parties.

(A) PUBLIC FINANCE INSTRUMENTS FOR ENHANCED TECHNOLOGY RESEARCH AND DEVELOPMENT

311. Currently, very little international public finance is available for technology R&D and demonstration. Mechanisms for international public finance to stimulate the early stages of the innovation process include: global innovation centres, inducement prizes, and advance market commitments.

⁶⁴ Grant monies are also used for technical assistance, capacity-building and programme operations costs.

Figure IV-7. Chain of financing through a development finance institution



Abbreviations: GEF = Global Environment Facility, MDB = multilateral development bank, ESCO = energy service company.

312. *Global energy innovation centres* (GEICs) represent cooperative technical programmes driven by the technology needs of developing countries. Joint innovation activities would be greatly facilitated and advanced by GEICs in different parts of the world, which could work on problems and technological solutions specific to that region (Sagar, 2008; Carbon Trust, 2008).⁶⁵, The GEICs would cover all aspects of technology innovation, going from basic research to demonstration and early deployment, with the combination of activities for any one technology being shaped by a nuanced understanding of the innovation gaps for that technology.

313. *Inducement prizes* are “ex-ante grand prizes” to stimulate R&D or technology development (Davis and Davis, 2004). An example is the Golden Carrot awards scheme in the United States, whose first initiative was the development of a super-efficient fridge. Inducement prizes should complement, not replace, traditional funding for research activities. To be successful it is important to define the parameters of participation and the goal to be achieved.

314. *Advance market commitments* involve commitments by governments to purchase a product that meets specified criteria. This approach is attractive since only products that meet the criteria are rewarded.⁶⁶ It also allows companies to pick their preferred R&D/product development strategies (Webber and Kremer, 2001). This approach can stimulate R&D and help to overcome barriers to the deployment of an already developed product (Levine *et al.*, 2005). To be successful, the commitment must be credible and include an explicit financial commitment.

(B) PUBLIC FINANCE MECHANISMS TO ENHANCE DEPLOYMENT AND DIFFUSION OF MITIGATION TECHNOLOGIES

315. **TABLE IV-22** summarizes public finance mechanisms for mitigation technologies that are in the latter stages of development but still face significant market barriers, keeping them from reaching their full economic and environmental potential.

4. SUMMARY

316. Although the vast majority of investment in mitigation technologies must come from the private sector, substantial additional public funding is needed to mobilize and leverage the investment. A substantial body of experience exists with public finance investment mechanisms that successfully mobilize commercial finance, especially in the clean energy field.

317. Public funding needs to shift towards providing more support for earlier stages of the technology development cycle, as private investors are relatively reluctant to move into R&D.

318. Presently, most R&D and demonstration of mitigation technologies is undertaken in a small number of developed countries. International public finance support may help to scale up such activity in developing countries and can develop or adapt technologies suited to their needs. Activities that might be funded include support for innovation centres in developing countries and encouraging participation of developing country institutions in international collaborative research efforts.

319. Besides being aligned to policy frameworks, public finance mechanisms must also be structured to act along the entire chain of financial intermediation, which can include development finance institutions, CFIs, investors, equipment manufacturers, energy service companies and other technology delivery companies.

⁶⁵ This is similar to the Consultative Group on International Agricultural Research (CGIAR) centers, although the analogy may be limited and the design of the GEICs may need to be very different. Such an idea has also been proposed independently by The Carbon Trust (2008).

⁶⁶ For example, in the United Kingdom of Great Britain and Northern Ireland, advance contracts for meningitis C vaccine stimulated the development of meningitis C vaccine (Levine *et al.*, 2005).

Table IV-22. Possible public finance mechanisms for financing mitigation technologies

Mechanism	Description	Barriers addressed	Market segment
Credit line (senior debt)	Debt facilities provided to commercial FIs for on-lending	Commercial FIs lack funds and have high interest rates	Large-scale RE and EE, wholesale loans for energy access markets
Credit line (mezzanine debt)	(Subordinated) Debt provided to (project sponsors through) commercial FIs, for on-lending, in combination with senior debt	Project sponsors lack equity, restrictive debt-to-equity ratios	Medium and small-scale RE projects
Guarantee	Shares project credit (i.e.loan) risks with commercial FIs	High perceived credit risk	Large-scale and grid-connected RE and EE and energy access markets
Project finance fund	Debt facilities by entities other than commercial FIs that provide direct project financing to clean energy projects	FIs lack experience with and capacity for clean energy project finance	Medium and small-scale EE and RE
Private equity fund	Equity investments in clean energy companies and/or clean energy projects	Lack of long-term capital, restrictive debt-to-equity ratios	Large-scale grid-connected RE, energy companies
Private equity fund	Equity investments in clean energy companies and/or clean energy projects	Lack of long-term capital, restrictive debt-to-equity ratios	Large-scale grid-connected RE, energy companies
Venture capital fund	Equity investments in technology companies	Lack of risk capital for new technology development	Any new technology
Contingent grants	Grants "loaned" without interest or repayment until projects are financially viable	Lack of sufficient capital during project development stage	Large-scale grid-connected RE perceived to be high risk
Carbon finance	Monetization of future cash flows from the advanced sale of carbon credits to finance project investment costs	Lack of early stage project development capital, lack of cash flow for additional security; uncertain delivery of carbon credits	Large-scale and grid-connected RE and EE, programme of activities such as in energy access markets
Grants for technical assistance	Funds aimed at building the capacities of market actors involved in project development, financing and operations	Lack of investment-ready projects, lack of skills and knowledge among market actors	All segments in the supply side of the market, demand side, FIs

Source: UNEP, A contribution to the update of the UNFCCC Technical Paper on Investment and Financial Flows to Address Climate Change.
Abbreviations: EE = energy efficiency, FI = financial institution, RE = renewable energy.

IV-F. NATIONAL POLICIES

1. INTRODUCTION

320. Well-designed policies and good institutional frameworks are key to attracting investment. It is important to note that, while some policies might need financial support to be put in place, the amount required is likely to be far smaller than the investment that those policies will leverage. Furthermore, many policies have strong sustainable development benefits, in addition to their GHG reduction benefits, such as improving energy efficiency, supporting governance objectives and creating important legal frameworks.

321. A variety of policies, measures and instruments are available to national governments to limit GHG emissions. Depending on the legal frameworks available to countries, these may be implemented nationally, regionally or locally. They may be supplemented with rules, guidelines and other administrative mechanisms to achieve different goals.

322. National policies also influence the deployment and diffusion of mitigation technologies by redirecting financial and other resources to those climate-relevant technologies. Different types of policies can be applied at different stages of the innovation chain and for different technologies. By mixing different policies a country can develop a mitigation strategy, including technological innovation, that fits its circumstances and development goals, thereby ensuring that it is nationally appropriate.

323. This section reviews available policies and their potential effects to serve as a basis for a discussion on how to incentivize well-designed national policies with GHG co-benefits in [PARAGRAPHS 324 – 327](#) below.

2. TYPES OF NATIONAL POLICIES⁶⁷

324. *Regulatory standards* are the most common form of environmental regulation, covering a wide variety of approaches. A regulatory standard specifies with some precision the action that a firm or individual must take to achieve environmental objectives. This could include specifying technologies or products to use or not use, general standards of performance, and clarification of acceptable and unacceptable behaviour. Technology standards mandate specific pollution abatement technologies or production methods, while performance standards mandate specific environmental outcomes per unit of product.

325. *Taxes and charges* are usually imposed by governments to raise revenue for the common good or to discourage the consumption of things that are perceived to harm the environment or lead to long-term societal costs. A tax on GHG emissions would require individual emitters to pay a fee, charge or tax for every tonne of GHGs released into the atmosphere. Taxes and charges are commonly levelled on commodities and services that are closely related to emissions, such as energy or road use.

326. *Tradable permit systems* have been or are being implemented in a number of OECD countries. However, relatively few developing countries are currently contemplating such an instrument. They are currently participating only by undertaking CDM projects.

327. *Financial incentives* in the form of direct and indirect subsidies can be an important environmental policy instrument, but they have strong market implications and may even lead to increased emissions, depending on their nature. For example, subsidies for fossil fuel production and consumption increase emissions⁶⁸ directly, while subsidies to agriculture can result in expansion of production into marginal lands and corresponding increases in emissions. In contrast, financial incentives to reduce emissions can take different forms, including support for R&D, investment tax credits, low-interest loans, rebate programmes and price supports such as feed-in tariffs for renewable electricity.

328. *Non climate related policies* can have an important influence on GHG emissions. They include policies that focus on poverty, land use and land-use change, land rights, energy supply and security; international trade, air pollution and structural reforms. The mitigation co-benefits of such policies may offer countries an opportunity to achieve synergy between their sustainable development strategies and climate-related goals at a time of limited financial and human resources.

329. Examples of national actions and possible metrics of their sustainable development or GHG mitigation performance are listed in [TABLE IV-23](#).

330. Measuring the climate benefits of such actions will require GHG accounting expertise. Such capacity may need to be built in developing countries.

3. SUCCESSFUL POLICY INSTRUMENTS AND THEIR EFFECT ON TECHNOLOGY DEVELOPMENT

331. Policy instruments can affect different stages of the technology development cycle. During the first two stages – R&D and demonstration – the main needs are for public funding and policies that attract private financing. Governments can for example implement measures, such as grants or tax credits for research spending, that reduce the net cost of research.⁶⁹

332. Most policies, however, are targeted at subsequent technology development stages – early deployment and diffusion – where they are needed to overcome market barriers, encourage take-up of the technology and stimulate continued innovation. Policies relying on financial incentives, such as feed-in tariffs and renewable energy obligations, are particularly suitable to accelerating adoption of the eligible technologies.⁷⁰

333. Different policies are needed for technologies, such as energy efficiency technologies, that face non-price barriers. They include regulations, which need to be carefully designed to ensure there is a continued incentive to innovate.⁷¹

4. ENERGY SUBSIDY REFORM

334. The 2007 report noted that energy subsidies total approximately USD 250 – 300 billion per year. About two thirds of the subsidies are for fossil fuels. Developing countries provide most of the subsidies, although they are concentrated in a few countries. In many cases the subsidies are provided to support poor segments of society, and any reforms of the subsidies undertaken to shift financing into more climate-friendly alternatives would need to ensure that the adverse impacts on these segments of society are avoided. The report also noted that subsidy reform often can yield economic benefits and reduce GHG emissions. A new report by UNEP (2008) confirms the estimate and the potential economic and environmental benefits of energy subsidy reform (UNEP, 2008).

⁶⁷ The discussion in this section is based on IPCC (2007) and Tirpak (2008).

⁶⁸ The 2007 report indicated that global energy subsidies amount to approximately USD 250 – 300 billion per year.

⁶⁹ An example for such a policy is the Kenyan Government's policy for promoting efficient cooking stoves. The main aim of this policy is to support R&D activities that increase the efficiency of stoves and lower their price, which will in turn make the stoves more accessible to urban and rural poor populations (Tirpak, 2008).

⁷⁰ Such policies also help to attract private investors to the technology by providing a return on their investment sooner than would otherwise be possible. An example for such a policy is the renewable energy/wind policy of India, which stipulated a national objective that 10 per cent of power-generating capacity additions should come from renewables in the period 2002 – 2012. To achieve this goal, various financial incentive instruments such as tax holidays and concessional loans were applied (Tirpak, 2008).

⁷¹ Japan's "Top Runner" programme is an example of a regulation that provides a continuous incentive to innovate. In another example, South Africa is considering energy efficiency standards as one of the means to achieve a target of reducing energy consumption by 12 per cent compared with a business as usual scenario (Winkler, Howells and Baumert, 2007). The best performers raise the standard for all products, so innovation tends to increase market share.

Table IV-23. Examples of national policy and action to mobilize climate-friendly investment and financial flows

National action	Metric(s)
Promotion of conservation tillage	Agricultural land under conservation tillage (ha)
Expansion of forest cover	Proportion of the land area under forest cover
Action Plan for the Prevention and Control of Deforestation	Deforestation rates
Consideration of climate externalities in evaluation of electric sector investment projects	Proportion of the generation capacity of natural gas plants
A renewable energy law	Renewable energy generated (GWh)
Promotion of concentrating solar thermal power	Capacity (MW)
Ambitious energy efficiency programmes	Efficiency standards, mandatory reduction targets
Restriction of steel exports	Steel exported (tonnes), emissions from steel production (t CO ₂ eq)
Tax incentives for smaller, more efficient and less polluting cars	Number of more efficient vehicles purchased, tax incentives claimed, estimated abated emissions (t CO ₂ eq)
Certification and labelling of biofuels	Volume ethanol certified
Reduce landfill methane emissions	Number of greenhouse gas reduction projects built
Carbon tax	Emissions taxed (t CO ₂ eq), revenue from tax
Entity- and project-level greenhouse gas registry	Number of entities/sectors enrolled, share of country's emissions registered, number of carbon market projects identified and implemented

Source: Adapted from WRI (2008).

5. SUMMARY

335. A diverse range of policies are available to enable countries to move to low GHG emitting development pathways. Each country needs to adapt or design policies to suit its own institutions and circumstances. Typically, a portfolio of policies, with different policies for different mitigation measures and stages of the innovation process, is likely to be most effective.

336. Mitigation policies could play an important role in attracting private financing for technology development. Different policies have different effects on innovation. Subsidy reform often can yield economic benefits and reduce GHG emissions.

IV-G. DELIVERY ISSUES FOR INTERNATIONAL FUNDING FOR MITIGATION

337. Parties have proposed many options, tools and mechanisms to enhance delivery of international funding for mitigation. These include options to expand the crediting mechanisms in their current form, new approaches to support nationally appropriate mitigation actions that are measurable, reportable and verifiable, and support for national policies to enhance mitigation action. This section explores these options, grouped into proposals to expand market-based mechanisms, proposals to expand public finance and, lastly, proposals to foster implementation of national policies

Table IV-24. Comparison of approaches to scale up mitigation efforts in developing countries

	Classic CDM	Programmatic CDM (programme of activities)
Applicability (sectoral scope)	Projects in almost all sectors possible	Wide deployment of specific technologies
Typical example	Wind power project	Programme for efficient lighting
Potential for large-scale transformation of economy	Small	Potentially large, depends on technology and programme
Contribution to overall global emission reductions	Zero sum at best	Zero sum at best
Additionality	Difficult to determine	Difficult to determine
Integration with Annex I targets	Easy	Probably no demand/supply matching problem
Non-crediting incentives	No	No
Recipient of incentive	Entity that implements project	Entity that implements project
Required government capacity	Low because oversight with United Nations	Low because oversight with United Nations
Transaction costs	High, owing to project by project approach	Lower than classic CDM, but still project cycle
Level of experience with the policy option	Exists, need for improvements	Exists, experience being gathered
Possibility to demonstrate MRV	Project-specific monitoring plans	Statistical methods necessary

Source: Adapted, modified and extended from Ward M, Streck C, Winkler H, Jung M, Hagemann M, Höhne N and O'Sullivan R. 2008. *The Role of Sectoral No-lose Targets in Scaling Up Finance for Climate Mitigation Activities in Developing Countries*. Prepared for the United Kingdom Department for Environment, Food and Rural Affairs, International Climate Division. Abbreviations: CDM = clean development mechanism, GHG = greenhouse gas, MRV = measurable, reportable and verifiable, PoA = programme of activities.

1. PROPOSALS TO EXPAND CREDITING FOR EMISSION REDUCTIONS IN DEVELOPING COUNTRIES

338. The international demand for carbon credits in 2020 is estimated to range between 0.5 – 1.7 Gt CO₂ eq – up to three times more than the current supply in PARAGRAPHS 283 – 284 above. Several approaches to generating larger quantities of credits have been proposed. They are summarized in TABLE IV-24. The coverage of a developing country’s emissions as well as the net contribution to global mitigation efforts increases from left to right. This table also suggests how data on the activities under each proposal could be collected to ensure measurability, reportability and verifiability.

339. The objective of *programmatic CDM*, or programmes of activities (PoAs), is to achieve a greater contribution to sustainable development than is typically possible through the individual project approach of the CDM. This is made possible by aggregating many small or medium GHG reduction opportunities that are geographically dispersed, and occur over a period of time, into a PoA (Hinojosa *et al.*, 2007). The approach is particularly well suited to the wide deployment of individual mitigation technologies such as end-use energy efficiency technologies.

	Sectoral CDM (multi-project baseline)	Sectoral CDM (entire sector baseline)	Sectoral no-lose targets	Policy CDM
	Relatively large sites and homogeneous commodity sectors			Only for easily regulated and monitored sectors
	Programme for efficient lighting	Cement: national average (t CO ₂ per t cement)	Cement: national baseline (t CO ₂ per t cement)	Efficiency standards
	Depends on level of baseline	High, depending on the sector	High, depending on the sector	High
	Zero sum at best	Zero sum at best	Possibly positive	Zero sum at best
	Difficult to determine	Difficult to determine	No issue once baseline negotiated	Very difficult to determine
	Probably no demand/supply matching problem	Demand/supply matching might become a problem due to quantity of credits	Demand/supply matching might become a problem due to quantity of credits	Demand/supply matching might become a problem due to quantity of credits
	No	No	Possibly a technology finance assistance package	No
	Entity that implements project	Government, passes on to private sector	Government, passes on to private sector	Government, passes on to private sector
	Low, only for baseline setting	High – if government passes on credits	High – if government passes on credits	High – if government passes on credits
	Lower than CDM and PoA once baseline is set	Low	Low	Low
	Data might not yet be available of a sufficient quality	Data might not yet be available of a sufficient quality	Data might not yet be available of a sufficient quality	Some experiences with different policies but not with MRV
	Relatively simple	National level GHG inventories	National level GHG inventories	Difficult, mix of methodologies

340. The objective of *sectoral CDM* is to target entire sectors. Two concepts of sectoral CDM are under discussion. One is to establish a *multi-project baseline* for a sector, which would grant credits to private entities whose GHG emissions fall under that baseline. Not all entities in the sector would need to participate, so overall emissions from the sector could theoretically increase. Once a baseline has been approved, the transaction costs for new projects are lower since they do not need to develop their own baselines.

341. The second interpretation of sectoral CDM involves the establishment of a *national sector baseline*.⁷² An entity – probably the national government – is granted credits if the entire sector performs better than the baseline. The government must decide how to incentivize the firms in the sector to implement mitigation actions, including how any credits earned should be distributed. Demonstrating the additionality of the baseline may be more difficult.

342. A *sectoral no-lose target* (SNLT) also seeks to engage entire sectors but differs from sectoral CDM in two ways (Ward *et al.*, 2008; Schmidt *et al.*, 2008). First, developing countries can voluntarily propose an emissions baseline for awarding sectoral credits, which would be negotiated and agreed by the COP together with targets for Annex I Parties.⁷³ Second, since the baselines would be more stringent than the business as usual level and negotiated by the COP together with Annex I Party targets, additionality would not need to be demonstrated.⁷⁴

343. Under *policy CDM*, emission reduction activities would be implemented by the developing country government using deliberate government policies. The main advantage of this proposal is to reduce perverse incentives that might impede GHG-reducing policies and instead to encourage them by crediting their achievements. The credits would accrue to the government, which decides how to incentivize the actors falling under the policy. If policies cut across sectors, it can be very difficult to quantify the reductions actually achieved.

344. Although the above policy tools have been studied and explained in the literature, it remains unclear whether a developing country can implement only one or several of these policy tools. While some tools such as policy CDM or classic CDM can apply to many sectors, sectoral CDM or no-lose targets are much more focused on one area. Therefore, it is important to provide guidance as to when an activity is eligible under which policy tool to avoid double-counting of emission reductions. Further

clarification is needed to draw clear distinctions between existing CDM projects and activities under any of the proposed mechanisms (Baron and Ellis, 2006).

345. Another proposal is to establish a registry of *nationally appropriate mitigation actions* (NAMAs) by developing countries. To secure finance for NAMAs, these actions could be rewarded by credits for the verifiable reductions arising from them. The credits could be established under the Convention as one of the means of finance and technology transfer for the Bali Action Plan. Some of the proposals in [TABLE IV-24](#) could be means of implementing NAMAs. If NAMAs are not eligible to receive credits but are simply recognized or supported by public finance, they would be similar to the concept of sustainable development policies and measures (SD-PAMs), which are discussed in [PARAGRAPHS 363 – 366](#) below.

2. PROPOSALS TO EXPAND INTERNATIONAL PUBLIC FINANCE

346. As part of the AWG-LCA process, many Parties and other stakeholders⁷⁵ have submitted proposals for raising new and additional public finance resources for enhanced mitigation action. Those proposals have been grouped here into four categories: defined contributions from national budgets, international funding sources, bilateral and multilateral initiatives, and other proposals. They are analysed for the origin of the financial resources and the potential to generate public finance resources.

(A) PROPOSALS BY PARTIES TO GENERATE PUBLIC FINANCE

347. Parties have submitted proposals to raise additional revenue from public sources such as national budgetary contributions and funds collected from international sources. These proposals are discussed in turn (see [TABLE IV-25](#)).

FUNDING FROM DEFINED CONTRIBUTIONS FROM NATIONAL BUDGETS

348. The Group of 77 and China has proposed that developed countries should contribute 0.5 – 1.0 per cent of gross national product to addresses climate change, which amounts to almost USD 201 – 402 billion per year. This amount would be over and above the existing ODA commitments.

349. In its proposal for a World Climate Change Fund, Mexico calls for dedicated contributions from national budgets of participating governments. Funds could also be raised by auctioning allowances for domestic emissions trading schemes and levies on air travel.

INTERNATIONAL FUNDING SOURCES

350. Switzerland proposed a uniform global carbon tax by which all fossil fuel emissions in excess of 1.5 t CO₂ per person would be taxed at USD 2 per t CO₂. The share of the revenue remitted to the international fund would rise with increasing GDP per capita. These funds still flow through national budgets.

351. Norway has proposed that a small portion of AAUs could be auctioned by an appropriate international institution.

352. International aviation and marine emissions could be regulated by emissions trading schemes or emissions fees. Revenue from auctioned allowances or a share of the fees could go to international funds.

(B) NEW BILATERAL AND MULTILATERAL INITIATIVES

353. Over the last year, many new bilateral and multilateral funding initiatives have been instituted by developed countries to support climate change mitigation.

NEW PUBLIC FINANCE COMMITTED FOR CLEAN ENERGY ⁷⁶

354. The *Cool Earth Partnership* established by Japan is a bilateral initiative with funding of USD 10 billion committed over five years. The programme intends to provide assistance for improved access to clean energy of up to USD 8 billion; the remaining funds will support other activities to address climate change.

⁷² The baseline can be expressed in terms of emission intensity or absolute sector emissions.

⁷³ Alternatively, each baseline could be based on a bottom-up expert assessment of different industries on a global scale, which might alleviate some competitiveness concerns (Schmidt *et al.*, 2006).

⁷⁴ One proposal suggests that Annex I Parties could provide technology finance and assistance, in addition to the credits that could be earned, to encourage countries to take on more stringent SNLTs (Schmidt *et al.*, 2008).

⁷⁵ Submissions from Parties and intergovernmental organizations are assembled in document FCCC/AWGLCA/2008/16, which also provides document symbols of all submissions. Submissions from NGOs can be found at <<http://unfccc.int/3689.php>>.

⁷⁶ Porter *et al.*, 2008.

Table IV-25. Analysis of proposals by Parties to raise public finances for mitigation

Proposals by Parties	Nature of public finance	Potential resource generation (USD billion)	Notes
Auctioning of small portion of assigned amount units (Norway)	Auctioning	15 – 25	To support both adaptation and mitigation
Auctioning of allowances for emissions from international aviation and maritime	Auctioning	28 ^a	To support both adaptation and mitigation
Uniform global carbon tax (Switzerland)	International taxes	48.5 (total) 18.4 (for international funds)	To support both adaptation and mitigation
World Climate Change Fund (Mexico)	Dedicated budgetary contribution and additional revenue from auctioning	10	To support both adaptation and mitigation
Group of 77 and China proposal	Dedicated budgetary support	201 – 402	To support both adaptation and mitigation

^a UNFCCC secretariat. 2007. *Investment and Financial Flows to Address Climate Change*. Available at: <http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf>.

355. The *International Climate Initiative* of Germany uses some of the revenue raised from auctioning allowances for its domestic emissions trading scheme for national and international climate initiatives. The international component has a budget of about USD 170 million in 2008, with a smaller allocation in subsequent years. Half of this amount will be used to fund sustainable energy supply projects. The other half will support climate change adaptation and measures to conserve biodiversity, mainly through bilateral projects.

356. The *Environmental Transformation Fund – International Window* of the United Kingdom has committed about USD 1.6 billion over three years from 2008 to support programmes and projects to address climate change. A part of the funding would be channelled through other multilateral sources.

357. The *Climate Investment Funds* – the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF) – are being established by the World Bank jointly with the regional development banks. These funds have a total funding committed by donors of USD 6.1 billion. The CTF aims to promote scaled up demonstration, deployment and transfer of low-carbon technologies in the power sector, transportation and energy efficiency in buildings, industry and agriculture.

NEW INITIATIVES FOR REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

358. The Bali Action Plan calls for policy approaches and positive incentives on issues relating to REDD in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. Many Parties have proposed both markets and fund-based mechanisms to support REDD action. Some Parties argue that funds supported by public finance would play a critical role in activities such as capacity-building, institutional strengthening, conservation, sustainable management of forests and other means to increase forest carbon stock. TABLE IV-26 summarizes several dedicated funds and financing instruments that are already operational to support capacity-building and facilitate actions in developing countries to address REDD.

(C) OTHER PROPOSALS

359. Another innovative proposal is “climate bonds”, which could be issued by developing countries in Africa, Asia and Latin America and sold to investors to pay for climate change mitigation projects. Developing country governments may take on the risk of guaranteeing these bonds. Each bond issue would finance projects designed to reduce GHG emissions, and mature bonds could be exchanged for emission reduction credits that could be used to meet developed country emission reduction commitments.

360. The 2007 report suggested that MDBs may be able to use debt swaps for renewable energy and energy efficiency projects. This mechanism would be new and additional to the extent that debt swaps have not yet been deployed for the purpose. However, the mechanism could be an unstable source of public finance over the long run, as the incentive for developed countries to swap debt diminishes as the economic conditions in developing countries improve and they undergo structural adjustments.

361. In summary, the need to scale up international public finance has been recognized and is reflected in several proposals to increase funding for mitigation and for technology development and transfer. Any of these proposals would, of course, require further analysis of the adequacy and predictability of revenues, and the new and additional nature of the funding sources.

3. PROPOSALS TO FOSTER IMPLEMENTATION OF NATIONAL POLICIES

362. The preceding sections have shown that private and public finance alone might not be sufficient to capture existing mitigation opportunities in all sectors and for all activities. For example, there are sectors in which commercially competitive technologies are not implemented because of non-price barriers. Furthermore, FDI tends to flow to countries with good regulatory and institutional frameworks. Both of these factors suggest that well-designed national policies could unleash large investments for mitigation.

363. *Sustainable development policies and measures* (SD-PAMs) could take the form of voluntary pledges by developing country governments to implement sustainable development policies.⁷⁷ The rationale is to start by defining a country’s long-term development goals and then identify domestic policies and measures to achieve a development path that results in lowered

GHG emissions. Consequently, targets would be framed as sustainable development benefits with GHG emissions reductions being reported as co-benefits (Winkler *et al.*, 2008).

364. To assess and compare SD-PAMs, methodologies for quantifying both their local sustainable development benefits and the global GHG co-benefits are required. Winkler *et al.* (2008) have proposed four methods: case studies, national energy modelling, analysis of sectoral data, and the use of global emission allocation models.

365. Scaling up mitigation efforts via SD-PAMs is likely to require substantial domestic and international financial resources. But proponents advocate abstaining from using carbon finance via crediting mechanisms to finance SD-PAMs, for two reasons. First, this makes funding more flexible in that climate change funding need not be

separated from non-climate funding. This addresses the real challenge of instilling carbon considerations into the broader set of international capital flows, only some being climate-specific (Winkler *et al.*, 2008). Second, SD-PAMs are thus kept distinct from the other proposals, such as policy CDM.

366. However, it could be possible to fund SD-PAMs in certain areas and thereby create the enabling environment for crediting mechanisms to yield better results.

⁷⁷ They can be single country pledges, mutual pledges between a developing country and a developed country, or harmonized pledges among multiple countries (Bradley and Pershing, 2005).

Table IV-26. National and multilateral initiatives with public finance for activities related to reducing emissions from deforestation and forest degradation

Initiative	Estimated level of funding (USD million)	Period	Nominal annual level of funding (USD million)
International Forest Carbon Initiative (Australia) ^a	135	Uncertain	50 (pledged so far)
Climate and Forest Initiative (Norway) ^b	2,250	2008 – 2012	450
Forest Carbon Partnership Facility (World Bank) ^c	300	2008 – 2018	Uncertain
UN-REDD Programme ^d	35	2008 – 2012	Uncertain
Amazon fund ^e	1,000	2008 – 2015	100 (pledged so far)
Congo Basin Forest Fund ^f	200	Uncertain	Uncertain

^a <<http://www.climatechange.gov.au/international/publications/Is-ifci.html>>.

^b <<http://www.regjeringen.no/en/dep/md/Selected-topics/klima/why-a-climate-and-forest-initiative.html?id=526489>>.

^c <<http://carbonfinance.org/Router.cfm?Page=FCPF&ft>About>>.

^d <http://www.undp.org/mdtf/UN-REDD/assistance_strategy.shtml>.

^e <http://www.bndes.gov.br/english/news/not191_08.asp>.

^f <<http://www.cbf-fund.org/>>.

IV-H. SUMMARY

367. Mitigating climate change will require technological and behavioural change on several fronts. Any future agreement to enhance mitigation action needs to encompass a variety of funding sources and delivery mechanisms that address GHG emissions from all sectors in all countries, and also foster development and transfer of mitigation technology.

368. New scenarios and estimates of emission reductions required in 2030 are virtually the same as those presented in the 2007 report. However, the estimates of the additional investment that will be needed are about 170 per cent higher, mainly due to of higher projected capital costs for energy supply facilities. This increases the scale of the challenge to generate additional investment and financial flows. In this light, the strategies presented in the 2007 report to scale up, shift and optimize investment and financial flows to mitigate climate change assume even greater significance.

369. Developed countries need to take the lead in addressing climate change by, inter alia, scaling up their mitigation efforts. However, a significant mitigation potential is available in developing countries. Therefore, it is important to assess how best to support mitigation efforts in developing countries in line with the commitments of developed country Parties under the Convention.

370. Updated estimates based on MAC cost curves using bottom-up analysis indicate a mitigation potential of approximately 5.8 – 7.5 Gt CO₂ eq in 2020.

371. Significant mitigation potential exists until 2020 with known technologies. However, to achieve the necessary reductions for 2030, mitigation actions, including changes in behaviour, have to be scaled up considerably and new mitigation opportunities need to be identified and developed. To make use of available technologies and to bring on new technologies, additional funding will be needed at all stages of the technological development cycle and across all sectors. The type and source of this funding must be appropriate for the stage of maturity.

372. Technologies at the deployment and diffusion stages may not be commercially competitive owing to price and/or non-price barriers. That cost difference can generally be addressed by various policies such as provision of additional public funding (e.g. GEF funding) and putting a price on GHG emissions, which is the basis

of emissions trading and mechanisms such as the CDM and JI. These approaches appear to work well in the energy supply and industry sectors.

373. However, even technologies that demonstrate favourable economics may not be deployed for a variety of other reasons such as market organization, lack of information and low availability of finance. The low penetration rates of the CDM in the buildings and transportation sectors suggest that several of the climate-relevant technologies in these sectors possibly face non-price barriers. Faster adoption of those technologies usually requires regulations, such as energy efficiency standards, or other policies as well as the capacity and infrastructure to implement the regulations or policies.

374. Present crediting mechanisms do not support technology at the R&D and demonstration stages. An acceleration of technology development in all sectors will require increased funding for R&D and demonstration, policies to promote near commercial technologies, and policies that mandate or reward emission reductions.

375. Global energy R&D and demonstration, which is currently concentrated in a few developed countries, will need increased funding, and a shift in the mix of technologies funded. The involvement of developing countries in such efforts can be enhanced by providing financial support for innovation centres and through their participation in international research agreements.

376. The challenge is to push a large, constantly-changing set of mitigation technologies in various sectors through the technology development cycle so that they become commercially competitive and to accelerate their adoption in developed and developing countries whose national circumstances vary widely. Private finance, including financial flows through carbon markets, public finance and well designed national policies can contribute to this goal.

377. Private investment in clean energy continued to grow rapidly during 2007. While incentives created by the carbon market may play a role, other factors such as sustained high oil prices, concerns over energy supply constraints and better policy frameworks and regulatory environments too are likely drivers of growth. This highlights the importance of improving policy frameworks to attract and shift the flow of private finance from conventional to climate-relevant technologies.

378. Crediting mechanisms have demonstrated their role in delivering additional financial resources to developing countries, a role that could be expanded by increasing the resource flows. The new estimates for the size of the international crediting mechanisms range from 0.5 to 1.7 Gt CO₂ eq per year in 2020. At an average price of USD 20 per t CO₂ eq, the potential demand would represent additional financial flows to developing countries of USD 10 – 34 billion.

379. Although market-based mechanisms are incentivizing the private sector to fund additional investment and financial flows needed for mitigation measures and technologies, substantial additional public funding is needed to mobilize and leverage more private investment. A substantial body of experience has accumulated in public finance investment mechanisms that successfully mobilize commercial finance, especially in the clean energy field.

380. International public finance could be provided to support efforts to scale up R&D and demonstration in developing countries. This might include support for innovation centres and encouraging participation in international collaborative projects.

381. Besides being aligned to policy frameworks, public finance mechanisms must also be structured to act along the entire chain of financial intermediation, which can include development finance institutions, CFIs, investors, equipment manufacturers, energy service companies and other technology delivery companies.

382. A diverse range of policies are available to enable countries to move to low GHG emitting development pathways. Each country needs to adapt or design policies to suit its own institutions and circumstances. Typically, a portfolio of policies, with different policies for different mitigation measures and stages of the innovation process, is likely to be most effective.

383. Clearly, financing enhanced mitigation action in developing countries will require options, tools and mechanisms to channel private and public finance enable through national policies and the Convention. These efforts may be explored in accordance with 1 b (ii) of the Bali Action Plan, which calls for “nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner”.

384. TABLE IV-27 summarizes the options, tools and mechanisms available to shift, scale up and optimize the provision of financial resources to enhance mitigation actions.

Table IV-27. Possible options, tools and mechanisms available to enhance mitigation actions

		Funding sources
		Private finance
Scale up	Mitigation measures	More stringent targets for domestic and international carbon markets Mitigation measures mandated or encouraged by national policies
	Technology development	Support all stages, especially technologies nearly commercially viable
Shift	Mitigation measures	Shift from GHG-emitting to non-emitting technologies, especially in power sector, and from purely project to more comprehensive approaches
	Technology development	
Optimize	Mitigation measures	Use mix of market and non-market policies to attract private funds to the most cost-effective measures
	Technology development	

Abbreviations: GHG = greenhouse gas, R&D = research and development, RD&D = research, development and deployment.

		Provision	
	Public finance	National policies	Convention
	Support mitigation measures not well addressed by carbon market because they face non-price barriers or need more financial support than is provided by the market price Scale up public finance support, especially in countries where private finance/carbon market is less successful	For facilitating measures that face non-price barriers, such as energy efficiency measures especially for buildings For facilitating measures that need more financial support than provided by the market price	Raise additional financial resources and agree on their distribution Agree on means of providing private and public support for mitigation measures in developing countries Support technology transfer to developing countries
	Finance RD&D when private sector not willing to invest (owing to high risk, long development times or 'public good' character) Early deployment support (e.g. if infrastructure crucial)	Domestic carbon markets and other policies that create demand for technologies at the deployment and diffusion stages	Agree on means to increase support for all stages of technology innovation in developed and developing countries Send long-term signal (important for private-sector innovation)
		Domestic carbon markets and other policies that induce a shift to low-emitting technologies Reform subsidies for fossil fuels and agriculture that increase emissions	Agree on support for changes to national policies in developing countries Agree on which actions need to be measured, reported and verified
	Shift support for R&D from GHG-emitting to non-emitting technologies		Joint R&D efforts
	Use public funds to optimize risk-return profile of mitigation measures in order to attract and leverage private funds, e.g. through public-private partnerships	Optimize national policies to achieve the most cost-effective emissions reductions Promote development of a robust financial sector to facilitate optimal financing mix, ensure coherence among different crediting mechanisms	Use Convention funds to leverage additional funds and finance implementation of national policies Agree on conditions for interplay between different finance mechanisms
	Use public funds to leverage private funds		Agree on mechanisms to facilitate developing country contributions to technology development

V. PROVISION OF FINANCIAL RESOURCES AND INVESTMENT TO SUPPORT ACTION ON ADAPTATION, MITIGATION AND TECHNOLOGY COOPERATION

385. CHAPTERS III and IV above discussed estimates of the resources needed for enhanced action on adaptation and mitigation, respectively. Acknowledging that adaptation needs and mitigation potentials vary with national circumstances and that lessons regarding the most effective mix of policies are still being learned, the two chapters considered the possible roles of public and private financing, as well as the role of national policies, in scaling up resources and optimizing their use, including by shifting investments towards climate-friendly and climate-resilient alternatives.

386. Taking into account findings from CHAPTERS III and IV as well as proposals from Parties and observer organizations submitted to the secretariat in the context of the AWG-LCA⁷⁸ and the AWG-KP, this chapter maps out the possible key elements for enhanced financing to support action on mitigation, adaptation and technology cooperation (see FIGURE V-8).

387. The remainder of the chapter is organized as follows: first, the mobilization of financial resources and investment is discussed (CHAPTER V-A), then access to, and disbursement of, financial resources and investment are examined (CHAPTER V-B). CHAPTER V-C explores possible institutional mechanisms for managing the financial resources and investment that will be required. All subchapters consider existing arrangements before examining the proposals for future arrangements. The chapter concludes with a summary of the elements of an overall financing framework.

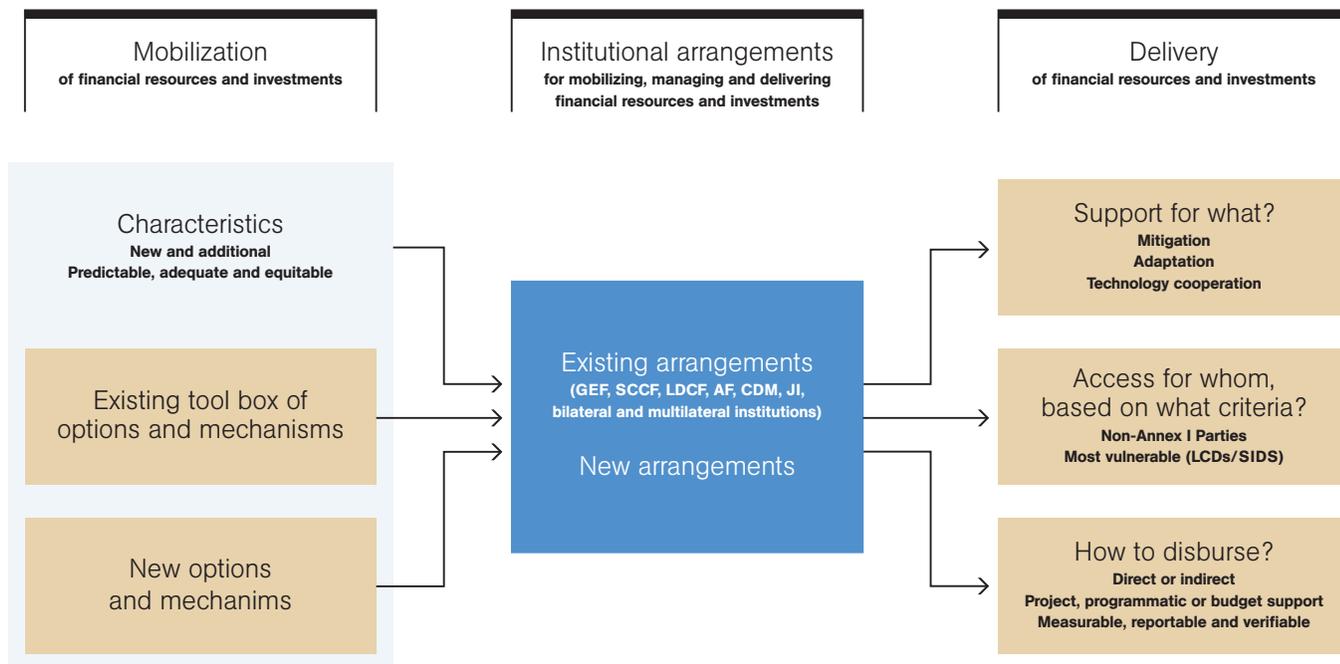
V-A. MOBILIZATION OF FINANCIAL RESOURCES AND INVESTMENT

388. According to the 2007 report, about 60 per cent of total global investment is mobilized from domestic sources, and foreign direct investment and international debt each provide about 20 per cent. By region, the share of domestic investment ranges from 20 per cent in the EU to 90 per cent in Africa and the Middle East. ODA funds provide less than 1 per cent of investment globally, but this rises to over 2 per cent in Africa and over 6 per cent in LDCs. A significant amount of financing is provided by the private sector, in particular in the area of mitigation and associated technology development, transfer and cooperation. Funding for adaptation comes currently mainly from public resources.

389. Under the Convention and its Kyoto Protocol, developed country Parties (specifically, Annex II Parties) agreed to provide new and additional financial resources to assist developing country Parties in implementing the Convention (Article 4, paragraph 3) and the Protocol (Article 11). This assistance may be provided through the financial mechanism defined in Article 11 of the Convention and referred to in Article 11 of the Kyoto Protocol. In accordance with Article 11, paragraph 5, of the Convention, the developed country Parties may also provide, and developing country Parties avail themselves of, financial resources through bilateral, regional and other multilateral channels.

⁷⁸ Submissions from Parties and intergovernmental organizations are assembled in document FCCC/AWGLCA/2008/16/Rev.1, which also provides document symbols of all submissions. Submissions from NGOs can be found at <<http://unfccc.int/3689.php>>.

Figure V-8. Possible key elements for enhanced financial support under the convention



Abbreviations: AF = Adaptation Fund, CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation, LDCF = Least Developed Countries Fund, LDCs = least developed countries, SCCF = Special Climate Change Fund, SIDS = small island developing States.

1. CURRENT AND PLANNED FUNDING AND INVESTMENTS FOR ADAPTATION, MITIGATION AND TECHNOLOGY COOPERATION

(A) AVAILABLE FUNDING UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

390. CHAPTERS III and IV above explored the funding for mitigation, adaptation and technology cooperation that is available under the Convention through the GEF Trust Fund, the SCCF and the LDCF, which all depend on voluntary contributions from donor countries, and from the Adaptation Fund, which is financed with the proceeds of the two per cent levy on CERs issued for CDM projects.

391. Funding is also available from the international carbon market established under the Convention and its Kyoto Protocol, which includes the CDM and JI. The total funding available from the various sources and GEF replenishment periods is shown in TABLE V-28.

(B) AVAILABLE AND PLANNED BILATERAL AND MULTILATERAL FUNDS

392. Total ODA provided in 2007 for all purposes through bilateral and multilateral channels was USD 103.7 billion (see PARAGRAPH 161 above). Although most ODA-funded activities do not target mitigation, adaptation or

Table V-28. Funding available under the Convention and its Kyoto Protocol (millions of United States dollars)

Source	Amount	Timeframe	Notes
Mitigation			
Funds			
Pilot phase	280.6	1991 – 1993	
GEF 1	507.0	1994 – 1998	
GEF 2	667.2	1998 – 2002	
GEF 3	881.8	2002 – 2006	
GEF 4	1,030.0	2006 – 2010	
Already committed under GEF 4	352.0		
SCCF (Technology)	16.2	As at 7 November 2008	Total, includes pledges
Special programmes under GEF 4: Sustainable forest management/LULUCF	154.0		
Investments			
CDM	8 400.0	During 2007	Market value of the expected emission reductions by CDM projects during 2007
JI	400.0	During 2007	Market value of the expected emission reductions by JI projects during 2007
Adaptation			
Funds			
SPA	50.0	GEF 3 – GEF 4	Resources have been allocated
SCCF (Adaptation)	90.3	As at 7 November 2008	Total, includes pledges
LDCF	172.0	As at 7 November 2008	Total, includes pledges
Adaptation Fund	400.0 to 1,500.0	2008 – 2012	Estimated total
	91.3	As at 31 October 2008	Estimated current funding

Source: FCCC/CP/2006/3, FCCC/CP/2007/3, GEF. 2008. *GEF Resource Allocation Framework: GEF 4 Indicative Resource Allocations for the Biodiversity and Climate Change Focal Areas Based on the Midterm Reallocation*, GEF. 2008. *Status Report on the Climate Change Funds*. GEF/LDCF/SCCF.5/Inf.2.
Abbreviations: CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation, LDCF = Least Developed Countries Fund, LULUCF = land use, land-use change and forestry, SCCF = Special Climate Change Fund, SPA = Strategic Priority on Adaptation under the GEF Trust Fund.

^a GEF 1 refers to the first replenishment period of the GEF Trust Fund, GEF 2 to the second replenishment period, and so on.

technology cooperation specifically, there is potential to leverage additional financial flows towards more climate-friendly and -resilient technologies. In addition, several bilateral and multilateral funding initiatives have been launched recently with the specific aim of addressing climate change or broader global environmental issues with a significant climate change component. These initiatives are discussed in CHAPTERS III and IV above. For an overview, see TABLE V-29.

393. In conclusion, current funding available for mitigation under the Conventions is less than USD 1 billion per year, whereas almost USD 9 billion was generated by the CDM and JI in 2007 alone. The new bilateral and multilateral initiatives will provide significant annual funding for mitigation. The amount of funding for adaptation that will be available from current sources and the new initiatives is much smaller: less than USD 500 million per year, most of which will be provided through the Adaptation Fund. Current and planned resources are insufficient to adequately respond to the identified adaptation needs and mitigation potential, which are estimated to amount to hundreds of billions of United States dollars.

Table V-29. New bilateral and multilateral climate-related funding initiatives

	Estimated level of funding (million)	USD million eq ^a	Purpose	Type	Period	Nominal annual level of funding (USD million)
Bilateral initiatives						
Cool Earth Partnership (Japan)	USD 10,000	10,000	A, M	G, L	2008 – 2012	2,000.0
ETF-IW (United Kingdom)	GBP 800	1,182 ^b	A, M	G, L	2008 – 2010	394.0
Climate and Forest Initiative (Norway) ^c			M	G, L		< 600.0
UNDP-Spain MDG Achievement Fund	EUR 90	114	A, M	G	2007 – 2010	28.5
GCCA (European Commission) ^d	EUR 60	76	A, M	G	2008 – 2010	25.3
International Climate Initiative (Germany) ^e	EUR 600	764	A, M	G	2008 – 2012 ^f	153.0
IFCI (Australia)	AUD 200	132	M	G	2007 – 2011	26.4
Multilateral initiatives						
UN-REDD ^g	USD 35	35	M	G	Not available	Not available
Forest Carbon Partnership Facility (World Bank) ^h	USD 300	300	M	G, L	2008 – 2020	23.0
Climate Investment Funds (World Bank), includes	USD 6,341	6,341			2009 – 2012	1,558.0
Clean Technology Fund	USD 4,334	4,334	M	G, L		
Strategic Climate Fund, includes	USD 2,006	2,006		G, L		
Forest Investment Programme	USD 58	58	M	G, L		
Scaling-up Renewable Energy	USD 70	70	M	G, L		
Pilot Programme for Climate Resilience	USD 240	240	A	G, L		

Source: Porter G, Bird N, Kaur N and Peskett L, 2008, *New Finance for Climate Change and the Environment*. The Heinrich Boll Foundation and WWF, World Bank, 2008, *Trustee Report Financial Status of the CIF*. CTF/TF.C.1/Inf.2. Abbreviations: A = adaptation, ETF-IW = Environmental Transformation Fund – International Window, G = grants, GCCA = Global Climate Change Alliance, IFCI = International Forest Carbon Initiative, L = loans, M = mitigation, MDG = Millennium Development Goals, UN-REDD = United Nations Collaborative Programme on Reduced Emissions from Deforestation and Degradation.

^a Valued at exchange rates available on 14 November 2008.

^b It is expected that most of the finance available under this initiative will be channelled through the Clean Investment Funds of the World Bank.

^c <http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/norway_accra.pdf>.

^d <http://ec.europa.eu/development/policies/9interventionareas/environment/climate/climate_en.cfm>.

^e <<http://www.oecd.org/dataoecd/38/61/40633487.pdf>>.

^f During 2008 – 2012, funding for the initiative will be generated from auctioning 10 per cent of allowances from the European Union emissions trading scheme.

Larger amounts of funding can be expected from 2013 onwards, with up to 100 per cent auctioning.

^g <<http://www.undp.org/mdtf/un-redd/overview.shtml>>.

^h <<http://wbcarbonfinance.org/Router.cfm?Page=FCPF&ItemID=34267&FID=34267>>.

2. PROPOSED OPTIONS, TOOLS AND MECHANISMS TO GENERATE FINANCIAL RESOURCES FOR ACTION ON ADAPTATION, MITIGATION AND TECHNOLOGY DEVELOPMENT AND TRANSFER AND COOPERATION

394. In their submissions, Parties and observer organizations have provided ideas and proposals on how to mobilize new and additional resources from public- and private-sector funding and investment for mitigation, adaptation, and technology development and transfer. Regarding the public sector, many Parties note that it plays a critical role in providing incentives and creating the legal, regulatory and governance structures that will mobilize funds from private sources. Many proposals recommend that public finance should be the main source of funding for adaptation and REDD. On the private sector, proposals underline its importance for generating financial flows for mitigation. Many Parties emphasize the use of the carbon market to leverage private sector funding, and propose the expansion of the market-based mechanisms.

395. Proposals involve either expanding existing tools and mechanisms or developing new ones; their specifics have been given in [CHAPTERS III](#) and [IV](#) above. There is a wide range in the funding that each proposal could be expected to generate, but together they have the potential to mobilize tens of billions of United States dollars per year.

(A) EXPANSION OF CURRENT FUNDING AND INVESTMENT UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

396. The fourth review of the financial mechanism was initiated at COP 13, by decision 6/CP.13. It is expected that the COP will make an assessment of the funds that are necessary to assist developing countries in implementing the Convention and provide input into the negotiations on the fifth replenishment of the GEF (GEF 5) covering the period 1 July 2010 to 30 June 2014. In order to avoid a break in programming between GEF 4 and GEF 5, resources need to be pledged and made available by July 2010. GEF 5 replenishment discussions were launched in November 2008. One issue that is likely to be discussed is the question of how to broaden and strengthen the existing funding base.⁷⁹

397. As detailed in [CHAPTER IV](#), the projected potential demand for international credits in 2020 is in the range of 500 – 1,700 million t CO₂ eq. At an average price of USD 20 per t CO₂ eq, the potential demand would represent additional financial flows to developing countries of USD 10 – 34 billion per year.

398. With regard to funding specifically for adaptation, proposals include retaining the existing 2 per cent levy on the CDM (EU) and possibly expanding it to 3 – 5 per cent (Bangladesh and Pakistan). If the levy on the CDM is retained as is, the level of funding could be USD 200 – 680 million per year. If the CDM levy were expanded to 3 – 5 per cent, the level of funding in 2020 could range from USD 300 million per year (assuming a 3 per cent levy and low demand for credits) to USD 1.7 billion per year (assuming a 5 per cent levy and high demand).

(B) NEW OPTIONS, TOOLS AND MECHANISMS

399. Parties have proposed a number of innovative options, tools and mechanisms to scale up resources to address climate change. Proposals include defined contributions from Annex I Parties, use of market mechanisms, expanding the carbon market, auctioning emission allowances, applying a carbon tax and levying aviation and maritime fuels. Many Parties have suggested that financial resources be provided by Parties, taking into account a variety of criteria, including (historical) GHG emissions, national circumstances and capabilities, and population. [TABLE V-30](#) presents the potential of various proposals to generate financial resources. Proposals vary in terms of how much of the resources would be allocated to adaptation, mitigation and technology cooperation. For details, see [CHAPTERS III](#) and [IV](#).

⁷⁹ FCCC/CP/2008/2.

Table V-30. Potential financial resources for adaptation, mitigation and technology cooperation (billions of United States dollars)

Proposal	Source of funding	Purpose	Notes	Nominal annual level of funding
Increasing the scale of existing mechanisms				
European Union	Continue 2 per cent levy on SoP from CDM	A	Ranging from low to high demand in 2020	0.2 – 0.68
Bangladesh, Pakistan	3 – 5 per cent levy on SoP from CDM	A	Ranging from low to high demand in 2020	0.3 – 1.7
Many Parties	CDM and other crediting mechanism	M	In 2020	10 – 34
Defined budgetary contributions from developed countries				
Group of 77 and China	0.5 – 1 per cent of GNP of Annex I Parties ^a	A, M	Calculated for 2007 GDP	201 – 402
Contributions raised through market-based mechanisms and taxation				
Mexico	Contributions based on GDP, GHG and population and possibly auctioning permits in developed countries	A, M	Initial phase	10
Norway	Auctioning of AAUs, for example 2 per cent	A	Annually	15 – 25
Switzerland	2 USD per t CO ₂ with a basic tax exemption of 1.5 t CO ₂ eq per inhabitant	A	Annually	18.4
Republic of Korea	Crediting NAMAs	M		Uncertain
Colombia, LDCs	2 per cent levy on SoP from joint implementation and emissions trading	A	Annually, after 2012	0.03 – 2.25
LDCs	Levy on international air travel (IATAL)	A, M	Annually	4 – 10
LDCs	Levy on bunker fuels (IMERS)	A	Annually	4 – 15
Tuvalu	Auction of allowances for international aviation and marine emissions	A, M	Annually	28

Sources: FCCC/AWGLCA/2008/16, FCCC/TP/2008/6, Müller B. 2008. *International Adaptation Funding, The Need For An Innovative and Strategic Approach*. Oxford: Oxford Institute for Energy Studies, and UNFCCC secretariat. 2007. *Investment and Financial Flows to Address Climate Change*. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf.
Abbreviations: A = adaptation, AAU = assigned amount unit, CDM = clean development mechanism, GDP = gross domestic product, GHG = greenhouse gas, GNP = gross national product; IATAL = International Air Travel Adaptation Levy, IMERS = International Maritime Emission Reduction Scheme, LDCs = least developed countries, M = mitigation, NAMAs = nationally appropriate mitigation actions, SoP = share of proceeds.

^a Owing to a lack of information on GNP, potential funding was calculated using GDP.

400. Comparing TABLES V-28, V-29 and V-30, it becomes apparent that potential resources to address climate change could be significantly larger – by two to three orders of magnitude – than currently available and planned resources. Parties have indicated that sources of financing should have certain characteristics, which could help to guide considerations of the wide variety of proposals and options put forward under the Bali Action Plan process. Specifically, the mobilization of resources should be:

- (a) *Adequate.* Resources are adequate if they are sufficient to cover the relevant costs of adapting to the adverse effects of climate change; undertaking nationally appropriate mitigation actions; and ensuring the technology cooperation required for the first two elements;
- (b) *Predictable.* Predictability of resources is important not only for proper planning and sequencing of adaptation and mitigation actions, but also for ensuring that the financing arrangements are able to address the varying and heterogeneous adaptation requirements and mitigation actions. There is therefore a greater emphasis on the non-discretionary nature of the financing arrangements. Conversely, the predictability of resources may be ensured by seeking options that do not rely on voluntarily transferred national funds but emphasize automaticity and defined or mandated contributions;
- (c) *Equitable.* Any process of generating revenue will do so through imposing financial burdens, and therefore the issue of equitable sharing of this burden among relevant actors becomes significant for the acceptability of the revenue option. In the context of climate change, the key burden-sharing principle is that of common but differentiated responsibilities and respective capabilities, as enshrined in Article 3, paragraph 1, of the Convention;
- (d) *New and additional.* In the light of the large disparity between requirements for funding to address climate change and the level of resources currently available to meet those requirements, the Bali Action Plan reiterates the need for the generation of new and additional resources. Funds sourced internationally through market-based mechanisms and taxation are, by definition, new and additional. Whether national contributions are new and additional depends on whether they are drawn from conventional fiscal revenue, and possibly count towards a country's ODA commitment, or whether they constitute new revenue from taxes on fossil fuels or GHG emissions.

V-B. DELIVERY OF FINANCIAL RESOURCES AND INVESTMENT

401. Efficient and effective delivery of financial resources and investment will be central to the success of global efforts to address climate change. It involves aspects of access, disbursement and allocation, and measuring, reporting and verifying the provision of financial support for measurable, reportable and verifiable action.

1. ACCESS TO FINANCIAL RESOURCES AND INVESTMENT

402. Issues related to access concern eligibility (i.e. who can receive funds, based on what criteria), ability (e.g. who can participate in the carbon market), amount (i.e. how much can be accessed by one country) and technicalities of access.

(A) CURRENT ACCESS

403. The majority of currently available funds under the Convention are accessible through the GEF, which manages the Trust Fund, the LDCF and the SCCF. Whereas developing countries and countries with economies in transition are eligible to access the GEF Trust Fund, only developing countries are eligible for the SCCF, and only LDCs are eligible for the LDCF.

404. Eligible countries cannot access resources directly. Instead, they have to propose projects for financing through one of currently 10 agencies, which assist governments and NGOs in the development, implementation and management of GEF-funded projects.⁸⁰

405. Climate change funds under the GEF Trust Fund are only used to meet a project's incremental costs of implementing measures covered by Article 4, paragraph 1, of the Convention. The remaining costs (of national and local benefit) are borne by the recipient country including through support by other bilateral and multilateral donors. Although the incremental cost principle does not apply to the LDCF or to the adaptation window of the SCCF, a similar principle is applied, in that these funds are only available for meeting the additional costs of adapting to climate change. The technology window of the SCCF covers another type of full incremental costs, which the GEF defines as "simply the programmatic costs of removing the barriers so that the markets will become established and operate more efficiently" (GEF, 2008d).

406. Responding to difficulties experienced by developing countries with the incremental cost principle, in June 2007 the GEF Council approved the “Operational guidelines for the application of the incremental cost principle”,⁸¹ which provide a simple five-step process for determining the incremental costs of a GEF project. According to the GEF, these guidelines have significantly enhanced the transparency and efficiency of determining the incremental costs of a project throughout the project cycle.⁸²

407. Provision of funding from the GEF Trust Fund is subject to the resource allocation framework (RAF), a system for allocating GEF resources to recipient countries based on each country’s capacity, policies and practices for successfully implementing GEF projects, as well as the particular project’s potential to generate global environmental benefits. The RAF applies only to mitigation funds. Allocation of adaptation funds under the SCCF takes geographical and sectoral balance into consideration, and allocation of adaptation funds under the LDCF aims for equitable access of LDCs.

408. The GEF Evaluation Office has reviewed the degree to which resources have been allocated to countries in a transparent and cost-effective manner based on global environmental benefits and country performance (GEF EO, 2008). The review concluded that unclear guidelines for the “group allocation system” in the RAF have limited access for countries with a group allocation⁸³ in the first period of the RAF, that the design and rules of the RAF are too complicated, and that guidelines and support have not succeeded in making the RAF transparent or accessible. At its November 2008 meeting, the Council agreed to reallocate unused funds for the remainder of GEF 4 and to improve RAF design and indices for GEF 5 (Joint Summary of the Chairs, 2008).

409. Issues raised periodically with regard to access to GEF funding include: effectiveness and efficiency of the system, transparency, predictability in project selection, and the overall length of the GEF project cycle (GEF EO, 2006). In response to these concerns, the GEF has been undergoing reforms to speed up its project cycle and introduce a new results-based management framework. It has also started a process of consultations with recipient countries regarding their national priorities. A Conflict Resolution Commissioner to address countries’ concerns has been appointed.

410. Funding for adaptation will also be provided through the Adaptation Fund. The Adaptation Fund Board is still in the process of developing operational guidelines outlining access matters. According to decision 1/CMP.3, Parties that are eligible for funding from the Fund are developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change.

411. Countries can also attract investments through the carbon market, notably through the CDM and JI. CDM projects must go through a public registration and issuance process designed to ensure real, measurable and verifiable emission reductions that are additional to the emissions reductions that would have occurred without the project. In order to be considered for registration, a project must first be approved by the project proponent’s designated national authority. Similarly, for JI projects, the host Party must verify the emission reductions as being additional to any that would have otherwise occurred.

412. Assessments of the regional and subregional distribution of CDM projects often emphasize the context of the market in which the mechanism operates.⁸⁴ CDM projects are concentrated in Parties not included in Annex I to the Convention (non-Annex I Parties) with particularly high GHG emissions reduction potential. This disadvantages Parties that are less economically advanced and therefore offer less potential for achieving large emission reductions at low cost.

⁸⁰ The 10 agencies are African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Food and Agriculture Organization of the United Nations, Inter-American Development Bank, International Fund for Agricultural Development, UNDP, the United Nations Environment Programme, United Nations Industrial Development Organization and the World Bank.

⁸¹ Available at: [http://www.gefweb.org/uploadedFiles/Documents/Council_Documents_\(PDF_DOC\)/GEF_31/C.31.12%20Operational%20Guidelines%20for%20Incremental%20Costs.pdf](http://www.gefweb.org/uploadedFiles/Documents/Council_Documents_(PDF_DOC)/GEF_31/C.31.12%20Operational%20Guidelines%20for%20Incremental%20Costs.pdf).

⁸² FCCC/CP/2008/2.

⁸³ “Group allocation” refers to a pool of funds accessible by a group of countries with no fixed allocation per country.

⁸⁴ FCCC/KP/CMP/2008/INF.2, paragraph 15.

(B) PROPOSED ACCESS

413. To improve access to funds, the Group of 77 and China has called for streamlined and efficient project development and approval cycles with faster processing of eligible activities. The group has also expressed a preference for direct access to funding rather than access through implementing agencies.

414. In terms of eligibility, many Parties maintain that LDCs, SIDS and countries in Africa affected by drought, desertification and floods should be given priority in line with the Bali Action Plan. Yet, other developing countries may be equally vulnerable. It has been suggested that eligibility for receiving funds could be decided on the basis of a vulnerability index or indicators reflecting a country's circumstances, respective capabilities, level of associated risk and physical impacts.

415. Proposals for differentiated access to mitigation funding include using criteria based on national circumstances such as per capita GDP. In their submissions, some Parties made specific proposals regarding the amount of funding that any single Party would be able to access. For example, Mexico has suggested an upper limit (e.g. 15 per cent of the total amount in its proposed World Climate Change Fund) on withdrawals by any single developing country.

416. As regards the carbon market, the promotion of equitable geographical distribution of projects has been underlined as key to improving access to market-based mechanisms.

417. Proposals by Parties to enhance financing for technology development, transfer and cooperation call for greater access to technologies required by developing countries for enhanced action on mitigation and adaptation. Ideas have been proposed to address the issue of intellectual property rights, including compulsory licensing and enhanced public financing to facilitate technology transfer.

418. While developing country Parties are currently facing constraints on access, the proposals by Parties summarized in this section have the potential to ensure fair and transparent access to funding as well as a wider participation of developing countries in the carbon market.

2. DISBURSEMENT OF FINANCIAL RESOURCES AND INVESTMENT

419. Issues related to disbursement concern allocation, (i.e. how much is allocated to adaptation, mitigation and technology transfer) and type of support (i.e. project, programmatic or budget).

(A) CURRENT DISBURSEMENT

420. The GEF Trust Fund focuses primarily on mitigation activities and the reduction of GHG emissions by supporting projects in renewable energy and energy efficiency. According to the report of the GEF to the COP at its fourteenth session, during the reporting period funds were allocated to 41 projects with the majority falling under energy efficiency in buildings and industry and under renewable energy programmes.⁸⁵ Up until now, most of the adaptation funding is disbursed through the LDCF and the SCCF (adaptation window).

421. In April 2008, the GEF Council agreed that programmatic approaches may be eligible for funding under the GEF Trust Fund. Financing the implementation of medium- to long-term programmes is seen as a more effective financing vehicle for supporting countries' sustainable development than the traditional project-by-project provision of funding. The GEF secretariat, in collaboration with the implementing and executing agencies, has initiated several regional and multi-country sustainable development programmes to assist especially LDCs and SIDS, including the Pacific Alliance for Sustainability programme, the Strategic Investment Program for Sustainable Land Management for Sub-Saharan Africa and the West Africa Program. Disbursement under the Adaptation Fund is also expected to support programmes as well as projects.

422. CDM and JI address mitigation exclusively in the context of sustainable development. Already, the revenue they have generated has contributed to the additional investment and financial flows required for GHG reduction projects. A study based on an analysis of CDM project design documents suggests that the CDM has also made some contribution to technology transfer by financing emission reduction projects using technologies that were previously unavailable in the host country (Seres, 2008). Still, the one-off, project-specific nature of the CDM raises questions about how much cumulative technological learning it can promote (UNDESA, 2008).

(B) PROPOSED DISBURSEMENT

423. In their proposals for the allocation of funds among adaptation, mitigation and technology cooperation, Parties and observer organizations have either called for discreet funding mechanisms for each of the three areas or suggested that funding be drawn from general funds with allocation to be agreed at a later stage.

424. On the question of how funds should be disbursed, Parties have highlighted that a shift from a project-based approach to a programmatic approach is needed in order to scale up climate action significantly and make best use of the full range of means of implementation available for adaptation and mitigation actions. This mirrors the steps already taken by the GEF in this direction (see PARAGRAPH 421 above).

425. As regards the carbon market, some Parties have proposed that the approach to programmes of activities (PoAs) under the CDM be enhanced.⁸⁶

426. This section has shown that, currently, the majority of resources available for climate change activities are spent on a project-by-project basis. Proposals to introduce programmatic funding, to explore the inclusion of programmes of activities under the CDM and to provide support at a more strategic level have the potential to effectively scale up efforts to address climate change through mitigation and adaptation.

3. MEASURING, REPORTING AND VERIFYING FINANCIAL SUPPORT

427. The Bali Action Plan foresees consideration of enhanced mitigation action by developing countries that should be nationally appropriate and be undertaken in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner. This could serve as a foundation for an institutional framework for supporting mitigation actions of developing countries through international financing measures.

428. Although the concept of “measurable, reportable and verifiable” is only mentioned in the Bali Action Plan in the context of mitigation actions that are supported and enabled by technology, finance and capacity-building, Parties have suggested that the concept also be applied to financial support for adaptation action. In order to measure, report on and verify the provision of support, clear targets and timelines would be needed. Addressing the implementation of adaptation actions would be more difficult, as it raises questions of how to measure, report and verify outputs and outcomes. Unlike in mitigation, with its CO₂ equivalence, adaptation lacks a common metric. The operational interpretation of “measurable, reportable and verifiable” is still under discussion.

⁸⁵ FCCC/CP/2008/2.

⁸⁶ FCCC/KP/CMP/2008/INF.3, paragraph 41.

V-C. INSTITUTIONAL ARRANGEMENTS FOR MOBILIZING, MANAGING AND DELIVERING FINANCIAL RESOURCES AND INVESTMENT

429. For resources to be managed efficiently and effectively in a manner that is perceived equitable by all stakeholders, appropriate institutional arrangements are needed.

1. CURRENT INSTITUTIONAL ARRANGEMENTS UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

430. A number of institutions currently manage and supervise investment and financial flows for adaptation and mitigation under the Convention and its Kyoto Protocol (for an overview see [FIGURE V-9](#)).

431. The COP provides guidance to the GEF on climate change policies, programme priorities and criteria for funding eligibility. The GEF is accountable to the COP through annual reporting of its operations and strategies. The COP also reviews the mechanism every four years, which is another opportunity for adjusting policies and priorities based on latest information. Besides guidance from the COP, the GEF is guided by its Council – the main governing body of the GEF. It is composed of members representing 32 constituencies (18 from developing countries, 14 from developed countries and two from countries with economies in transition), who meet twice a year. Decisions by the Council are taken by consensus, failing which any member may request a formal vote.⁸⁷

432. In contrast to the GEF, the Adaptation Fund Board, the CDM Executive Board and the Joint Implementation Supervisory Committee (JISC) receive their sole guidance from, and are only accountable to, the CMP. The Adaptation Fund Board is composed of 16 members (two from each of the five United Nations regional groups, one from the group of SIDS, one from the LDCs, two from Annex I Parties and two from non-Annex I Parties). Decisions by the Board are taken by consensus; if no agreement has been reached, decisions are taken by a two-thirds majority of the members present at the meeting on the basis of one member, one vote.

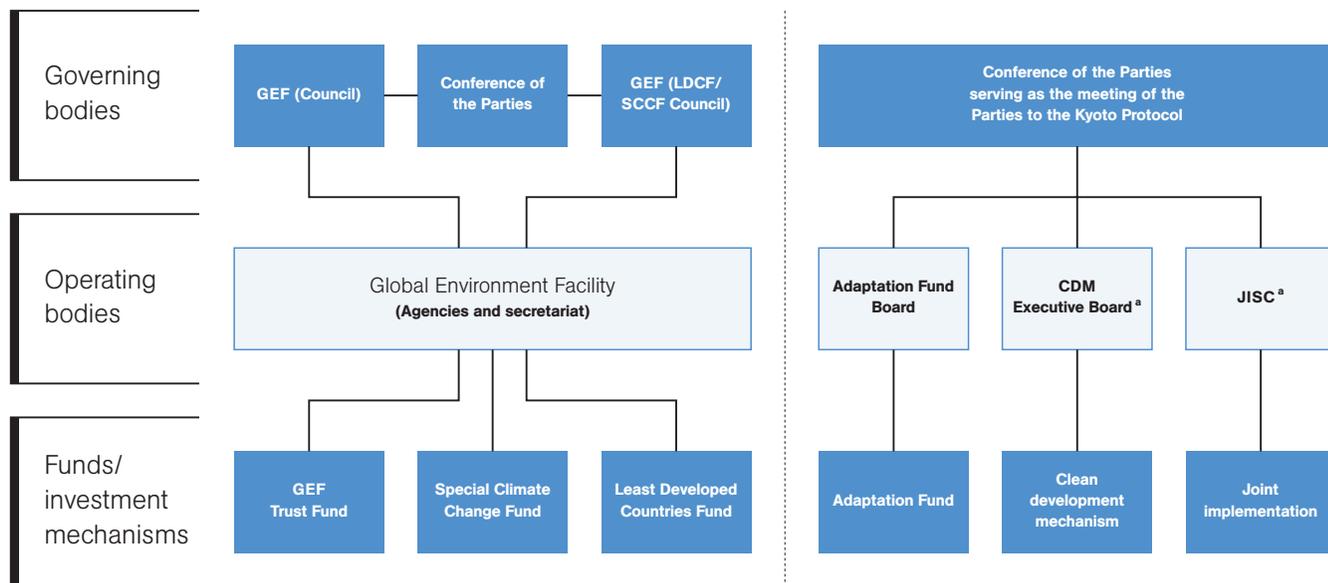
433. The CDM Executive Board supervises the CDM, under the authority and guidance of the CMP, and is fully accountable to the CMP. The Executive Board comprises 10 members from Parties to the Kyoto Protocol, as follows: one member from each of the five United Nations regional groups, two other members from Annex I Parties, two other members from non-Annex I Parties, and one SIDS representative, taking into account the current practice in the Bureau of the COP.

434. The JISC, under the authority and guidance of the CMP, supervises the verification procedure defined in paragraphs 30 – 45 of the JI guidelines (Decision 9/CMP.1). The JISC has 10 members from Parties to the Kyoto Protocol, as follows: three members from Annex I Parties that are undergoing the process of transition to a market economy, three other members from Annex I Parties, three members from non-Annex I Parties and one SIDS representative.

435. Decisions by the CDM Executive Board and the JISC are taken by consensus, whenever possible. If all efforts at reaching a consensus have been exhausted and no agreement has been reached, decisions shall as a last resort be adopted by a three-fourths majority vote of the members present and voting at the meeting. Members abstaining from voting shall be considered as not voting. Each member has one vote.

⁸⁷ The outcome of the vote is decided by a double weighted majority – requiring both a 60 per cent majority of the total number of participants and a 60 per cent majority of total monetary contributions to the GEF. So far, all GEF decisions have been taken by consensus and the voting arrangements have never been used.

Figure V-9. **Current institutional arrangements to provide financial resources and investments under the Convention and its Kyoto Protocol**



Abbreviations: GEF = Global Environment Facility, JISC = Joint Implementation Supervisory Committee, LDCF = Least Developed Countries Fund, SCCF = Special climate Change Fund.

^a Entities supervising investment mechanisms and not delivering financial resources.

2. PROPOSED INSTITUTIONAL ARRANGEMENTS FOR A FUTURE
FINANCIAL FRAMEWORK

436. While some proposals call for making use of and improving existing institutions, such as the Adaptation Fund and the GEF, to avoid a proliferation of institutions and funds, others suggest the establishment of new institutional arrangements to manage the new and possibly existing financial resources that will be required in future. The main issues relating to future institutional arrangements concern governance (direct accountability to the COP and equal voice to developed and developing countries) and coherence (links and coordination between the various sources and funds).

(A) OVERARCHING INSTITUTIONAL ARRANGEMENTS

437. A number of Parties and observer organizations have proposed the establishment of overarching institutional arrangements to allow for an effective and efficient financial mechanism. For example, the Group of 77 and China has called for the operationalization of an effective financial mechanism that would be under the supreme authority and guidance of, and be fully accountable to, the COP. It would have an equitable and geographically balanced representation of all Parties within a transparent and efficient system of governance.

438. The Group of 77 and China has suggested a board with equitable and balanced representation of all Parties and assistance from a secretariat. The COP and the board would establish specialized funds and funding windows under its guidance, and a mechanism to link various funds. Each of the funds could be advised by an expert group or committee, supported by a technical panel or panels. To ensure transparency, other possible elements could include a consultative or advisory group of all relevant stakeholders and an independent assessment panel. An overview of such an institutional arrangement is shown in [FIGURE V-10](#).

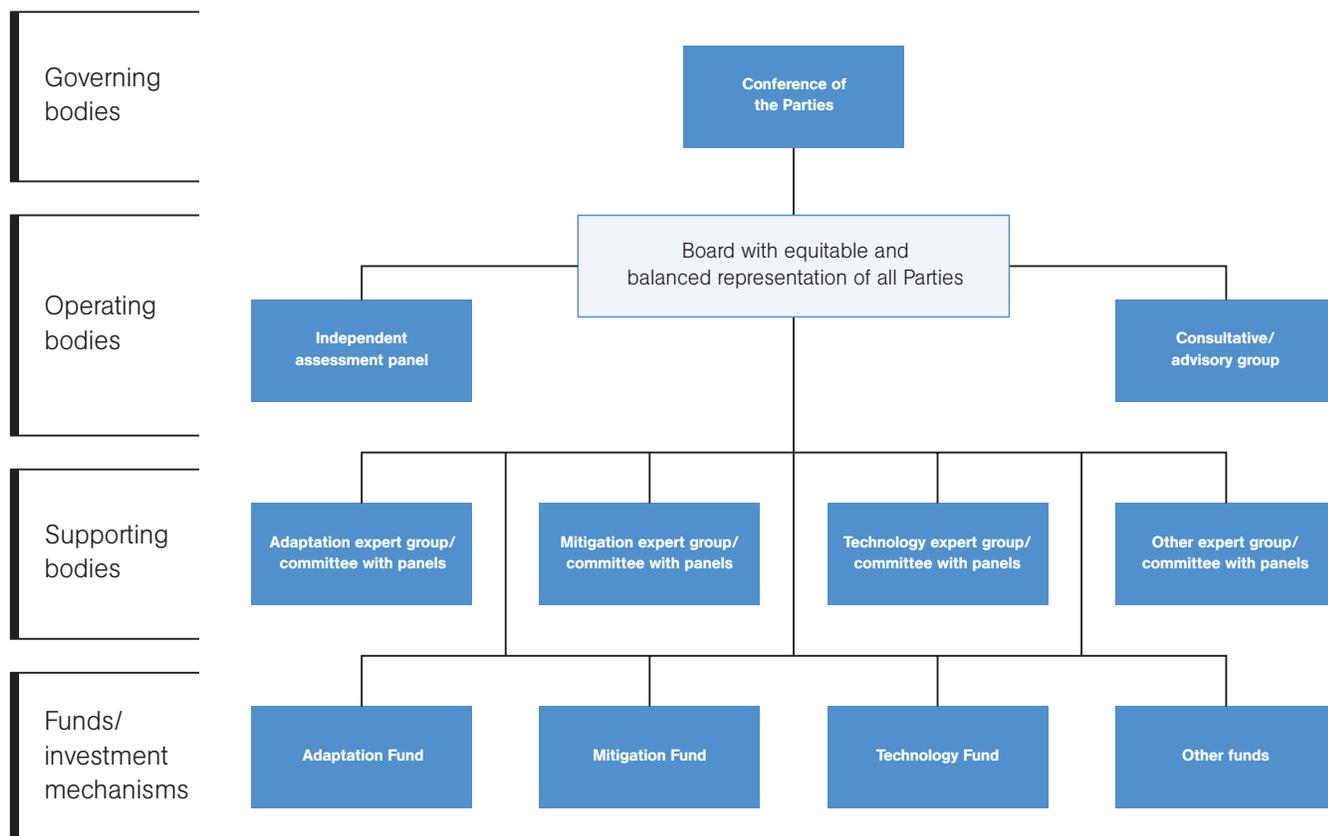
439. Similarly, Mexico has proposed a World Climate Change Fund for both mitigation and adaptation activities, operating under the aegis of the COP and with an inclusive and transparent governance system. An executive council, constituted by representatives of all participant countries grouped in a balanced and practical way, would operate the fund. The council would have three independent counsellors – a scientific counsellor, one from MDBs and one from social organizations. In addition, a scientific committee and a multilateral banks committee would support the functioning of the council. The fund could be administered by an existing multilateral institution agreed by the COP.

440. Some Parties have proposed that the financial mechanism should be modelled on the Multilateral Fund for the Implementation of the Montreal Protocol. Its operations are overseen by an Executive Committee comprising seven Article 5 Parties (developing countries) and seven non-Article 5 Parties (developed countries). The Executive Committee is in charge of developing and monitoring the implementation of operational policies, guidelines and administrative arrangements, including the disbursement of resources. In delivering financial and technical assistance, it works together with four implementing agencies – UNDP, UNEP, the United Nations Industrial Development Organization and the World Bank – as well as nine bilateral implementing agencies of contributing Parties.⁸⁸

441. To complement international funds, Switzerland has suggested that countries establish national climate change funds to finance national climate change policies according to their specific circumstances and needs covering adaptation, technology transfer or mitigation measures.

⁸⁸ Other institutional arrangements of an overarching nature have been suggested by the South South Center, which has proposed the establishment of a climate change fund, and by the Third World Network, which has suggested a multilateral financial structure.

Figure V-10. Institutional arrangements reflecting the Group of 77 and China proposal to provide overall financial resources under the Convention



Abbreviations: GEF = Global Environment Facility, JISC = Joint Implementation Supervisory Committee, LDCF = Least Developed Countries Fund, SCCF = Special climate Change Fund.

^a Entities supervising investment mechanisms and not delivering financial resources.

(B) INSTITUTIONAL ARRANGEMENTS FOR ADAPTATION

442. With regard to specific institutional arrangements for adaptation, the EU has proposed a Framework for Action on Adaptation to serve as a guide for the financial mechanism operating within the context of the Convention but also to be considered by bilateral and multilateral organizations in their activities in adaptation and building resilience to climate change.

443. AOSIS has advocated the establishment of an adaptation fund under the Convention, in addition to the one under the Kyoto Protocol, which would be linked to GHG emissions taking into account the polluter pays principle. Switzerland has proposed the creation of a global multilateral adaptation fund, consisting of two “pillars”, or components: a prevention pillar to support climate change risk reduction through appropriate policies and measures; and an insurance pillar to support responses to climate impacts through the funding of relief, rehabilitation and recovery.

444. Other proposed institutional arrangements aimed at enhancing risk reduction and management include an international insurance mechanism to help fund financial resilience to the impacts of extreme weather events, and solidarity funds or mechanisms to address catastrophic risk, collective loss sharing and compensation of climate victims.

(C) INSTITUTIONAL ARRANGEMENTS FOR MITIGATION,
INCLUDING FOR REDUCED EMISSIONS FROM DEFORESTATION
AND DEGRADATION

445. Parties have proposed a variety of options for the creation of a new institutional structure and funds to finance enhanced mitigation action. This includes expanding market-based mechanisms, new funds to deliver new and additional public finance, a framework and funds for technology development and transfer, and a new mechanism and fund to support REDD.

(D) INSTITUTIONAL ARRANGEMENTS FOR TECHNOLOGY
DEVELOPMENT, TRANSFER AND COOPERATION

446. Many Parties have noted that effective mechanisms and enhanced means are needed to remove obstacles to scaling up development and transfer of technologies for mitigation and adaptation. Mechanisms and means are also needed to provide financial and other incentives for this technology development and transfer. These measures should be comprehensive in order to address all stages of the technology development cycle; namely, R&D, demonstration, deployment and diffusion. Providing incentives to the private sector through market-based mechanisms and public finance support has been proposed by Parties as an option to enhance financing for technology cooperation.⁸⁹

447. Parties have made many specific proposals for new mechanisms and funds to enhance financing for technology R&D, deployment, diffusion and transfer of affordable environmentally sound technologies. The Group of 77 and China has proposed a technology mechanism under the Convention, which would include an executive board on technology established as a subsidiary body under the Convention and a multilateral climate technology fund operating under the guidance of the COP. The EU has proposed a framework for international technology cooperation to address four areas: institutional and organizational arrangements; enabling environments; technology agreements; and financial mechanisms and tools.

448. Other specific proposals include: (1) a multilateral funding mechanism to be operated under the Convention to support the dissemination of existing technologies; (2) a clean technology fund to support project preparation and development, demonstration, transfer and dissemination of technologies; (3) a global venture capital fund for early-stage and mature technologies; and (4) an international fund to fast-track development of renewable energy technologies. However, some Parties have stated that enhancing financial and technology promotion tools would not necessarily require the creation of new institutions under the Convention.

⁸⁹ FCCC/AWGLCA/2008/CRP.2.

V-D. OVERALL FINANCIAL FRAMEWORK

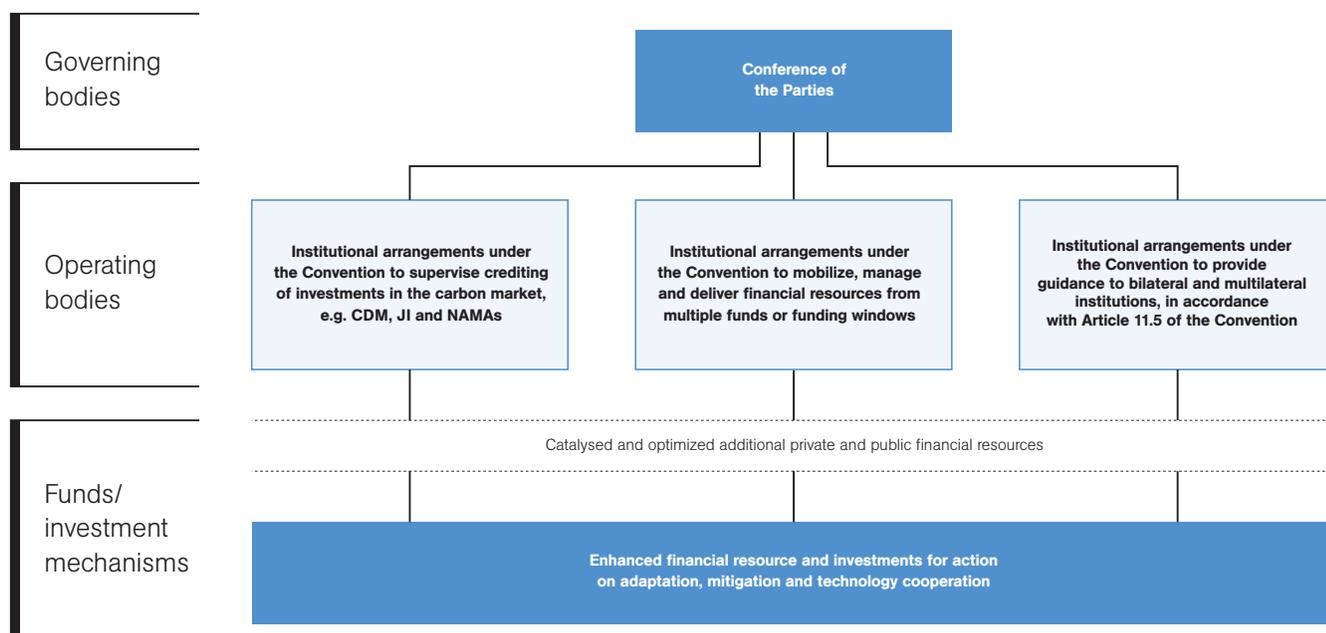
449. In conclusion, for an overall financial framework under the Convention to mobilize, manage and deliver enhanced financial flows and resources for adaptation, mitigation and technology cooperation, institutional arrangements need:

- (a) To ensure the efficient and effective management and supervision of the various investment mechanisms and multiple funds;
- (b) To ensure coordination and coherence with other bilateral and multilateral financial flows;
- (c) To enable the engagement of the private sector with a view to leveraging additional resources for climate-friendly and climate-resilient investments (see [FIGURE V-11](#)).

450. In order for Parties to agree on an overall financial framework, a number of questions need to be addressed, including:

- (a) What should be the principles underlying an overall financial framework?
- (b) How can existing institutional arrangements such as the GEF be improved and scaled up and proliferation of institutions and funds be avoided in the context of an overall financial framework?
- (c) What new institutions should be established to provide new and additional financial resources and investment?
- (d) How should financial support for adaptation and mitigation provided through different bilateral, regional and multilateral channels be deployed so that it is measurable, reportable and verifiable?

Figure V-11. Possible overall financial framework under the Convention



Abbreviations: GEF = Global Environment Facility, JISC = Joint Implementation Supervisory Committee, LDCF = Least Developed Countries Fund, SCCF = Special climate Change Fund.

^a Entities supervising investment mechanisms and not delivering financial resources.

VI. SUMMARY AND CONCLUSIONS

451. The purpose of this update was two fold: to update information where available; and to move the discussion forward on to options, tools and mechanisms for enhanced financing for mitigation, adaptation and technology cooperation, in order to enable an effective response to climate change in developing countries taking into account paragraph 1 of the Bali Action Plan.

VI-A. UPDATED ESTIMATES OF THE INVESTMENT AND FINANCIAL FLOWS NEEDED TO ADDRESS CLIMATE CHANGE

452. In its *World Energy Outlook 2008*, the IEA has revised the emissions scenarios presented in the WEO 2006. Nevertheless, the Reference Scenario and the 450 ppm stabilization scenario are essentially the same as the BAPS scenario presented in the previous report.

453. Since publication of the 2007 report, UNDP has projected in its *Human Development Report 2007/2008* that investment needs for climate change adaptation will be USD 86 billion by 2015; a substantially higher estimate than equivalent estimates in the 2007 report and other analyses. A number of studies that are likely to provide more information on adaptation needs at regional and national levels are under way. The estimated financial flows and investment needs for adaptation are still estimated to be in the tens, possibly hundreds, of billions of United States dollars per year.

VI-B. MEANS TO OPTIMIZE, SHIFT AND SCALE-UP INVESTMENT AND FINANCIAL FLOWS

454. To support developing countries in optimizing and scaling up investment and financial flows, and shifting them into more climate-friendly and -resilient alternatives, four broad means can be considered and influenced by Parties:

- (a) Private finance;
- (b) Public finance;
- (c) National policies;
- (d) The Convention itself.

455. Private-sector resources, suitably guided by international and national public-sector finance, could make an important contribution to mitigating climate change in developing countries. Public funding is expected to play a larger role in adaptation, although here too investments in a large number of sectors will be financed by the private sector.

456. In particular, public funding may be needed by developing countries for:

- (a) Implementation of adaptation measures in sectors traditionally funded by governments, including public infrastructure, coastal protection and water supply;
- (b) Implementation of national policies, such as efficiency standards;
- (c) Funding mitigation measures whose costs are significantly higher than the market price;
- (d) Support for technology transfer to enable faster deployment and diffusion. In terms of technology development, the support will have to be channelled through institutional arrangements that create collaborative R&D institutions.

457. The carbon market, through the CDM, has mobilized substantial private investment for mitigation measures. But many mitigation opportunities are not effectively captured by the crediting mechanisms. The CDM, for example, finances only a small share of demand-side energy efficiency opportunities that have negative or very low cost but face non-price barriers. There are also mitigation opportunities, such as solar PV, that have costs higher than the current market price of carbon. Finally, the regional distribution of projects has shown the limitations of the CDM in supporting mitigation opportunities in countries that have difficult investment conditions.

458. In terms of adaptation investments, the vulnerability and exposure of private sector infrastructure investments can be reduced by policies such as building standards and planning guidelines. The private sector can also develop and implement financial risk management mechanisms, including insurance, that encourage more adaptive behaviour.

459. A diverse range of policies are available to stimulate adaptation and mitigation action. They include regulatory standards, taxes and charges, tradable permit systems, and financial incentives. All are currently being used in various countries. Implementation of the available adaptation and mitigation measures is likely to require a mix of different types of policies – however, each country must adapt or design policies that suit its own institutions and circumstances.

460. In addition to stimulating mitigation action, mitigation policies play an important role in stimulating technology innovation, which is essential for action in future. By creating markets for low-emitting technologies, mitigation policies attract private finance for the technologies' development. Different policies have different effects on innovation. Market-based policies provide an economic incentive for technologies that can reduce emissions at lower cost; standards and regulations can actually reduce the incentive to innovate unless they are well designed.

461. Non-climate policies can have an important influence on emissions. Examples include policies that focus on poverty, land use and land-use change, energy supply and security, international trade, air pollution, structural reforms, and demography. Emissions could also be reduced by changing national policies to attract more foreign investment and by reforming subsidies that increase emissions taking into account the poverty reduction aspect of such subsidies.

462. In order to avoid adverse affects of policies on national development, developing countries may require international financial support for the design, implementation and enforcement of national policies that address both mitigation and adaptation.

VI-C. POSSIBLE NEW AND ADDITIONAL SOURCES OF INTERNATIONAL FUNDING

463. Increased international public finance is likely to be needed for the following purposes in developing countries:

- (a) Funding adaptation actions;
- (b) Funding specific types of mitigation actions, such as REDD and CCS;
- (c) Funding implementation of national policies, such as energy efficiency standards and building standards for adaptation;
- (d) Funding participation in international research, development and deployment of mitigation and adaptation technologies;
- (e) Funding technology transfer measures such as capacity-building and creation of enabling environments.

464. Parties have tabled many proposals to increase the financial resources available for adaptation, mitigation and technology cooperation. Some proposals generate larger, more stable or more predictable amounts of revenue than others. Some of the proposed funding sources would be under the Convention, others would be outside it. Some proposals would generate funds internationally, while for others the funds would flow through government budgets.

465. Parties could agree on a combination of proposals, which together could generate several billions of United States dollars per year of relatively stable and predictable funding. Such a combination could include, for example, increased contributions by Annex II Parties to the financial mechanism of the Convention, extension of the share of proceeds to other mechanisms, revenue from auctioning a share of the assigned amount or allowances for international aviation and marine emissions, and measured, reported and verified support provided through bilateral and multilateral channels.

466. Proposals have highlighted principles and criteria for generating resources, which could be applied to arrive at an optimal combination of options to meet the requirement for financial resources. A key challenge is to assess how funding provided through bilateral, regional and multilateral channels relates to the implementation of the Convention as per Article 11, paragraph 5.

VI-D. DELIVERY OF ENHANCED FINANCIAL RESOURCES AND INVESTMENTS

467. Delivering substantially larger amounts of financial resources for mitigation, adaptation and technology cooperation will require consideration of several important issues, including:

- (a) Which countries will have access to resources and based on which criteria;
- (b) Whether the funds are distributed by country or project type;
- (c) Whether funds are distributed for individual projects (as is currently the case under the GEF), for programmes, or even as budget support;
- (d) Whether, or under what conditions, funds can be provided to Parties directly through direct access.

468. Regardless of how funds are allocated, disbursement could be carried out on a project basis or a programme basis. A project approach enables each proposed project to be reviewed carefully, but the disadvantage of this approach is the length of time needed to process each project, which incurs high administrative costs. In order to ensure efficiency, the current predominance of the project-based approach will need to change if the scale of funding increases significantly.

469. The Bali Action Plan foresees consideration of enhanced mitigation action by developing countries that should be nationally appropriate and be undertaken in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner. Some Parties have suggested that the provision of support for – and the implementation of – adaptation actions should also be measurable, reportable and verifiable. The operational interpretation of “measurable, reportable and verifiable” is still under discussion.

VI-E. INSTITUTIONAL ARRANGEMENTS FOR AN EFFECTIVE RESPONSE TO CLIMATE CHANGE

470. Institutional arrangements for mobilizing, managing and delivering several billions of United States dollars per year to meet many different needs will be a challenge. According to Parties, criteria for any institutional arrangement are that it should be overseen by the COP, that there is balanced representation of all Parties, and that there is transparency, efficiency and effectiveness in delivering funding. The specifics of the institutional arrangements that need to be agreed upon include the number of bodies, the mandate of each body, the manner of reporting to the COP and to each other, the membership of each body, the powers of each body and the rules of procedure of each body.

471. For an overall financial architecture under the Convention to mobilize, manage and deliver enhanced financial flows and resources for adaptation, mitigation and technology cooperation, institutional arrangements need:

- (a) To ensure the efficient and effective management and supervision of the various investment mechanisms and multiple funds;
- (b) To ensure coordination and coherence with other bilateral and multilateral financial flows consistent with Article 11, paragraph 5 of the Convention;
- (c) To enable the engagement of the private sector with a view to leveraging additional resources for climate-friendly and climate-resilient investments.

472. In order for Parties to agree on an overall financial framework, a number of questions could be addressed, including:

- (a) What should be the principles underlying an overall financial framework?
- (b) How can existing institutional arrangements, be improved and proliferation of institutions and funds be avoided in the context of an overall financial framework?
- (c) What new institutions should be established to provide new and additional financial resources and investment?
- (d) How should financial support for adaptation and mitigation provided through different bilateral, regional and multilateral channels be deployed in a way that is measurable, reportable and verifiable?

VI-F. THE PRESENT FINANCIAL CRISIS AND THE FUTURE FINANCIAL ARCHITECTURE FOR ADDRESSING CLIMATE CHANGE

473. The update was finalized while the global financial crisis was unfolding. Many of the initiatives that are being undertaken to address the crisis through reform of the financial systems and international financial institutions have a bearing on the ongoing discussions under the Convention, and on discussions regarding investment and financial flows needed to address climate change in particular.

474. The initiatives to reform financial institutions and governance present opportunities to shift governments' investments made as part of economic recovery on to a more efficient, lower GHG-emitting and more climate-resilient path.

475. Finding the right balance between national and global policy is also a continuing struggle. Since all Parties are interconnected – by global finance, by climate change – the need to find coordinated, global solutions has never been clearer. It may be hoped that out of the simultaneous economic and climate crises, a climate conscious future can be forged.

ANNEX

LIST OF REFERENCES

ACTIONAID. 2007. *Compensation for Climate Change: Principles and Lessons for Equitable Adaptation Funding*. Available at: <http://www.actionaidusa.org/images/climate_change/CompensatingforClimateChange.pdf>.

AGRAWALA S AND FANKHAUSER S. (EDS). 2008. *Economic Aspects of Climate Change: Costs, Benefits and Policy Instruments*. Paris: Organisation for Economic Cooperation and Development.

BAKKER SJA, ARVANITAKIS AG, BOLE T, BRUG E, DOETS CEM AND GILBERT A. 2007. *Carbon credit supply potential beyond 2012. A bottom-up assessment of mitigation options*. ECN report. Petten.

BARON R AND ELLIS J. 2006. *Sectoral Crediting Mechanisms for Greenhouse Gas Mitigation: Institutional and Operational Issues*. Paris: OECD/IEA.

CARBON TRUST. 2008. *Low Carbon Technology Innovation and Diffusion Centres*. London: The Carbon Trust.

CARMODY AND RITCHIE. 2007. *Investing in Clean Energy and Low Carbon Alternatives in Asia*. Asian Development Bank.

CHAIRS OF THE GEF COUNCIL. 2008. Joint summary of the Chairs. GEF Council meeting November 11 – 13, 2008. Washington, DC: Global Environment Facility. Available at: <[http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__\(PDF_DOC\)/GEF_C34/Joint%20Summary%20of%20the%20Chairs_C.34.pdf](http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__(PDF_DOC)/GEF_C34/Joint%20Summary%20of%20the%20Chairs_C.34.pdf)>.

DAVIS L AND DAVIS J. 2004. "How effective are prizes as incentives to innovation? Evidence from three 20th century contests." Presented at the DRUID Summer Conference 2004 on Industrial Dynamics, Innovation, and Development. Elsinore, Denmark, June 14 – 16, 2004.

DB ADVISORS. 2008. *Investing in Climate Change 2009: Necessity and Opportunity in Turbulent Times*. Available at: <<http://dbadvisors.com/climatechange>>.

DOORNBOSCH R AND KNIGHT E. 2008. *What Role For Public Finance In International Climate Change Mitigation*. Paris: OECD.

GEF 2005. *Operational Guidelines for the Strategic Priority "Piloting An Operational Approach to Adaptation" (SPA)*. GEF/C.27/Inf.10. Washington, DC: Global Environment Facility.

GEF. 2006. *Programming Paper for Funding the Implementation of NAPAs under the LDC Trust Fund*. GEF/C.28/18. Washington, DC: Global Environment Facility.

GEF. 2008a. *Report on the Completion of the Strategic Priority on Adaptation*. GEF/C.34/8. Washington, DC: Global Environment Facility. Available at: <[http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__\(PDF_DOC\)/GEF_C34/C.34.8%20Report%20on%20the%20Completion%20of%20the%20SPA.pdf](http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__(PDF_DOC)/GEF_C34/C.34.8%20Report%20on%20the%20Completion%20of%20the%20SPA.pdf)>.

GEF. 2008b. *Progress Report on the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF)*. GEF/LDCF/SCCF.5/Inf.3. Washington, DC: Global Environment Facility. Available at: <http://www.gefweb.org/uploadedFiles/Documents/LDCFSCCF_Council_Documents/LDCFSCCF5_November_2008/LDCF.SCCF.5.Inf.3%20Progress%20Report.pdf>.

GEF. 2008c. *Results-Based Management Framework for LDCF and SCCF*. GEF/LDCF.SCCF.5/3. Washington, DC: Global Environment Facility. Available at: <http://www.gefweb.org/uploadedFiles/Documents/LDCFSCCF_Council_Documents/LDCFSCCF5_November_2008/LDCF.SCCF.5.3%20Resource-Based%20Management%20Framework.pdf>.

GEF. 2008d. *Elaborating a Strategic Program to Scale-up the Level of Investment in the Transfer of Environmentally-Sound Technologies*. Available at: <http://www.gefweb.org/uploadedFiles/Documents/LDCFSCCF_Council_Documents/LDCFSCCF4_April_2008/LDCF.SCCF.4.5%20Technology%20Transfer.pdf>.

GEF EVALUATION OFFICE. 2006. *Evaluation of the GEF Activity Cycle and Modalities. Joint Evaluation of the GEF Evaluation Office and the Evaluation Offices of the Implementing and Executing Agencies of the GEF*. GEF/ME/C.30/6. Washington, DC.

- GEF EVALUATION OFFICE. 2008. *Mid-Term Review of the Resource Allocation Framework*. Available at: <[http://www.gefweb.org/uploadedFiles/Documents/Council_Documents_\(PDF_DOC\)/GEF_C34/GEFME-C34.2-RAF_MTR.pdf](http://www.gefweb.org/uploadedFiles/Documents/Council_Documents_(PDF_DOC)/GEF_C34/GEFME-C34.2-RAF_MTR.pdf)>.
- HAITES E. 2007. *Carbon Markets*. Available at: <http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/haites.pdf>.
- HINOSTROZA M, CHENG C, ZHU X AND FENHANN J. 2007. *Potentials and barriers for end-use energy efficiency under programmatic CDM*. CD4CDM Working Paper Series. UNEP Risoe Centre.
- HÖHNE N, MICHELSEN C, MOLTMANN S, OTT H, STERK W, THOMAS S AND WATANABE R. 2008. *Proposals for contributions of emerging economies to the climate regime under the UNFCCC post 2012*. Available at: <<http://www.umweltdaten.de/publikationen/fpdf-l/3658.pdf>>.
- IDD AND ASSOCIATES. 2006. *Evaluation of General Budget Support: Synthesis Report*. Birmingham: International Development Department, School of Public Policy, University of Birmingham. Available at: <<http://www.oecd.org/dataoecd/42/38/36685401.pdf>>.
- IEA. 2008. *IEA World Energy Outlook 2008*. Paris: IEA.
- INTERNATIONAL ENERGY AGENCY (IEA). 2006. *IEA World Energy Outlook 2006*. Paris: IEA.
- IPCC. 2007. *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. B Metz, OR Davidson, PR Bosch, R Dave, LA Meyer (eds). Cambridge: Cambridge University Press.
- KAINUMA M. 2008. Case study of Greenhouse Gas Emissions Reduction Potentials in 2020 – Regional and sectoral analysis. Paper presented at the International Workshop on Sectoral Emission Reduction Potential, 8th May 2008. Paris. Available at: <http://unfccc.meta-fusion.com/kongresse/AWG_08_Ghana/download/080822_Ghana_AWG_SE_1300_Kotaro_Kawamata.pdf>.
- KLEIN RJT, ERIKSEN SEH, NÆSS LO, HAMMILL A, TANNER TM, ROBLEDO C, O'BRIEN KL. 2007. Portfolio screening to support the mainstreaming of adaptation to climate change into development assistance. *Climatic Change*. 84(1): pp. 23 – 44.
- LEAST DEVELOPED COUNTRIES EXPERT GROUP (LEG). 2007. *Background paper to the LEG Stocktaking meeting on the preparation and implementation of National Adaptation Programmes of Action*. Available at: <<http://unfccc.int/files/meetings/application/pdf/stocktaking-paper.pdf>>
- LEVINA E, JACOB JS, RAMOS LE, ORTIZ I. 2007. *Policy Frameworks for Adaptation to Climate Change in Coastal Zones: the Case of the Gulf of Mexico*. Paris: Organisation for Economic Co-operation and Development. Available at: <<http://www.oecd.org/dataoecd/36/22/38574805.pdf>>.
- LEVINA E. 2007. *Adaptation to Climate change: International agreements for local needs*. Paris: Organisation for Economic Co-operation and Development. Available at: <<http://www.oecd.org/dataoecd/15/11/39725521.pdf>>.
- LEVINE R, KREMER M AND ALBRIGHT A. 2005. *Making Markets for Vaccines: Ideas to Action*. Washington, DC: Center for Global Development
- MCGRAY H, HAMMILL A AND BRADLEY R. 2007. *Weathering the Storm: Options for Framing Adaptation and Development*. Washington DC: World Resources Institute. Available at: <<http://www.wri.org/publication/weathering-the-storm>>.
- MÜLLER B AND HEPBURN C. 2006. IATAL – an outline proposal for an International Air Travel Adaptation Levy. Oxford: Oxford Institute for Energy Studies
- MÜLLER B. 2008. *International Adaptation Funding. The Need For An Innovative and Strategic Approach*. Oxford: Oxford Institute for Energy Studies. Available at: <<http://www.oxfordenergy.org/pdfs/EV42.pdf>>.
- NATIONAL AUDIT OFFICE. 2008. *Department for International Development – Providing budget support to developing countries*. Report by the Controller and Auditor General. HC6 Session 2007-8. London: House of Commons. Available at: <http://www.nao.org.uk/publications/nao_reports/07-08/07086.pdf>.
- NEPSTAD D, SOARES-FILHO B, MERRY F, MOUTINHO P, RODRIGUES HO, BOWMAN M, SHWARTZMAN S, ALMEIDA O AND RIVEIRO S. *Custos e Benefícios da Redução das Emissões de Carbono do Desmatamento e da Degradação (REDD) na Amazônia Brasileira*. IPAM, June 2008.
- OECD. 2008b. *An Overview of Alternative Instruments to reduce Greenhouse Gas Emissions and Interactions across them*. OECD Background Note. Paris: OECD. Available at: <www.oecd.org/dataoecd/4/0/40231690.pdf>.

- ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD). 2008. *Economic aspects of adaptation to climate change: integrated assessment modelling of adaptation costs and benefits*. Paris: OECD (forthcoming).
- PHILIBERT C, ELLIS J AND PODKANSKI J. 2007. *Carbon capture and storage in the CDM*. Paris: IEA and OECD. Available at: http://www.iea.org/textbase/papers/2007/CCS_in_CDM.pdf.
- POINT CARBON. 2008. *Carbon Market Transactions: Dominated by Financials?* Carbon Market Analyst 21st May 2008 .
- PORTER G, BIRD N, KAUR N AND PESKETT L. 2008. *New Finance for Climate Change and the Environment*. Washington, DC: The Heinrich Boll Foundation and WWF. Available at: http://assets.panda.org/downloads/ifa_report.pdf.
- PORTER M AND VAN DER LINDE C. 1995. Toward a New Conception of the Environment-Competitiveness Relationship. *The Journal of Economic Perspectives*. 9(4): pp. 97 – 118.
- RAWORTH K. 2007. *Adapting to climate change: what's needed in poor countries and who should pay*. Oxfam International. Available at: http://www.oxfam.org/en/files/bp104_climate_change_0705.pdf/download.
- SAGAR A AND MATHUR A. 2000. *Energy Innovation, Climate Change and Sustainable Development*. Draft Mimeograph.
- SAGAR AD. 2008. "Technology Cooperation in the Greenhouse" presented at Key Elements in Breaking the Global Climate Change Deadlock meeting, Center for Global Studies/OECD/Center for International Governance Innovation. Paris, March 2008.
- SCHMIDT J, HELME N, LEE J AND HOUDASHELT M. 2008. Sector-based Approach to the Post-2012 Climate Change Policy Architecture. *Climate Policy*. 8(2008): pp. 494 – 515.
- SERES S. 2007. *Analysis of Technology Transfer in CDM Projects* (Report to the UNFCCC Registration and Issuance Unit).
- STERN N. 2007. *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
- TIRPAK D. 2008. *National policies and their linkages to negotiations over a future international climate change agreement*. Report prepared for UNDP. Available at: www.undp.org/climatechange/docs/UNDP_NationalPolicy.pdf.
- UNCTAD. 2006. *World Investment Report 2006: FDI from Developing and Transition Economies. Implications for Development*. Geneva: United Nations Conference on Trade and Development.
- UNCTAD. 2008. *World Investment Report 2008: Transnational Corporations and the Infrastructure Challenge*. Geneva: United Nations Conference on Trade and Development
- UNDESA. 2008. *Climate Change: Technology Development and Technology Transfer*. Background paper prepared for the Beijing High-level Conference on Climate Change: Technology Development and Technology Transfer. United Nations Department of Economic and Social Affairs. Available at: <http://www.ccchina.gov.cn/bjctc/WebSite/bjctc/UpFile/File125.pdf>.
- UNEP. 2008. *Reforming Energy Subsidies: Opportunities to Contribute to the Climate Change Agenda*. Paris: UNEP Division of Technology, Industry and Economics. Available at: http://www.unep.org/pdf/PressReleases/Reforming_Energy_Subsidies.pdf.
- UNEP SEFI. 2008. *Global Trends in Sustainable Energy Investment 2008: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency*. Nairobi, United Nations Environment Programme. Available at: <http://sefi.unep.org/english/globaltrends>.
- UNITED NATIONS DEVELOPMENT PROGRAMME. 2007. *Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World*. New York: UNDP. Available at: <http://hdr.undp.org/en/reports/global/hdr2007-2008/>.
- UNITED STATES ENVIRONMENTAL PROTECTION AGENCY. 2006. *Global mitigation of non-CO₂ greenhouse gases*. Washington, D.C: United States Environmental Protection Agency.
- WARD M, STRECK C, WINKLER H, JUNG M, HAGEMANN M, HÖHNE N AND O'SULLIVAN R. 2008. *The role of sectoral no-lose targets in scaling up finance for climate mitigation activities in developing countries*. Report prepared for DEFRA
- WEBBER D AND KREMER M. 2001. Perspectives on stimulating industrial research and development for neglected infectious diseases. *Bulletin World Health Organization*. 79(B): pp. 735 – 741

WINKLER H, HÖHNE N AND DEN ELZEN M. 2008. Methods for quantifying the benefits of sustainable development policies and measures (SD-PAMs). *Climate Policy*. 8(2008): pp. 119 – 134.

WINKLER H, HOWELLS M AND BAUMERT K. 2007. Sustainable development policies and measures: institutional issues and electrical efficiency in South Africa. *Climate Policy*. 7(2007): pp. 212 – 229.

WORLD BANK. 2006. *Clean Energy and Development: Towards an Investment Framework*. Washington, D.C: World Bank. Available at: [http://siteresources.worldbank.org/Devcommint/Documentation/20890696/DC2006-0002\(E\)-CleanEnergy.pdf](http://siteresources.worldbank.org/Devcommint/Documentation/20890696/DC2006-0002(E)-CleanEnergy.pdf).

WORLD BANK. 2008a. *The Pilot Program for Climate Resilience under the Strategic Climate Fund*. Washington, DC: World Bank. Available at: <http://siteresources.worldbank.org/INTCC/Resources/PPCRGovernanceStructure.pdf>.

WORLD BANK. 2008b. *Trustee Report Financial Status of the CIF*. Washington, DC: World Bank. Available at: http://siteresources.worldbank.org/INTCC/Resources/CIF_Trustee_Report_Financial_Status_of_the_CIF_for_November_TFC_Meetings.pdf.

WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT. 2002. *Towards a Sustainable Cement Industry*. Geneva: WBCSD. Available at: <http://www.wbcd.org/web/publications/toward-a-sustainable-cement-industry.pdf>.

WORLD ECONOMIC FORUM. 2008. *CEO Climate Policy Recommendations to G8 Leaders*. Geneva: World Economic Forum. Available at: <http://www.weforum.org/documents/initiatives/CEOStatement.pdf>.

WORLD RESOURCES INSTITUTE. 2008. *Measuring the way to a new global climate agreement* (forthcoming).

ZAKKOUR P, KING E, COOK G, MARUYAMA N AND RANA S. 2008. *Carbon Dioxide Capture and Storage in the Clean Development Mechanism: Assessing market effects of inclusion*. ERM report for IEA





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