



PROJECT EXECUTIVE SUMMARY
REQUEST FOR Council Work Program Inclusion
UNDER THE Special Climate Change Fund

GEFSEC PROJECT ID:
IA/ExA PROJECT ID: 3520
COUNTRY: Ecuador
PROJECT TITLE: Adaptation to Climate Change through Effective Water Governance in Ecuador
GEF IA/ExA: UNDP
OTHER PROJECT EXECUTING AGENCY(IES):
 Instituto Nacional de Hidrologia y Meteorologia (Inhmi), Consejo Nacional de Recursos Hidricos (Cnrh), Camaren, Ministry of the Environment
DURATION: 4 years
GEF FOCAL AREA: Climate Change
GEF STRATEGIC OBJECTIVES:
GEF OPERATIONAL PROGRAM: Special Climate Change Fund (SCCF)
PIPELINE ENTRY DATE: November 2005
EXPECTED STARTING DATE: AUGUST 2007
EXPECTED CEO ENDORSEMENT:
IA/ExA FEE: US\$301,500

FINANCING PLAN (\$)		
	PPG	Project*
GEF Total	350,000	3,000,000
Co-financing	(provide details in Section b: Co-financing)	
GEF IA/ExA	50,000	
Government	100,000	3,000,000
Others		3,000,000
Co-financing Total	150,000	6,000,000
Total	500,000	9,000,000
Financing for Associated Activities If Any:		

** For multi-focal projects, indicate agreed split between focal area allocations

FOR JOINT PARTNERSHIP**		
GEF PROJECT/COMPONENT (\$)		
(Agency Name)	(Share)	(Fee)
(Agency Name)	(Share)	(Fee)
(Agency Name)	(Share)	(Fee)

*** Projects that are jointly implemented by more than one IA or ExA

CONTRIBUTION TO KEY INDICATORS IDENTIFIED IN THE FOCAL AREA STRATEGIES:

Approved on behalf of the *United Nations Development Programme*. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for work program inclusion.

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 Project Executive Summary Template V4.doc
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1. PROJECT SUMMARY

Background and project rationale

1. Because of its geographical location and rugged topography, Ecuador is highly vulnerable to anticipated impacts of climate change on water resources (UNFCCC First National Communication, Quito, 2000). Periodic El Niño events, particularly those of 1982-83 and 1997-98, have already demonstrated the likely magnitude of catastrophic effects from climatic perturbations (refer to the Project Document for details). Due to the cross-cutting nature of water resources, increased mean temperature, recurrent droughts and floods, retreating glaciers, and more intense and infrequent rainfall patterns will have a wide ranging set of impacts on water supply (Annex 1 outlines a detailed summary of anticipated climate change scenarios for Ecuador and implications on water resources). These heightened vulnerabilities to climate hazards will compound current water governance problems in Ecuador.
2. The project **goal** is to “mainstream climate change risks into water management practices in Ecuador.” As a contribution to this goal, the project **objective** is “to increase adaptive capacities to address climate change risks in water resource management at the national and local level.”¹ Towards this end, three outcomes will be realized including the integration of climate change risks into key national and local water development and management plans, implementation of adaptation measures, and information management and knowledge brokering (see below for details).
3. The project focuses on interventions (“system boundary”) at the national and local level. At the national level, the project will improve water governance by incorporating climate risks consideration into water management and decision making processes. At the local level, interventions will be in specific provinces that have been identified based on climate change vulnerability assessments and stakeholder consultations completed during the preparatory phase. These provinces which host key watersheds have shown a political willingness to implement adaptation measures to climate change to improve the governance and management of water resources in the face of climate change. The participation of provincial authorities and local communities is an integral component of this project and will ensure the sustainability of the interventions beyond the lifetime of SCCF support. The provinces where pilot measures will be implemented include Los Rios, Manabi, Loja, and Azuay.
4. The formulation of the project strategy (outcomes and activities outlined below) is based on the guidance of UNDP-GEF’s Adaptation Policy Frameworks document². A vulnerability-based approach was utilized by applying criteria by which climate change risks on water resources are assessed, taking into consideration the probability of exceeding a threshold level of risk. The project approach answers critical questions for the identification and adoption of policies that address climate risks in the context of national development priorities. For instance, some of the key questions that the project will address include: To what extent are the expected benefits from existing water management and development programmes or projects sensitive to climate risks? How should future climate change be incorporated into the design of water management and development initiatives or into national planning processes? How should current climate variability be taken into account to build climate resilience of key sectors that rely heavily on water resources?

¹ The project Objective also corresponds to the third of the four global objectives identified under Thematic Area 2 (Water Resources and Quality) in UNDP’s global “Monitoring and Evaluation Framework for Adaptation”, namely Adaptive Capacity: Institutional capacity of water sector including supply and demand management to respond to long-term climate variability and change enhanced.

² UNDP, 2005, Adaptation Policy Frameworks for Climate Change: Developing strategies, policies, and measures.

5. During the PDF process, the following steps were undertaken to design the project and involve key stakeholders:

Establishment of a project team

- An inter-disciplinary team was formed to guide the development of the proposal.

Scoping of project

- *Review and synthesis of existing information*- this included in particular information from the Initial National Communication and various sectoral strategies and plans.
- *Establishment of a stakeholder process*- Numerous consultations were undertaken with key stakeholder groups (see Annex 2 for a list of stakeholders consulted).
- *Prioritization of key systems* - Information from the FNC and other sources was used to identify the water resources sector as especially vulnerable to climate change. In addition, potential case study interventions were identified based on vulnerability assessments of key users of water resources.
- *A review of the institutional structures* – A review of the sectoral and inter-sectoral institutional structures relevant to water management at the national and local level. This activity was key to identify gaps, weaknesses and opportunities to be considered when designing appropriate water governance schemes to address climate change risks on the water sector. The review was carried out in the context of the institutional structures needed to implement long-term interventions that will ensure the sustainability of the project.
- *A review of the policy process* – This involved examining the relationship between key policy process and climate change adaptation, the potential for integrating adaptation concerns into policy agendas, and ways to improve existing linkages for policy coherence and to strengthen commitment to adaptation. Special attention was given to the potential linkages between the project and the achievement of the relevant MDG goals.
- *Monitoring and Evaluation* - Definition of the criteria for a monitoring and evaluation framework to assess the impacts of an adaptation strategy for the water sector in the context of broader development priorities.
- The details of the findings are reflected in the Situational Analysis section of the UNDP Project Document.

Design of the project

- Selection of approaches and methods – as discussed above, the vulnerability-based approach was selected as the basis for project design
- Determination of project objectives and outcomes
- Development of indicators, on the basis of discussions among stakeholders
- Development of a monitoring and evaluation strategy, based on the project log-frame matrix

6. The project is well aligned with the UN programming objectives in Ecuador. The country programme (CPO/CPD) for UNDP in Ecuador (2004-2008) supports the new government's efforts to reinforce citizen participation and democratic dialogue, combat corruption, reduce poverty and exclusion, and reactivate the economy to create jobs and wealth, as well as improve the environmental security. The country programme of UN agencies in Ecuador is articulated around three UNDAF objectives: (i) poverty reduction through improved access to basic social services and employment; (ii) democratic governance and transparency through strengthening of government institutions and decentralisation process; and (iii) sustainable environment through equitable access to natural resources. UNDP is assisting Ecuador combat poverty by strengthening social protection networks and technical and other resource support for expanding livelihood opportunities. The proposed project will contribute directly to outcomes under two of these objectives:

- UNDAF objective 1: poverty reduction through access to quality basic social services and productive activities
 - Public awareness and policy dialogue on sustainable human development. *This project will contribute through promoting awareness of climate change risks on water resources and therefore on livelihood opportunities. It will contribute to the policy dialogue on sustainable human development through the focus on climate change issues of relevance to human development.*
 - Capacity of and partnership between local authorities and civil society organizations. *This project will contribute by focusing on developing partnerships between government, the private sector and civil society to manage climate change risks.*
 - Access to basic social services and systems for risk management. *The project will contribute through establishing information systems that can support climate change risk management strategies.*
 - Capacity development to manage and reduce risk of natural disasters. *This project will contribute by focusing on capacity development of key stakeholders to manage climate change risks.*
 - UNDAF objective 2: environmentally sustainable development to reduce poverty
 - National policy, legal and regulatory framework for environmentally sustainable development. *The project's focus on policy instruments to manage climate change risks will promote environmentally sustainable development.*
 - Institutional framework for sustainable environmental management and energy development. *The development of institutional structures to better manage climate change risks will be an important contribution to sustainable environmental management.*
7. The project will contribute to the MDG Goal 7, Target 9: “Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources”. Improved management of climate change risks and water management practices will also contribute towards the achievement of MDG Goal 1, “Eradicating extreme poverty and hunger”. The project is designed to address a range of considerations that are of priority for the improved management of climate risks in the water sector. For one, the project will integrate climate change concerns into planning and policy formulation processes for water resources, including day-to-day practices of planners and other stakeholders (i.e. “top-down” intervention). The project will also train local and regional water resources managers in governmental agencies, grassroots organizations and NGOs on innovative approaches to mainstream climate change adaptation to water management practices (i.e. “bottom-up” intervention). Details of the proposed interventions including baseline and additionality considerations are outlined in the next section.
8. UNDP has a comparative advantage, relative to other GEF agencies, in designing and implementing this project. UNDP supports efforts in Ecuador towards meeting the Millennium Development Goals by sharing knowledge and best practices learned from our global knowledge network. UNDP contributes actively towards the establishment of alliances between central government agencies, local governments, social organizations, agencies of the UN System and other multi- and bilateral donors. UNDP has supported the development of national capacities to develop climate change mitigation and adaptation policies ever since the elaboration of the First National Communication to the UNFCCC and through the execution of the NCSA – Phase 1 project. Through the Small Grants Programme, UNDP has acquired direct on-the-field experience in the implementation of community-level climate change projects. UNDP’s experiences in the implementation of and coordination of a major multi-stakeholder project (re-electricification of the Galapagos Islands with renewable energies) will be invaluable in the context of this project. UNDP has a proven track record in leveraging partnerships and co-financing as with the Galapagos project where an investment of 5 million dollars by GEF has been met with more than 25 million dollars in co-financing.

9. UNDP has capacities that constitute true comparative advantages in the context of international cooperation in Ecuador. Among these the following stand out:
- The provision of flexible, effective, opportune technical assistance focused toward strengthening institutional capacities both at the national and local level.
 - A well established capacity to mobilize resources for development.
 - Access to global information networks, experience and knowledge
 - Neutrality, credibility, and social trust aimed at facilitating agreements and prevention and mediation of social conflicts.

Project outcomes and outputs

10. The project has 3 main outcomes. These outcomes, and their associated outputs, are listed below:

Outcome 1: Climate change risk on the water sector integrated into key relevant plans and programmes.

11. This Outcome corresponds with Outcome 4 in UNDP's draft global "Monitoring and Evaluation Framework for Adaptation", namely "New plans or adjusted policies based on plausible climate change impacts on water availability and use developed and piloted"

Baseline (US\$1,200,000 Co-financing from SENPLADES, CNRH, and leading Provincial Governments³)

12. At present, the water sector in Ecuador is characterized by unclear institutional coordination mechanisms for policy makers, the absence of a clear water resources strategy that takes into account climate change risks, and limited stakeholder participation in decision-making processes. The assessment carried out under the PDF-B phase found that, in spite of a number of on-going relevant initiatives, there is a lack of solid understanding of how climate change would impact water supply and demand. Thus many plans and programmes that affect water resources are being designed or implemented without considering the need to address climate change risks on water resources and adaptation requirements in the water sector. Under this business-as-usual scenario, these on-going initiatives will continue to ignore the threats of climate change including variability in water availability. In turn, the viability of such plans and programmes will be compromised. For instance, Ecuador has developed a National Water Management Plan (*Gestion de los recursos hidricos del Ecuador, politicas y estrategias* – currently in a draft form), which does not acknowledge the climate risks that will have direct impacts on the water sector. Similarly, the National Risk Management Plan, under the Coordination of SENPLADES and published in 2005, makes only brief references to adaptation needs in a generic fashion.
13. However, these ongoing plans and programmes also represent an opportunity to integrate climate change concerns into water management plans and strategies at different levels. Coordination among different government institutions is expected to take place under the new Government to move forward a water development agenda at different institutional levels (national, provincial, etc). This includes the finalization of the national water management plan and the development of a new framework to guide the development of Ecuador.
14. Over the last few years, within the context of state modernization, Ecuador has been implementing a policy of decentralization. Ecuador's decentralization law allows for local governments to request the transfer of responsibilities from the central to the provincial and municipal levels. This

³ Discussions with all the relevant institutions that will provide co-financing for the project are currently taking place. Co-financing will be secured by the time of CEO endorsement.

includes several attributions with respect to water governance and has resulted in strong demands for decentralization. Within a decentralized framework, provincial councils and municipalities will thereby assume an important role in (among others) water resource management by developing public policies, creating an enabling environment for development and participatory processes, and providing support in financial and human resources.

15. Current measures that are being implemented or planned to improve institutional frameworks that are of relevance to adaptation to climate change in the water sector include:
 - *National water management plan.* The proposed plan is currently in draft form. A review process will take place to improve the plan and involve a wider range of stakeholders. The review process will establish the basis for a more comprehensive water management plan and will represent an opportunity to open the debate on how the plan could incorporate adaptation to climate change in the water sector.
 - *National Development Plan.* The Government is initiating the process of defining the development course of action for Ecuador over the next 5-10 years. Policy makers at different levels and across sectors are expected to play a key role in the definition of the new development plan. This project will build on the structure and institutional framework for such a plan as it is developed by working in collaboration with the relevant institutions. The Government has placed a high priority on water governance in the new plans.
 - *National Risk Management Plan.* The objective of this plan is the formulation of policy guidance to reduce exposure to disasters, with some consideration to climate risks. SENPLADES will be establishing a consultation process with the relevant stakeholders in the water sector to identify ways in which this plan can be operationalized.
 - *Provincial development plans and risk management proposals.* The provinces that this project will focus on have developed water development plans and risk management proposals. These provide an overall framework for decision-making across sectors, including the water sector, and some general principles for risk management. Neither the provincial plans nor the risk management proposals take into account climate change risk on the water sector. However, they provide a sound basis for the inclusion of such risks (and adaptation needs) into the governance of water at the provincial level.
16. The above baseline activities are expected to provide key contributions to the process of integrating water-related climate risk into relevant national initiatives. However, substantive inputs from the proposed project are required to ensure that the baseline activities are successfully achieved. In this sense, the project is expected to play a catalytic role in bringing climate change concerns in the water sector to the attention of policy makers through practical and effective actions. These are described in the section below.

Additional Cost Reasoning (US\$400,000-SCCF)

17. Without GEF intervention, water management schemes that address climate change concerns will not be introduced systematically. Responses to address climate change concerns with regards to water resources will likely be adopted on an ad hoc basis, and in response to extreme climatic events that affect water availability and allocation. Currently, there are neither concrete measures nor sufficient institutional capacities to ensure that climate change issues in the water sector are addressed. This project will meet the additional costs of addressing such key gaps including i) developing practical guidance to assist relevant water management institutions to integrate climate change concerns, and ii) incorporating climate risks into relevant water management plans and programmes.
18. SCCF funds will contribute towards ensuring that climate change risks are mainstreamed from specialized forums on climate change to national and local institutions, particularly those involved in regional and local water resource planning and management. With GEF support, climate

change risks in the water sector will be integrated into the relevant programmes described above at the national and particularly at the local level. The focus of this project will be on activities in provinces that will be covered under the project, namely Manabi, Los Rios, Azuay, and Loja. These provinces were selected on the basis of a consultative-based vulnerability and capacity assessment undertaken during the preparatory phase.

19. The project will promote collaboration among governmental and non-governmental stakeholders associated with water governance, with the objective of ensuring that climate change risks are appropriately incorporated into the policy making process. Given the lack of understanding and experiences on how climate risks and relevant policy frameworks can be integrated into the water sector, the project will develop a practical approach to facilitating this integration and educate the policy makers along the process.
20. The expected project outputs from the integration of climate change risks issues related to water management plans and programmes include:

Output 1.1: Practical guidance on the integration of climate risks into relevant water management plans and programmes developed

21. This output will provide a practical framework to guide the process of integrating water climate change risks and adaptation into relevant water management plans. The guidance will serve as a comprehensive and practical reference on how local water governance institutions can conduct the integration of climate change risks into ongoing strategies and plans more effectively. Key stakeholders both at the central level (MoE, Ministry of Agriculture, the CNRH and SENPLADES) and at the provincial and local levels (Provincial Councils, Water Agencies, Municipal governments, NGOs) will be involved in the formulation of practical measures, taking into account the evolving needs of the institutions and the policy context for the water sector. More importantly, the guidelines will target the needs of the on-going planning efforts mentioned earlier to ensure that this integration will be established as a learning exercise. Thus, the ultimate goal of the guidelines is to effectively assist policy makers in setting up a framework for the integration of climate risk in the water sector. The proposed activities in support of this outcome include:
 - Review of the gaps and opportunities in existing plans to identify viable approaches to the development of the guidance.
 - Set up a consultative process to include key stakeholders in the process of integrating climate concerns into water management plans.
 - Review experiences from other regions and, if available, in Ecuador on similar initiatives to facilitate integration of climate risks concerns in development plans.

Output 1.2: Relevant plans and programmes incorporate climate risks in the water sector

22. Informed by the details in output 1.1, output 1.2 will focus on the integration of climate risk in the water sector into the relevant planning process at the national and the provincial level. At the national level, the proposed activities in support of this output include:
 - Revision of key water governance plans described below to incorporate climate change risks in water management:
 - *National Water Management:* Given that the National Water Management plan is already available in draft form, this project will ensure that the revision process adequately addresses the basic principles of climate risks on water availability. The objective is to create the conditions for more effective initiatives of adaptation in the water sector. The plan itself does not intend to cover all aspects of adaptation but rather to bring the priority

needs for adaptation interventions at the higher institutional level within the water sector. The project will coordinate with CNRH to assist in the review process, by advising on the climate issues to be considered and providing information on adaptation requirements.

- *National Development Plan*: The project will take advantage of the fact that key national institutions are part of the National Steering Committee of this project. This includes the National Secretariat of Planning (SENPLADES), MoE, CNRH, and CONCOPE. These institutions are key participants in the ongoing reformulation of the national development plan. They are best placed to promote the inclusion of climate change issues into the National Development Plan. Their direct involvement will help to ensure that the inclusion of climate change risk management strategies and measures in the water sector do not become an obstacle to the achievement of broader development objectives. The project will ensure that the National Development Plan incorporates climate change concerns on water resources by acknowledging (a) the threat posed by climate change and (b) creating an enabling environment (e.g. through legislative changes) that will promote adaptation.
- *National Risk Management Plan*. The project will work with SENPLADES to assist in the process of updating the National Risk Management Plan so that considerations for climate change risk management in the water sector are also included. Given that this National Risk Management Plan provides overall guidance on risk management, SCCF funds will be used to meet the additional costs of ensuring that adequate consideration is given to climate change impacts and adaptation needs on water resources.

23. At the local level, provinces and municipalities have development plans, and some of them also include risk management plans. However, these plans do not take into account risks from climate change. Currently, these plans are implemented based on public priorities and potential investment opportunities by public and private stakeholders. In some selected provinces, actions taken to improve water management and conservation are driven by negative water balance effects, which are partly the result of climate-induced factors. Although there is insufficient public awareness, some actions are undertaken already in important watersheds such as Paute, Jubones, Catamayo and others which are within the scope of this project. To facilitate the inclusion of climate change risks criteria into provincial and local development plans, the project will develop, with appropriate stakeholder input, an implementation and follow-up plan to apply the guidelines from output 1.1.

24. At the local level, the proposed activities in support of this output include:

- Insertion of climate risk management criteria in the provincial and local water sector plans. The guidelines from output 1.1 will be implemented in at least two of the four provinces of intervention to guarantee the inclusion of climate risks in the water sector into provincial and local development and risk management plans.
- Preparation of a follow up mechanisms to monitor the climate change adaptation actions in the implementation of the development plans.
- Updating and improvement of provincial and local development plans and provincial risk management plans will be funded through co-financing (as they focus on baseline (non-climate) related risks). The incorporation of climate change risk information into these plans represents interventions that will be supported with SCCF funds. SCCF funds will also be used to further strengthen local capacity to mainstream climate change adaptation issues into water management policies and practices. These efforts are essential for facilitating the integration of climate change risks into the national water development agenda. Two national agencies with key roles both in water governance and planning will lead the production of this output: CNRH, which presides over the Water Resources group of the CNC, and SENPLADES, the national planning secretariat. At the local level, Adaptation Councils will be created in the four provinces to lead the integration process in provincial development and risk-management plans.

Outcome 2: Strategies and measures that will facilitate adaptation to climate change impacts on water resources implemented at the local level.

25. This Outcome corresponds with Outcome 1 in UNDP's global "Monitoring and Evaluation Framework for Adaptation", namely "Development plans/specifications informed by or revised to account for potential impact of climate change on future water resources" and Outcome "2 (or 3)" in UNDP's global "Monitoring and Evaluation Framework for Adaptation", namely "Water saving measures (e.g. rainwater harvesting, micro dams, efficient technologies) introduced"
26. The outcome focuses on practical solutions to impending problems at the local level. In the absence of the project, responses to climate change would be reactive and adaptive capacity constrained by lack of a coherent strategy that addresses long-term climatic conditions. Without access to tools to build resilience and the means to put in place appropriate response measures, local organizations and communities will be constrained in their abilities to address specific climate threats on water resources. Field-based adaptation provides opportunities to obtain practical experience and develop best practices. The project will pilot interventions that integrate climate risks into activities which rely heavily on water.
27. The consultative process during the preparatory phase revealed that adaptation measures could be implemented in four provinces, two in the Pacific Coast and two in the Andean region: Manabí, Los Ríos, Azuay and Loja. The selection was based on the following criteria: (i) the existence of some institutional capacity to mainstream adaptation in existing activities; (ii) past history of extreme climatic events coupled with social vulnerability, (iii) experiences in spontaneous adaptation that could be identified and further developed, and (iv) interest and motivation of local authorities and other stakeholders. The four provinces are also in the process of implementing emergency response plans and risk management measures to improve their preparedness to confront extreme climate events. As such, this project will catalyze substantial baseline co-financing towards the achievement of this outcome.
28. The two pilot interventions implemented under this outcome focus on integrating climate change risks into water management in activities of strategic importance to Ecuador, namely in agriculture and hydroelectric power. Case 1 refers to the Paute Hydropower plant, located in the province of Azuay. HidroPaute, the company that manages the plant, is currently investing US\$320 millions in increased generation with the construction of two additional hydropower plants in the same river: Mazar (190 MW) and Sopladora (312 MW). Case 2 refers to introducing water adaptation measures and technologies in small-holder agricultural practices in the provinces of Los Rios, Manabi and Loja.

Baseline (US\$3,250,000- Co-financing from CGPaute, HidroPaute and the Provincial Governments of Manabi, Los Rios, and Loja)

29. There are a number of baseline development issues that are of relevance for this outcome and which will form the foundation of the proposed interventions.
 - *Development of water resources inventories and provincial information systems.* Local authorities in the selected provinces are carrying out various activities with the objective of putting in place a more effective management scheme for water resources. The most advanced is the Province of Azuay, where the provincial council and other entities such as the Council for the Paute Watershed (CG Paute) and the water utility ETAPA completed the first phase of a water inventory at a cost of US\$125,000. A second phase will be implemented at a cost of approximately of US\$325,000.
 - *Local water management initiatives:* Climate extremes on the water sector (i.e. floods and droughts) in the selected provinces have caused significant impacts on local livelihoods. Over

the last few years, several NGOs and international/bilateral cooperation programmes have implemented projects to improve local management of natural resources, including the creation of watershed committees. Specific measures include reforestation programmes, building of water reservoirs, and protection of water sources, promoted by provincial entities, municipalities, and community organizations.

- *Local funds for the conservation of water sources in strategic watersheds:* Several local trust funds exist to support local actions that promote environmental sustainability. The National Environmental Fund (FAN) represents an important and useful instrument to finance local initiatives in natural resource management. Over the last few years, similar instruments have been developed for water resources, particularly the Water Fund for Quito (FONAG), which represents a significant initiative to mobilize local resources to support actions for the protection of water sources in the Quito Valley. Based on this experience, Cuenca's water utility (ETAPA) and an energy producer (Elec Austro) have agreed to establish a water fund (with approximately \$410,000 in seed capital) for the Paute watershed. Additional partners, such as other energy utilities, partners in the industrial sector, and Hidropaute are expected to materialize over the coming months. Other entities are exploring the feasibility of adopting a similar mechanism for the Province of Loja. There is also interest from other provinces to develop a similar approach for funding water protection.

30. This outcome will be achieved by building on the efforts of three critical stakeholders: a) Regional Development Corporations, Provincial and Municipal authorities, and watershed-management authorities, all in charge of water-related infrastructure investments and/or of the care of key watersheds; b) International organizations and NGOs involved in technical cooperation and sustainable development institutions, microfinance, and risk management initiatives and projects; c) Communities and local NGOs. Particular attention will be paid to the latter group to facilitate strong involvement of local communities in the design and implementation of this component from the beginning of the project. In each province, the Adaptation Councils (see Outcome 1) will secure the participation of relevant stakeholders and will lead a public awareness strategy to target the relevant groups.

Additional Cost Reasoning (US\$2,000,000 - SCCF)

31. With SCCF support, the project will promote, complement, and co-finance technical aspects and concrete measures in four provinces. Interventions will focus on implementation of climate change adaptation strategies in water resources management in two activities (hydropower generation and agricultural practices), provision of financial mechanisms to support adaptation responses in strategic watersheds.

Output 2.1: Measures, technologies and practices to improve the adaptive capacity of water resources management introduced and implemented in pilot systems.

32. The pilot interventions in this project will address climate risks affecting water availability for different uses (e.g. agricultural production and/or energy provision). The project will integrate climate change information into the planning and management of a hydro-power facility, and also (with the support of co-financing) in community-based water management measures. Technologies and practices will be modified and/or introduced to increase the resilience of these activities to anticipated changes in the water supply and rain intensity and frequency. Funding for these local adaptation measures will be provided by already-existing funds (FAN, FONAG, Paute Watershed fund) that will receive technical support of the project to help them incorporate climate risk considerations when deciding on which interventions to finance. The project will provide additional funding to help local stakeholders in the elaboration of proposals of concrete adaptation measures. The actual funding of these proposals will be provided through co-financing by these funds.

33. *Anticipated activities include:*

2.1.1 *Case 1: Improve water management practices in the agricultural sector of selected provinces.*

34. The SCCF funds will support improvements such as:

- Implementing practices that lead to improved water conservation and efficient use. This includes changes in crop planting/harvesting patterns, selection of drought-tolerant crops, improving land management techniques, implementing changes in land use.
- Incorporation of water saving technologies for irrigation such as drip irrigation, adjusting timing and volumes of water application in irrigated land, etc;
- Identification and implementation of economic incentives to promote the adoption of climate change risk reduction measures by small producers;
- Designing insurance mechanisms to protect producers from climate induced harvest failures.
- Improving the existing mechanisms for the allocation of water use rights, considering future variations in water supply due to climate change, as well as the need to rationalize water consumption.
- Develop and implement criteria for project formulation and selection that can be applied to funds available through local sources (e.g. by FAN, FONAG, Paute). This will ensure that funding for watershed management promotes adaptation to climate change and discourages maladaptation in the water sector.
- Elaboration of a list of prioritized adaptation interventions to be funded with local resources (for instance by FAN and FONAG).

2.1.2 *Case 2: Integrate climate risks into water management practices in a hydroelectric project.*

- In partnership with a private company, HIDROPAUTE S.A., the project will support the application of planning models such as WEAP (Water Evaluation and Planning), which will include details of national climate change scenarios. Such models will help managers to decide upon the allocation of water resources between different sectors, and to consider supply and demand, water quality and ecological needs when planning. Key information on hydro meteorological information of the basin, different uses of water in the area, and systems that are able to forecast the most likely climate change scenarios will be incorporated to enable improved planning of water usage for hydropower production by this plant.
- Implement concrete adaptation measures to improve water inflow to the Paute reservoir. This includes improvement of land management practices in the upper parts of watershed to address seasonal droughts which are becoming more unpredictable and prolonged. These measures will complete ongoing efforts by HidroPaute, such as increasing reservoir capacity, efficiency of turbines and energy efficiency.

Output 2.2: Information management systems reflecting climate change impacts on the water sector developed

35. Existing institutional arrangements do not promote the efficient transfer of information between climate information providers and users. This results in problems such as water use permits being administered without any foresight of likely water supply pressures, water development planning failing to account for future water resources availability, and the lack of useful hazard maps. In turn, faulty or insufficient information contributes to the limited awareness of the risks associated with climate change among policy makers, officials in key water management agencies at the central government level and in vulnerable provinces and the general public. This is a serious limitation for the interpretation of climate risks into the design of appropriate policy responses.
36. Without GEF intervention, information used for water planning and management will not address climate risks and will fail to provide accurate and timely data. Furthermore, the weak capacity to

design and put in place appropriate information and knowledge management schemes will represent a key barrier to water management in the context of climate change.

37. SCCF funds will be used to complement ongoing local initiatives to improve the monitoring of water resources by integrating climate information. This includes improving the currently sub-standard hydrological monitoring network (through co-financing), using downscaled climate change scenarios to detect vulnerabilities, producing updated hazard maps in flood-prone regions, especially in the Los Rios and Manabi provinces, and providing support to policy makers in charge of making decisions about land use and long-term adaptation measures.
38. The project will contribute to the improvement of information management systems through the following activities:

2.2.1. Include climate change considerations in provincial hydrological inventories (water balances)

39. Local authorities in the provinces of intervention have advanced in the compilation of hydrological inventories. The project would finance the incorporation of climate change impacts on inventories, to identify vulnerability of water resources at a scale appropriate to support the design of policies and strategies on water resources management and climate change adaptation at the local level. National institutions like CNRH and INAMHI, and regional entities with responsibilities in water management will be the relevant actors of these processes.

2.2.2. Strengthen the hydrological and meteorological information networks at the provincial level.

40. The project will establish an integrated information system taking into account climate risk and impacts in the water sector in the selected provinces. The current agreements and inter-institutional arrangements will be improved in order to ease the flow of climate-relevant water resources risk information for decision makers, the monitoring of climate risks on water resources and the articulation of information systems with national and regional hydro-meteorological data. Common procedures to collect, archive and manage climate data and climate risk information for the water sector will be designed and implemented. These procedures will strengthen existing early warning systems for floods and droughts.

Outcome 3: Institutional and human capacity strengthened, and information/lessons learned disseminated

41. This Outcome corresponds with Outcome 3.1 in UNDP's global "Monitoring and Evaluation Framework for Adaptation" (see Annex 3, Table 2: Adaptation Goals, Objectives and Indicative Outcomes and Indicators for Water Resources and Quality).

Baseline (US\$1,550,000- Co-financing from MoE, SENPLADES, CNRH, INHAMI, leading Provincial Governments)

42. In the absence of the project, institutional capacity to address climate risk in water management will continue to be weak. On-going efforts to strengthen national capacity on climate change adaptation are restricted to the Second National Communication, which covers generic adaptation issues but neither addresses the capacity needed for implementation of adaptation measures on the ground, nor the strengthening of institutional capacity to mainstream adaptation in the water sector. Similarly, no lessons on adaptation to climate change would be generated. The lack of successful and practical adaptation intervention in Ecuador continues to hinder the possibilities of innovative adaptation policy frameworks at the national or local level. Adaptation interventions in Ecuador have been limited to assessments and general descriptions of adaptation measures, which have not produced lessons that can be replicated at different scales. As a result, stakeholders and

national institutions have not been able to learn from relevant experiences that can feed into national and local planning to address climate risks in the broader development context. However, the Government is currently developing a strategy to inform stakeholders on the need to address environmental concerns in the context of human development. For instance, with funding from the Bureau of Crisis Prevention and Recovery (BCPR), UNDP is working with the Provincial Council and four municipal governments of the Province of Los Rios, to create local capacity for early recovery after seasonal floods.

Additional Cost Reasoning (US\$600,000 - SCCF)

43. Integration of climate change concerns into water management plans and strategies, as well as implementation of adaptation measure on the ground is not a trivial task. They require a comprehensive understanding of the steps needed to prepare the enabling environment, identify specific measures that need to be implemented, information to support the integration process and application of adaptation measures, and the appropriate follow up mechanisms to assess progress and take corrective actions (monitoring and evaluation).
44. SCCF funds will be used to develop institutional capacity to design and implement a more comprehensive and strategic approach to address climate-related risks in the water sector. As a result, incorporation of climate risks into water planning and management is more likely to succeed. All interventions supported by the project will generate lessons of relevance not only to Ecuador but also to other countries facing similar hazards. Consequently, all the costs associated with codifying and disseminating such lessons are eligible for GEF funding.
45. Learning is an important goal of the GEF adaptation portfolio. This project, like others, will implement a significant learning component, using monitoring and evaluation good practices. Rigorous evaluation will enable the GEF and other agencies to measure progress and the GEF to learn how to strengthen and widen its portfolio. A template for lessons learned is attached as an annex to the project document and will be amended to fit the local context during implementation by the Project Management Unit.
46. Through linkages to UNDP-GEF's Adaptation Learning Mechanism (ALM), the learning process should be effectively promoted. The ALM is designed to contribute to the integration of adaptation to climate change within development planning of non-Annex I countries, and within the GEF's portfolio as a whole. From the GEF family perspective, sharing knowledge among users will ensure that the GEF portfolio, as a whole, can benefit from the comparative strengths and experience of the various Implementing Agencies. Outputs of this component will include:

Output 3.1: Improved institutional and technical capacities to support the mainstreaming of climate risks and implementation of adaptation measures in the water sector

47. Training of personnel in key agencies is essential to build institutional capacity to ensure adoption of appropriate measures and appropriation of the above mainstreaming process. Given the broad range of technical, institutional and policy issues that will be involved in this mainstreaming process, capacity-building activities will target staff at different institutional levels. Ultimately, staff responsible for overseeing the mainstreaming process at different stages and levels, should be able to advise decision makers and other stakeholders to ensure effective integration of climate risks into key water management plans and strategies. Target agencies will include central government agencies such as MoE, MoA, CNRH, INAMHI, SENPLADES, CONCOPE, and FRH as well as the local water agencies of CNRH. Capacity building activities will include training on targeted approaches for mainstreaming climate change risks through information management, knowledge brokering, and mechanisms to promote local innovation in sustainable adaptation

measures in water management. The overall capacity building approach will include follow-up procedures to assess impacts and ensure sustainability beyond the life of the project.

48. The proposed activities in support of this output include:

3.1.1. Develop and implement a comprehensive capacity strengthening approach addressing among others: (a) use of climate change-water resources risk information in decision making process in the water sector; (b) linkages between climate risks and development issues for more effective planning and management of water resources; (c) development of a follow up mechanism to assess progress of measures adopted as a result of the mainstreaming of climate risks and implementation of adaptation measures on the ground. Training will be conducted both at the national level, targeting policy-makers and staff of relevant ministries/institutions, and at the local level, targeting the main stakeholders of the four provinces, including the local communities involved.

3.1.2. Identify learning experiences from other relevant initiatives so that capacity strengthening initiatives build on and coordinate with other climate change projects, such as the Second National Communication to the UNFCCC and the Regional Adaptation Project in Ecuador, Bolivia, and Peru (led by the World Bank).

3.1.3. Develop a public awareness campaign to increase support for adaptation measures in the water sector. Awareness of the risks associated with climate change is low among all segments of society. A public awareness campaign, targeted at a number of different audiences, including government officials, schools, and the general public will emphasize the potential impacts of climate change, factors increasing vulnerability, and potential solutions. Cooperation with the education departments of the MoE and the Ministry of Education will also be established, in order to mainstream climate change contents into their ongoing educational programmes.

Output 3.2 Knowledge and lessons learned to support implementation of adaptation measures compiled and disseminated

49. The project will provide key information on climate change adaptation in a user-friendly way to all relevant local water users and authorities. Once (a) hydrology inventories have been compiled and systems established to continuously reflect and update projections with evolving climate change information, and (b) mechanisms to harmonize climate change adjusted water resources information systems at provincial level are established (under outcome 2), the project will support measures to improve the access to the information by key stakeholders. In cooperation with provincial governments, NGOs and other local interested entities, the project will oversee the creation of a public “observatory” for informing on water management in the context of climate change. This public forum will provide essential information on adaptation options, and serve as a mechanism for dissemination of state of the art knowledge on climate change and water resources. It will host of periodic meetings to sensitize local stakeholders to relevant information on climate change impacts on water resources and the contribution that key constituents can do to adapt to impending impacts.

50. To achieve this activity, the following actions will be supported:

3.2.1. *Insert climate change information into training and courses* directed at local water users (for example: this will build on an existing course on integrated water management of CAMAREN)

3.2.2. *Create a forum* for the exchange of experiences on integrating climate risks concerns between water users and authorities of different provinces

3.2.3. *Establishment of a project web site.* The site will facilitate exchange of information and dissemination of project experiences and lessons learned. The site will include both public access and restricted-access areas, and will also be linked to the ALM web-site, which will serve as a hub for the GEF's adaptation learning programme. This Internet based tool will be the main instrument of project information and communication. It will be designed through a wide innovative vision in order to share project experiences, studies, and documents in a friendly, dynamic, and attractive way. The site will include a knowledge network on Climate change and water resources at provincial level.

3.2.4. *Compilation of lessons learned with the participation of key stakeholders.* The project will provide analytical descriptions of experiences, including interim results that will be systematically compiled to provide inputs to the ALM and its learning process.

Output 3.3: Guidance documents for GEF and MoE on climate change adaptation programming in the water resource sector provided.

51. The project will highlight possible future areas of investment for the GEF and for the MoE to improve the quality of policy advice available to the water resource sector. The activities that will be developed under this output are:
 - 3.3.1 Initial workshops on the intervention sites
 - 3.3.2 Periodic visits to monitor on the ground actions
 - 3.3.3 Recurrent meetings with all involved actors
 - 3.3.4 Reports, statements and briefs on successful and unsuccessful activities
 - 3.3.5 Final report of activities of each intervention site, highlighting recommendations relevant to GEF activities on adaptation
 - 3.3.6 Identification of new sites for intervention on climate change and water resources adaptation measures, with recommendation to MoE on replication of experiences, as appropriate.
52. All the outputs referred will need to have GEF financing to guarantee the success of the implementation of the capacity building activities, sharing information and lessons learned, contribution to the ALM, and providing inputs to the GEF on policy issues in the adaptation area, including the monitoring of adaptation activities to measure success on adaptation interventions on the ground. Co-financing for this outcome are related to (i) the monitoring activities by the relevant institutions of the plans and programmes that provide the foundation for mainstreaming climate change into water issues; (ii) staff cost allocated to ensure sustainability of information dissemination activities and (iii) related capacity building activities to ensure effective implementation of project activities.
53. The costs assumed by the GEF and national counterpart to develop the three outcomes are detailed in Section II, Part I: Additional Costs Matrix.

B. KEY INDICATORS, ASSUMPTIONS AND RISKS

Key indicators

54. At the level of the project Objective, the indicator will rely on the Vulnerability Reduction Assessment (VRA) methodology, piloted in other GEF adaptation projects, such as the Community-based Adaptation Programme. This is also the recommended indicator in UNDP's global "Monitoring and Evaluation Framework for Adaptation" for Objective 3 (Adaptive Capacity: Institutional capacity of water sector including supply and demand management to respond to long-term climate variability and change enhanced). The advantages of using VRA are:
 - It is participatory, incorporating the views of key stakeholder groups regarding changes in their capacity to respond to climate-induced water resource sector issues.

- It generates a unit-less index, which can therefore be used to measure and compare progress at different sites within each country. This allows the project management team globally and within each country to practice adaptive management, utilizing regular assessments of changes in VRA to identify required modifications in the project strategy to maximize impact.
55. At the level of the three Outcomes, indicators are:
- Outcome 1: (i) Number of references to climate change risks to water in relevant plans and programmes; (ii) Number of plans and programmes that apply Guidelines; (iii) Number of plans that integrate Climate change risk issues related to water management. The target figures for these indicators are: (i) By the end of year 1, practical guidance to mainstream water climate risk has been made available to relevant stakeholders; (ii) By the end of the project, the National Water Management Plan, National Development Plan, National Risk Management Plan, and at least two Provincial /Risk management Plans include climate change risk and adaptation measures for the water sector.
 - Outcome 2: (i) Number of adaptation measures implemented at the local level; (ii) Number of communities undertaking adaptation measures; (iii) Number of farmers adopting water saving measures; (iv) Number of climate-induced inflow disruptions in the Paute hydroelectric plant project; (v) Number of institutional agreements to improve climate information networks. The target figures for these indicators are: i) By the end of the project, four provinces adopt adaptation measures to address climate risks in the water sector; (ii) By the end of the project, a climate network that includes climate change information is operational in at least two provinces.
 - Outcome 3: (i) Number of lessons learned systematized; (ii) Number of staff trained; (iii) Number of cases included in the ALM. The target figures for these indicators are: (i) Within 6 months of the start of implementation, a publicly accessible web-site will be created; (ii) At the time of project completion, at least 3 examples of lessons learned have been compiled and disseminated; (iii) At the time of project completion, at least 3 examples of best practice generated through the project will be accessible through the ALM.; (iv) At the time of project completion, draft documents will be prepared to guide future GEF and MoE support for interventions on adaptation to climate change including variability; (v) Survey of heads and technical officers of key national and local agencies.
56. For more information, and for indicators at the level of Outputs, refer to the log-frame matrix in Section 2, Part 2.

Assumptions and Risks

57. Key assumptions underlying the project design include:
- Stakeholders are able to perceive reductions in vulnerability over the time-scale determined by project duration
 - Stakeholders are able to distinguish vulnerability to climate change from baseline weaknesses in water resources management
 - The government remains supportive to improved water resource management.
 - Turnover of staff does not negate the benefits of training.
 - Selected pilot province is best placed to demonstrate the benefits of measures to adapt to climate change.
 - Communities are sufficiently homogeneous to support community action.
 - Provincial and local development plans are implemented.
 - Projects are under implementation long enough for lessons to be transferred to other projects before the end of the project
 - ALM becomes operational and effective in time to document best practices from the project.

58. Risks that might affect the success of the project include:
- A series of unusually wet years might weaken the resolve of key stakeholders in addressing water resources issues.
 - The slow pace of policy modification may mean that identified policy changes are not implemented in a timely fashion.
 - The demonstration projects fail to influence capacity development and policy modification
59. None of these risks are considered to be “high”. The most serious risk, rated “Moderate”, concerns the slow pace of policy modification. The mitigation strategy to address this risk involves early and consistent application of an awareness programme for policy makers, and engagement of senior levels of government in monitoring project implementation.
60. All other risks are considered to be “Low”, and do not warrant a mitigation strategy.

2. COUNTRY OWNERSHIP

A. COUNTRY ELIGIBILITY

61. Ecuador ratified the UNFCCC through a Congressional Resolution dated January 6th 1993, which was published as Executive Decree No. 565 in the Official Journal No. 148, March 16th 1993. The Kyoto Protocol was also signed and ratified by Ecuador in December 1999 (Official Journal No. 342, December 20th, 1999). The technical focal point for the UNFCCC and the Kyoto Protocol is the Under-Secretary of Environmental Quality at the Ministry of Environment of the Republic of Ecuador. The GEF Operational Focal point has been consulted during the preparatory phase and is fully up to date on the details of the proposed project. The project has been endorsed by the GEF Operational Focal Point.

B. COUNTRY DRIVENNESS

62. In recent country studies such as the National Communications to the UNFCCC and the NCSA, water governance has emerged as a growing public concern and the impact of climate change has been defined as a critical cross cutting issue affecting the most vulnerable sectors of the economy.
63. Climate Policy in Ecuador dates back to the early 1990s, as it became clear the country was particularly vulnerable to the effects of climate change. Following the UNFCCC ratification in 1993, the INAMHI led the Climate Change Process in Ecuador Project (PCCE). This initiative brought for the first time the issue of climate change to the attention of public policy makers in Ecuador. This initiative generated a flurry of other projects including:
- The Ecuador Climate Change Country Study (EPA).
 - A Dutch funded project on the impact of climate change on the coastal region.
 - UNITAR’s Climate Change Training Program - Ecuador (climate change Train).
 - UNEP’s Program for Offsetting of GHG emissions in Ecuador (UNEP-RISO).
 - UNDP-GEF technical support for Stages I and II of Ecuador’s National Communication to the UNFCCC.
64. Following a training programme by UNITAR, the Government of Ecuador created the Climate Change Unit, hosted by the Under-Secretary for Environmental Quality in the MoE and the CNC. The MoE chairs the CNC, and the INAMHI serves as its secretariat. Other institutions taking part in it are the Ministry of Energy and Mines, the Ministry of Foreign Affairs, and representatives from the National Council of Higher Education (CONESUP), the NGO community, and the private sector. It has functioned as the main forum for discussing climate policy in Ecuador, and

conducted the First National Communication (FNC) to the UNFCCC in 2000. The CNC guarantees the conditions for a broad-based national ownership of the process leading to the SNC.

65. Faced with heightened policy debate surrounding the management of water resources, the CNRH, produced in 2002 a policy position document, proposing a decentralized water governance structure, in the form of a National Policy and Strategy for Water Resources in Ecuador. The new policy establishes 9 major watersheds as territorial units for water management. Each watershed would have an authority which would issue water rights concessions (water is a public property in Ecuador) and permits for liquid waste disposal. The authority would also plan and control the use of water resources. Local and regional stakeholders would be part of the authority. This proposal also seeks to strengthen the CNRH, which would be presided by the Ministry of the Environment, and not the MoA as is now the case.
66. The NCSA process stresses that considerable opportunities for integrating climate change adaptation into the policy arena are being lost due to lack of inter-institutional coordination and insufficient national and local capacities in this area. The NCSA process provided an opportunity to engage a wide range of stakeholders at the national and regional level.
67. In 2001, the First Forum on Water Resources laid the foundation of what has become an important public arena for discussions on water policy. The Fourth National Forum on Water Resources was held in 2006 and brought together over 1800 participants from around the country to discuss issues related to water governance and national policy. This forum offers a unique framework through which to mainstream climate change concerns into the emerging agenda on water in Ecuador.

3. PROGRAM AND POLICY CONFORMITY

A. FIT TO GEF OPERATIONAL PROGRAMME AND STRATEGIC PRIORITY

68. The project will build upon the momentum created by the SNC in Ecuador in order to guarantee the political support required in a scenario of political uncertainties. Ecuador faces multiple hazards and presents a wide range of vulnerabilities to climate change. The impact of recurrent ENSO events demonstrates the widespread effects of climate variations in the country. In the past, Ecuador has suffered the impact of recurrent drought, periodic flooding, and associated losses in productive sectors. The effects of climate change are expected to intensify these impacts over the coming years and decades.
69. As the distribution and availability of water resources is projected to change over time, governance structures and water use practices will need to adapt. Much adaptation will be local and will occur spontaneously. However, deliberate and planned adaptation to climate change requires an iterative and multi-tiered approach that enables the adoption of sound development choices that will increase climate resilience of the water sector. It will also require involving different sectors and levels of society.
70. Future public and private investment in productive uses of water, particularly in irrigation, hydro energy, industry and urban water supply in vulnerable areas will need to factor in changes in the reliability of rainfall and the availability of surface water. Incremental investments will be needed to increase water storage, introduce water-saving technology and protect settlements and productive assets from storm surges and floodwaters. Sturdy institutions and adequate water governance schemes are required to tackle the growing threats of climate change impacts in the availability and quality of water resources.
71. A single project cannot address the entire spectrum of climate risks in Ecuador. For this reason, the scope of the project is limited to priority interventions in capacity development, institutional/policy frameworks and pilot demonstration activities. Programming for adaptation

will promote climate-resilient development of the water sector. The project will seek to integrate climate change risks into the water sector, thus contributing also to the fulfillment of the Millennium Development Goals, particularly Goal 1 (poverty eradication) and Goal 7 (environmental sustainability).

72. The project will work with the relevant stakeholders in the formulation and adoption of national policies that increase the resilience of water resources. It seeks to strengthen monitoring capacities for environmental changes linked to climate change as a means to assess current vulnerabilities and design/update appropriate management responses. At the local level, financing for pilot activities will seek to increase local awareness of climate related risks and improve the adaptive capacity of vulnerable groups. Special attention will be given to innovative approaches to adaptation through revised water rights allocations, strengthened water authorities, and accessible water-saving technologies.
73. The project is consistent with the eligibility criteria for the SCCF, as laid out in “Programming to Implement the Guidance for the Special Climate Change Fund Adopted by the Conference of the Parties to the United Nations Framework Convention on Climate Change at its Ninth Session” (Council paper GEF/C.24/12; October 15, 2004). Consistent with the Council Paper (paragraph 40), the project is:
 - country-driven, cost-effective and integrated into national sustainable development and poverty-reduction strategies; and
 - takes into account national communications and other relevant studies and information
74. The project will also serve as a catalyst to leverage additional resources, and efforts have been made to maximize co-financing from other sources (GEF/C.24/12, paragraph 25). The selected sector is one of the priorities outlined in paragraph 44 of the GEF document, namely water resources management.
75. The project will support capacity building, including institutional capacity, for preventive measures, planning, preparedness and management of disasters relating to climate change, including contingency planning for droughts and floods in areas prone to extreme weather events (GEF/C.24/12, paragraph 46), and support strengthening existing centers and information networks for rapid response to extreme weather events, utilizing information technology as much as possible (GEF/C.24/12, paragraph 47). Furthermore, as described earlier, the costs of water resources use falls disproportionately on the poor, and the project therefore recognizes the link between adaptation and poverty reduction (GEF/C.24/12, paragraph 41).
76. This proposal requests the GEF to finance the additional costs of achieving sustainable development imposed on Ecuador by the impacts of climate change (GEF/C.24/12, paragraph 51).

B. SUSTAINABILITY (INCLUDING FINANCIAL SUSTAINABILITY)

77. The concept of sustainability differs for adaptation to climate change projects, compared with other types of GEF-funded projects. This is because adaptation projects seek to raise the adaptive capacity to long-term climate change. Consequently, raised adaptive capacity automatically implies sustainability. Of greater concern is the risk that the raised adaptive capacity is eroded over time such that as the impacts of climate change are experienced, the benefits secured through the GEF project are not realized. To avoid this situation, the project design relies on the following elements:
 - A commitment to long-term planning at all levels, from strategies (such as promotion of inter-sectoral decision-making through inter-sectoral fora), to policies (such as projection of water supply for hydropower projects), to specific measures (such as pre-defined action plans for dealing with floods).

- Building of multi-sectoral teams, to allow climate-change adaptation to be integrated into planning in a wide range of sectors;
 - Explicit consideration of costs and benefits, with endorsement of strategies, policies and measures only if they can be expected to provide overall net benefits to sustainable development;
 - Commitment to continuous monitoring and regular evaluation of interventions over time; and inclusion of awareness-building and fund-raising amongst national and international agencies and donors as a core activity.
78. In the case of Ecuador, project sustainability turns on the initiative's effectiveness influence over existing water governance structures and integrating adaptation into national policies. In the context of decentralization, it will also require the project to be rooted in regional and local institutions. Successful mainstreaming of climate change concerns into national and regional development planning will facilitate sustainability of the climate change agenda in the long-term. Activities in support of the adaptation agenda to climate change will be integrated into the mainstreaming of planning, as decision support mechanisms, and this is expected to facilitate its long-term sustainability. Public awareness and outreach activities will also help to build the institutional and political support needed to facilitate mainstreaming after project completion.
79. The concept document establishes that the project will focus on capacity development of local actors and institutional building through existing networks. This will constitute an important step to insure sustainability beyond the project term. Securing support from key political and other leaders for adaptation and the water resources management is crucial. The CNRH, the head of the water authority, and leaders of businesses (e.g. agroindustry representatives) and non-governmental organizations (e.g. the National Water Resources Forum) can play a critical role in defining and communicating the set of core values that will guide adaptation and catalyse the process. Combined with on the ground experiences with local water boards and municipal authorities, it is hoped that the project will develop long-term capacities to manage future climate risks at the local level.
80. Finally, the global flow of information on climate change has markedly increased national consciousness about climate change, its causes and impacts⁴. A positive attitude towards "doing something" to address climate change can be noticed at all levels. This will improve the chances of success of the proposed adaptation measures.

C. REPLICABILITY

81. Climate change adaptation is at an early stage of development both in Ecuador and in the region. This project is therefore explicitly designed to pilot adaptation in Ecuador subject to the broadest possible range of climatic vulnerabilities to different kinds of water governance issues, but which have reasonable capacity in terms of infrastructure and human resources. By developing systemic capacity while demonstrating adaptation measures on the ground, the project will establish experience necessary for replication and scale up.
82. The project will seek to show practical results that can be immediately replicated. The projections of water supply in the face of climate change for the Paute Hydropower project will enable its management to immediately design and adopt adaptation measures. Lessons learned can be immediately applied in other major hydropower projects, like Agoyan and Daule-Peripa, and in medium-sized and small hydropower projects like Abanico, Sibimbe, and Rio Calope. New projects, like the Coca-Codo Sinclair (approx. 859 Megawatts), Mazar and Sopladora, will benefit

⁴ An internet search of national newspapers showed a marked increase of references to climate change. See Annex 3

from the conclusions reached in this project. The implementation of focused measures to enable small-holder farmers in the project sites to better manage water will be invaluable for those in other regions to replicate. The lessons on integrating climate risks into national policies will be also an important contribution to the GEF and the agencies as additional efforts are put into helping other countries address similar climate change concerns.

83. The identification of vulnerable zones has taken into account the geographic location in relation to climatic conditions and risks to which it is exposed: Manabí is a coastal zone which is particularly susceptible to droughts and floods. The lessons learned from the pilot projects will be especially valuable for replication in other areas of the country.
84. Further, the design and eventually lessons learnt from the project will contribute to further adaptation learning, and implementation of effective climate change adaptation in other vulnerable countries. The project will make use of the GEF Adaptation Learning Mechanism, to ensure that the lessons learnt from the project contribute to, and benefit from, experience in adapting to climate change across the whole of the GEF portfolio.

D. STAKEHOLDER INVOLVEMENT

86. The project will rely on a wide range of key partners to mainstream climate change and adaptation concerns into the water sector in Ecuador. In this sense, participation will be the key to success of the project. Key stakeholders to be involved in the project, and who have been consulted during the preparatory phase of this project, are described below:
 - Comité Nacional del Clima (CNC)- the National Committee for Climate- is a collegiate body composed of representatives from several ministries (environment, energy and mines, foreign affairs, planning), as well as from the private sector, the NGO environmental sector and the academic sector.
 - Ministry of the Environment (MoE) is the GEF operational focal point. The technical focal for the UNFCCC is also located in the Under Secretary for Environmental Quality. The MoE presides over the National Climate Committee (CNC). The MoE will chair the National Steering Committee of this project (see section on implementation arrangements).
 - The Planning and Development National Secretary (SENPLADES), which is in charge of planning and management of strategies for the development of the country. SENPLADES has formulated general and sectoral risk management plans (health, transport, drinking water and sewage systems).
 - The National Council of Hydrologic Resources (CNRH) was created in 1994, to replace the INERHI, with responsibility for monitoring the state of water resources and managing the concession of water rights. Created in conjunction with Regional Development Corporations (CRD) such as CEDEGE, the regional water agencies of the CNRH are the prime agents of water governance, and a key actor in the attribution of water rights and the resolution of conflicts between end users.
 - The INAMHI is the National Institute for Meteorology and Hydrology of Ecuador. It has a key role in climate affairs in Ecuador, with a network of monitoring stations and overall supervision of official forecasting. INAMHI will have a lead role in climate data and observation, early warning system, along with the Navy's Oceanographic Institute (INOCAR) and the International Centre for Research of El Niño phenomenon (CIIFEN). Coordination with the World Meteorological Organization, through its Global Climate Observation Systems Programme (GCOS) and United Nations Environment Programme (UNEP) will be established

given the expertise and relevant initiatives of these organisations in climate data around the world.

- The Water Resources Forum (FRH), a water users association, represents the views of the small consumers, peasants and NGOs. This Forum has become an important public arena for discussions on water policies.
- The provincial and municipal authorities, regional development corporations and watershed-management authorities, all in charge of water-related infrastructure investments and/or of the care of key watersheds in the selected provinces (Manabí, Los Ríos, Azuay and Loja).
- Other entities in charge of meteorological monitoring of water flow in watersheds, sea level, marine currents and related issues and ENSO events such as, CDRs, INOCAR, CIIFEN, amongst others.
- Other institutions that group provincial/local governments such as the Consortium for Provincial Governments of Ecuador (CONCOPE). This Consortium comprises of all the provincial councils of Ecuador and the Association of Municipalities of Ecuador (AME). It also consolidates funds created to manage environmental and water management projects (i.e. FONAG, FAN). CONCOPE, supported by the Sweden Technical Cooperation, is currently executing a project that seeks to strengthen the watershed management in Provinces.
- The technical teams and institutional structure in place for the Second National Communication (SCN). The SNC team reports to the UNFCCC on national efforts to address climate change, to formulate a national strategy, and to identify priorities for mitigation and adaptation, including potential projects for funding in these areas.
- The technical teams and institutional structure for the GEF-World Bank Andean Region Adaptation Project, whose objective is to implement adaptation measures to meet the anticipated impacts from the catastrophic glacier retreat induced by climate change.

87. The list of key stakeholders for project implementation is presented in Annex 2. The following organizations played a pivotal role in the design of the project proposal:

- Ministry of Environment: Lead the process of project formulation by providing a coordination role in the formulation of the project and the consultation process and bilateral discussions with experts and key institutions. MoE was responsible for the analysis of the information provided and the preparation of the project proposal for submission to the GEF Secretariat through UNDP.
- National Council of Water Resources: It provided key information on the water baseline and water polices, and participated directly in the project formulation.
- National Secretary of Planning and Development: Assisted in the definition of priorities for the project by providing key inputs to the project design. It also contributed with key information such as risk maps, policies for the national development plans, among others.
- National Institute of Meteorology and Hydrology: Provided information for the baseline and assisted in the identification of key issues to be improved at the provincial level (e.g. strengthening of climate information)
- The Water Resources Forum: It contributed to the discussions from the perspective of small water users. Its participation confirmed the need to include the local communities in the design and implementation of adaptation measures on the ground. It reinforced the strategy to ensure adequate linkage between the policies to address climate risks in the water sector and the needs of the vulnerable community.

- The Consortium for Provincial Governments of Ecuador: Assisted in the selection of the Provinces to be included in the project, through an analysis of vulnerable areas, including the identification of identify key actors in the vulnerable areas.
- United Nations Development Programme: As the Implementing Agency for the project, UNDP facilitated the preparation of the
 - Other institutions: Other institutions included CG Paute, Hidro Paute, FONAG, Intercooperacion (Swiss Foundation), among others

12. MONITORING AND EVALUATION (M&E)

88. Project monitoring and evaluation will be conducted in accordance with established UNDP and GEF procedures, which will involve the UNDP Country Office (UNDP-CO) for country-level monitoring, and the MoE at the project level. The Logical Framework Matrix provides performance and impact indicators for project implementation along with their corresponding means of verification. These will form the basis on which the project's Monitoring and Evaluation system will be built. The UNDP Project document (Part IV) outlines in detail the M&E framework for this project as per established procedures.
89. The project's Monitoring and Evaluation Plan will be presented and finalized in the Project's Inception Report following a collective fine-tuning of indicators, and means of verification.

1. FINANCING (for all tables, expand or narrow table lines as necessary)

a) PROJECT COSTS

Project Components/Outcomes	Co-financing (\$)	GEF (\$)	Total (\$)
1. Climate change risk on the water sector integrated into key relevant plans and programmes	1,200,000	400,000	1,600,000
2. Strategies and measures that will facilitate adaptation to climate change impacts on water resources implemented at the local level	3,250,000	2,000,000	5,350,000
3. Institutional and human capacity strengthened, and information/lessons learned disseminated	1,550,000	600,000	2,050,000
4. Project management budget/cost*	115,000	227,000	342,000
Total project costs	6,000,000	3,000,000	9,000,000

* This item is an aggregate cost of project management; breakdown of this aggregate amount should be presented in the table b) below.

b) **PROJECT MANAGEMENT BUDGET/COST**⁵

Component	Estimated staff weeks	GEF(\$)	Other sources (\$)	Project total (\$)
Locally recruited personnel*	350	152,000	0	152,000
Internationally recruited consultants*				
Office facilities, equipment, vehicles and communications		20,000	50,000	70,000
Travel		50,000	50,000	100,000
Miscellaneous		5,000	15,000	20,000
Total		227,000	115,000	342,000

* Local and international consultants in this table are those who are hired for functions related to the management of project. For those consultants who are hired to do a special task, they would be referred to as consultants providing technical assistance. For these consultants, please provide details of their services in c) below:

c) **CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:**

Component	Estimated staff weeks	GEF(\$)	Other sources (\$)	Project total (\$)
Personnel				
Local consultants	838	870,280	0	870,280
International consultants	125	200,000	300,000	500,000
Total	963	1,070,280	300,000	1,370,280

d) **CO-FINANCING SOURCES**⁶ (expand the table line items as necessary)

Co-financing Sources				
Name of co-financier (source)	Classification	Type	Amount (\$)	Status*
MoE	Nat'l Gov't	in kind	300,000	To be confirmed
CNRH	Nat'l Gov't	in kind	250,000	To be confirmed
INAMHI	Nat'l Gov't	in kind	300,000	To be confirmed
SENPLADES	Nat'l Gov't	in kind	600,000	To be confirmed
CONCOPE	Nat'l Gov't	in kind	250,000	To be confirmed
Gobierno Provincial Manabí	Nat'l Gov't	in kind	500,000	To be confirmed
Gobierno Provincial Los Ríos	Nat'l Gov't	in kind	500,000	To be confirmed
Municipio de Babahoyo	Nat'l Gov't	in kind	300,000	To be confirmed
Intercooperación	Private	in kind	300,000	To be confirmed
Hidropaute	Private	in kind	2,700,000	To be confirmed
Sub-total co-financing			6,000,000	

* Reflect the status of discussion with co-financiers. If there are any letters with expressions of interest or commitment, please attach them.

90. This project applies the sliding-scale approach to co-financing, in keeping with the principles outlined in the GEF Council paper GEF/C.24/12 (October, 2004), which states that the SCCF will be available to finance the additional costs of achieving sustainable development imposed on vulnerable countries by the impacts of climate change. In particular, SCCF projects will address

⁵ For all consultants hired to manage project or provide technical assistance, please attach a description in terms of their staff weeks, roles and functions in the project, and their position titles in the organization, such as project officer, supervisor, assistants or secretaries.

⁶ [Refer to the paper on Cofinancing, GEF/C.206/Rev. 1](#)

the challenges faced by developing country Parties as a result of the impacts of climate change. The need to adapt to the adverse impacts of climate change presents additional barriers to the achievement of a country's sustainable development goals. Activities to overcome some of these barriers may not generate global benefits, e.g. activities in the health sector.

91. The same paper also proposed that Proposals for SCCF funding be assessed pragmatically by adopting a presumptive co-financing sliding proportional scale. Drawing on past experience and practices, the sliding scale rules state that for projects requesting between US\$1 million and \$5 million, the SCCF will finance up to one third of the total project costs. The proposed financial plan meets this rule, with the total request from the SCCF amounting to \$3 million, and with \$6 million being contributed through co-financing.

COST EFFECTIVENESS

92. In general, evaluations of community-based projects such as this one have consistently identified that community-based projects are more cost-effective.
85. The project will operate with participation and collaboration of different stakeholders. This will avoid redundancy and promote complementarities among different projects, thus contributing to cost effectiveness. In addition, the communities' willingness to participate in the project with their labor and in-kind contribution also contributes to cost effectiveness. The project will also undertake intensive capacity-building interventions as an investment in human capital, producing a viable capacity to adapt to drought and climate change, which is a cost effective way of ensuring sustainability.

5. INSTITUTIONAL COORDINATION AND SUPPORT

A. CORE COMMITMENTS AND LINKAGES

93. Given the country's vulnerability to natural disasters, Ecuador requires an articulated system for prevention and vulnerability assessment, to avoid recurrent costly disasters. The populations with fewer resources are the most vulnerable to natural phenomenon and are exposed to the risk of losing all their assets. The impact on infrastructure is another negative factor for these groups. By working with governmental institutions at the local and central level, a more risk averting society can be created for the future. UNDP will work closely with international financial institutions as well as with United Nations sister agencies and national authorities on the prevention and response to any future events. The United Nations system contingency plan and the United Nations Emergency Team for Ecuador represent invaluable assets to be utilized in support to this programme.
94. The country programme is articulated around three UNDAF objectives: (i) poverty reduction through improved access to basic social services and employment; (ii) democratic governance and transparency through strengthening of government institutions and decentralisation process; and (iii) sustainable environment through equitable access to natural resources.
95. The proposed project will contribute directly to outcomes under two of these objectives:
 - UNDAF objective 1: poverty reduction through access to quality basic social services and productive activities
 - Public awareness and policy dialogue on sustainable human development
 - Capacity of and partnership between local authorities and civil society organizations
 - Access to basic social services and systems for risk management
 - Capacity development to manage and reduce risk of natural disasters

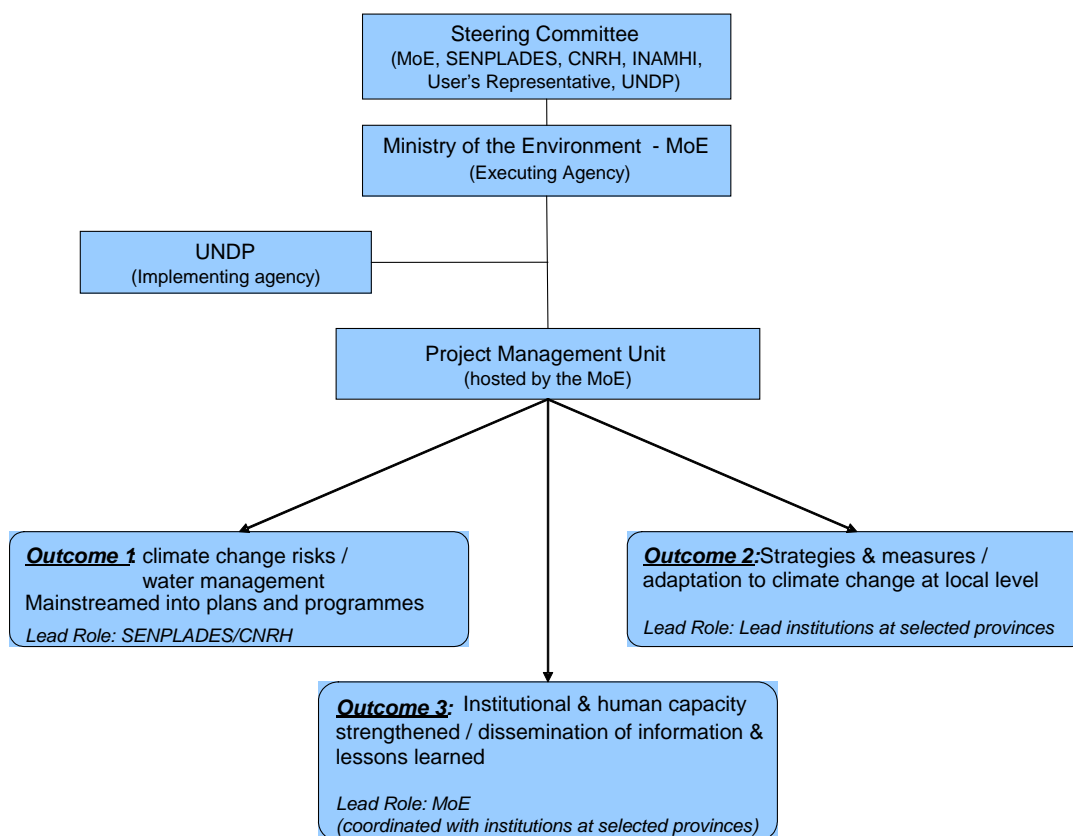
- UNDAF objective 2: environmentally sustainable development to reduce poverty
 - National policy, legal and regulatory framework for environmentally sustainable development
 - Institutional framework for sustainable environmental management and energy development
96. In recent country studies such as the National Communications to the UNFCCC and the NCSA, water governance has emerged as a growing public concern and the impact of climate change has been defined as a critical cross cutting issue affecting the most vulnerable sectors of the economy.

B. CONSULTATION, COORDINATION AND COLLABORATION BETWEEN IAS, AND IAS, AND EXAS, IF APPROPRIATE

97. Close coordination and consultation have been established with the project team of the GEF-World Bank Regional Adaptation Project (Bolivia, Ecuador, Peru), which aims to implement adaptation measures to meet the anticipated impacts from the catastrophic glacier retreat induced by climate change. The Project is centered on interactions between high-altitude ecosystems, tropical glaciers and the production of water in the Andean Region. In Ecuador, the project will address impacts on the production of drinking water for the city of Quito. Local interventions will aim to foster adaptation in the management of small watersheds originated in the Antizana volcano. Key partners of the project include the Municipality and the water facility of Quito. Both projects will take advantage of synergies, mainly climate information and scenarios, and the use of similar tools such as the WEAP model. The fact that the MoE is the executing agency in both projects has already facilitated agreements with national institutions like INAMHI and CNRH. MoE will ensure that information is shared between projects and that both projects provide information and feedback to the CNC

C. PROJECT IMPLEMENTATION ARRANGEMENT

98. The project will be implemented through a National Execution arrangement. Implementation arrangements seek to establish a bridge between national authorities responsible of formulating and integrating Climate Change policies, and national, regional and local authorities and practitioners of water resource management. Knowledge and information provided through monitoring institutions and best practices and lessons learned through the implementation of pilot projects will be the tools to ensure effective coordination and follow among the institutions involved in the project.
99. The proposed governance structure for the project and the division of responsibilities among the key institutions are represented in the figure below:



100. The executing agency of the project will be the MoE, which is also GEF's national focal point. In its capacity as Executing Agency, the MoE will be responsible for the technical and financial execution following UNDP procedures. It will be responsible for: (i) directing the project, (ii) meeting its stated outcomes and projected outputs in a timely manner, and (iii) making effective and efficient use of the financial resources allocated in accordance with the Project Document. The Under-Secretary of Environmental Quality would be the official institutional focal point. The Executing Agency will request from UNDP all financial funds and the accomplishment of selection and bidding processes in accordance with UNDP proceedings. As part of the activities and budget monitoring, UNDP will present annual financial statements relating to the status of UNDP-GEF funds (CDR) as registered in the ATLAS system. These statements will be certified by the executing Agency. In addition, UNDP will be in charge of selecting a recognized independent auditor that will conduct an annual audit of the project execution, according to the procedures set out in relevant documents. The cost of these audits will be charged to the project budget.
101. Overall guidance and support for the project will be provided by a Steering Committee (SC) with the participation of MoE, SENPLADES, CNRH, INAMHI, UNDP and a representative from water users.
102. The Steering Committee will have the following responsibilities and objectives;
- To take part in the selection of the project coordination team;
 - To approve annual reports and operative plans presented by the project team;
 - To agree on a common monitoring system, and a minimal set of indicators;
 - To serve as a platform for exchange of experiences and lessons learnt;
 - To provide a key inter-institutional coordination platform, to define the basic project implementation rules and the roles and responsibility of each executing agency and to allow for the resolution of disputes between different project partners.

103. A project management unit (PMU) will be established in the Under-Secretariat. The Project Coordinator, who will be hired through a competitive selection process following UNDP procedures, will head this unit. The PMU will receive specific training on UNDP procedures upon its establishment. The unit will co-ordinate, supervise, assist, control, monitor and report on project execution and budget, and is responsible of reporting to the Undersecretary and UNDP on a regular basis. The Project Coordinator, in accordance with UNDP formats and guidelines, will prepare the Annual Work Plan (AWP) reflecting project activities and outcomes. In addition to the AWP a detailed activity work plan will indicate the implementation periods of each activity and the parties responsible for carrying them out. The Project Coordinator will also be the registered signatory under delegation of the Ministry of Environment. The Project Coordinator will be responsible for the project preparation process and for the completion of the project brief and of the other expected products. The Project Coordinator will work under the direct supervision of the MoE, and will be accountable before the project Steering Committee.
104. In brief, project outcomes will be executed by leading institutions to secure a decentralized execution. CNRH and SENPLADES will be responsible for Outcome 1: Climate change risk of the water sector integrated into key relevant plans and programmes. These institutions will lead efforts in the area of policy development. It is worth to point out that PDF B phase has made possible to sign an MOU between the MoE and CNRH, in order to facilitate the implementation of this project.
105. The provincial governments of Manabí, Los Ríos and Loja will lead the execution of activities of Outcome 2: Strategies and measures that will facilitate adaptation to climate change impacts on water resources implemented at local level in their provinces. In the province of Azuay, the Water Management Council for the Paute Watershed (CG Paute) will lead the intervention in the Paute basin. CG Paute is a multistakeholder entity that includes: (i) representatives of the MoE in the province of Azuay, (ii) local governments (e.g. the provincial government of Azuay, municipalities located in the Paute watershed), (iii) universities, (iv) main water users (e.g. Hidropaute S. A., Elecaastro, ETAPA), (v) private sector (e.g the Production Chambers).
106. In implementation of the Outcome 3: Generation and dissemination of information on climate change and impacts and water resources generated and disseminated among water planners, the MoE will facilitate the flow of information between project participants, as well as the dissemination of studies, data and lessons learned generated by the project activities. Building networks amongst project participant will be a key issue to meet this outcome.
107. The National Institute of Meteorology and Hydrology (INAMHI) will have a lead role in climate data and observation, early warning system, along with the Navy's Oceanographic Institute (INOCAR) and the International Center for Research of El Niño phenomenon (CIIFEN). Coordination with the World Meteorological Organization, through its Global Climate Observation Systems Programme (GCOS) and United Nations Environment Programme (UNEP) will be established given the expertise and relevant initiatives of these organisations in climate data around the world.
108. The above national institutions will be instrumental in designing and implementing an information management system that meets stakeholders' needs. The National Secretary of Planning and Development (SENPLADES) will play a key role in leading the process of mainstreaming climate change issue into the National Agenda, and provide technical expertise in risks and planning. The project will work closely with the Bureau for Crisis Prevention and Recovery of UNDP in order to build on the tools and expertise already available for risk management.

ANNEX A: INCREMENTAL COST ANALYSIS/ADDITIONAL COST ANALYSIS

Project background

1. Ecuador faces multiple hazards and a wide range of vulnerabilities to climate change. The impact of recurrent ENSO events demonstrates the widespread effects of climate variations in the country. Ecuador has in the past suffered the impact of recurrent drought, periodic flooding and associated losses in productive sectors. The effects of climate change are expected to intensify these impacts over the coming years and decades.
2. As the distribution and availability of water resources will change over time, governance structures and water use practices will need to adapt. Much adaptation will be local and will occur spontaneously. However, deliberate and anticipatory adaptation to climate change requires an iterative and multi-tiered approach that will facilitate the adoption of sound development choices in the face of climate change risks. It also must involve the participation of key stakeholders at different levels (national, regional, and local).

Baseline

3. Over the last few years, in the context of state modernization Ecuador has been implementing a policy of decentralization. Ecuador's decentralization law allows for local governments to request the transfer of responsibilities from the central to the provincial and municipal levels. This includes several attributions with respect to water governance and has resulted in strong demands for decentralization.
4. Current measures that are implemented or planned to improve institutional frameworks that are of relevance to the proposed project include:
 - *National Water Management Plan.* The proposed plan is currently in draft form. A review process will take place to improve the plan and involve a wider range of stakeholders. The review process will establish the basis for a more comprehensive water management plan and will represent an opportunity to open the debate on how the plan could incorporate adaptation to climate change in the water sector.
 - *National Development Plan.* The Government is initiating the process of defining the development course of action for Ecuador over the next 5-10 year period. Policy makers at different levels and across sectors are expected to play a key role in the definition of the new development plan. This project will build on the details on the structure and institutional framework for such a plan as it is developed by working in collaboration with the relevant institutions. The Government has placed a high priority to water governance in the new plans.
 - *National Risk Management Plan.* The objective of this plan is the formulation of policy guidance to reduce exposures to disasters, with some consideration to climate risks. SENPLADES will be establishing a consultation process with the relevant stakeholders in the water sector to identify ways on how this plan can be operationalized.
 - *Provincial development plans and risk management proposals.* The provinces that this project will focus on have developed water development plans and risk management proposals. These provide an overall framework for decision-making across sectors, including the water sector, and some general principles for risk management. Neither the provincial plans nor the risk management proposals take into account climate change risk on the water sector. However, they provide a sound basis for the inclusion of such risks (and adaptation needs) into the governance of water at the provincial level.
5. There are a number of baseline development activities that are of relevance and which will form the foundation of the proposed interventions.
 - *Development of water resources inventories and provincial information systems.* Local authorities in the selected provinces are carrying out various activities with the objective of putting in place a more effective management scheme for water resources. The most

advanced is the Province of Azuay, where the provincial council and other entities such as the Council for the Paute Watershed (CG Paute) and the water utility ETAPA completed the first phase of a water inventory. A second phase will be implemented shortly.

- *Local water management initiatives:* Climate extremes on the water sector (i.e. floods and droughts) in the selected provinces have caused significant impacts on local livelihoods. Over the last few years, several NGOs and international/bilateral cooperation programmes have implemented projects to improve local management of natural resources, including the creation of watershed committees. Specific measures include reforestation programmes, building of water reservoirs, and protection of water sources, promoted by provincial entities, municipalities, and community organizations.
- *Local funds for the conservation of water sources in strategic watersheds:* Several trust funds support local actions that promote environmental sustainability. The National Environmental Fund (FAN) represents an important and useful instrument to finance local initiatives in natural resource management. Over the last few years, similar instruments have been developed for water resources, particularly the Water Fund for Quito (FONAG), which represents a significant initiative to mobilize local resources to support actions for the protection of water sources in the Quito Valley. Based on this experience, Cuenca's water utility (ETAPA) and an energy utility (Elec Austro) have agreed to establish a water fund for the Paute watershed. Currently, the fund has seed capital with partnerships planned with other energy utilities, partners in the industrial sector, and private sector companies (e.g. Hidropaute). Other entities are exploring the feasibility of adopting a similar mechanism for the Province of Loja. There is also interest from other provinces in developing a similar approach for funding water protection.

6. Without financial and technical support for adaptation through the GEF and UNDP, the existing water governance regime in Ecuador will continue to be ill-adapted to current climate variability, let alone to withstand future climate change risks. While national level institutions have undergone several structural adjustments and a reduction in resources and mandate, local stakeholders in charge of managing water resources have increased in number and size. Over the past few years, increasing social conflicts surrounding water resources and watershed management in Ecuador have led to a growing public debate and awareness for policy reform in the water sector.
7. The multi-sectoral needs of key sub-sectors (irrigation, hydro-energy, water for human consumption) would not be strategically addressed. These problems would continue to be particularly relevant to the issue of irrigation, which represents the single largest use of water in Ecuador. Most current irrigation systems were built under the auspices of the National Water Resources Institute (INERHI), which neglected the formulation of policies and development plans. Consequently, irrigation systems fail to serve the poorer farmers effectively, resulting in unnecessary wastage. In the absence of the project, the water shortages to poor farmers would intensify, resulting in lower total yields and increased hardship for poor families. In the agriculture sector, crop yields would be affected both by increased frequency and intensity of droughts, and by more frequent damaging floods. This would affect the national economy, and would affect rural farmers, who have least capacity to deal with environmental disasters, most severely. In the hydro-power sector, the yearly power shortages would become more frequent, last longer and lead to large losses for key economic sectors.
8. In terms of information management, up-to-date and reliable information on water resources would continue to be deficient, thereby compromising efforts to plan for the impacts of climate change. Also, a considerable body of information on climate change would remain dispersed and ineffective to support complex decisions that policy makers need to make. As result of low levels of awareness, both among decision makers and the general public, knowledge of the impacts of climate change would remain low, necessary policy changes would not be made, and public

support for such changes would remain to be absent. As a result, neither provincial authorities nor community-based organizations would be able to design and implement locally appropriate solutions to increase resilience against the impacts of climate change. Without this project, necessary technical skills and case studies from which local solutions could be replicated to promote adaptation would not be available.

GEF Alternative

9. The project alternative scenario is a water resource sector in Ecuador where climate risks are mainstreamed into relevant plans and programmes at the national level and in four provinces. Local stakeholders are informed about current climate vulnerability conditions and climate change risk factors, and incorporate this information into local policies and decisions. The project will provide a practical framework to guide the process of integrating water climate change risks and adaptation into relevant water management plans. The guidance will serve as a comprehensive and practical reference on how local water governance institutions can conduct the integration of climate change risks into ongoing strategies and plans more effectively.
10. SCCF funds will contribute towards ensuring that climate change risks are mainstreamed from specialized forums on climate change to national and local institutions, particularly those involved in regional and local water resource planning and management. Funds will be used to establish a practical framework to guide the process of integrating water climate change risks and adaptation into relevant water management plans. The guidance will serve as a comprehensive and practical reference on how local water governance institutions can conduct the integration of climate change risks into ongoing strategies and plans more effectively. Key stakeholders both at the central level (MoE, Ministry of Agriculture, the CNRH and SENPLADES) and at the provincial and local levels (Provincial Councils, Water Agencies, Municipal governments, NGOs) will be involved in the formulation of practical measures, taking into account the evolving needs of the institutions and the policy context for the water sector. More importantly, the guidelines will target the needs of the on-going planning efforts mentioned earlier to ensure that this integration will be established as a learning exercise. Thus, the ultimate goal of the guidelines is to effectively assist policy makers in setting up a framework for the integration of climate risk in the water sector.
11. With GEF support, climate change risks in the water sector will be integrated into the relevant programmes described above at the national and particularly at the local level. The focus of this project will be on activities in provinces that will be covered under the project, namely Manabi, Los Rios, Azuay, and Loja. Specific interventions will include revision of key water governance plans described below to incorporate climate change risks in water management:
 - *Climate change risks included in National Water Management:* Given that the National Water Management plan is already available in draft form, this project will ensure that the revision process will seek to ensure that the basic principles of climate risks on water availability are adequately addressed. The objective is to create the conditions for more effective initiatives of adaptation in the water sector. The plan itself does not intend to cover all aspects of adaptation but rather to bring the priority needs for adaptation interventions at the higher institutional level within the water sector. The project will coordinate with CNRH to assist in the review process, by advising on the climate issues to be considered and providing information on adaptation requirements.
 - *National Development Plan:* The project will take advantage of the fact that key national institutions are part of the Management Support Group of this project. These institutions are key participants in the current elaboration of the national development plan, including the National Secretariat of Planning (SENPLADES), the MoE, CNRH, and CONCOPE. These partners will promote the consideration of climate change issues into the National Development Plan. This will ensure that climate risks in the water sector do not become an obstacle to the achievement of related development objectives. Concretely, the project will

ensure that the National Development Plan incorporates climate change concerns on water resources by acknowledging (a) the threat posed by climate change and (b) creating an enabling environment (e.g. through legislative changes) that will promote adaptation.

- *National Risk Management Plan.* The project will work with SEMPLADE to assist in the process of updating this plan so that considerations for climate change risk management in the water sector are also included. Given that this National Risk Management Plan provides overall guidance on risk management, SCCF funds will be used to ensure that adequate consideration is given to climate change impacts and adaptation needs on water resources.
12. At the local level, provinces and municipalities have development plans, and some of them also include risk management plans. However, these plans do not take into account risks from climate change. Currently, these plans are implemented based on public priorities and potential investment opportunities by public and private stakeholders. In some selected provinces, actions taken to improve water management and conservation are driven by negative water balance effects, which are partly the result of climate-induced factors. Although there is insufficient public awareness, some actions are undertaken already in important watersheds such as Paute, Jubones, Catamayo and others which are within the boundaries of the project.
 13. To guarantee the inclusion of climate change risks criteria into provincial and local development plans, the project will develop, with appropriate stakeholder input, an implementation strategy to apply the guidelines. The execution of this strategy will result in the integration of climate change concerns into key provincial and local development plans. This will help to facilitate a systematic adoption of climate change adaptation actions related to water management which, together with baseline development programmes, will contribute towards more efficient water use and reduced water supply vulnerability.
 14. With SCCF support, the project will co-finance technical aspects and specific pilot interventions in four provinces. The pilot interventions in this project will address climate risks affecting water availability for different uses (e.g. agricultural production and/or energy provision). The project will integrate climate change information into the planning and management of a hydro-power facility, and also (with the support of co-financing) in community-based water management measures (among small holder farmers). Technologies and practices will be modified and/or introduced to increase the resilience of these activities to anticipated changes in the water supply and rain intensity and frequency. The project will partner with ongoing initiatives including existing funding mechanisms (FAN, FONAG, Paute Watershed fund).
 15. The project will promote collaboration among governmental and non-governmental stakeholders associated with water governance, with the objective of ensuring that climate change risks are appropriately incorporated into the policy making process. Given the lack of understanding and experiences on how climate risks and relevant policy frameworks can be integrated into the water sector, the project will develop a practical approach to facilitating this integration and educate the policy makers along the process.
 16. The project will result in modified national and local water policies that will in turn facilitate the increase the flexibility and resilience of the resource. At the national level, monitoring capacities for environmental changes linked to climate change there will be strengthened, which will provide the means to assess vulnerability to the impacts of climate change and to design appropriate responses. Decision makers at all levels and the general public will be more aware of the impacts of climate change and options for increasing capacity to deal with those impacts in the water sector.
 17. At the local level, provincial authorities and community-based organizations will have the capacity to integrate climate change issues into local development planning, and will be able to

design locally appropriate solutions to the impacts of climate change. They will have recourse to lessons learnt from demonstrations of adaptations affecting irrigation and hydro-power, and they will also have access to financing for pilot activities to implement local solutions. Agriculture activities in selected provinces and one hydro-power plant will be more resilient to the impacts of climate change, thus supporting sustainable economic development.

System Boundary

18. The system boundary for the project will be represented by both the national and local level. At the national level the project will address water governance by incorporating climate risks consideration into ongoing planning processes. At the local level, the system boundary will be represented by certain provinces which host key watersheds where adaptation measures to climate change can be applied to improve the governance and management of water resources in the face of climate change with the participation of provincial authorities and local communities. The provinces where the project apply adaptation pilot measures, are Los Rios, Manabi, Loja and Azuay (specifically in the watershed that feeds the Paute hydroelectric project). In these provinces, the project will address current institutional limitations, lack of access to timely and reliable information on climate related hazards and the need for bolstering local adaptive capacities.

Summary of Costs

19. This project will apply a sliding-scale approach to co-financing, in keeping with the principles outlined in the GEF Council paper GEF/C.24/12 (October, 2004), which states that the SCCF will be available to finance the additional costs of achieving sustainable development imposed on vulnerable countries by the impacts of climate change. In particular, SCCF projects will address the challenges faced by developing country Parties as a result of the impacts of climate change. The need to adapt to the adverse impacts of climate change presents additional barriers to the achievement of a country's sustainable development goals. Activities to overcome some of these barriers may not generate global benefits, e.g. activities in the health sector.

The same paper also proposed that Proposals for SCCF funding be assessed pragmatically by adopting a presumptive co-financing sliding proportional scale. Drawing on past experience and practices, the sliding scale rules state that for projects requesting more than \$5m, the SCCF will finance up to one quarter of the total project costs. The proposed financial plan meets this rule, with the total request from the SCCF amounting to \$3 million, and with \$6 million being contributed through co-financing. The division of these costs across Outcomes is shown in the matrix below.

PART I: ADDITIONAL COST MATRIX

Cost/Benefit	Baseline (B)	Alternative (A)	Project and Additional costs (A-B)
Benefits			
	Distribution and availability of water will change over time with climate change, therefore governance structure and water use practices will need to adapt. But, deliberate and planned adaptation requires an interactive and multi-tiered approach that enables the adoption of sound development choices in the face of uncertainty. It also involves different sectors and levels of society.	The project seeks to ease the way to the formulation and implementation of a regulatory framework and an institutional design adapted to changing supply of water and increasing uncertainty related to a changing climate.	
Costs			
Outcome 1: Climate change risks to the water sector integrated into key relevant plans and programmes..	\$1,200,000 Uncertain institutional coordination of policy makers, the absence of a water resources strategy that take into account climate change risks, and limited stakeholder participation	\$2,400,000 Ongoing plans and programmes represent an opportunity to integrate climate change concerns into water management plans and strategies at different levels	\$1,200,000 of which: GEF: \$400,000 Co-financing: \$800,000
Output 1.1: Practical guidance on the integration of climate risks into relevant water management plans and programmes developed			\$500,000 of which: GEF: \$300,000 Co-financing: \$200,000
Output 1.2: Relevant plans and programmes incorporate climate risks in the water sector			\$800,000 of which: GEF: \$100,000 Co-financing: \$600,000

<p>Outcome 2: Strategies and Measures that will facilitate adaptation to climate change impacts on water resources implemented at the local level.</p>	<p>\$3,250,000 Provincial and local organizations lack experience in designing and implementing locally appropriate responses. Due to the lack of adequate knowledge on anticipatory measures to address specific climate related threats on water resources, and tools to build climate resilience and the means to put in place adaptation measures, local communities will be constrained in their abilities to implement strategic responses</p>	<p>\$10,000,000 Interventions at the local level. The success of adaptation policy and measures will be measured in terms of increased resilience to impending climate hazards.</p>	<p>\$6,750,000 of which: GEF: \$2,000,000 Co-financing: \$4,750,000</p>
<p>Output 2.1: Measures, technologies and practices to use water more efficiently at local level introduced and implemented in pilot systems</p>	<p>\$2,000,000</p>	<p>\$1,300,000 (SCCF) (\$600,000- for pilot demonstration activity 1 (Ag) \$700,00 for pilot demonstration activity (2) Hydro</p>	<p>\$3,500,000 of which: GEF: \$1,300,000 Co-financing: \$2,500,000</p>
<p>Output 2.2: Information management systems reflecting climate change impacts on the water sector developed</p>	<p>\$1,250,000</p>	<p>\$700,000 (SCCF) for setting up information management</p>	<p>\$3,250,000 of which: GEF: \$1,000,000 Co-financing: \$2,250,000</p>
<p>Outcome 3: Institutional and human capacity strengthened, and information/lessons learned disseminated</p>	<p>\$500,000</p>	<p>\$1,550,000 All interventions supported by the project will generate lessons of relevance not only to Ecuador but also to other countries facing similar hazards.</p>	<p>\$1,050,000 of which: GEF: \$600,000 Co-financing: \$450,000</p>
<p>Output 3.1: Improved institutional and technical capacities to support the mainstreaming of climate risks and implementation of adaptation measures in the water sector</p>	<p>\$250,000</p>	<p>\$200,000 (SCCF)</p>	<p>\$400,000 of which: GEF: \$200,000 Co-financing: \$200,000</p>

Output 3.2 Knowledge and lessons learned to support implementation of adaptation measures compiled and disseminated	\$125,000	\$250,000 (SCCF)	\$300,000 of which: GEF: \$250,000 Co-financing: \$50,000
Output 3.3: Guidance documents for GEF and MoE on climate change adaptation programming in the water resource sector	\$125,000	\$250,000 (SCCF)	\$350,000 of which: GEF: \$250,000 Co-financing: \$100,000
Cost Totals	\$4,950,000	\$13,950,000	\$9,000,000 of which: GEF: \$3,000,000 Co-financing: \$6,000,000

Co-financing includes activities for the monitoring of the baseline, especially for outcome 1.

Co-financing costs include cash and in-kind contributions

ANNEX B: PROJECT LOGICAL FRAMEWORK

LOGICAL FRAMEWORK ANALYSIS

Result	Indicator	Baseline value	Target and benchmarks	Means of verification and frequency	Assumptions
<p>Goal</p> <p>Objective: To reduce vulnerability to climate change through effective water resource management.</p>	Mainstream adaptation to climate change into water management practices in Ecuador.	Baseline value: climate change risks in the water sector are not addressed in relevant policies, plans and projects both at the national and local level.	By the end of the project, national and regional relevant plans include climate change risk considerations for the water sector.	Surveys/interviews /plans	
<p>Outcome 1: Climate change risk of the water sector integrated into key relevant plans and programmes.</p>	Number of reference to water climate change risks in relevant plans and programmes.	Relevant development and risk management plans do not address climate change risk in the water sector.	By the end of the project, climate change risks in the water sector are addressed in three national plans and at least two provincial development plans.	Revised plans.	Political will to review the plans is ensured and maintained throughout the life of the project.
<p><i>Output 1.1: Practical guidance to integrate water climate risk into relevant plans and programmes, developed.</i></p>	Number of plans and programmes that apply Guidelines.	No guidelines to mainstream water climate risk exist.	By the end of year 1, practical guidance to mainstream water climate risk has, made available to relevant stakeholders by the end of Year 1.	Documents	Relevant stakeholders adopt the guidelines.
<p><i>Output 1.2: Relevant plans and programmes incorporate climate</i></p>	Number of plans that integrate Climate change risk issues	Relevant development and risk management	By the end of the project, the National Water Management Plan, National Development Plan,	Revised plans	Political will to review the plans is ensured and maintained

Result	Indicator	Baseline value	Target and benchmarks	Means of verification and frequency	Assumptions
<i>risks in the water sector</i>	related to water management.	plans, both at the national and the local level, do not address climate change risk in the water sector.	National Risk Management Plan, and at least two Provincial /Risk management Plans include climate change risk and adaptation measures for the water sector.		throughout the life of the project.
Outcome 2: Strategies and measures that facilitate adaptation to climate change impacts on water resources implemented at the local level.	Number of adaptation measures implemented at the local level	Adaptation measures are ad hoc. No long term adaptation measures implemented.	By the end of the project, adaptation measures to address climate risks in the water sector have been adopted by local stakeholders.	Evaluation reports	Local stakeholders support the adoption of adaptation measures.
<i>Output 2.1: Measures, technologies and practices to improve the adaptive capacity of water resources management introduced and implemented in pilot systems.</i>	Number of communities undertaking adaptation measures	Adaptation measures are ad hoc. No long term adaptation measures implemented.	By the end of the project, at least 10 communities implementing adaptation measures-	Field Surveys	Selected pilot province is best placed to demonstrate the benefits of measures to adapt to climate change.
	Number of farmers adopting water saving measures	None	By the end of the project, at least 50% if farmers participating in the project apply water saving measures.	Field Surveys	
	Certainty of the inflow to the Paute hydroelectric project	Hydropaute's risk management plan does not include	By the end of the project, a revised risk management plan incorporates measures that address the impact of	Revised Hydropaute's risk management plan	

Result	Indicator	Baseline value	Target and benchmarks	Means of verification and frequency	Assumptions
	under a climate change scenario	adaptation to climate change related to water availability.	climate change in the water inflow to the Paute hydroelectric project.		
<i>Output 2.2: Information management systems reflecting climate change impacts on the water sector developed</i>	Number of institutional agreements to improve climate information networks	Climate information networks do not account for climate information data	By the end of the project, a climate network that includes climate change information is operational in at least two provinces	Reports of CNRH, INAMHI, and field inspection	INAMHI designates technical counterparts to support the hydro meteorological network. Local governments contribute to the implementation of the monitoring network Basic hydro meteorological data is compiled in a regular basis.
Outcome 3: Institutional and human capacity strengthened, and information/lessons learned disseminated <i>Output 3.1: Improved institutional and technical capacities to support the mainstreaming of climate risks and</i>	Number of staff trained. Number of awareness campaigns implemented Number of staff trained.	None Only specialized staff in the MoE has some knowledge of concrete adaptation measures.	At 300 personnel from relevant institutions in selected provinces are trained.	Training reports Evaluation reports	

Result	Indicator	Baseline value	Target and benchmarks	Means of verification and frequency	Assumptions
<i>implementation of adaptation measures in the water sector</i>					
<i>Output 3.2 Knowledge and lessons learned to support implementation of adaptation measures compiled and disseminated</i>	Number of lessons learned systematized	No web site exists No lessons learned compiled	Within 6 months of the start of implementation, a publicly accessible web-site will be created. At the time of project completion, at least 3 examples of lessons learned have been compiled and disseminated.	Website	Local stakeholders implement adaptation measures on the ground.
<i>Output 3.3: Guidance documents for GEF and MoE on climate change adaptation programming in the water resource sector provided</i>	Number of cases included in the ALM	No cases of best practices recorded	At the time of project completion, at least 3 examples of best practice generated through the project will be accessible through the ALM. At the time of project completion, draft documents will be prepared to guide future GEF and MoE support for interventions on adaptation to climate change including variability .	Documents	ALM becomes operational and effective in time to document best practices from the project GEF and MoE continue to target adaptation to climate change including variability in the water resource sector

ANNEX C: RESPONSE TO PROJECT REVIEWS

a) Convention Secretariat comments and IA/ExA response

None

b) STAP expert review and IA/ExA response

A Technical Review of GEF proposal
“Adaptation to Climate Change through Effective Water Governance in Ecuador”

Dr Monirul Mirza

KEY ISSUES

This project proposes mainstreaming of a string of adaptation strategies and measures in the water sector to reduce vulnerability of agriculture and energy sectors of Ecuador. The country has diverse climatic settings and key economic sectors are vulnerable to climate variability and extremes such as droughts and floods. The situation becomes worse during El Nino and La Nina years as stated in the project proposal. *While the project proposal focuses on vulnerable regions and sectors, no quantitative information on past losses from extreme weather events has been furnished. This deficiency could be easily corrected by citing average annual losses (especially in agriculture and energy sectors) with inclusion of some extreme years. A graphical representation is appreciated.*

The proposal appropriately applied ‘**vulnerability-based approach**’ because of high uncertainty in future climate change scenarios due to geographical location, terrain and complex climatic process. For example, in the proposal it was cited that projected changes in precipitation could be -15 to +15%. In this context, a range of coping mechanisms could be introduced to tackle a variety of climatic futures. *However, in the proposal, categorically these mechanisms have not been mentioned. It is therefore suggested to include a list of measures in the revised proposal.*

The project proposal discusses long-term planned response strategies, policies and measures to enhance resilience of the two key economic sectors in question. However, it does not discuss the short-term coping mechanisms that are in place in response to extreme climatic hazards. Many short term measures are being adopted in the areas/regions are vulnerable to hazards. For example, during crop loss (partial or full), farmers are allowed to have access to low interest credit, distribution of seeds/seedlings, introduction of short rotation crops, etc. For energy sector, for example, during generation failure due to low water levels in dams/reservoirs, short-term measures could be in the form of: importation of electricity from the surplus regions, electricity rationing, support to business/individuals from the government, reduction of water losses from the reservoir, etc. *This deficiency in the proposal could be rectified by incorporation of information available on short-term measures that are in practice in the two economic sectors in the vulnerable regions in Ecuador.*

Additionality: The project document discusses ‘additionality’ issue in the main texts (page 19-20), and in Section II. Four major characteristics of current ‘**baseline**’ have been identified which are: dispersed and ineffective water governance; no attention to development of policies centered at climate change; lack of coherence and coordination among the executing agencies; and lack of financial and technical resources for local water agencies and at community level. The alternative GEF scenario (climate change) is characterized by: mainstreaming of climate risk; targeted capacity development; sustainable and productive projects; retrofitting of existing projects; modified national policies; and empowering local authorities and community-based organization to integrate climate change issues into development

planning. Definitely, if the project is successfully implemented, it would generate long-term benefits for the stakeholders.

Additional cost reasoning has clearly been discussed in pages 25-31 under four major project outcomes. (items 96-111). Cost estimates for 'baseline', 'alternative scenario' and 'additional cost' due to climate change are presented in 'Additional Cost Matrix' in Section II. I have difficulty in understanding the basis of these estimates which could have been spelled out in detail. For example, in several places in the text, the issue of weak and insufficient hydro-meteorological stations have been cited but I do not see any specific breakdown (perhaps included in the total cost of a component) of costs for the hydro-meteorological networks. I strongly suggest a detailed breakdown of the estimates and explanations for arriving to such estimates in an 'Annexure'.

The financing/cost sharing mechanism looks OK. The GEF contribution that sought is 33% of the 'Additional Cost'.

If successfully implemented (by avoiding or handling the risks), the lessons to be generated could be used to develop good practices for incorporating adaptation measures to climate change into broader development planning in Ecuador.

Management co-modality: The proposal included a co-management of the project with the involvement of Ministry of Environment and UNDP local office in Ecuador. Stakeholders/experts to be involved will be managed by the 'Project Management' Unit and shall be responsible for reporting to the UNDP on a regular basis. This co-management structure is designed in accordance with the lessons learned in other GEF funded projects. *In my view this management structure should work but the GEF may ask the executing agency for conflict resolution plans in case of arise of any potential management problems during execution of the project.*

Project Monitoring and Evaluation: A plan for project monitoring and evaluation has been presented in Part IV of the proposal. As stated, the plan has been devised according to the established UNDP and GEF procedures. The Plan will involve UNDP Country Office for country level monitoring and MoE at the project level. Monitoring responsibilities have also been spelled out. The presented 'monitoring plan' seems to be adequate but I do not see any contingency plan in case of spill over of the project beyond the project life and *possible cost-over run*. In addition, the *annual monitoring* has been proposed through a **Tripartite Review**. In the context of complex structure of water governance in Ecuador, in my view, instead of 'Annual Tripartite' review, '**half-yearly**' review will enhance project implementation efficiency and will help sorting out any inherent problem.

Fitness of the Project in the context of the goals of the GEF and the specific objectives and priorities of the SCCF: The project fits within the areas identified in SCCF created in 2001⁷ (see footnote below). Adaptation is one of the major eligible areas for funding. One of the project objectives is to set up pilot

⁷ ...that a special climate change fund shall be established to finance activities, the resources allocated to the climate change focal area of Global Environment Facility and by bilateral and multilateral funding, in the following areas:

- (a) Adaptation, in accordance with paragraph 8 of decision 5/CP.7;
- (b) Transfer of technologies, in accordance with decision 4/CP.7;
- (c) Energy, transport, industry, agriculture, forestry and waste management

The Special Climate Change Fund adaptation program focuses on the following area: water resources, agriculture, health, infrastructure, integrated coastal zone management, and fragile ecosystems, including mountain ecosystems ([http:// www.GEF.org](http://www.GEF.org)).

program that fits within the recent decision of the UNFCCC to support pilot and demonstration projects in the field of adaptation. This project will provide benefits to the stakeholders in agriculture and energy and will mainstream adaptation measures in the water sector policies. This broad objective fits within the funding criteria of the GEF.

Regional and Sectoral Context: The project is focused on vulnerable regions and sectors. It did mention about Ecuador's first National Communications (submitted in November 2000; see www.unfccc.de) which identified "climate change as a critical cross cutting issue affecting most vulnerable sectors of the economy." Although the Paute hydropower project identified in the National Communication has been included in the case study of the proposal, I strongly feel that more information on vulnerability of: water, agriculture and energy sectors could have been drawn from the National Communications and a linkage with the mainstreaming objective could also have been established. For example, four climate change scenarios were applied to estimate future (2010) changes in water resources in Ecuador. "Assuming scenarios CCS1 and CCS2, which involve a drop in rainfall, the Agoyan Hydropower project would be affected by a 23% decline in water flow volumes, basically during the low-water period, and the Paute project would meet only between 43% and 45% of average power capacity, which would mean a deficit of about 27% in energy production under normal conditions".(National Communication: Republic of Ecuador, p. xx). The proposal could have included a paragraph on how such future scenario could be tackled through mainstreaming of adaptation measures.

The proposal did not establish linkage with NAPAs. I have scanned through the UNFCCC website, but could not find reference of any ongoing NAPA projects in Ecuador. It did mention about some other projects which include:

- (a) A Dutch funded project on the impact of climate change on the coastal region.
- (b) UNITAR's Climate Change Training Program - Ecuador (climate change Train).
- (c) UNEP's Program for Offsetting of GHG emissions in Ecuador (UNEP-RISO).
- (d) UNDP-GEF technical support for Stages I and II of Ecuador's National Communication to the UNFCCC.

Sustainability of the Project:

The major objective of the project is to mainstream adaptation to climate change into water management practices in Ecuador through: targeted capacity development; information management and knowledge brokering. In the LFA, the proposal did mention (indirectly) some of the adaptation interventions in the form of upgrading forecasting/measurement stations, data archive and dissemination, reducing water losses, introduction of new technologies, reduction of uncertainty in forecast, etc.

However, few other issues need to be addressed:

- In the text, retrofitting of physical structures has been mentioned so that they will remain functional in the wake of climate change and extremes. But how this target will be achieved need to be addressed. Retrofitting could be very expensive, for example, capacity increase of a hydropower dam/reservoir and that could have many spill-over impacts.
- For the new infrastructure, the design criteria need to be updated by taking into account climate change as well as uncertainties surrounding it.
- In the LFA, it has been mentioned that at least 50% of the farmers would use new water saving technology.

-But what kind of technology?

- How the diffusion will take place?
- How the functionality and efficiency of these technologies will be monitored?

- It has also been stated that water use efficiency will be improved by 15%. How that will take place?
- “The uncertainty of the forecast water availability is reduced by 75%”. How this could be achieved? and in my view this is at a high end.

Developmental Benefits: Implementation of the projects will certainly generate developmental benefits in terms of higher agricultural production, improved living standards, revenues from electricity production, and irrigation water, etc. Future sustainability depends on a number of factors such as: continuation of the pilot scheme, revenue earning and expenses and strong institution and political will.

Behavioral changes, social learning and institutional development: Yes, the project aims at these issues and can be achieved.

Replicability of the Project: Successful completion of this project will certainly enable policymakers, professionals and donor agencies to replicate and scaling up the results in else where. However, methodologies, tools and outputs of this project could be replicated in other parts of Ecuador with similar socio-economic, climatic and environmental conditions. This point should be taken into account in the revised proposal. However, caution should be taken to replicate the model in other parts of the region with different ground and political conditions and water governance. But the project outcomes will certainly carry a lot of values while developing some similar programmes in other countries in the region.

SECONDARY ISSUES

Linkages to other focal areas/beneficial and damaging effects: The project may have spill-over effect (positive) on socio-economic sectors and human settlement. Retrofitting of reservoirs/dams may inundate (if capacity increased) forest areas. Risk of failure (in case of capacity exceeded by future abrupt climate change) can threaten human settlements and infrastructures at the downstream areas. The revised proposal should address these issues. A figure showing linkages with other economic sectors is appreciated.

Linkages with other programmes and action plans at regional and sub-regional levels:

The proposal lacks information on how this project is:

- connected with other regional and sub-regional programmes
- bilateral and technical assistance
- building on other ongoing initiatives on climate change

Degree of involvement of stakeholders: The project proposal has assessed the degree of stakeholders' involvement in the project. Twelve key players in the agriculture, water and energy sector included as stakeholders and listed in Annex 2. I have a few concerns:

- low level (only one) representation of the NGOs and Civil Societies in the stakeholders' list
- No indication of grassroots level stakeholders' association or integration with the project
- involvement of political and legal forces is necessary for successful completion of the project and extending it beyond the project cycle.
- gender balance is not clear at this stage
- a clear statement is required about how coordination among the stakeholders will be maintained.

Capacity building aspects: The proposed capacity building through training, field level works, seminars/workshops. A statement is required about how the build capacity would possibly be used to train up professionals in other sectors where climate change is a key concern.

Innovativeness of the Project: In terms of innovativeness, the project proposed to introduce effective governance in the water sector in Ecuador. Effective governance requires transparency and accountability. While these are true for governance of any economic sector, it is necessary to spell out how transparently the adaptation governance will be executed in the water sector.

Overall Assessment: This is an interesting project aiming at mainstreaming adaptation in agriculture and energy sector through improving water governance. The strategies outlined in the proposal need to be improved by addressing the concerns raised in the review.

Responses to STAP reviewer comments

STAP Reviewers Comment	Response
<p>While the project proposal focuses on vulnerable regions and sectors, no quantitative information on past losses from extreme weather events has been furnished. This deficiency could be easily corrected by citing average annual losses (especially in agriculture and energy sectors) with inclusion of some extreme years. A graphical representation is appreciated.</p>	<p>The proposal has been modified to explicitly cite quantitative information on past losses from extreme weather events. See section on Economic impacts of extreme events, paragraph 28 and 29, including table and figures on pages 11 and 12 of the Project Document. Description of the vulnerability in the agriculture and hydro-energy sectors in relation to climate impacts on water, have been summarized in boxes on pages 16 and 17.</p>
<p>The proposal appropriately applied ‘vulnerability-based approach’ because of high uncertainty in future climate change scenarios due to geographical location, terrain and complex climatic process. A range of coping mechanisms could be introduced to tackle a variety of climatic futures. However, in the proposal, categorically these mechanisms have not been mentioned. It is therefore suggested to include a list of measures in the revised proposal.</p>	<p>The proposal has been edited in different sections as a response to this comment. However, further analysis will included at the time of CEO endorsement.</p>
<p>The project proposal discusses long-term planned response strategies, policies and measures to enhance resilience of the two key economic sectors in question. However, it does not discuss the short-term coping mechanisms that are in place in response to extreme climatic hazards. This deficiency in the proposal could be rectified by incorporation of information available on short-term measures that are in practice in the two economic sectors in the vulnerable regions in Ecuador.</p>	<p>The proposal has been modified to include a section on short-term coping mechanisms that are in place in response to extreme climatic hazards. As a result of some extreme event, the Government of Ecuador has put in place some measures to strengthen the organization of farmers, including the establishment of seed banks and train communities how to make better use of the available meteorological data to prepare for floods. Reactive measures also include campaigns on how to improve agriculture practices to face droughts experienced in high lands. Other measures include improvement of flood zoning. In the energy sectors, public campaigns for energy saving have been implemented as well as the, importing fuel to compensate energy demand.</p>
<p>Additional cost reasoning has clearly been discussed in pages 25-31 under four major project outcomes. (items 96-111). Cost estimates for ‘baseline’, ‘alternative scenario’ and ‘additional cost’ due to climate change are presented in ‘Additional Cost Matrix’ in Section II. I have difficulty in understanding the basis of these estimates which could have been spelled out in detail. For example, in several places in the text, the issue of weak and insufficient hydro-meteorological stations have been cited but I do not see any specific breakdown (perhaps included in the total cost of a component) of costs for the hydro-meteorological networks. I strongly suggest a detailed breakdown of the estimates and explanations for arriving to such estimates in an ‘Annexure’.</p>	<p>The costs of the hydro-meteorological network are included in the costs for Outcome 2 (Output 2.2). As noted in the text, these costs will be provided through co-financing. Breakdown of co-financing is provided in the table Additional Cost Matrix in the Annex Section.</p>

<p>The financing/cost sharing mechanism looks OK. The GEF contribution that sought is 33% of the ‘Additional Cost’.</p> <p>If successfully implemented (by avoiding or handling the risks), the lessons to be generated could be used to develop good practices for incorporating adaptation measures to climate change into broader development planning in Ecuador.</p>	<p>We agree with the STAP reviewer comment</p>
<p>Management co-modality: The proposal included a co-management of the project with the involvement of Ministry of Environment and UNDP local office in Ecuador. Stakeholders/experts to be involved will be managed by the ‘Project Management’ Unit and shall be responsible for reporting to the UNDP on a regular basis. This co-management structure is designed in accordance with the lessons learned in other GEF funded projects. In my view this management structure should work but the GEF may ask the executing agency for conflict resolution plans in case of arise of any potential management problems during execution of the project.</p>	<p>This is the normal management structure for UNDP projects (not only GEF-funded projects). In the event of conflicts arising, UNDP has a well-established process to resolve such conflicts. (see Paragraph 160 of the Project Document.</p>
<p>Project Monitoring and Evaluation: A plan for project monitoring and evaluation has been presented in Part IV of the proposal. As stated, the plan has been devised according to the established UNDP and GEF procedures. The Plan will involve UNDP Country Office for country level monitoring and MoE at the project level. Monitoring responsibilities have also been spelled out. The presented ‘monitoring plan’ seems to be adequate but I do not see any contingency plan in case of spill over of the project beyond the project life and possible cost-over run. In addition, the annual monitoring has been proposed through a Tripartite Review. In the context of complex structure of water governance in Ecuador, in my view, instead of ‘Annual Tripartite’ review, ‘half-yearly’ review will enhance project implementation efficiency and will help sorting out any inherent problem.</p>	<p>There will be no spill-over in the project duration. UNDP-GEF projects apply the principles of adaptive management. If unexpected costs are encountered, the project monitoring process will identify the likelihood of cost over-runs and consider an appropriate management response. There is a well-established process of modifying the project structure, if required due to unforeseen circumstances. Depending on the scale of modification, a decision may be made by the project team, by the UNDP CO, by UNDP-GEF, or by the GEF.</p> <p>Regarding the frequency of tripartite reviews, the trend in UNDP has been for these to be discarded, rather than an increase in frequency. Experience has shown that a well-designed and well-functioning Steering Committee negates the benefits of Tripartite reviews.</p>
<p>Fitness of the Project in the context of the goals of the GEF and the specific objectives and priorities of the SCCF: The project fits within the areas identified in SCCF created in 2001⁸ (see footnote below).</p>	<p>Agree with the STAP reviewer comment.</p>

⁸ ...that a special climate change fund shall be established to finance activities, the resources allocated to the climate change focal area of Global Environment Facility and by bilateral and multilateral funding, in the following areas:
(a) Adaptation, in accordance with paragraph 8 of decision 5/CP.7;

<p>Adaptation is one of the major eligible areas for funding. One of the project objectives is to set up pilot program that fits within the recent decision of the UNFCCC to support pilot and demonstration projects in the field of adaptation. This project will provide benefits to the stakeholders in agriculture and energy and will mainstream adaptation measures in the water sector policies. This broad objective fits within the funding criteria of the GEF.</p>	
<p>Regional and Sectoral Context: The project is focused on vulnerable regions and sectors. It did mention about Ecuador’s first National Communications (submitted in November 2000; see www.unfccc.de) which identified “climate change as a critical cross cutting issue affecting most vulnerable sectors of the economy.” Although the Paute hydropower project identified in the National Communication has been included in the case study of the proposal, I strongly feel that more information on vulnerability of: water, agriculture and energy sectors could have been drawn from the National Communications and a linkage with the mainstreaming objective could also have been established.</p>	<p>See the previous response to the comment requesting additional information, which has been inserted into the document.</p>
<p>The proposal did not establish linkage with NAPAs. I have scanned through the UNFCCC website, but could not find reference of any ongoing NAPA projects in Ecuador. It did mention about some other projects which include:</p> <p>(a) A Dutch funded project on the impact of climate change on the coastal region. UNITAR’s Climate Change Training Program - Ecuador (climate change Train). UNEP’s Program for Offsetting of GHG emissions in Ecuador (UNEP-RISO). UNDP-GEF technical support for Stages I and II of Ecuador’s National Communication to the UNFCCC.</p> <p>However, linkages with lessons learnt from these projects are rather weak and there is a scope to strengthen this.</p>	<p>Ecuador is not under the category of Least Developed Countries and thus not eligible for NAPA funding. Ecuador therefore does not have a NAPA document.</p> <p>These other projects mentioned by the STAP reviewer provide the basis and key lessons for the consolidation of climate change initiatives in Ecuador. For instance, following UNITAR’s climate change Training program, the government of Ecuador created the Climate Change Unit, hosted by the Under-Secretary for Environmental Quality in the MoE and the CNC. The CNC has functioned as the main forum for discussing climate policy in Ecuador, and conducted the Initial National Communication (INC) to the UNFCCC in 2000. The CNC guarantees the conditions for a broad-based national ownership of the process leading to the SNC. These processes and studies have in turned provided substantive technical expertise, information and lessons learned on the climate change</p>

- (b) Transfer of technologies, in accordance with decision 4/CP.7;
(c) Energy, transport, industry, agriculture, forestry and waste management

The Special Climate Change Fund adaptation program focuses on the following area: water resources, agriculture, health, infrastructure, integrated coastal zone management, and fragile ecosystems, including mountain ecosystems ([http:// www.GEF.org](http://www.GEF.org)).

	institutional processes, which have helped in shaping the scope, approach and design of institutional arrangements of the proposed project.
<p>The major objective of the project is to mainstream adaptation to climate change into water management practices in Ecuador through: targeted capacity development; information management and knowledge brokering. In the LFA, the proposal did mention (indirectly) some of the adaptation interventions in the form of upgrading forecasting/measurement stations, data archive and dissemination, reducing water losses, introduction of new technologies, reduction of uncertainty in forecast, etc.</p> <p>However, few other issues need to be addressed:</p> <p>In the text, retrofitting of physical structures has been mentioned so that they will remain functional in the wake of climate change and extremes. But how this target will be achieved need to be addressed. Retrofitting could be very expensive, for example, capacity increase of a hydropower dam/reservoir and that could have many spill-over impacts.</p> <p>For the new infrastructure, the design criteria need to be updated by taking into account climate change as well as uncertainties surrounding it.</p> <p>In the LFA, it has been mentioned that at least 50% of the farmers would use new water saving technology.</p> <p>-But what kind of technology? -How the diffusion will take place? -How the functionality and efficiency of these technologies will be monitored?</p> <p>It has also been stated that water use efficiency will be improved by 15%. How that will take place?</p> <p>“The uncertainty of the forecast water availability is reduced by 75%”. How this could be achieved? and in my view this is at a high end.</p>	<p>Concerning sustainability of the project benefits, the project document does not mention retrofitting of physical structures, only retrofitting of projects, by which it is meant that projects which fail to take account of climate change will be modified through the contributions of this project. We agree that the design criteria for any new infrastructure need to take account of the impacts of climate change – this is indeed a major contribution of the project, though GEF funding will not be used for new infrastructure.</p> <p>Regarding the water-saving technologies to be introduced through the project, there are numerous potential “technologies”, both “hard” technologies such as drip irrigation, and “soft” technologies such as improved understanding of crop-water interactions, so that irrigation is applied only when necessary. The project will consider any such technologies, but is not prescriptive – the implementation strategy will depend on local conditions and institutional capacity.</p> <p>The indicators have been modified to respond to this comment. Success of indicators will be measured through the project’s monitoring system. In this regard, as part of standard UNDP project management practice, the structure and target values of all indicators will be reviewed during the inception workshop.</p> <p>Diffusion of lesson generated by the project will take place though activities under Outcome 3.</p>
<p>Developmental Benefits: Implementation of the projects will certainly generate developmental benefits in terms of higher agricultural production, improved living standards, revenues from electricity production, and irrigation water, etc. Future sustainability depends on a number of factors such as: continuation of the pilot scheme, revenue</p>	<p>We agree with the STAP reviewer.</p>

earning and expenses and strong institution and political will.	
Behavioral changes, social learning and institutional development: Yes, the project aims at these issues and can be achieved.	We agree with the STAP reviewer.
Replicability of the Project: Successful completion of this project will certainly enable policymakers, professionals and donor agencies to replicate and scaling up the results in elsewhere. However, methodologies, tools and outputs of this project could be replicated in other parts of Ecuador with similar socio-economic, climatic and environmental conditions. This point should be taken into account in the revised proposal. However, caution should be taken to replicate the model in other parts of the region with different ground and political conditions and water governance. But the project outcomes will certainly carry a lot of values while developing some similar programmes in other countries in the region.	The proposal has been edited as a response to this comment.
Linkages to other focal areas/beneficial and damaging effects: The project may have spill-over effect (positive) on socio-economic sectors and human settlement. Retrofitting of reservoirs/dams may inundate (if capacity increased) forest areas. Risk of failure (in case of capacity exceeded by future abrupt climate change) can threaten human settlements and infrastructures at the downstream areas. The revised proposal should address these issues. A figure showing linkages with other economic sectors is appreciated.	Ensuring appropriate water supply through improved management under climate change scenarios will bring benefits to other important economic sectors. Industrial activities and production has suffered economic losses due to energy rationing that has taken place in periods of extreme droughts. This in turn affected commercialization of goods. Reduction in agriculture outputs has a direct effect in exporting of cash crops, reducing incomes of farming communities and inflow of hard currency. As climate risks are increasingly influencing these key sectors, addressing water issues will have direct positive socio-economic effects, including improved health and food security. A figure showing the linkages with other socio-economic sectors will be included prior to CEO endorsement.
Linkages with other programmes and action plans at regional and sub-regional levels: The proposal lacks information on how this project is: -connected with other regional and sub-regional programmes -bilateral and technical assistance -building on other ongoing initiatives on climate change	The proposal has been modified to include a section on linkages with other programmes and action plans at regional and sub-regional levels. See section under paragraph 149 of the Project Document.
Degree of involvement of stakeholders: The project proposal has assessed the degree of stakeholders' involvement in the project. Twelve key players in the agriculture, water and energy sector included as stakeholders and listed in Annex 2. I have a few concerns: -low level (only one) representation of the NGOs and Civil Societies in	The National Water Resources Forum (FRH) represents the civil society and NGOs. This forum includes small and community water users and is the most representative group related with water. Through the Forum, the project will ensure a broad participation of the relevant NGO and civil societies that will contribute to and benefit from the project.

<p>the stakeholders' list</p> <p>-No indication of grassroots level stakeholders' association or integration with the project</p> <p>-involvement of political and legal forces is necessary for successful completion of the project and extending it beyond the project cycle.</p> <p>-gender balance is not clear at this stage</p> <p>-a clear statement is required about how coordination among the stakeholders will be maintained.</p>	<p>Local organizations will play an important role in the implementation of some of the project's activities, especially those related to Outcome 3 (Provincial and local planning and community action demonstrate adaptation to climate change). Additional explanation was added in the project document on how grassroots participation will be ensured.</p> <p>The National Steering Committee of this project is compounded by the institutional, political and legal forces relevant to the water sector. Given the long-term nature of the adaptation strategies, the project's institutional arrangements have been designed to ensure that mainstreaming of adaptation to climate change become an integral part of planning and decision making.</p> <p>The Adaptation Local Fund would include criteria to prioritize projects which promote women participation in adaptation activities in the context of the project. The criteria and the approach to encourage gender balance will be defined during the design phase of the fund.</p> <p>Coordination between stakeholders will be defined during the inception workshop.</p>
<p>Capacity building aspects: The proposed capacity building through training, field level works, seminars/workshops. A statement is required about how the build capacity would possibly be used to train up professionals in other sectors where climate change is a key concern.</p>	<p>An explanation was added to outcome 3 to respond to this comment.</p>
<p>Innovativeness of the Project: In terms of innovativeness, the project proposed to introduce effective governance in the water sector in Ecuador. Effective governance requires transparency and accountability. While these are true for governance of any economic sector, it is necessary to spell out how transparently the adaptation governance will be executed in the water sector.</p>	<p>The project proposes the development of a follow-up approach to ensure that decision-making regarding the water sector is conducive to the mainstreaming of adaptation in the relevant programmes at the national and local levels. The key stakeholders will play a pro-active role in this process during the duration of the project. The appropriation of the project results by these stakeholders will ensure that activities will be carried out beyond the life of the project. Thus, rather than having one institution solely</p>

	<p>responsible for all the project's activities, the proposed institutional arrangements is based on the participation of a number of key partners, with specific responsibilities according to expertise and competitive advantage. The coordination mechanism under MoE as the Execution Agency, and with the support by UNDP, will enhance the transparency of the project and its implementation beyond its lifetime.</p>
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c) GEF Secretariat and other Agencies' comments and IA/ExA response

GEF COMMENTS	RESPONSES
Both the first section (Project rationale, objectives, outputs and activities, pages 2 - 4) and Annex A (Additional cost analysis, page 17 - 19) include several conceptual issues:	
1. List of outcomes 1-4: text focuses mostly on capacity building, where is the action?	The project's outcomes have been modified to provide a more substantive discussion on what the project is expected to achieve. Three instead of four outcomes have been identified in the revised proposal. Capacity building activities have been limited to one outcome while the other two outcomes focus on demonstration activities and improving water governance frameworks (i.e. legislation, national plans, etc) to integrate climate change risks.
2. List of outcomes 1-4 (with description) text focuses mostly on process, where is the action? In this case outcomes 3 and 4 may generate some action, please clarify.	The outcomes now provide a description of their scopes as well as more detailed description of the activities to be implemented.
3. Key indicators; again, outcome 3 and 4 may generate some benefits on the ground; please clarify through which actions;	Outcome 2 is now focused on adaptation measures at the local level and the text provides elaborates on specific intervention. A distinction has been made between baseline and additional interventions to address climate change issues across all outcomes.
4. The baseline is too vague. In these kinds of projects it is not acceptable to say that the baseline does not include adaptation. The baseline must include specific development activities that will be "climate-proofed" through this project;	The baseline section has been clarified, and we have provided substantial detail on the direct contribution of baseline activities to the proposed activities funded by SCCF. Each outcome provides a description of the relevant baseline issues as well as additionality.
5. Baseline overambitious (practically includes any sector and any activity in it); 10 billion would not be enough to climate proof it.	The project is focused on one sectoral intervention. As explained above, the baseline provides a clear description of relevant activities under the 3 project outcomes, namely: 1) integration of climate change risk on the water sector integrated into key relevant plans; 2) Adaptation strategies and measures for the water sector on the ground, and strengthening of human and institutional capacity. It is important to note that more 2/3 of the SCCF funds are allocated to achieve concrete results at the local level. The scope of the interventions is redefined following discussions at the bilateral.
6. Please define a more realistic baseline including limited activities and a more limited climate proofing activities in the water sector, as originally planned at project concept stage.	The baseline descriptions for each outcome has been improved in the text.
7. The budget must be modified as the GEF cannot be the only source of financing for M&E -- co-sharing must be sought.	Co-financing for M&E activities has now been included. This is based on the follow up of baseline activities that the key institutions will commit to do in their respective capacities. Such commitment will help to ensure that project activities will not be at risk because of lack of appropriate monitoring of the baseline activities.
8. Please provide a justification of the \$6 million co-financing including the specific sources of co-financing (letters of commitments are not necessary at this stage) and for which baseline activities.	Specific sources of co-financing have been added. Letter of commitments will be submitted at CEO endorsement.

OTHER ESSENTIAL DOCUMENTS FOR SUBMISSION AS PART OF A PROJECT REVIEW:

- 1) **Full Project document**

Attached

2) **Endorsement letter from the Operational Focal Point(s)**


ministerio del
ambiente
República del Ecuador
Quito, 03 de abril de 2007
Oficio No. 0001648-07 DASI/MA

Señor
René Mauricio Valdés
REPRESENTANTE RESIDENTE UNDP
Ciudad

De mi consideración:

El Ministerio del Ambiente, autoridad nacional en temas relacionados a Degradación de Suelos, Cambio Climático y Diversidad Biológica, entre otros, forma parte de las Convenciones y Acuerdos internacionales que sobre los referidos tópicos se han suscrito. En virtud de lo cual el Ecuador se encuentra comprometido con las acciones que en el marco de estas responsabilidades se prevé realizar.

El proyecto "Adaptación al Cambio Climático a través de una Efectiva Gobernabilidad del Agua en el Ecuador", es una propuesta liderada por esta Cartera de Estado como co-ejecutor y aprobada por el Fondo para el Medio Ambiente Mundial – FMAM en su fase preparatoria Project Design Form - B, la misma que no compromete recursos asignados para la cuarta reposición y cuenta con recursos de contrapartida de varias organizaciones, hecho que garantiza la sostenibilidad financiera de la propuesta.

Toda vez que la unidad técnica correspondiente, ha realizado el análisis técnico del proyecto de la referencia, se recomienda su aplicación, toda vez que apoya los esfuerzos gubernamentales para reforzar la participación de los ciudadanos y promover una adecuada interrelación entre organizaciones de interés intergubernamental y no gubernamental.

En este contexto, el Ministerio del Ambiente presenta su **conformidad** al Proyecto, por considerar que el objetivo principal permitirá la disminución de la pobreza por medio del acceso a servicios sociales básicos de calidad y a las actividades productivas, centrado en una efectiva resolución del manejo del agua, incorporando metas de conservación del recurso, para promover la sustentabilidad de la capacidad hídrica.

Es importante resaltar que el Ministerio del Ambiente atendiendo a la norma establecida realizará el seguimiento y evaluación de la presente propuesta.

Con especial consideración me suscribo.

Atentamente,


Anjira Amador
MINISTRA DEL AMBIENTE

OTHER ANNEXES

Annex 1: Climate Change Impacts on Water Resources

1. Ecuador faces a variety of potential climate change risks associated with changes in temperature and precipitation, as well as possible alterations to ocean currents. Climate change impacts are difficult to predict and model for Ecuador due to its complex geographical and climatic situation associated with the existence of coastal, highland and forest regions, Ecuador's situation in the Inter-Tropical Convergence Zone (ITCZ), and the influence of the Humboldt Current and warm equatorial current, which converge off the coast. Nonetheless, it is possible to identify a range of plausible climate change scenarios for Ecuador and its regions, with relevance for planning in the water sector. These scenarios may be used to develop plans that will enable Ecuador to prepare for a range of possible outcomes of climate change, increase the resilience of the water sector, and avoid maladaptation.

Temperature and Precipitation Projections

2. Country-level data from the Tyndall Centre Country Scenarios (University of Norwich, UK), representing projections in average seasonal temperature and precipitation from a number of global climate models (GCMs), suggest increases in temperature of between 0.5° C and 6° C throughout the year by the latter half of the 21st century (2070-99), relative to the 1961-90 mean (Figure 1). Projected changes in precipitation range from about -15 to +15 per cent, with the most coherent signal evident for the period June-August, when most simulations indicate a modest increase in rainfall of a few per cent, although values range from about -2 to +12 per cent. These simulations should be treated with caution due to the coarse resolution of the GCMs used to generate them, and because of the country-level aggregation inherent in the values, which neglects spatial variations in impacts. For example, a very small change in rainfall in data aggregated at the national level may mask extreme variations of opposite signs in different regions. Nonetheless, the projections provide a range of values around which planning can take place.

Coastal Region and El Niño

3. The climate of Ecuador's southern coastal region is dominated by the cold Humboldt current, which flows north along the coasts of Chile, Peru and southern Ecuador, generating the arid conditions and coastal fog characteristic of the Atacama and Sechura desertsⁱ. The northern coastal region of Ecuador is affected by the warm equatorial current, which delivers moist air and rainfall as it flows south along the northern coast before meeting the Humboldt current near the Equator. The southward extension of this warm current from December to April is associated with a single wet season. In El Niño years, up-welling associated with the Humboldt current weakens and the normally cool offshore waters associated with arid conditions on land are replaced by warmer waters and rainfall in the normally dry coastal region of southern Ecuador, which often leads to severe flooding. A study of the 1991/2 El Niño found that the centres of precipitation were restricted to the coastal plain below altitudes of 1000 m. Local rainfall maxima were observed over the Amazon region near the Peru-Bolivia border; however, rainfall over the Amazon region of Ecuador was reduced, a pattern also observed during other El Niño yearsⁱⁱ.
4. A tendency towards more El Niño and fewer La Niña events became evident in the final three decades of the twentieth century, and there are suggestions that this change in the frequency and duration of El Niño conditions may be consequence of anthropogenic climate change that will persist or intensify in the coming decades. However, there is still considerable scientific uncertainty regarding the likely future evolution of El Niño. It might be noted that the periodicity of El Niño has varied over the past few millennia. Results from palaeoclimatic studies of the last period when global temperatures were comparable with those predicted for the latter half of the 21st century (some 3 million years ago) are contradictory, although

studies over a wide geographical area suggest that El Niño like conditions dominated in the Pacific during this periodⁱⁱⁱ.

5. In the absence of a clear scientific consensus on this matter, and given these results, it would seem sensible to adopt a flexible planning approach that accommodates the possibility of more frequent and protracted El Niño events, with higher rainfall in the coastal regions, but which does not preclude alternative scenarios. It must also be recognized that El Niño is a complex phenomenon, and different El Niño events in the past have not resulted in identical impacts on rainfall and water availability^{iv}. The water sector will therefore benefit from improved scientific capacity to monitor and forecast El Niño events.

Andean Region

6. Glaciers and ice caps in the Andean region of Ecuador are already being affected by atmospheric warming associated with climate change, and this will continue and accelerate as global temperatures increase by some 2° C by around 2050 and at least 3° C by the end of the 21st century. Between 1939 and 1998 air temperature increased by 0.11° C per decade in the Andean highlands, compared with a global 0.06° C per decade. Ice masses are already declining rapidly and glacier retreat is underway in all Andean countries. Climate models predict that maximum temperatures will increase in the Ecuadorian highlands, and increases in temperature in highland regions across the globe are expected to be greater than average. These trends may lead to an initial increase in water availability due to increased melting, but water stress will increase dramatically as glaciers and ice sheets shrink and disappear. Many Andean glaciers are likely to disappear completely within the next few decades^v, with severe consequences for high altitude cities which depend on them for their water supplies. Quito currently receives part of its drinking water supply from the Antisana glacier, which is reported to have shrunk 7-8 times faster during the 1990s than in previous decades^{vi}. A study in Columbia using high-resolution regional climate simulations indicates that projected temperature increases and change in rainfall patterns have the potential to disrupt water and power supplies for significant numbers of the population even at low altitudes^{vii}.
7. Dry conditions associated with negative mass balance in glaciers and ice sheets on the eastern Andean slopes of Ecuador occurred during the 1982/3 and 1991/2 El Niño events^{viii}. Other research suggests that glacier retreat in the Andean region is broadly associated with warm El Niño conditions and increased sea-surface temperatures in the eastern tropical Pacific, with glaciers responding rapidly to changes in ocean temperature on timescales of months to years^{ix}. Below average rainfall occurs during El Niño years in the north-western part of the Andes during December-February and in the eastern Cordillera during June-August.^x Climate change may therefore further exacerbate water stress in certain highland areas through changes in El Niño, although, as noted above, there is at present no consensus on the likely future evolution of El Niño.

Amazon Region

8. A number of studies suggest that climate change may result in a widespread drying of the Amazon region resulting in a loss of forest cover^{xi}. While the most vulnerable regions are thought to be those in the northeast of the Amazon basin, in the longer term (i.e. by 2100) the impacts of climate change on the entire Amazon region could be severe. Warmer sea-surface temperatures during past El Niño events have been associated with anomalously dry conditions over northern Amazonia, as the ITCZ shifts north and subsidence occurs over the Amazon region of Ecuador^{xii}. Coupled with reduced water availability from ice melting on the eastern slopes of the Ecuadorian Andes, a significant reduction in water availability in Amazonian Ecuador is a real possibility, particularly in the event the El Niño conditions become more common. In the lowland Amazonian region of eastern Ecuador, strong El Niño events are associated with more marked dry seasons, during which river levels drop.

9. Climate change will lead to increased stress on the water sector in those parts of Ecuador which depend on melt water from glaciers and ice sheets, as these shrink and disappear over the coming decades as a result of increased atmospheric temperatures. Changes in highland meltwater and runoff may also affect lowland river systems. The water sector should prepare for reduced water availability in the Andean region immediately.
10. A key challenge for the water sector is to decouple variability in water supply, and risks in the water sector, from climatic variability, which is strongly associated with El Niño and La Niña. At present it would be premature to plan for either an increase or a decrease in El Niño events, given the uncertainty regarding past and future impacts on El Niño of warmer average global surface temperatures and related changes in atmospheric and oceanic circulation. While high uncertainty remains in this area, capture and storage of water in extreme rainfall years associated with El Niño could play a major role in decoupling variability in water supply from climatic variability.
11. Planners in the water sector should have a broad scientific understanding of El Niño, and keep up-to-date with scientific developments in this field, including research into past El Niño variability, which may give an indication of the likelihood that El Niño activity will increase with anthropogenic climate warming. As more research results become available over the coming years it might be possible to identify emerging or likely trends in El Niño which can form the basis for planning decisions.
12. It should be acknowledged at this stage that, despite the uncertainties described above, an increase in El Niño events is a real possibility. The water sector in Ecuador should therefore develop advance plans to cope with such changes should they materialise. In addition to an increase in water stress in the Andean region, these plans should focus on reduced water availability in the Amazonian region, coupled with an increase in water availability (largely in the form of extreme rainfall events) in the coastal region. Such plans should not be implemented immediately, but should take the form of contingency plans pending improved understanding of the likely future evolution of El Niño. Improved monitoring and forecasting of El Niño events will greatly improve preparedness for year-to-year climatic variations within the water sector, and may help to identify emerging trends that can be used for planning purposes. General measures to increase resilience in the water sector in the face of increased year-to-year climatic variability should be developed and implemented immediately.

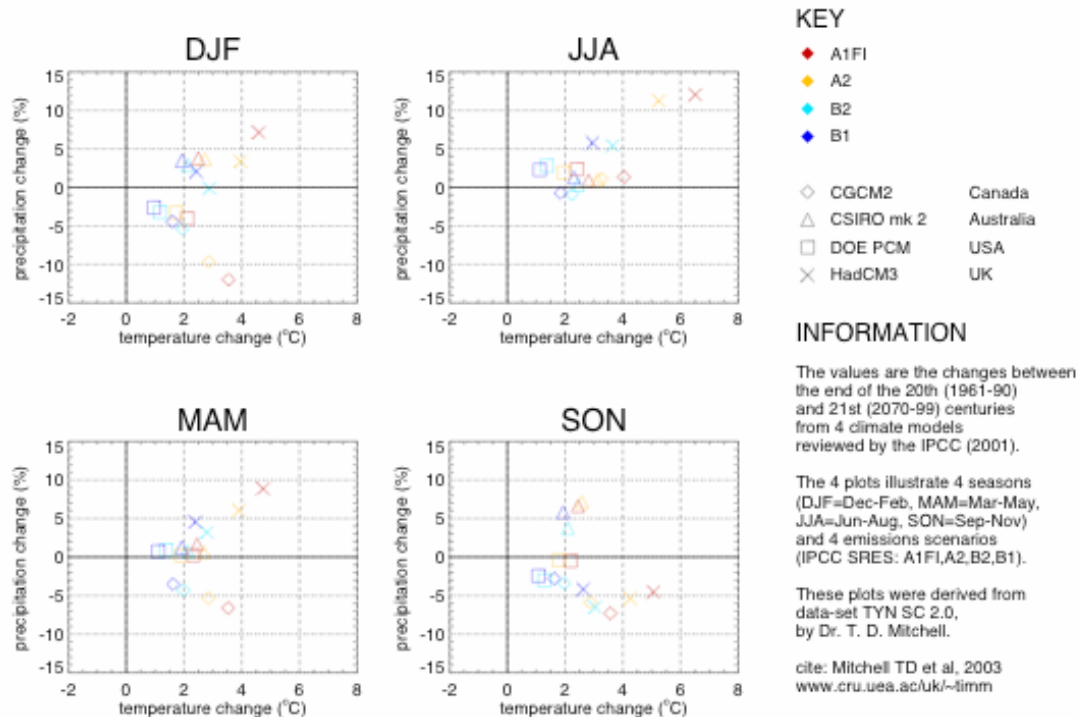


Figure 1. Projections of changes in seasonal mean precipitation against temperature for Ecuador averaged at the national scale, from a variety of GCM simulations.

13. Under Ecuadorian legislation, water is considered a public resource and its use is authorized by the State through the concession of rights. Dispersion and overlapping of roles have evolved during the last two decades because of the lack of a national policy to promote an integrated management of the resource. Dispositions regulating several aspects of water management but with sectoral biases have been introduced in approximately 27 legal instruments⁹. Decentralization has also assigned roles to local institutions, which need strengthening in order to carry out their newly acquired responsibilities.
14. There is currently no updated assessment of the state of water resources in Ecuador. The last available study dates back to 1989, and was commissioned by the former Instituto Ecuatoriano de Recursos Hidráulicos (INERHI) and the Centro de Estudios y Experimentación de Obras Públicas de España (CEDEX). This assessment served as a basis for the formulation of the National Plan for Water Resources (PNRHE), which inventoried surface waters and compared supply and demand for consumptive and non-consumptive uses of water. Fewer studies still exist regarding the state of groundwater supplies in Ecuador.
15. In year 1989, total surface water availability in Ecuador was 146,798 hm³/year. Ninety percent of this total was found in the Eastern Lowlands which are part of the Upper Amazon Basin. This total runoff should theoretically supply 43,500 m³/capita/year for all water consumption – four times the world average (10,800 m³). In real terms, the assessment estimated that

⁹ National Water Resources Forum, “Policies Proposal”, Ecuador, 2003.

Ecuadorians had some 1,300 m³ /capita/year at their disposal with values varying from one region to another, as the country has a sharp precipitation gradient between the Amazon Basin, the high Andes and the dryer Pacific Coast. End use of water in Ecuador was estimated at 9.700 hm³, of which irrigation constituted 82.1% of consumption needs, followed by domestic use with 12.3% and industrial use with 5.6%. Still, these figures have not been updated, and projections of supply have not factored-in the impact of climate variability and climate change on water supplies in Ecuador.

16. According to the First National Communication of Ecuador, among the current climate risks that are set to increase over time with climate change, the disruption of adequate water supplies are considered the most critical, particularly in highland Ecuador. Due to the cross-cutting nature of water resources, increased mean temperatures, recurrent drought, retreating glaciers and more intense and concentrated rainfall will have a wide ranging set of impacts in agriculture, energy and water supply. These heightened vulnerabilities to climate hazards will also compound current water governance problems in Ecuador.
17. Certain provinces of the coast and the Andean region, such as Loja, Manabí and El Oro, have already suffered intense droughts that have put these regions in the verge of desertification. In some cases, aquifers have descended from 15 to 20 meters to 80 to 100 meters. Many wells already do not provide water and small communities lack the resources to perforate deeper wells.
18. In the province of Loja, to the South of the country, water flows seasonally through the main rivers and remote communities depend on small creeks and shallow wells that have almost dried off since the drought began. In the province of Manabí, water must be transported in trucks at a very high cost.

Economic impacts of extreme events

19. During 1982-83, floods in Ecuador left 600 dead and \$650 million in economic losses. The information available for the period, 1997-1998 indicates that the El Niño phenomenon caused a total of \$112.3 million in damages, which is 4.7% of the agricultural GDP and 0.6% of the total GDP. In the energy sector, the greatest damages affected the Paute hydroelectric power station, whose repair costs amounted to \$17 million.¹⁰

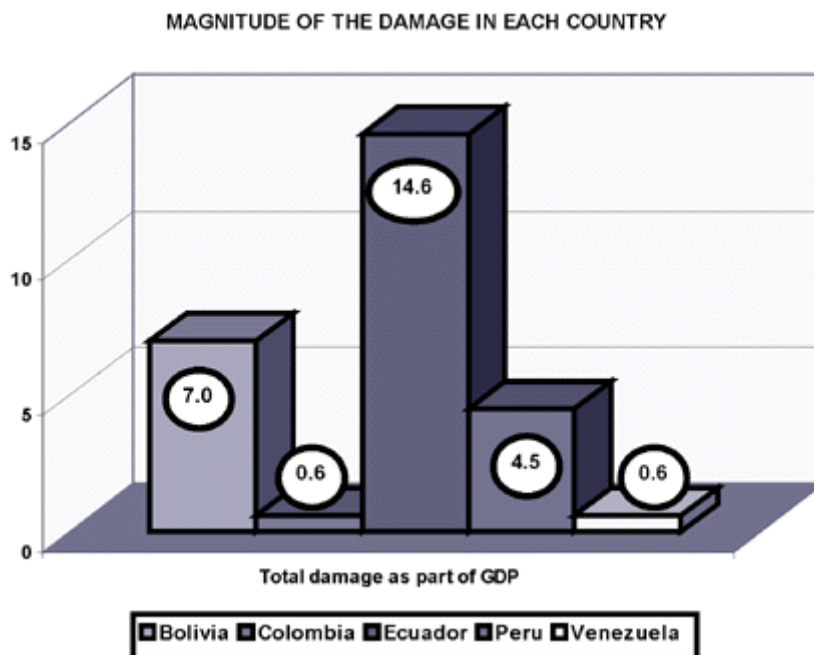
¹⁰ CEPAL, 1998

Estimation of the Overall Direct Cost of the Damages Caused by El Niño, 1997-8

Sub-sector	1997-8 (until June 1998) (Millions of US dollars)		
	Costs	Benefits	Net Costs
Agriculture	182.3	15.3	167.0
Farmers-owners	50.8	6.7	44.1
Agricultural workers	73.9		73.9
Domestic traders	57.6	8.6	64.9.0
Livestock	7.7		7.7
Livestock farmers-owners	2.4		2.4
Wage-earners in livestock	2.7		2.7
Shrimp farming	7.5	75.5	-68.1
Fishing	12.4	6.7	5.7
Traditional fishing	12.4		12.4
Industrial fishing boats	6.7		6.7
Total Agriculture, Livestock and Fishing	209.9	97.5	112.3
(% of agricultural GDP)	8.8%	4.1%	4.7%
(% of total GDP)	1.1%	0.5%	0.6%

Sources: Vos, Velasco and De Labastida (1998).

20. A study carried out by the Andean Development Corporation estimated that the total economic impact of the damage caused by the El Niño phenomenon in the Andean region between 1997 and 1998 was US\$7.5 billion. Ecuador's bill came to 14.6% of its Gross Domestic. The figure below provides a breakdown of the cost of this climatic event as part of the GDP by country.¹¹



21. As a result of El Niño, the Ecuadorian coast is frequently impacted and bears significant costs. For example, the coastal area that was mainly affected by flooding during the most recent El Niño

¹¹ ISDR, 2001

event was the Central Coastal Zone of Manabí, which includes the river basins of Chone, Portoviejo, Jipijapa and Zapotal. Measures have been proposed to strengthen the organization of farmers so that the farmers are able to take measures such as the establishment of seed banks and learn to make better use of the available meteorological data to prepare for the floods.

22. Among other recommended measures are improved flood zoning, reforestation of watersheds, a reduction in pasturing, and the construction of check dams. In parallel, measures to improve the capacity of local populations include training in interpretation of meteorological data, control of disease vectors, and organization of safe water supplies, including the rehabilitation of water-treatment plants.

Annex 2: Roles, Responsibilities and Contact Details of Key Stakeholders

Institution	Contact person	Contact details	Main responsibility	Role in Project
National Climate Change Committee (CNC)	Ing. Roberto Urquizo Subsecretario de calidad ambiental	Av. Eloy Alfaro y Amazonas, Edificio MAG 7mo. Piso. Quito Phone: 593-2 256-3423 593-2 256-3291 ext. 144	Collegiate body composed of representatives from several Ministries (Environment - permanent president - Energy and Mines, Foreign Affairs) as well as, private sector - represented by the Production Chambers-, the National Council for University Education (CONESUP), the Ecuadorian Committee for the Nature and Environment (CEDENMA) - an umbrella NGO entity - and the INAMHI - secretary of the CNC - The Committee operates through technical multi-sectoral Working Groups; which are led by public entities. For example, CNRH - Water Resources and climate change, Ministry of Energy and Mines - Energy and climate change.	Be a key political project counterpart for supporting the mainstreaming climate change criteria through national institutions.
Ministry of the Environment (MoE)	Ing. Roberto Urquizo Subsecretario de calidad ambiental	Av. Eloy Alfaro y Amazonas, Edificio MAG 7mo. Piso. Quito Phone: 593-2 256-3423 593-2 256-3291 ext. 144	National Environment Authority, management of protected areas (which host important watersheds) Forms part of the Board of CNRH. Lead the CNC.	Be part of the Management Support Group for this project. Is the GEF operational focal point. Could collaborate in result #2, Public awareness campaign increasing support for adaptation measures. Policy development and enforcement.
National Council of Water Resources (CNRH)	Ing. Víctor Mendoza Secretario General	Av. Eloy Alfaro y Amazonas, Edificio MAG 3er. Piso. Quito Phone: 593-2 255-4255 593-2 255-4376	National Authority of Water in Ecuador. Should elaborate a National Water Resources Plan, regulate the use of water in governmental projects, the management of irrigation systems and its transfer to users, water quality control	As National Authority, CNRH will be responsible for the completion of outcome 1 and will form part of the

			and the management of watersheds; establish cost recovery policies. Part of the CNC; be in charge of the Working Group on water resources and climate change.	Management Support Group of the project. Be responsible for the result #1: Improved systemic capacity supports effective water management under conditions of climate change. Policy development and enforcement.
National Secretary of Planning and Development (SENPLADES)	Ec. Blanca Fiallos	Benalcázar 679 y Chile. Edif. La Unión 4to. Piso Quito Phone: 593-2 258-0737 593-2 295-1213	In charge of planning and managements of strategies for the development of the country. Formulate of sectoral risk management projects.	Key partner to introduce the climate change issue into the National Agenda, considering the opportunity of the new government arrangements. Technical expertise in risks and planning.
National Institute of Meteorology and Hydrology (INAMHI)	Dr. Laureano Andrade Director ejecutivo	Iñaquito 700 (N36-14) y Corea. Quito Apartado 16-310 http://inamhi.gov.ec Phone 593-2 243-6910	Meteorological monitoring, monitoring of water flow in watersheds INAMHI has a secretarial role in the CNC; has lost an important fraction of monitoring equipment, understaffed	Key role in climate data and observation, early warning system. It will be useful to work with these institutions to obtain good results in the output #2, information management system that meets stakeholder's needs.
Navy's Oceanographi	Capitán de Fragata de	Av. 25 de Julio Vía Puerto Marítimo,	Monitoring of sea level, marine currents and related	Key role in climate data

<p>c Institute (INOCAR)</p> <p>International Center for Research en the El Niño Phenomenom (CIIFEN).</p>	<p>Estado Mayor Mario Proaño Silva</p> <p>Rodney Martínez Güingla Oceanógrafo Coordinador Científico</p>	<p>Base Naval Sur phone: (593-4) 2481300 Fax: (593-4) 2485166 Guayaquil – Ecuador</p> <p>Escobedo y 9 de Octubre 1204 phone: (593) 4 2 514770 Fax: (593) 4 2 514771 Web site: www.ciifen-int.org Guayaquil - Ecuador</p>	<p>issues.</p> <p>Monitoring of ENSO and related issues</p>	<p>and observation, early warning system. It will be useful to work with these institutions to obtain good results in the output #2, information management system that meets stakeholder's needs.</p>
<p>The Consortium for Provincial Councils of Ecuador (CONCOPE)</p>	<p>Gustavo Abdo / Raúl Egas</p>	<p>La Pinta E6-14 y Rábida 2do. Piso. Quito Phone: 593-2 223-0475</p>	<p>Group all the provincial councils of Ecuador.</p>	<p>Facilitate the approach to provincial councils in which the project will be working.</p>
<p>The Association of Municipalities of Ecuador (AME)</p>	<p>Lorens Olsen Pons Presidente Dr. Guillermo Tapia Secretario General</p>	<p>Agustin Guerrero E5-24 y Jose Maria Ayora Quito-Ecuador Phone: 593-2 246-9796 593-2 227-4949 www.ame.gov.ec</p>	<p>Federates all the municipal government of Ecuador. Building and operation of wastewater systems and drinking water treatment and distribution networks.</p>	<p>Facilitate the approach to municipal government in which the project will be working.</p>
<p>The Water Resources Forum (FRH)</p>	<p>Aline Arroyo Castillo Coordinadora</p> <p>Antonio Gaybor Secretario Ejecutivo</p>	<p>Av. Eloy Alfaro y Amazonas, Edificio MAG 7mo. Piso. Quito Phone: 593-2 256-3419 593-2 256-3485</p>	<p>This Forum has become an important public arena for discussions on water policies</p>	<p>A water users association, represents the views of the small consumers, peasants and NGOs Technical secretariat CAMAREN</p>
<p>Regional Development Corporations (CDR's)</p>			<p>Created at the same time than CNRH. In charge of design, build and operate water and flood control infrastructure in different regions of the country.</p>	<p>If this project decides to work in an specific region, it would help to coordinate with the corresponding CDR, in order to do not duplicate efforts. It</p>

				would be possible to mainstreaming the climate change criteria into their projects.
National Electrification Council (CONELEC)	Patricio Oliva	Av. Naciones Unidas E7-71 y Av. De los Shyris Edificio CONELEC Quito Phone: 593-2 244-0123 593-2 226-8738	Regulation of energy generation, fixation of tariffs, environmental permits for generation and transmission projects.	The project plans to work with hydroenergy tasks, so we could coordinate with CONELEC in order to take into account climate change criteria into their approvals for hydroenergy projects.

Notes

ⁱ Cornejo, C. 2003. Use of an evapotranspiration model and a geographic information system (GIS) to estimate the irrigation potential of the trasvase system in the Santa Elena peninsula, Guayas, Ecuador, University of Florida.

ⁱⁱ Bendix, J. 2000. Precipitation dynamics in Ecuador and northern Peru during the 1991/92 El Niño: a remote sensing perspective *International Journal of Remote Sensing* 21, 533–548

ⁱⁱⁱ Kerr, 2005. El Niño or La Niña? The Past Hints at the Future. *Science* 309, 687.

^{iv} McPhaden, M. J. 2004. Evolution of the 2002/03 El Niño. *Bulletin of the American Meteorological Society*, 677-694 (May 2004).

^v Bradley, R. S., Mathias Vuille, M., Diaz, H. F., Vergara, W. 2006. Threats to water supplies in the Tropical Andes. *Science* 312, 1755-1756;

^{vi} Francou, B., Ramirez, E., Caceres, B., and Mendoza, J. 2000. Glacier evolution in the tropical Andes during the last decades of the 20th century: Chacaltaya, Bolivia, and Antizana, Ecuador. *Ambio* 29, 416-422.

^{vii} W. Vergara, 2005. Adapting to Climate Change. Latin America and Caribbean Region Sustainable Development Working Paper 25 World Bank, Washington, DC.

^{viii} Bendix, 2000 (Note 2).

^{ix} Vuille, M., Bradley, R. S., Werner, M. and Keimig, F. 2003. 20th century climate change in the tropical andes: Observations and model results. *Climatic Change* 59, 75–99,

^x Vuill, M., Bradley, R. S. and Keimig, F. 2000. Climate Variability in the Andes of Ecuador and Its Relation to Tropical Pacific and Atlantic Sea Surface Temperature Anomalies. *Journal of Climate* 13, 2520-2535.

^{xi} Cox, P. M., Betts, R. A., Collins, M., Harris, P. P., Huntingford, C. and Jones, C. D. 2004. Amazonian forest dieback under climate-carbon cycle projections for the 21st century. *Theoretical and Applied Climatology* 78, 137-156.

^{xii} Morengo, J. A. and Hastenrath, S. 1993. Case studies of extreme climatic events in the Amazon Basin. *Bulletin of the American Meteorological Society*. April 1993.