ADAPTATION FUND

DATE OF RECEIPT:
ADAPTATION FUND PROJECT ID:
(For Adaptation Fund Board Secretariat Use Only)

PROJECT PROPOSAL

PART I: PROJECT INFORMATION

PROJECT/PROGRAMME CATEGORY:	Regular Project
COUNTRY/IES:	**El Salvador**
TITLE OF PROJECT/PROGRAMME:	Promoting Climate Change Resilient Infrastructure Development in San Salvador Metropolitan Area (PIMS 4585)
TYPE OF IMPLEMENTING ENTITY:	Multilateral Implementing Entity
IMPLEMENTING ENTITY:	UNDP
EXECUTING ENTITY/IES:	Ministry of Public Works, Transport, Housing and Urban Development (MOP)
AMOUNT OF FINANCING REQUESTED:	US$ 5,425,000

PROJECT BACKGROUND AND CONTEXT:

1. El Salvador has been identified as one of the most vulnerable countries in Latin America with regard to climate-related disasters[1]. The country is particularly sensitive to the negative impacts of climate change due to its location (on the narrow part of the Central American isthmus, exposing it to weather systems in both Pacific and the Caribbean/ Atlantic), which increases the probability of extreme weather events being experienced. In addition, the effects of climate change are exacerbated by the extent of El Salvador's social, economic, and environmental problems (deforestation, and poor communities with inadequate housing located on critical slopes in ravines and gullies). This situation constrains effective responses to extreme weather events and magnifies the consequences of lack of preparedness and inaction at the community level.

2. Since the end of the civil war in 1992, El Salvador has sought to create new paths for growth, but the extent of ongoing socioeconomic and environmental problems has hindered the ability to foster structural changes in society, and increasing climate variability has introduced additional pressures. The current administration is seeking to build sustainable paths for growth, including the improvement of social well-being, economic growth, and the protection of the environment. In particular, the National Government of El Salvador has begun to recognize the importance of considering climate change as a major environmental problem and a key development challenge. The 5-Year Development Plan 2010-2014 incorporates responses to climate change (mitigation and adaptation) as part of its objectives. It also creates an initial framework for

[1] Global Facility for Disaster Reduction and Recovery (GFDRR) (2009). Integrating Disaster Risk Reduction into the Fight against Poverty. Annual Report 2009. Washington, D.C.; and, OCHA and UNDAC (2010), Evaluacion de la Capacidad Nacional para la Respuesta a Emergencias. Mision UNDAC El Salvador. San Salvador.

strategies that define specific actions to reduce the vulnerability of the El Salvador to the negative impacts of climate change and to build resilience in the short and long-term.

3. What exactly is the climate context for El Salvador and what are the implications? The country has been exposed to a growing number of hurricanes and tropical storms from the Pacific and the Caribbean/ Atlantic Ocean, with concomitant heavy rainfall events that have boosted annual rainfall in El Salvador, especially in the last ten years (see Figure 1a). While the rainfall amount per 24-hours has only increased slightly over the last forty years, the total amount of rainfall during each storm has shown a clear increasing trend over the last fifty years, most notably with Tropical Depression 12E in October 2011 (discussed further below). The increasing frequency of extreme weather events, their intensity, and their negative impacts (flooding and landslides, in particular) have severe consequences for El Salvador (and indeed other countries in Central America – see Figure 2), especially in the current period of global financial instability and high risk of recurrent recession, which overshadow the domestic policies and attempts at social stability and environmentally sustainable economic growth in the country. Historical data[2] indicate that natural hazards between 1972 and 2009 have caused 6,500 casualties in El Salvador, with 87% of natural hazards, 68% of all economic losses, and 62% of all fatalities caused by climatic events. The related economic costs were close to US$16 billion. Most important to note is that 53% of all natural hazards in the past 100 years have occurred in the last decade, and 76% of these were climate related. In its annual report for 2012, the Global Facility for Disaster Reduction and Recovery reported that 88.7% of the total area of El Salvador is considered to be at risk with 95.4% of population living in areas at risk (GFDRR).

4. The recent trends suggest increasing variability and extremes in local climate which portend an ominous future for El Salvador. ECLAC, in collaboration with the Science Center for the Atmosphere of the Autonomous University of Mexico (UNAM) and the MARN prepared precipitation scenarios for the Central American region, including El Salvador, for the 2020-2100 period using Scenarios A2 and B2 of the IPCC Special Report on Emissions Scenarios[3]. The precipitation scenarios (see Table 1) suggest two general changes to the precipitation regime for El Salvador. In the first instance, the total annual precipitation is projected to decrease (significantly) in the two emissions scenarios. On the other hand, the projections also indicate that the existing high level of seasonal and inter-annual precipitation variability will be exacerbated by climate change. The precipitation projections indicate that the frequency of extreme events (i.e., short and high intensity precipitation, as well as droughts) will increase in the future; this is certainly evident in the data in Figure 1, especially over the last ten years. Especially as annual rainfall may actually diminish over the next 90 years (see below), water that currently flashes off the land during extreme events will need to be retained, or facilitated into aquifer recharge, in order to meet growing water needs in the future.

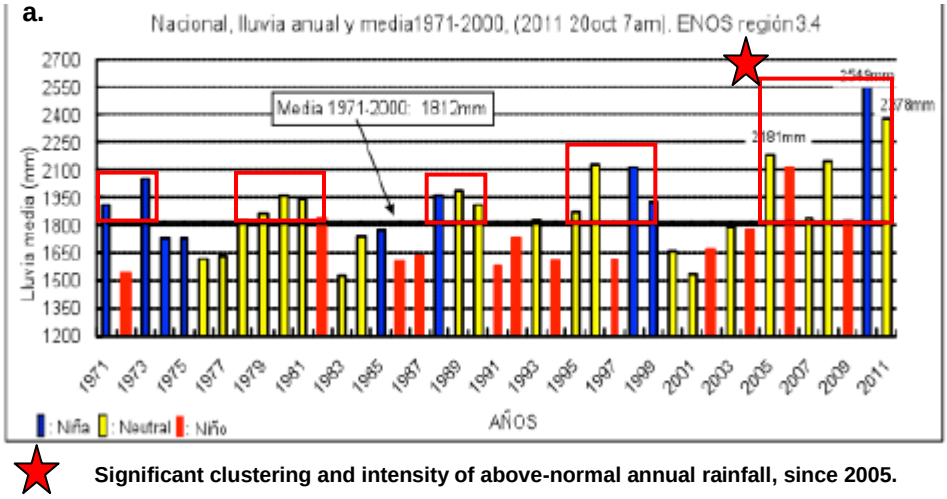
5. The predictions (both scenarios) suggest that temperature will increase rapidly in El Salvador over the next 90 years. Importantly, these possible temperature increases may reinforce the expected changes in extreme precipitation (even though total annual precipitation may decline). For example, a clear relationship exists between the sea surface temperature and the intensity

[2] The Center for the Epidemiology of Natural Hazards in Louvain, Belgium, 2009, and the UN Economic Center for Latin America, 2009.

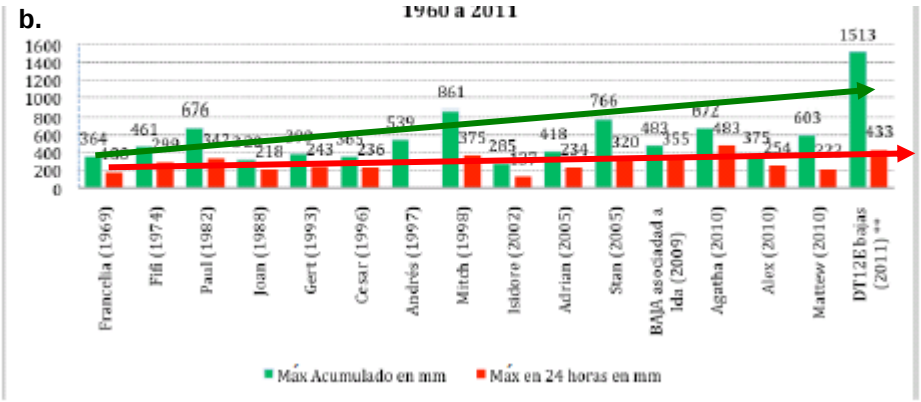
[3] CEPAL (2010). La Economía del Cambio Climático en Centro América: Síntesis 2010. Accessible at: http://www.eclac.org/publicaciones/xml/3/41723/ECCA-SINTESIS-102911.pdf

of tropical cyclones; in El Salvador, temperature increases of 2 degrees or more will likely spawn more frequent and more intense storms, from both the Pacific and the Caribbean/ Atlantic Ocean sides[4].

Figure 1. a. annual rainfall and long-term average in El Salvador, with above-normal annual rainfall amounts indicated; b. maximum rainfall per event and per 24-hours.[5]



Significant clustering and intensity of above-normal annual rainfall, since 2005.



[4] Zeng, Z., L. Chen, Y. Wang. (2008). An Observational Study of Environmental Dynamical Control of Tropical Cyclone Intensity in the Atlantic. *Mon. Wea. Rev.*, 136: 3307–3322.

[5] CEPAL (2011). Evaluacion de Danos y Perdidas en El Salvador Ocasianados por la Depresion Tropical 12E. Informe Preliminar. Octubre 2011.

Figure 2. Time-series of observed drought, storm, and flooding occurrences in the Central American region, including El Salvador.[6]

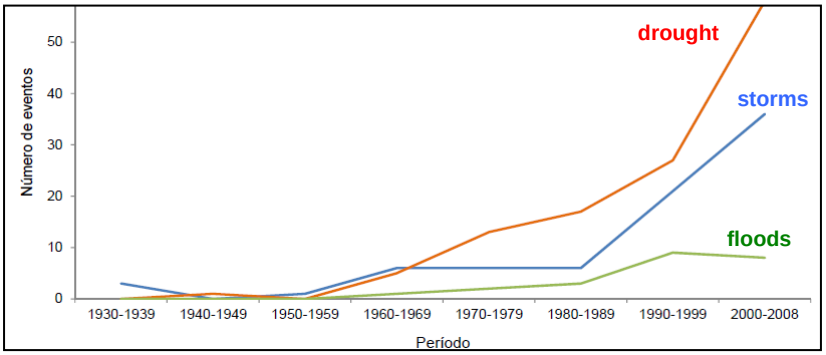


Table 1: A2 and B2 precipitation and temperature scenarios for El Salvador (2020-2100).

Scenario	2020	2030	2050	2070	2100
A2 Scenario (precipitation)	-2.67%	-0.63%	-15.23%	-15.73%	-31.27%
B2 Scenario (precipitation)	+5.40%	-3.53%	-2.44%	+0.43%	-11.03%
A2 Scenario (temperature)	+0.77 °C	+0.93 °C	+2.03 °C	+2.90 °C	+4.73 °C
B2 Scenario (temperature)	+0.53 °C	+0.97 °C	+1.40 °C	+1.97 °C	+2.63 °C

6. As noted previously, the main concern in El Salvador is the interaction between these extreme weather events and the physiography, social conditions, and economic activities in the country, and the fact that there is, at the moment, little time between extreme weather events to effect repairs and introduce some stability into communities that are exposed to the highest risks from such events. The recent extreme events in the country are reviewed below, as they serve to identify what exactly are the immediate and foreseeable climate change pressures, especially in the Metropolitan Area of San Salvador (MASS)[7] and environs, and therefore what the specific climate change adaptation needs are, to which this proposal responds.

7. The combination of a tropical depression and Hurricane Ida in November 2009 is a recent example of the vulnerability of El Salvador to extreme climatic events. Precipitation reached a peak of 355 mm within five hours on November 8, 2009. This caused severe flooding and landslides in several parts of the country, including the capital city, San Salvador. The Post

[6] International Disaster Database, EM-DAT. www.emdat.be

[7] The Metropolitan Area of San Salvador (MASS) is conformed by 14 municipalities that are officially considered as one urban unit: Antiguo Cuscatlán, Santa Tecla (departement of la Libertad), Apopa, Ayutuxtepeque , Cuscatancingo, Delgado, Ilopango, Mejicanos, Nejapa, San Marcos, San Martín, San Salvador y Soyapango (departement of San Salvador).

Disaster Needs Assessment (PDNA) estimated that Hurricane Ida affected 122,000 people and caused over US$239 million in damages and losses to services and infrastructure in El Salvador. In the MASS alone, damage was estimated at US$54.6 million, directly affecting 6,200 households and indirectly affecting 24,000 people (particularly the municipalities of San Martin and Ilopango)[8].

8. Less than a year later, in May 2010, El Salvador was again impacted by a tropical storm (Agatha). Although the total precipitation recorded in six days was higher during Hurricane Mitch in 1998 (737 mm) and Hurricane Stan in 2005 (765 mm), Agatha's accumulated precipitation was near those peaks (678 mm). When considering these numbers, it is important to note that mean annual precipitation in San Salvador is 1,668 mm (the average for the country is 1,812 mm); almost half the annual precipitation in the area fell in a few days. In fact, up to that time, Agatha had the highest concentration of precipitation in 24 hours (483 mm), compared to other major climatic events in the last century (Tropical Strom 12E in October 2011 has exceeded that; see below).

9. Tropical storm Agatha caused extensive damage in the MASS, related to flooding and landslides, which required the evacuation of inhabitants in several parts of the city. Agatha also caused damage to the drinking water system (pipes, pumping stations, and a water treatment plant), affecting water supply in several parts of the metropolitan area. The economic cost of Agatha was estimated to be US$112 million (for all of El Salvador; a significant portion of that cost was incurred in the MASS.

10. El Salvador was again hit by a major weather event in October 2011 (Tropical Depression 12E). Heavy rains across most of Central America over eight days caused swollen rivers (the Lempa, in particular), flooded towns and farmland, and killed nearly 100 people, with more than thirty deaths in El Salvador, and more than 50,000 people in the country having to leave their homes. Lack of food and increased risk of disease were significant issues. In the end, more than 500,000 people in El Salvador were directly affected. Figure 3 shows the extent of damage in the area in and near the MASS; some areas were nearly completely devastated. The total value of the damaged and lost infrastructure and services was estimated by ECLAC to be about US$ 840 million (4% of the GDP) (see Table 2), a staggering amount of money that will have serious consequences for the GDP of El Salvador. More than a quarter of the damaged and lost assets were in the transportation sector, followed by losses in the housing sector (representing about 17% of the value of losses), and the agriculture sector (16% of the value of damaged and lost assets). Losses in the commercial sector amounted to about 11% of the total value of damaged assets and losses due to Tropical Depression 12E.

11. The MASS, in particular, is vulnerable to flooding and erosion during these extreme weather events, due to the combination of steep physiography and high population density, with many residents living in very high risk areas. The MASS is formed by 14 municipalities, hosting approximately 2 million inhabitants, representing more than 30% of the total population in the country (OPAMSS), and contains 514 precarious urban settlements (FLACSO, UNDP, MINEC). It occupies an area of 591.5 km2 and is located in the central area of the country on the central plateau. Most of its area is situated at an elevation between 400 m and 950 m upon the sea

[8] Direccion de Proteccion Civil (2010). Estudio del Impacto del Huracan Ida en El Salvador. San Salvador.

level. The highest point is the volcano of San Salvador's Picachu Peak (1959.7 m). The AMSS is located in the watershed of the river Acelhuate and the lake Ilopango. The majority of the AMSS drains toward the Acelhuate River and its effluents, río San Antonio, río Tomayate, río Urbina, río Las Cañas. Parts of the municipalities of Ilopango and San Martin drain towards El Lago de Ilopango. The primary hydrographic network is composed by the watercourses Lechuza, Montserrat and Acelhuate encompassing an area of 117 km2 (OPAMSS, FORGAES).The AMSS is principally vulnerable to flooding, landslides, debris flow and earthquakes (Correra Consultores Asociados S.A. de C.V). Apart from earthquakes, all the other vulnerability risks are principally caused by climatic events, combined with anthropogenic activities (urbanization) and their prevalence are increased by climate change. Climate related hazards have become more frequent as rapid urban growth has modified the landscape in the MASS, and the extreme events have become more frequent. Urban growth, driven by both low and high income groups, has given little consideration to the flow and control of storm water within urban areas; many low income families have built their homes on fragile and easily eroded land along the borders of the rivers and ravines. Public authorities have not been able to re-orientate the rapid urbanization process towards protecting key physiographic features of the landscape that would allow the proper flow of runoff during extreme climatic events.

Figure 3. Images of destruction from Tropical Depression 12E, October 2011, in the MASS area. And

Table 2. Estimated value of losses and damaged assets in El Salvador from Tropical Depression 12 E in October 2011.[9]

Sector	Damaged (US$)	Lost (US$)	Total (US$)
Infrastructure	232,954,515	27,624,933	260,579,448
Social sectors	105,148,994	102,648,166	207,797,160
Productive sectors	67,507,674	231,843,962	299,351,636
Natural environment	72,689,935	-	72,689,935
Total	**478,301,119**	**362,117,060**	**840,418,179**

12. As a result, both the deficiencies in urban planning and ineffective enforcement of existing by-laws have resulted in reduced, modified, or even blocked water flow in the rivers and ravines in the MASS, which are used as primary drains for storm water, as well as repositories for solid waste, and untreated industrial and domestic wastewater. Various studies suggest that flooding, erosion, and landslides in several parts of the metropolitan area occur with precipitation higher than 50 mm per hour[10]. Using data from the meteorological station in the MASS and its surrounding areas, it has been estimated that there is a 50% chance that events with precipitation of 90 mm in 24 hours will occur every year[11]; thus, flooding in the MASS may become an annual event, possibly exposing up to 150,000 people to very high risks of losing their homes, and possibly their lives, in the low-lying areas in the metropolitan areas and in the low income neighbourhoods on the upper slopes of the MASS, below the areas that have been cleared for subsistence agriculture.

13. In addition to the problems noted above, urbanization in the upper parts of the basins surrounding San Salvador has increased the volume of runoff and flooding in the lower parts of the city. Normally, vegetated areas in the upper sub-basins can infiltrate the first 70 to 100 mm of precipitation without causing any runoff. However, the deforestation of these areas by urbanization and farming now causes runoff after the first 5 mm of precipitation[12]. Reducing the flow of storm water in the upper parts of the metropolitan area is a requisite for effective drainage capacity in the lower parts of the metropolitan area[13]. An additional problem is the

[9] CEPAL (2011). Evaluacion de Danos y Perdidas en El Salvador Ocasianados por la Depresion Tropical 12E. Informe Preliminar. Octubre 2011.

[10] SNET (2003). Analisis de Riego por Inundaciones y Deslizamientos de Tierra en la Microcuenca del Arenal de Montserrat. San Salvador.

[11] Fernandez-Lavado, C. (2010) Caracterizacion de la Inundabilidad en el Area Metropolitana de San Salvador. San Salvador, Geologos del Mundo.

[12] Bolund, P. and S. Hunhammar (1999). Ecosystem services in urban areas. Ecological Economics 29:293–301; Pauleit, S. and Duhme F. (2000). Assessing the environmental performance of land cover type for urban planning. Landscape and Urban Planning 52: 1-20; Viceministerio de Vivienda y desarrollo urbano (VMVDU) (2008). Guía metodológica para la elaboración de cartografías de riesgos naturales. Ed: Manuel Regueiro y González- Barros.

[13] SNET (2003). Analisis de Riego por Inundaciones y Deslizamientos de Tierra en la Microcuenca del Arenal de Montserrat. San Salvador; Bertoni, J. C. (2005). Dispositivos de regulación y control del drenaje pluvial urbano. Informe técnico para OPAMSS financiado por el proyecto FORGAES; Correa Consultores Asociados (2008) Estudio de Factibilidad y Diseno Final de las Obras de Drenaje del Rio Garrobo. San Salvador; Rubio Dimas, C., Artiga Martinez, R., Romero, M., Pineda, Maria, Membreno, A. (2008). Estudio de Amenazas en el Area Metropolitana de San Salvador. Geologos del Mundo, San Salvador, El Salvador.

lack of maintenance of the primary and secondary drains in the storm water system in the MASS, causing the accumulation of water in different parts of the urban area and reduction of the capacity of the system to drain storm water in a relatively short time. Current efforts to build flood controls in the lower parts of the city will not have enough capacity to control the amount of runoff generated in the upper parts of the metropolitan area; this situation will be compounded in the future under the projected climate change scenarios for El Salvador.

14. A very important element of the climate change vulnerability of the marginal communities in the MASS is their limited capacity to relocate to safe areas; they have neither the financial resources nor the organizational abilities and political clout required to move away from flood-prone areas. The metropolitan authorities and the national government do not have enough resources to provide adequate and safe housing for the large number of vulnerable inhabitants in areas that might be safer. An additional problem is the reluctance of many of its residents to relocate to other parts of the metropolitan area, or even to evacuate their houses in case of an emergency. The key here is to develop suitable adaptive measures that can work within and adjacent to the vulnerable communities along the river banks, in the ravines, and in areas that routinely flood.

15. The Government of El Salvador seeks to enhance the country's preparedness for climatic events within the framework of sustainable development. Likewise, the Government recognizes that in order to effectively address its increased exposure and vulnerability to climatic events due to climate change, it must lead the response though a national strategy that is implemented by multiple domestic actors and is financed from a variety of national and international sources of funding. In this context, the Government has been designing an integrated program to address this issue over the past two years, called the "National Programme of Ecosystem and Landscape Restoration" (PREP). The PREP recognizes the necessity of a combined and integrated approach to adapt to climate and reduce El Salvador's vulnerability. The PREP was launched formally on 07 of May 2012 by the Ministry of Environment (MARN) jointly with the Ministry of Public Works (MOP), the Ministry of Agriculture (MAG) and the Technical Secretary of the Presidency (STP), and has four components:

- the promotion of sustainable agriculture
- the restoration and conservation of critical ecosystems such as mangroves, forests and wetlands
- the development of physical infrastructure in combination with natural infrastructure
- the joint work of government entities with local actors

The United Nations Development Programme (UNDP) and other international organizations have been assisting the country in addressing its vulnerability to climate change, and initial interventions have raised general awareness of the importance of adaptation. The President, Mauricio Funes, has recently highlighted the need to mainstream climate change adaptation as a key element of public policies. The Ministry of Public Works, Transport, Housing and Urban Development (MOP) and the Ministry of the Environment and Natural Resources (MARN) have taken a leading role by incorporating climate change adaptation as a major concern in their agenda. The MOP has recently created a new direction named the Direction of Climate Change Adaptation and Strategic Risk Management (DACCGER) focusing on risk management

and climate change adaptation, particularly associated with extreme climatic events. This division counts with 18 new professional positions focused on developing new approaches to risk management in the country and climate-proofing infrastructure. The MOP is also taking a dynamic leadership role in the Central American region, promoting integration as part of the solution for disaster risk management and climate change adaptation. It is encouraging neighboring countries to coordinate regional regulations and standards for the construction of infrastructure that will incorporate climate change adaptation considerations. Two high level ministerial meetings were held in 2010 and 2011. The declaration stemming from the latest meeting (Annex C) emphasizes the political commitment of all Central American countries and highlights the importance of international cooperation as a key element to address adaptation issues in the region.

16. The Government of El Salvador and communities in the MASS require a catalytic start to plan and implement tangible climate change adaptation measures that are now especially urgent, given the recent flooding events in October 2011. Within the context of the PREP initiative, the project directly responds to the third component addressing natural and physical infrastructure. This Project aims to focus on two chronic problems in the MASS area that are being exacerbated by climate change: (a) flooding, erosion, and landslides associated with high intensity precipitation; and, (b) securing drinking water for the metropolitan area through water retention and aquifer recharge. With the support of the Adaptation Fund, El Salvador could become an example of the role national governments can play in preparing societies to face the potential impacts of climate change. The collaboration between the MOP and the MARN in this project will facilitate the development of an integrated coordination model within the national government that centers on building climate resilience[14]. The partnership fostered by this project so far has been developed with the political support and commitment from the two ministries. The overall goal of this partnership is to illustrate the necessity of building resilience and adapting to climate change in the country and reducing the vulnerability of the MASS to flooding and water stress intensified by the impacts of climate change. The project will also demonstrate the benefits of crosscutting collaboration within the public sector, between the national and municipal governments, and among the public, social, and private sectors.

PROJECT OBJECTIVES:

17. The overall **goal** of the project is to increase climate resilience in El Salvador through implementation of concrete adaptation measures in the most vulnerable urban areas, supported with appropriate policy and regulatory development, and to disseminate best practices demonstrated therein for eventual replication throughout El Salvador, and perhaps other parts of Central America. More specifically, the main **objective** of the project is *to reduce the vulnerability of selected urban areas in the Metropolitan Area of San Salvador to flooding, erosion, and landslides created by extreme precipitation associated with current climate variability and expected climate change in the near future* (as discussed above). This will be achieved through three project components:

- The design and construction of resilient infrastructure (at two locations in the MASS; see Figure 4) that can resist and mitigate the impacts of extreme events (improved storm water management, capture, and aquifer recharge). Current interventions to address

[14] The relationship between the public institutions managing the environment and those dedicated to public works is often characterized by conflict, rather than by collaboration.

water flow are focused on downstream measures designed to prevent major erosion or flooding. As noted previously, such measures are becoming very expensive and mostly ineffective, as they can hardly cope with one or two major events. The project will therefore incorporate a broader approach to water management that also addresses upstream measures necessary to reduce peak flows and the stress on current drainage infrastructure. The proposed approach will also reduce the necessity to relocate large numbers of people. It is expected that the project will catalyze new paths of growth in the MASS and other urban communities in the country, reducing their vulnerability and enhancing their resilience to the negative impacts of climate change.

- Institutional strengthening, including improved policy guidelines, more appropriate building standards and codes, and more effective coordination of private and public stakeholders, to increase the climate resilience of vulnerable communities in El Salvador.
- Related knowledge management and dissemination, to increase the public awareness of climate resilient options for future public and private construction in urban areas.

18. The project structure, with 76.1% of requested funding focused on building climate resilient water management infrastructure in two urban locations, 12.4% on related technical assessments and storm water master plan in support of developing resilient infrastructure in the MASS, 9.4% on related institutional strengthening to support climate change risk management, and 2.1% on knowledge management and dissemination/awareness raising, is believed to be the most appropriate and balanced approach to tackle climate-related vulnerability in the populous urban areas in El Salvador. The **expected outcomes** of the proposed project will be:

1. Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices. Two urban communities in the MASS with climate-proof water management infrastructure that provides protection and resilience to up to 3,000 people directly (with their households and land climate-proofed) and perhaps another 31,000 people indirectly (protected from flooding by the storm water management infrastructure at the demonstration sites). Aquifer recharge will also be increased to address possible urban water shortages in the future.
2. Increased capacity of the public sector to address climate change risks on infrastructure. Improved policy guidelines, building standards and codes, and coordination mechanisms that embody the planning and technical principles demonstrated above, to facilitate their incorporation into future urban development in the MASS (and elsewhere in El Salvador).
3. Increased public and private awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador, in support of replication throughout the country.

PROJECT COMPONENTS AND FINANCING:

19. The project components, their expected outcomes, and the outputs to be produced by project activities, along with the specific output budgets, are summarized in Table 3 below. The details of outputs and activities and their rationale are provided in Part II, Section A, and the specific output budgets are explained in Part III, Section D: Results Framework.

Figure 4. The two areas of intervention in the MASS(Apopa and Santa Tecla).

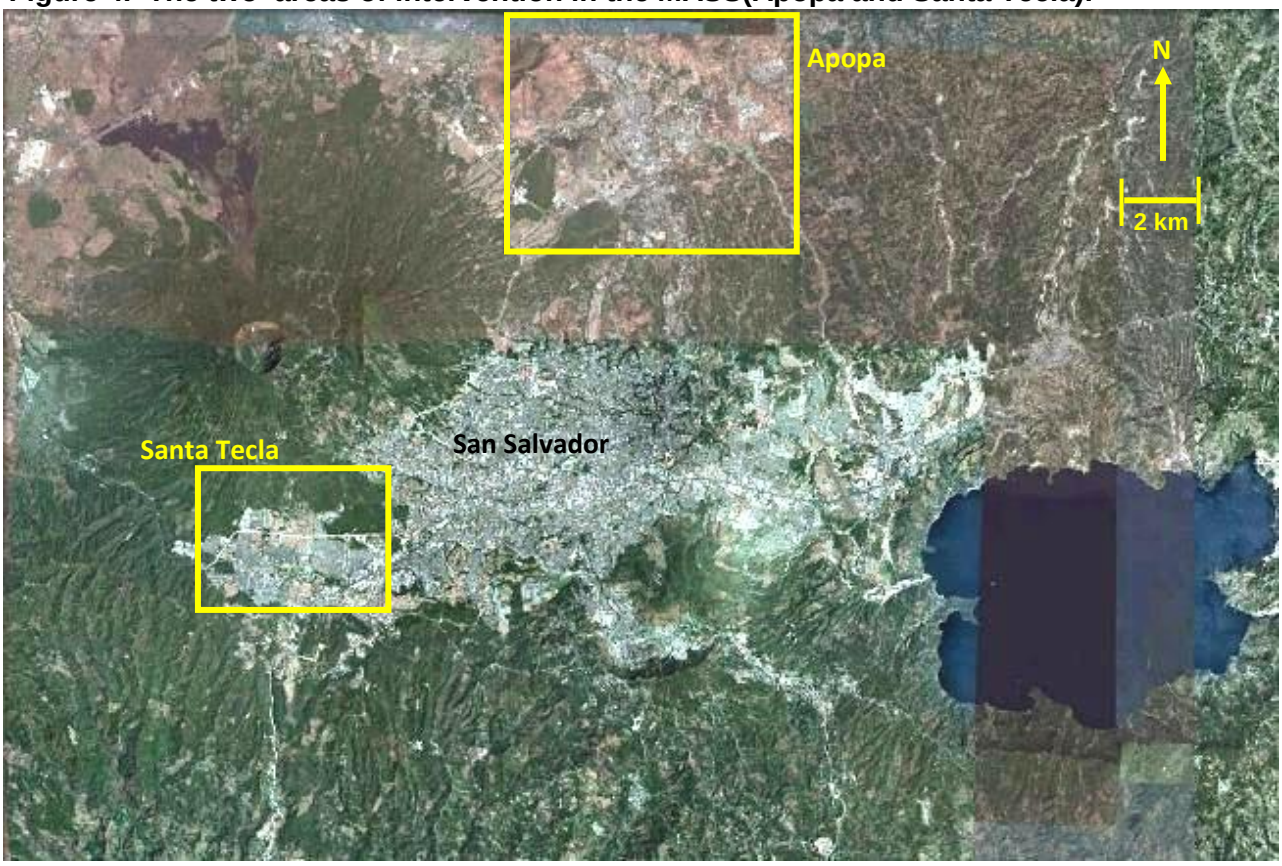


Table 3: Summary of project components.

PROJECT COMPONENTS	EXPECTED OUTCOMES	EXPECTED CONCRETE OUTPUTS	AMOUNT (US$)
1. Infrastructure Climate Proofing in MASS.	1. Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices.	1.1 An integrated analysis of flooding and erosion vulnerability in the MASS area. 1.2 An integrated database for flooding, including climate, hydraulic and economic variables. 1.3 Development of a 5-year storm water master plan for the MASS that accounts for the likely range of climate change risks. 1.4 Resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability.	175,000 199,900 205,000 3,547,600 **Total for #1 = US$4,127,500**
2. Institutional Strengthening.	2. Increased capacity of the public sector to address climate change risks on infrastructure.	2.1 Development with the OPAMSS of policy guidelines to improve the planning for climate resilient human settlements in the MASS. 2.2 Revised and improved building codes and planning standards for climate-resilient public infrastructure. 2.3 Coordination mechanisms established between the MOP, the MARN, OPAMSS and other stakeholders to address climate change risks on infrastructure in the MASS.	117,000 230,000 90,000 **Total for #2 = US$437 ,000**
3. Knowledge Management and Dissemination.	3. Increased public and private awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador.	3.1 Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders. 3.2 Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure. 3.3 Dissemination of technical specifications, revised building codes, and relevant planning guidelines.	30,000 40,000 30,000 **Total for #3 = US$100,000**
4. Project Implementation Costs			US$4,664,500

PROJECT COMPONENTS	EXPECTED OUTCOMES	EXPECTED CONCRETE OUTPUTS	AMOUNT (US$)
Components 1, 2, 3 Project Total Execution Costs			US$4,900,000
Monitoring & Evaluation			US$100,000
Grand Total Project Cost			US$5,000,000
Project cycle management fee charged by the IA[15]			US$425,000
Amount of Financing Requested			**US$5,425,000**

PROJECTED CALENDAR:

MILESTONES	EXPECTED DATES
Start of Project Implementation	September 2012
Mid-term Review	December 2014
Project Closing	September 2016
Terminal Evaluation	November 2016

PART II: PROJECT JUSTIFICATION

1. DESCRIPTION OF THE PROJECT COMPONENTS

20. The project is designed to strengthen the resilience of the Metropolitan Area of San Salvador (MASS) to extreme precipitation events, currently being experienced and expected to increase in frequency and intensity, according to the climate change scenarios for El Salvador. This will be accomplished through the design and installation/construction of climate-resilient infrastructure in vulnerable neighborhoods, supported by development of appropriate policy and building standards and codes, and dissemination of project experiences. All project components are expected to facilitate replication of best-practice climate resilient actions

[15] On the request of the Government of El Salvador, the project will be implemented by UNDP using the MIE modality. UNDP is able to provide the following implementation services through its country office, regional and headquarters networks: project identification, formulation, and appraisal; determination of execution modality and local capacity assessment of the national executing entity; briefing and de-briefing of project staff; oversight and monitoring of AF funds, including participation in project reviews; receipt, allocation and reporting to the AF Board of financial resources; thematic and technical capacity building and backstopping; support with knowledge transfer; policy advisory services; technical and quality assurance; and troubleshooting assistance to the national project staff. Further details on the types of specialized technical support services which may be provided are articulated in the table provided to the AFB Secretariat on 14 May 2010 (See Annex A).

throughout El Salvador, as they relate to extreme rainfall events. The project has three complementary components, which are described below.

21. **Component 1: Infrastructure Climate Proofing in the Metropolitan Area of San Salvador (MASS).** The first component of the project aims to establish an integrated storm water system to reduce peak water flow and prevent flooding, erosion and other damage in critical areas in the MASS. By implementing measures in the upper basin to reduce and delay runoff flowing to the lower parts of the basin in populated areas in the MASS, primary and secondary drainage systems in the urban areas, which are prone to saturation during periods of intense precipitation, will be spared and flooding can be reduced or eliminated altogether. Two areas in the municipalities of Apopa and Santa Tecla which are especially vulnerable and prone to cause heavy runoff and saturation have been identified, based on recent experiences with extreme rainfall events. The implementation of Component 1 will also involve the identification, analysis, and quantification of the collection and storage capacity for storm water within the urban area, and the identification of other sites for remedial action in the future, with adjustments to the technical features of climate-resilient water management infrastructure that will be implemented in Apopa and Santa Tecla to the socio-demographic and urban conditions of different parts of the city. Each of the five outputs in Component 1 is described below.

22. **Output 1.1: An integrated analysis of flooding and erosion vulnerability in the MASS area.** This assessment will consider the vulnerability (resulting from the combined effects of exposure to extreme rainfall events) and the sensitivity of the drainage systems in the MASS with regard to capacity and potential damage from heavy runoff (based on climate change scenarios), and the adaptive capacity of the inhabitants (their ability to reduce or overcome the negative consequences of flooding and erosion[16]). The metropolitan area has grown rapidly during the last few decades and the urbanization process has modified the landscape and the flow of runoff in the basins. Some studies[17] have studied flooding problems in selected isolated basins in the MASS; however, they have not considered the impact of climate change on the current situation. As a first step in this analysis, a complete hydrological study of MASS will be developed, incorporating climate change scenarios. This will allow definition of the most suitable areas where the capture and retention of runoff can be more effective, to reduce the overflow of primary and secondary drains in the municipal storm water system.

23. The vulnerability analysis will be based on the results of the hydrological study, the scenarios noted in the Second National Communication on Climate Change (rainfall predictions), the results of the study on Urban Poverty and Social Exclusion in El Salvador (UNDP) and other studies documenting climate-related hazards (see previous footnotes). It will also incorporate data from the last national census and from the Metropolitan Urban Planning Agency. Part of the study will consist of semi-structured interviews with inhabitants in flood-prone areas, to seek a better understanding of their perceptions of hazards that they are exposed to, their economic ability to cope with extreme events, and their strategies and alternatives of action in case of an emergency.

[16] Adger, N. (2006). Vulnerability. Global Environmental Change 16 (3): 268-281.

[17] SNET (2003). Análisis de Riesgo por Inundaciones y Deslizamientos de Tierra en la Microcuenca del Arenal de Montserrat; Dr. Juan Carlos Bertoni (2005) Dispositivos de Regulación y Control del Drenaje Pluvial Urbano; Adriana María Erazo Ch. (2010). Impactos de Cambios de Uso de Suelo en la Escorrentía Superficial de la Cuenca del Arenal Montserrat en la Ciudad de San Salvador en el Periodo 1992-2009; Carles Fernández-Lavado (2010). Caracterización de la Inundabilidad en el Área Metropolitana de San Salvador.

24. The results of the vulnerability assessment will assist local and national authorities and stakeholders in identifying social groups and areas of the city, both in upper and lower basins, where investment in resilient water management infrastructure (over the long-term) can be more effective for climate change adaptation and increasing resilience of vulnerable communities. Note that this study will cover the whole of the MASS but it will also be used to fine-tune the details for Output 1.4 – the proposed infrastructure in Apopa and Santa Tecla. A methodology will be developed and capacity transferred to the MOP DACCGER to simplify the process of realizing this assessment when updates are needed and to offer a dynamic format. The proposed assessment is a much-needed tool that will help link, finally, climate change adaptation and urban planning in MASS, and will also identify areas in the MASS where the risks associated with extreme rainfall events are too high for human settlements, to help with future urban planning scenarios for the MASS.

25. **Output 1.2: An integrated database for flooding, including climate, hydraulic and economic variables.** Database development will be undertaken in coordination with the MARN (in particular with SNET). Obviously, an essential element for assessing the performance of the existing and proposed storm water management programme is appropriate data collection and analysis. In order to support the proper design and monitoring of the proposed interventions, the following information, to be collected by the municipalities and the national governments, is required:

- rainfall and associated climate data in multiple locations within the MASS watershed;
- gauging stations in multiple locations in various drainages within the MASS watershed; and,
- economic loss data associated with particular storm events.

26. In the past, the collection of this information would have been tedious, and expensive, requiring many person-hours of skilled labor. With the advent of small, inexpensive weather stations and stream gauging stations it is possible to collect large amounts of data that can be automatically sent to a central location using WiFi technology and the internet. This approach will suffice for rainfall and stream discharge rates. The only real challenge with the collection of information about storm damage (using accepted protocols for descriptions of infrastructure and building damage) is assigning a dollar amount to the total damage within the watershed, and associating that information with a particular storm. A GIS mapping system will be developed to facilitate this process, by geo-referencing the information so that physical damage, peak flows, and storm intensity can be correlated. Positioning the weather stations in multiple locations will be extremely important, since the MASS basin will have different rainfall intensities and consequently different total volumes of water entering the various sub-basins within the watershed. Locating the gauging stations in the various drainage channels in the MASS will allow determination of the correlation between storm events (rainfall amounts), discharge rates, and degrees of building and infrastructure damage, as well as determination of the relative effectiveness of the proposed storm water management systems, as they come into operation.

27. **Output 1.3: Development of a 5-year storm water master plan for the MASS that accounts for the likely range of climate change risks.** The goal of a 5-year storm water master plan is to locate those areas within the city where construction of various storm water management interventions can have the greatest cost/benefit ratio, in terms of the effects in

reducing peak flows, retention of storm water, and minimizing damage to infrastructure. Note that the master plan will address the whole of the MASS area, and will guide investment in storm water management throughout the MASS area over that period and beyond, but the project strategy also requires that the two proposed interventions in Apopa and Santa Tecla, which are currently known priority vulnerable areas, must proceed in parallel (while still being adjusted by the storm water master plan and the other studies noted above), in order to achieve concrete climate change adaptation results and some feedback on their effectiveness within the timeframe of the project, to guide other initiatives that may be constructed in the near future.

28. The master plan will focus on those particular sub-watersheds in the MASS area known to experience the most negative impacts during flooding events (areas that have suffered the greatest economic damage in the past). The master plan must also take into account anticipated future developments within the 5-year period, and clearly identify requirements for construction of on-site storm water retention systems that must be installed by developers. In these particular cases, an important outcome of the master plan will be the construction of various combinations of storm water management systems, planned and built by developers, and approved by municipality officials and the OPAMSS, according to the experiences in Apopa and Santa Tecla, and supported with the new policy guidelines and building standards and codes to be developed by the project. In case where common areas in neighborhoods can be identified and are practical for storm water retention interventions, the master plan will examine options for storm water management fees that can be shared between developers and the Government, to promote storm water management through the MASS area and also accommodate some cost-recovery.

29. Because of the highly variable terrain throughout the MASS, it is likely that there will be several flood management districts that will have different water management standards. Once the plan has been developed, it is expected that numerous public meetings throughout the various flood management districts will be required to explain the importance of storm water management and the associated downstream effects that will vary from neighborhood to neighborhood. Differences will become apparent to the public and the rationale for different standards and combinations and scales of technical solutions will have to be explained, especially to developer and homebuilders. As noted above, the master plan will have to address the need for future financing and cost-sharing, in which the risks and benefits associated with storm water management are clearly identified, so that equitable cost-sharing formulas can be developed, and operational and maintenance responsibilities are clearly defined.

30. **Output 1.4: Resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability.** The most important aspect of the proposed project is implementation of specific concrete measures to strengthen the climate resilience of infrastructure in the MASS, and to help alleviate water stress through aquifer recharge. Output 1.4 comprises about 75% of the project budget and is expected to bring immediate benefits to about 3,000 direct beneficiaries (not losing their homes in the next flood) and about 31,000 indirect beneficiaries (not suffering flood damage in their homes or losing the use of their land). The concrete measures will reduce vulnerability and build resilience in two sites in the MASS, namely in communities of the municipality of Apopa and in the municipality of Santa Tecla (see Figure 4 above). The proposed interventions are based on assessments conducted by UNDP and specialized engineering and architectural firms during the project preparation phase. Two main activities were conducted during this stage; (a) detailed analysis of local conditions and expected water

flows in various degrees of storm events, and (b) in depth assessment and conceptual design of the most feasible and cost effective measures for the sites. Final engineering designs and construction plans to be conducted during project implementation will determine the exact details of the proposed infrastructure projects. The measures to be taken and infrastructure works to be constructed are presented in this section.

31. The two pilot areas were selected jointly between UNDP, The MOP and the MARN based on numerous considerations. An essential selection parameter was that the areas to be intervened were able to demonstrate visible climate change adaptation benefits through the AF proposal. The focus was on the reduction of peak water flows generated upstream, as high volumes of water flowing through the MASS are the main reason for flooding, erosion, and landslides. An additional selection criterion, suggested by the Government of El Salvador, is that the AF interventions should complement planned infrastructure works financed by the Government, in order to make such investments more resilient to climate change. This will allow the Government to learn how to incorporate climate change adaptation measures in their own plans, thus promoting replication. Another consideration was that the targeted locations would be able to undertake investments with significant adaptation benefits within the budget constraints of the expected AF project budget defined at the concept stage. Finally, the projects were selected to demonstrate clear direct and indirect, gender balanced social benefits.

32. Potential project replication was fully assessed while selecting pilot locations, and the opportunity to diversify the types of infrastructure interventions was also considered. The intervention in Santa Tecla will take place in the development of a new urbanization in an urban area upstream of the Arenal Montserrat watershed. The area of intervention was selected as it is highly representative of an upstream community in which water management measures can have a strong impact on downstream communities. Given the topography of El Salvador, similar interventions at the upper end of the urbanized watershed would have a significant impact in substantially reducing peak water flows downstream. The extreme rainfall retention measures that will be installed will demonstrate the cost-effectiveness of upstream rainfall measures in the AMSS and offer the possibility to be easily replicated in future urbanizations. The intervention in Apopa takes place in a peri-urban area, with semi-rural conditions even though it's situated in the AMSS. Its conditions, including vicinity to the hillsides and exposure to the risks caused by extreme rainfall (flood, landslides, etc), are found in numerous other communities that border the AMSS. Because of the very different terrain and development conditions in Apopa and Santa Tecla, they offer the opportunity to implement a variety of techniques and resilience-building measures, to test and demonstrate their effectiveness. The project will incorporate appropriate measures to strengthen resilience to climate change into the ongoing development programmes in these two locations, such that national and municipal responses to meet housing demands in low-income social groups can be designed for climate resilience. It is expected that the interventions in Apopa and Santa Tecla will create the necessary precedents to foster and catalyze similar initiatives in other parts of the city, in other urban areas of El Salvador, and in neighboring countries in the Central American region. The Ministry of Public Works is committed to mainstreaming such adaptation measures in its operational budget, which ensures replication in its urban infrastructure budget as well as in forthcoming public housing development projects.

33. The first intervention will be in the low income communities of Santa Carlota I, Santa Carlota II and Campo de Oro in the municipality of Apopa (referred to as Apopa in the rest of this document). The Apopa area is located on the side of the hills north of San Salvador, and consists of 390 families (and approximately another 25,000 people in the downstream areas

influenced by Apopa). Storm water from the steep slopes above the community has, in the past, put homes in this community partially under water during storm events. These slopes have been cleared of vegetation and re-planted with maize, which has a shallow root system that does not consolidate soil or retain water well. Storm water then flows, almost unchecked, through the community, down the slopes below, and on to the city of San Salvador, with concomitant damage in the drainage infrastructure downstream. Apopa is a key site for appropriate interventions, as it is representative of many of the other communities that are located on the slopes above San Salvador.

34. Apopa provides the opportunity to implement several cost-effective technical options, which have been examined during preparation of this proposal. The proposed technical options are not extensively used in El Salvador but are proven techniques and technologies that are being used in other countries and region (USA, Europe, and China for example). These include terracing, porous paving, and vegetated swales, all of which can play a dramatic role in reducing flooding within the community and downstream areas. They are cost effective and much more efficient than current downstream practices for rainfall management and have a strong potential of diffusion throughout the MASS. The technical options are considered as viable technical options by the Ministry of Public Work, the Ministry of Environment, the OPAMSS and the municipalities of Apopa and Santa Tecla. The strong involvement of the communities in the project will ensure their acceptance and maintenance. The importance of terracing in the agricultural areas above the community should prove to be one of the most cost effective options. The hillside forest above Apopa has been cleared and replaced with annual, shallow rooted crops, such as maize, which has severely compromised the ability of the soil to retain water, which in turn leads to downstream flooding and severe erosion. Terracing, with appropriate soil and gravel mixes and suitable vegetation, is a relatively inexpensive but effective means to retain rainwater in the area and help with percolation to the aquifer. The terracing solutions proposed for this location will be constructed in considering the community's agricultural practices and will provide co-benefit of enhanced agricultural productivity. Preventive measures will be taken during construction and initial operation to preserve topsoil and enhance the quality of soil as necessary, as well as minimizing erosion. As part of the terracing effort, reforestation and the use of cover crops within the immediate hill slopes will be further assessed and implemented as deemed feasible. Furthermore, the project will coordinate with national and local reforestation efforts conducted under the National Programme of Ecosystem and Landscape Restoration to potentially integrate further upstream watershed protection efforts, which would further enhance the resilience of this pilot intervention.

35. Paving the community streets in the area of intervention in Apopa with porous paving will significantly reduce erosion along the curbs, while adding vegetated swales (especially those with reeds), adjacent to streets and in cul-de-sacs will help reduce sediment transport, as well as providing some treatment for any wastewater that is discharged into the streets (until such time as a proper sewer system can be installed). All natural drainage systems will also have small check dams constructed at suitable intervals to reduce the velocity of storm water, as well as providing sediment and erosion control. Finally, a retention/recharge basin will be constructed at the lower end of the community watershed. The final details on the specific locations of each kind of structure to be constructed, and the exact costs of each intervention will be determined as part of the engineering design included in this output. Budget scoping has been undertaken for this proposal, to determine the envelope within which to plan and work. Adjustments will be made, as necessary, as the Apopa design is finalized. Exact costs for each element will of course depend on the particular site conditions, local acceptance, soil type, and cost of labor and materials. The intention is to rely on local labor and materials as much as

possible, to build community confidence and ownership in the technical concepts, and stimulate local interest in their design and maintenance. However, concrete, grass, and gravel pavement will likely have to be brought in from other locations in the MASS.

36. An engineering and architectural assessment was conducted during project preparation to define the most cost effective water retention measures at the site. Different scenarios were modeled, assessing water retention interventions that are feasible for Apopa and can be fully integrated into the community's daily life. The solutions proposed below, as well as their water retention capacity, are based on engineering that is site specific and included a comprehensive site visit. The final design for the intervention will define the engineering detail, sizing, exact configuration, and construction specifications for the measures described below. A necessary first step will be the preparation of a topographic site plan showing buildings, roads, utilities, and existing natural drainages; satellite images will be used for this step. In addition, a soil map with soil characteristics, including permeability and depth to bedrock will be essential. Using this site master plan, a detailed analysis of site conditions will be undertaken to show where exactly the various storm water management options can be located for optimal effect and then determine the exact costs (within the current estimated budget for Output 1.4). Detailed engineering plans and specifications will then be elaborated and discussed with the community and local government (a local community advisory board can be established to manage this dialogue); then implementation can begin once the plan is approved and budgetary requirements, including local contributions, are defined. An operation and maintenance plan will be developed jointly with the Ministry of Public Works and the Municipal authorities, with a clear budget and appropriate division of labor. This will be closely interlinked to community involvement efforts, as local ownership is essential for appropriate use and maintenance of infrastructure.

37. The current technical assessment and budgeting for the Apopa site (developed for preparation of this proposal) shows that the interventions, assumed to have a 50-year life cycle, will be appropriate and effective in reducing flooding in the Apopa area (see Table 4), with terracing and recharge basins expected to provide 88% of the flood protection and recharge potential. The overall aim of the Apopa intervention is to retain 115.6 million m^3 of rainwater over a 50-year period for an initial direct construction cost of US$ 2.333 million, representing a cost of US$ 0.02/m^3. See section 2 and 3 for more detail on the impacts of retaining this volume of rainwater. It is important to note that all the infrastructure to be built will be designed to last at least 50 years, and will be constructed according to specifications that ensure it can resist natural events expected within this 50 year lifespan.

Table 4: Apopa proposed rainwater retention interventions and associated costs

Technical Option	Area to be constructed (m^2)	50 Year Volume Retained (m^3/m^2)	Total Volume Retained – 50 Years (m^3)	Cost/m^2 US$	Total Cost US$	50 Year Life Cycle Cost/m^3 Retained (in-cremental)
Parks as retention basins	15,000	414.4	6,215,790	2.35	35,250	$0.01
Parks and playing fields	5,000	36.9	184,430		0	$0.00
Permeable concrete	8,000	36.9	295,088	12.59	100,720	$0.41

pavement						
Grass pavement	2,000	36.9	73,772	18.57	37,140	$0.60
Gravel pavement	4,000	76.5	306,094	12.92	51,680	$0.20
Terracing	125,000	445.5	55,681,250	14.90	1,862,500	$0.07
Vegetated swales with check dams	20,000	370.0	7,399,000	9.05	181,000	$0.03
Polyethylene tanks	100	1,529.5	152,948	256.88	25,688	$0.08
Recharge basins	10,000	4,530.0	45,300,000	3.92	39,200	$0.00
TOTAL	**189,100**		**115,608,372**		**2,333,178**	

38. The second site selected for the project is in the municipality of Santa Tecla, located in the western part of the MASS (referred to as Santa Tecla in the rest of this document; see Figure 4 above), with a population of 121,000 inhabitants (about 5% of whom are located near the La Cruz area proposed for the demonstration). Santa Tecla exhibits different conditions than the municipality of Apopa, since it is located in the middle part of the Arenal Montserrat watershed, which runs through most of San Salvador. Therefore, any intervention in this municipality will have a significant positive impact on the lower lying areas of San Salvador.

39. There will be two main interventions in Santa Tecla. The first will be implementation of decentralized water management practices throughout the municipality to retain water during extreme rainfall events and to diminish the peak volumes and speed of runoff. This will involve the optimization of specific measures that can be taken using existing infrastructure (such as housing, parks, secondary drainage piping, etc), to increase the capacity of Santa Tecla as a whole to act as a buffer zone for rainwater. Furthermore, Santa Tecla lies immediately south of the “Parque el Espino”, a protected area on the slopes of the San Salvador Volcano, which already serves as a buffer zone for the metropolitan area. Given this proximity, this green area can be used to retain additional volumes of water. As such, the project will assess whether the diversion of runoff to this area is feasible. An environmental assessment will be performed to assess the infiltration capacity of the area to define the potential consequences of deriving runoff to this area.

40. The second intervention in Santa Tecla will be focused on the low-income residential area called La Cruz. This area is currently a slum occupied by marginalized families. Because these dwellings are built on essentially level ground with salvaged materials without foundations to raise the dwelling, without roads, storm drains, or sewers, La Cruz residents are highly vulnerable to any extreme rainfall event. The resultant highly contaminated storm water poses both a health and safety threat to the downstream areas in the municipality of Santa Tecla. Over the next few years, the Municipality of Santa Tecla will formalize this neighborhood with a housing project to accommodate 128 families (la Gran Manzana Project). This is a project that is financed by the Government of El Salvador with approximately US$ 18 million and is a flagship initiative for the formalization of illegal dwellings. The AF project will build upon this initiative to incorporate climate change adaptation measures that will notoriously increase the project’s capacity to retain water and diminish peak water flows. This joint intervention between the AF project and the Government of El Salvador’s infrastructure investment is a unique opportunity to mainstream climate change adaptation concerns in public investment. A

successful AF intervention in this project will be highly visible and will go a long way in supporting the replication of such best practices in other infrastructure projects. Furthermore, it is a cost effective intervention for the AF project as it allows for the modification of the original project design for efficient water management. The AF funding can therefore be focused explicitly on specific adaptation measures to increase the resilience of the infrastructure project and the downstream areas of the MASS. As such, the project will intervene in the design and construction of this complex to ensure that the most appropriate storm water management measures (built to specifications that account for estimates of climate change induced runoff flows) are put in place.

41. Since this is an area with new construction proposed, there are many more opportunities to implement storm water management practices that include storage and reuse options at the household and neighbourhood levels, (including rooftop collection, rain gardens, small-scale water storage tanks), and in public and business areas, retention, percolation, and recharge (such as pervious parking lots with water storage). This intervention will allow the new residential area to cope with extreme rainfall events, and will help demonstrate how low-income neighborhoods can become an integral part of reduction of vulnerability to flooding in the lower areas of the San Salvador urban area. It will also demonstrate in general the benefits of building climate resilient communities, while reducing the demand on natural resources, and alleviating the pressure on the existing metropolitan storm water system. For the water harvesting system, adequate operation and maintenance will be put in place in the collection areas, filters and tank systems, to ensure the quality of the water and avoid mosquito breeding. Tests will be run periodically to assess the quality of the water during the first year of operation of the systems, as to adjust the operation and maintenance if necessary.

42. Because the design work for La Cruz has already begun, the Santa Tecla initiative will be put on a fast track. As with Apopa, the proposed water retention measures have been developed following a site specific engineering and architectural analysis which included an extensive field visit. The final design incorporating these measures will require the modification of existing construction plans for the current housing project, as there is a need for full integration of the adaptation measures. During project preparation, there has been active cooperation with the project architect so that the proposed measures can be feasibly integrated to the existing design without a major overhaul of the entire project. Some of the items, such as basement cisterns, will require the assistance of a structural engineer, while grading and drainage plans can be adjusted for the site without much delay. External above-ground concrete tanks will become part of the La Cruz architecture. Rain gardens will be expanded to incorporate play features for children, and fountains can be built with underground storage so that during the dry season water is still available for the fountain. The technical feasibility analysis undertaken as part of this proposal's development demonstrates that rooftop rainwater collection and storage in basement cisterns will be the primary interventions in Santa Tecla, but the use of cisterns as an alternative supply for toilets and washing must be stressed as well, especially with the expectation that there will be less annual rainfall in the future (despite the increased frequency of extreme rainfall events). Every litre of water that is harvested is one less litre that must be supplied by the municipal water system, and is one less litre running down city streets.

43. The "greenfield" aspect of Santa Tecla will allow consideration of many different rainwater management options throughout the La Cruz development. Table 5 shows the infrastructure measures that have been selected for Santa Tecla after the evaluation of several options, as well as the costs and rainwater retention expectations. While the proposed retention basin on

the periphery of La Cruz is expected to account for about 65% of rainwater retention over the life of the project, the household-level initiatives (rooftop collection and storage in basement cisterns) will account for about 20% of the expected rainwater retention in La Cruz. The overall aim of the Santa Tecla pilot initiative is to retain about 34 million m^3 of rainwater over a 50-year period for an initial direct construction cost of US$ 1.016 million, representing a cost of US$ 0.03/m^3. See section 2 and 3 for more details on the impacts of retaining this volume of rainwater. It is important to note that all the infrastructure to be built will be designed to last at least 50 years, and will be constructed according to specifications that ensure it can resist natural events expected within this 50 year lifespan.

44. To ensure that a suitable maintenance programme is in place after the initial construction and installation of technical measures, a detailed and budgeted maintenance pan will be developed and agreements will be signed with the Ministry of Public Works, administrators of the developments and the respective municipalities. In addition, during the construction process and the initiation of operations, as noted previously, community organizations will be supported, so that the affected communities have full input to the design and operation of the various technical measures. These organizations will have a supervision function and will ensure that maintenance is effective, particularly in the areas that also have community social functions. The maintenance process should also provide work opportunities for some local residents. Capacity development activities will be implemented to inform the residents in the pilot project areas about the nature and function of the rainfall and water management infrastructure and the benefits that they provide (see Component 3 below).

Table 5. Santa Tecla proposed rainwater retention interventions and associated costs.

Technical Option	Area to be constructed (m^2)	50 Year Volume Retained (m^3/m^2)	Total Volume Retained – 50 Years (m^3)	Cost/m^2 US$	Total Cost US$	50 Year Life Cycle Cost/m^3 Retained (in-cremental)
Parks as retention basins	7,000	414.4	2,900,702	2.35	16,450	0.01
Parks and playing fields	2,585	36.9	95,350	0	0	0.00
Permeable concrete pavement	1,700	36.9	62,706	12.59	21,403	0.41
Grass pavement/ parking	200	36.9	7,377	18.57	3,714	0.60
Gravel under-pavement	1,500	73.8	110,658	10.20	15,300	0.12
Gravel pavement/ parking	200	76.5	15,305	12.92	2,584	0.20
Basement cisterns	4,000	1,143.2	4,572,778	96.98	387,920	0.06
Concrete tanks	100	1,817.8	181,783	1,717.34	171,734	0.39
Roof storage	5,000	425.8	2,129,100	58.08	290,400	0.24
Rain gardens	2,500	445.5	1,113,625	16.11	40,275	0.79

Tree wells	2,000	132.5	265,005	23.50	47,000	0.42
Recharge basin	5,000	4,530.0	22,650,000	3.92	19,600	0
TOTAL	**31,785**		**34,104,389**		**1,016,380**	

45. **Component 2: Institutional Strengthening.** Institutional barriers constitute a major constraint in fostering adaptation and building resilience to climate change at the country level. Institutions, particularly public institutions, are often reluctant to change their structure and operation in order to better respond to the challenges of climate change, due to institutional inertia. However, El Salvador is counting on the political will of the MOP and the MARN, and on the support of the President of El Salvador to introduce institutional changes that will allow them to better respond to climate change and other challenges that they currently face. The Government of El Salvador recognizes the limitation of current institutional approaches; this Adaptation Fund financed project will assist the country in putting institutional strengthening on the climate change agenda, as a catalyst which can be associated with the concrete action proposed in Component 1 above. The Government of El Salvador is fully committed to enacting the domestic policy changes stemming from this project as part of its adaptation strategy.

46. The Government of El Salvador has prioritized the following outputs: planning guidelines to improve resilience and adaptation to climate change in human settlements; improving building codes and standards for public infrastructure to meet conditions expected under the climate change scenarios for El Salvador; technical and economic decision making tools for infrastructure in the context of climate change; and, building collaboration within the public sector at the national level and between the national and municipal levels to create appropriate multi-dimensional responses to climate change that are backed up by policies, regulations, and clear responsibilities defined for both the public and private sectors. The expectation of the Government is that the combination of concrete actions and related institutional strengthening might serve as a positive example of approaches for promoting climate resilient infrastructure development in both El Salvador and in the Central America region.

47. **Output 2.1: Development with the OPAMSS of policy guidelines to improve the planning for climate resilient human settlements in the MASS.** The objective of Output 2.1 is to support public officials in the development of policy and planning guidelines to support adaptation and resilience to climate change in urban areas in El Salvador. Given the recent volatility in the frequency and intensity of climate events in the country, it is clear that existing guidelines cannot accommodate the extremes that are presently occurring and will be experienced in the future. Climate change adaptation and building up resilience are an iterative process, based on experiences over time and in different locations; it cannot be a one-time effort. Conditions in urban societies change dynamically and often unpredictably, requiring periodic adjustments in planning guidelines that are intended to safeguard urban infrastructure over the long-term (the expected life span of infrastructure in urban areas is about 50 years; it therefore needs to be designed for such longevity, taking into all known risks). The project will convene two national workshops and one regional workshop in Central America on planning urban growth with adaptation to climate change built in. These workshops will be oriented to help national and municipal decision-makers and planning officials consider alternatives for adapting urban areas to climate change, and will build on the experiences generated by other activities within the project.

48. As a part of the process to develop planning guidelines that accommodate climate change adaptation and resilience in urban areas, the project will create an information portal and

electronic resources focused on best regional practices (Central America) for adapting urban areas to climate change through the use of resilient infrastructure. The project will also facilitate the exchange of experience and knowledge obtained by countries that are using innovative approaches to build community and infrastructure resilience through the development of policies, guidelines, norms, construction standards, and building codes that promote and support adaptation of infrastructure to climate change.

49. These lessons will constitute valuable references that can help to prevent maladaptation in El Salvador (which generally occurs when old practices persist, without much foresight; the institutional inertia noted above). Even though the policies and guidelines that will be examined in this activity may reflect specific local conditions different from those in El Salvador, the project can still extract lessons from policy and guideline implementation in other areas, to strengthen national and local officials' skills and to help them develop standards designed to meet the conditions, resources, and needs of El Salvador.

50. Based on the integrated analysis of vulnerability to flooding in the MASS area developed in Output 1.1, planning guidelines for rainfall and flood risk management will be elaborated for the Metropolitan Area in coordination with the Office for Planning of San Salvador Metropolitan Area (OPAMSS). The guidelines will include recommendations on infrastructure retrofitting to enhance climate change risk management. Furthermore, a comprehensive analysis of zoning regulations within San Salvador will be undertaken, as the increased vulnerability of hilly terrains in the MASS requires a medium and long term policy approach that deters further urbanization and land use in these areas, as well as possible relocation. The development of these planning guidelines is critically important, to support the concrete actions proposed in this project, and to facilitate their replication throughout El Salvador, especially to ensure that future urban development is climate resilient, and to help with the suitable location of new infrastructure.

51. **Output 2.2: Revised and improved building codes and planning standards for climate-resilient public infrastructure.** The project will finance technical training for the development of norms, construction standards, and building codes appropriate for the new conditions forced by climate change in the coming decades. This will include two days of technical training every six months. Each workshop will involve three-four international experts or public officials from other countries and cities who are responsible for the design and implementation of planning guidelines and norms, building standards and codes for sustainable infrastructure in their own jurisdictions. The objective of the training will be to extract useful lessons that can be applied to the development of appropriate national and regional building codes, norms, and planning standards and guidelines that will encourage the building of climate resilient communities in El Salvador.

52. A committee will be established, in coordination with the OPAMSS, the Salvadoran Chamber of Construction (CASALCO), the Association of Salvadoran Engineers and Architects (ASIA) and other stakeholders, to revise existing building standards and construction codes to include climate change risks and promote climate change adaptation. The project will support efforts by the government and the private sector to revise the construction norms. The CASALCO has publicly stated the importance of having revised building codes and planning standards for infrastructure that incorporates climate change risks to avoid the generation of new constructed risks and to guarantee transparency and competitiveness in the construction sector. Additionally, policies to create incentives and ensure the enforcement of the new proposed guidelines and standards will be explored and implemented. Likewise, zoning

regulations will be revised accordingly, incorporating the results of the integrated stormwater assessment developed in Outcome1.

53. **Output 2.3: Coordination mechanisms established between the MOP, the MARN, OPAMSS and other stakeholders to address climate change risks on infrastructure in the MASS.** The process of adapting to climate change requires integrated multi-dimensional strategies and actions. The project will seek to enhance collaboration within the public sector at the national level and between officials at the national and the municipal levels. The creation of the DACCGER in the MOP increases the necessity of a coordination mechanism between the MOP, the MARN, the Technical Secretariat of the Presidency, the Direction of Civil Protection, the Ministry of Agriculture, and OPAMSS (including the 14 municipalities o the MASS) to promote the development of climate resilient infrastructure in the MASS. A coordination platform led jointly by the MOP and the MARN will be developed, for communication and exchange of information that is needed to improve collaboration and to identify possible synergies between these institutions at the technical and decision making level. This coordination mechanism is expected to be integrated to the governance structure of the National Programme of Ecosystem and Landscape Restoration, which is the Government's overarching strategy for Climate Change adaptation. This will include the coordination of all related donor initiatives such as the approved donation from Japan and the IDB loan (see paragraphs 95 and 96). The associated donors will be invited to participate in Steering Committee meetings when relevant, to foster such coordination.

54. Fostering collaboration between these national and municipal levels institutions is essential in building a long-term adaptation strategy for urban infrastructure and avoiding a fragmented response to the problem of urbanization and rainfall management. Guidelines for coordinated urban planning that includes more than one jurisdiction, in the context of climate change, will be developed. This activity is also expected to support the political process required for the elaboration and approval of a national land-use planning law which includes climate change considerations.

55. **Component 3: Knowledge Management and Dissemination.** The appropriation of knowledge generated by the project by stakeholders is an important function of the project that will assist communities in El Salvador in better responding to the challenges of climate change. The project will make use of several instruments as part of its strategy to disseminate knowledge and information to the different actors involved in the project and to other potential users in El Salvador. These are described below.

56. **Output 3.1: Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders.** This output will involve dissemination of the lessons learned from the constraints and opportunities encountered during the implementation of the project through workshops with local governments and stakeholders. The objective will be to accelerate the dissemination of project-based experiential information from the earliest days of the project, rather than waiting until its completion; this will also permit stakeholder reflection and observations that may help refine project activities that remain to be done. It is hoped that the workshops will also foster similar initiatives in other communities in El Salvador, thus leveraging the project activities, and building trust and understanding among stakeholders and public officials involved in their development. The project will carry out one-day workshops, every six months with relevant government officials and private sector stakeholders. The workshops will bring together project participants with mayors, public officials and decision

makers from other municipalities, together with representatives from professional associations, the private sector, community-based organizations, NGOs, and academia. This will constitute an open forum to ensure broad-based and varied perceptions in exploring adaptation solutions required for the development of sustainable infrastructure in El Salvador.

57. **Output 3.2: Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure**. To increase knowledge and awareness of the requirements for climate change adaptation and the use of sustainable infrastructure, a communication campaign will be designed and implemented. The campaign will be disseminated through the media, professional forums, community events, and schools. The communication strategy will be based on the linkages between current urban and environmental problems in the MASS and the increasingly evident impacts of climate change. The campaign will be designed to keep the communities informed about climate change and the benefits of constructing resilient and sustainable communities through adaptive measures, as well as how individual measures and behaviors may have positive and negative impacts on infrastructure. Examples and lessons learned from the project will be used to illustrate the opportunities and benefits from appropriate adaptation responses. The intention is to target the communication campaign at vulnerable communities within the MASS area. The principal focus will be on how individual action can produce adaptation (or maladaptation, if poorly informed). For example, solid waste management is a serious problem in El Salvador and indiscriminate disposal contributes to flooding by clogging drains and canals with trash. For the proper functioning of the concrete actions in Output 1.4, it will be necessary to induce behavioral changes in parallel with the infrastructure solutions; the long-term benefits of proper respect for and maintenance of the technical measures will be clarified for all immediate beneficiaries. This communication campaign will be implemented throughout the lifetime of the project.

58. **Output 3.3: Dissemination of technical specifications, revised building codes, and relevant planning guidelines.** Building resilience and adaptation to climate change is a process that requires the development of new approaches and ways of thinking about growth and development. Incorporating the challenges posed by climate change into the training of new professionals will facilitate the process towards sustainability in El Salvador. This output will ensure the dissemination of the planning guidelines and norms, construction standards, building codes and tools prepared by the project through technical workshops noted previously. The workshops will be oriented to public officials from the national and municipal governments, and professional associations working with infrastructure planning, development management and maintenance in El Salvador.

2. ECONOMIC, SOCIAL, AND ENVIRONMENTAL BENEFITS OF THE PROJECT

59. Climate vulnerability occurs when individuals, social groups, or communities are exposed to extreme weather events that are beyond their capacity in terms of resisting physical and emotional damage and loss. This reflects their inability to secure all their land, assets, and livelihoods, because there is lack of forewarning, they are not sufficiently protected, or they cannot move away from the high risk areas, or various combinations of all of these factors. Typically, vulnerable groups are those with low incomes, inhabiting marginal areas that inherently have high risks associated with weather events, and lacking the knowledge and financial resources to create buffers or replace lost and damaged assets. As indicated previously, the most common form of climate vulnerability in El Salvador is exposure to extreme

rainfall events, and associated flooding and erosion. In addition, there is increasing concern for water shortages in the future, as annual rainfall will decline, despite increasing frequency and intensity of extreme events.

60. Clearly, managing rainfall and surface discharge to reduce the damage caused by excessive rainfall and to conserve this resource for use in the dry season could bring many economic, social, and environmental benefits. This is especially true as the El Salvador budget is continuously compromised by the need to pay for infrastructure repairs, which reduces funds available for public social and environmental programmes; constantly effecting repairs and funding social assistance during emergencies forecloses opportunities to be pre-emptive and progressive with Government investment in the future. Of course, if the function and longevity of the technical measures to be implemented by this project can be assured, then the expected benefits of the project will have incremental value compared to the initial investment; benefits over 20-50 years, for example, will have significant increased economic value, even when discounted, compared to benefits over a shorter period, such as five years. The project therefore aims to implement measures that can be operational, maintained, and sustained over 50 years, the normal lifespan for the types of assets to be constructed/ installed by the project, when properly maintained.

61. The intended project actions (to address flooding in two neighbourhoods in the MASS, with related studies, institutional strengthening, and information dissemination) will produce benefits in several ways, noted below (these are also examined in Section 3: Cost Effectiveness, below):

- approximately 3,000 people, as direct beneficiaries, in two low-income neighbourhoods protected from flood and erosion damage, with protection of assets, maintenance of livelihoods, ongoing use of adjacent land, and increasing sense of security, stability, and social cohesion (social and economic benefits);
- approximately 31,000 people, as indirect beneficiaries, in the immediate downstream areas with reduced vulnerability to flooding and erosion and reduced risk of damage to property and disruption of services and livelihoods (social and economic benefits);
- in both the areas noted above, reduced damage to and disruption of public infrastructure and services (social and economic benefits);
- consolidation of the integrity of green areas and spaces in the MASS neighbourhoods, with ongoing provision of environmental services related to water retention and aquifer recharge, and less erosion and soil clogging drainage systems in the metropolitan area (environmental benefits);
- increased volume of usable water in the future, as less flood water flashes off, water can be stored for household use, and the aquifer will have increased capacity for household and commercial uses (economic benefits);
- increased public awareness of household-level options for climate resilience, and increased internalized investment by households and businesses in climate resilience as the benefits can be demonstrated and disseminated (social and economic benefits); and,
- potential replication of the demonstrated technical measures throughout the MASS and other urban areas in El Salvador (with this project catalyzing all the benefits described above in other locations) (social, economic, and environmental benefits).

62. More specifically, with regard to the immediate beneficiaries in the vulnerable neighborhoods targeted by the project, benefits can be fairly simply expressed in economic terms (in 2011 dollars, without discounting, and with very conservative assumptions about

current values). The interventions in Apopa will have a direct positive impact in reducing the climate change vulnerability of about 400 low-income households and indirectly for thousands of households in the communities below the Apopa site. Every cubic meter of stormwater that can be retained or slowed down in Apopa will have a measurable positive impact on Apopa and on the communities further down the slope. With retention of 115 million cubic meters of rainwater over 50 years, from 16 expected extreme rainfall events (based on recent frequencies, about one event every three years), it is expected that the investment of US$ 2.333 million can produce the following economic benefits:

- 2,200 people[18] will not suffer significant damage to their homes, or loss of homes, and will not have to be re-located (to a "greenfield" site); a **benefit of US$ 20 million** (2011 dollars; assuming a proxy value, based on the price of small lots and very small homes in the MASS at US$ 50,000[19], that would be required for re-location of the Apopa community).
- 25,000 people in immediate downstream areas not suffering flooding damage or loss of property due to soil and debris contamination due to erosion; even assuming a real or opportunity cost of just US$ 200 per person, with 16 possible extreme rainfall events over 50 years, this represents **benefits worth US$ 80 million**.
- Lack of disruption of livelihoods (whether small businesses, or informal market activities); just for the 400 low-income households directly benefiting from the Apopa intervention, assuming 16 events over the next 50 years, and assuming an average annual family income of just US$ 3,500 (rural), and assuming three months of disruption per event; a **benefit of US$ 5.6 million** (not having to be paid by the State or made up by the individual households).
- With a total from the above of **US$ 105.6 million**, this alone would suggest that the intervention proposed for Apopa will have significant economic benefits; all other benefits listed (less direct savings, and environmental and social benefits noted above, would obviously have additional value; however, they are more difficult to monetize). For example, part of the advantage of the more natural proposed solutions for the Apopa site is that water retention areas can be protected from illicit use, as communities assume ownership of such communal "green" areas for mutual benefit, precluding individual, spontaneous, and perhaps misguided uses. In addition, damage to public infrastructure, and the cost of repairs, can be avoided.

63. In the municipality of Santa Tecla the project intervention will have a direct impact on the community of La Cruz (128 households) and the municipality of Santa Tecla as a whole (121,908 people, perhaps 5% of whom are in the flood-influenced area near La Cruz). As in the case of the Apopa site, this intervention will also have an indirect impact in reducing the runoff in the lower basin of MASS. The overall impacts are expected to be similar, however, the combination of technical measures will vary. With retention of 34 million cubic meters of rainwater over 50 years, from 16 expected extreme rainfall events (based on recent frequencies, about one event every three years; the same scenario as above), it is expected that the investment of US$ 1.016 million can produce the following economic benefits:

- 700 people[20] will not suffer significant damage to their homes, or loss of homes, and will not have to be re-located (to a "greenfield" site); **a benefit of US$ 6.4 million** (2011

[18] This assumes 5.5 people per household.

[19] www.globalproperytyguide.com; San Salvador 2011 property prices; values for very small 70 m^2 houses.

[20] This assumes 5.5 people per household.

dollars; assuming a proxy value, based on the price of small lots and very small homes in the MASS at US$ 50,000[21], that would be required for re-location of the La Cruz community).

- 6,000 people in immediate downstream areas not suffering flooding damage or loss of property due to soil and debris contamination due to erosion; even assuming a real or opportunity cost of just US$ 200 per person, with 16 possible extreme rainfall events over 50 years, this represents **benefits worth US$ 19.2 million**.
- Lack of disruption of livelihoods (whether farming, small businesses, or informal market activities); just for the 128 low-income households directly benefiting from the Santa Tecla intervention, assuming 16 events over the next 50 years, and assuming an average annual family income of just US$ 3,500, and assuming three months of disruption per event; a **benefit of US$ 1.8 million** (not having to be paid by the State or made up by the individual households).
- Household retained water that does not have to be purchased (6.9 million m^3, @ US$ 0.3/m^3); a **benefit of US$ 2 million**.
- The **benefits above total US$ 29.4 million**, which is about 29x the initial investment, in 2011 constant dollars. As with the Apopa intervention, there would be additional benefits associated with less direct cost savings (lack of repairs to flood-damaged infrastructure, and social and environmental benefits).

Even using very conservative assumptions about the value of property and the incomes that might be lost during extreme rainfall events, the project is expected to bring benefits to residents of the MASS worth about US$ 135 million (over 50 years); even if there is effective protection from these measures in the next extreme event, sometime in the next 2-3 years, the net benefit will be worth at least US$ 33 million in 2011 dollars, equivalent to precluded damage and maintenance of undisturbed livelihoods. This is about 10x the amount of the initial investment. If both the Apopa and Santa Tecla initiatives were to be replicated just once, facilitated by the knowledge dissemination and institutional strengthening, the benefits could obviously double, assuming similar numbers of beneficiaries and similar physical and economic contexts.

64. The composition of the areas to be intervened is gender balanced. Men are the primary income source through formal and/or informal employment, while women, to a large part, are home caretakers (approximately 70% of women in the communities are not employed). The environmental benefits of the project are mostly gender balanced, although as women are traditionally expected to be responsible for the home, they usually assume higher responsibilities to respond and cope with flooding or similar rain related disasters. Additional social and economic benefits include increased employment during the project construction phase, which can greatly benefit women since the works will be conducted at their area of residence. Construction of terraces, for example, can offer an important opportunity for employment of women and income generation. Likewise, improved agricultural yield, a secondary benefit of terracing, will positively affect the home economy and food security. Increased access to safe drinking water will be a result of the project interventions in both Santa Tecla and Apopa, with substantial positive impacts impact on women and children. Finally, the community involvement that is fostered by this project creates indirect benefits such as greater community ties and social cohesion, which are extremely important in the context of violence and insecurity of El Salvador that affects primarily younger generations. On this last point

[21] www.globalproperytyguide.com; San Salvador 2011 property prices; values for very small 70 m^2 houses.

regarding the security situation in El Salvador, the project promotes social cohesiveness as an important component of climate change adaptation. As such the full participation of communities will be required in construction, operation, and maintenance of the infrastructure investments. These interventions are mainstreamed in Government funded social welfare efforts that are also focused on social cohesiveness. As such, it is expected that communities will protect the project infrastructure investments from situations such as vandalism or theft. Previous UNDP experiences in El Salvador demonstrate that such a community approach is effective in prevention of violence. Furthermore, the municipalities involved have experience in working with these communities and coping with security issues.

65. This project seeks to move beyond actions focusing only on a limited number of inhabitants or communities in the MASS. It seeks to create a sustainable process to build resilience and adaptation to climate change, improving the quality of life of the communities directly affected, eventually leading to a climate-smart sustainable development process in other parts of the MASS and the country. It is therefore intended as a catalyst for building climate resilience through replication of best practices in stormwater management. Note that this assessment of benefits is focused on the economic value assigned to the direct and indirect beneficiaries; benefits can also be inferred from previous estimates of repair costs associated with extreme rainfall events for the whole of the MASS, pro-rated to different rainfall amounts and the specific neighborhoods of Apopa and Santa Tecla, but not assigned to specific beneficiaries. The latter analysis is examined in detail in Section 3 (Cost-Effectiveness), as this allows scaling up of cost savings (benefits) to the whole of the MASS, assuming full replication of the demonstrated technical measures to all of the MASS area over the next 20 years.

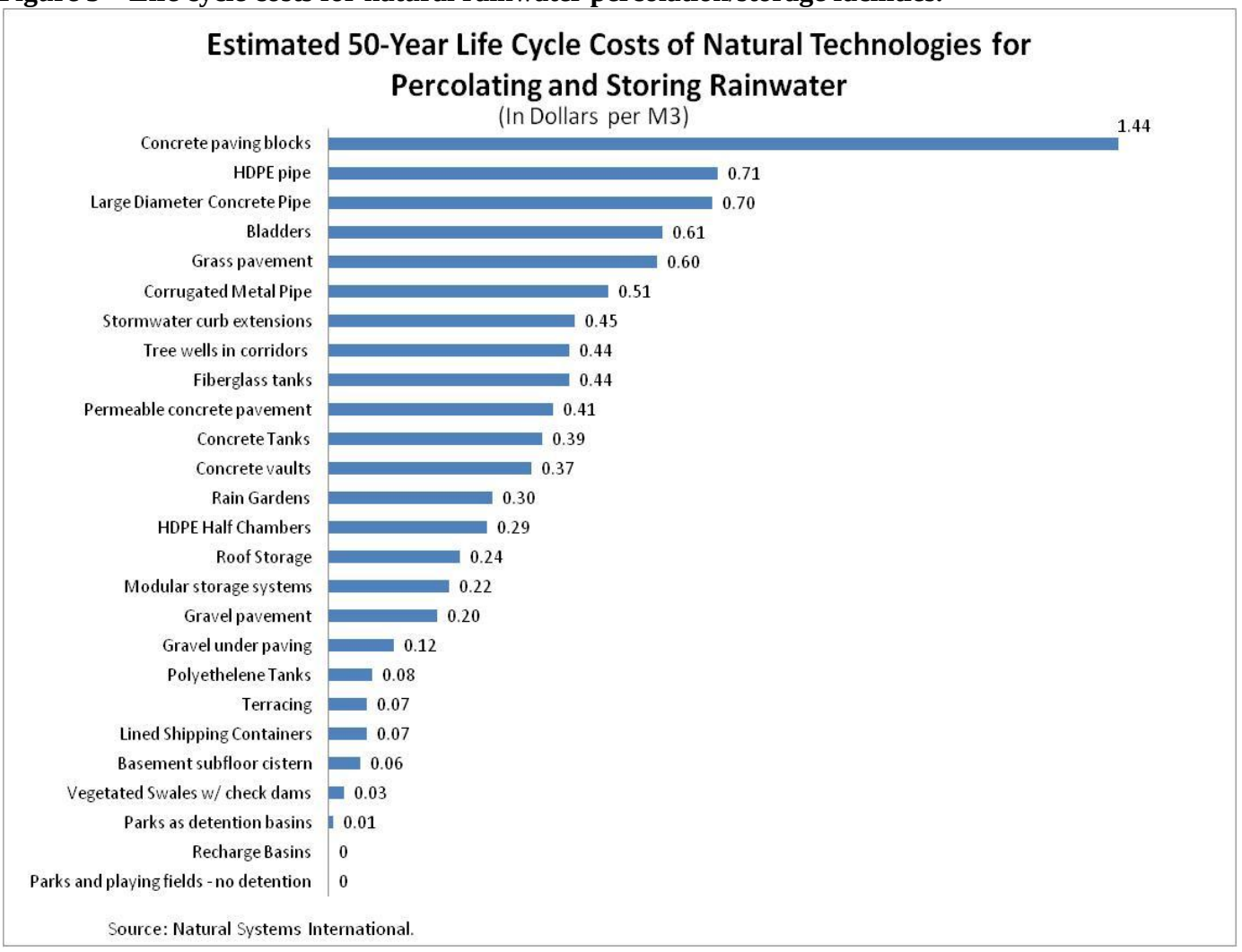
3. COST-EFFECTIVENESS OF THE PROJECT

66. As noted above, the project is expected to bring direct benefits to about 3,000 people in the project intervention areas and indirect benefits to another 31,000 who live in the immediate downstream areas below Apopa and Santa Tecla which are normally subjected to flooding during extreme rainfall events. In the simplest type of analysis, and taking from the assumptions and analysis in Section 2 above, an investment of US$ 3.5 million can save US$ 33 million in the next extreme rainfall event in the Apopa and Santa Tecla neighborhoods (sometime in the next few years), and US$ 135 million over 50 years (in 2011 dollars), with proper operation and maintenance of the storm water management schemes in these two neighborhoods (about 38x the initial investment, in 2011 dollars, and with no future discounting; benefits far outweighing the costs). This is much more cost-effective than maintaining the status quo (doing nothing; replacing damaged infrastructure with the same designs and forms in the same locations, each time there is a flood and erosion).

67. Climate-related disasters in El Salvador have high economic, social, and environmental costs. As suggested above, previous efforts to reduce these costs have not yielded adequate results. Infrastructure damaged by flooding is reconstructed at the same location and with only slight modifications to the building design, or none at all. The same infrastructure is damaged during the next extreme rainfall event in the same manner, sometimes only a few months later; a needless recurrent cost that has virtually no benefits. Another common response during extreme rainfall events, the evacuation of inhabitants located in hazardous areas, is particularly complex. The sheer number of inhabitants in hazardous situations, and their common reluctance to relocate to other areas, limit the various alternatives to reduce their vulnerability. Corrective actions in the lower part of the basin in the MASS have proven to be very expensive (and needlessly recurrent) and have had decreasing effectiveness given the increased runoff in

the upper part of the MASS basins in recent years. Clearly, the time has come for an end to reactive responses, which are extremely wasteful of government resources, and investments, such as those proposed in this project, can be promoted as a more cost-effective means to reduce or eliminate risks associated with extreme rainfall events altogether.

Figure 5 – Life cycle costs for natural rainwater percolation/storage facilities.



68. The alternative response proposed here is application of the most viable natural technological options available with limited costs of operation, maintenance, and repair. A technical pre-feasibility analysis and cost-benefit analysis was undertaken to help select the Apopa and Santa Tecla sites, two neighborhoods where the proposed combination of technologies can provide the maximum benefit for the funding amounts proposed. The technical pre-feasibility took into account factors such as land availability, social constraints,

public financing, political constraints, etc., and the optimal mix of technologies, based on efficiency criteria, including hydraulic impacts and economic costs and benefits. These are examined in detail below.

69. The cost-effectiveness analysis for the proposed concrete adaptation actions at Apopa and Santa Tecla, and their scaling up to cover other sub-basins in the MASS area, involved the following steps:

- estimating the damage from extreme rainfall events in the MASS;
- apportioning the damage among the various scales of events;
- calculating the potential damage costs, and net benefits from precluding them, for rainfall events in the Santa Tecla and Apopa areas; and,
- scaling up the net benefits expected from the Apopa and Santa Tecla interventions to the MASS.

70. The assumptions that were incorporated into the cost-effectiveness analysis are as follows[22]:

- total average annual damage from storm events in El Salvador is US$ 353 million;
- 70% of the total damage occurs in the MASS; and,
- 55% of all damage in the MASS occurs in the Arenal de Montserrat Basin (AMB; the location of Santa Tecla and San Salvador).

71. Thus, the total annual damage in the AMB is estimated to be equal to $135.9 million. Assuming that damage is mainly related to the volume of water and the velocity of discharge (the faster and larger the flow in the drainage channel, the greater the damage), costs can be apportioned to various degrees of storm events as follows:

- 1% from small storm events (1,512,000 m^3/day storm water) = $1,359,000;
- 5% from medium-sized storm events (2,683,800 m^3/day storm water) = $6,795,000; and,
- 94% of damage costs are due to severe storm events (4,951,800 m^3/day of storm water) = $127,746,000.

72. As described above, the estimated total annual damage in the AMB is equal to $135.9 million. The volume of annual flood waters received in the AMB, for which some damage occurred, is 0.738 m/year x the area in the watershed of Arenal de Montserrat (47 km^2), for a total of 34,686,000 m^3/yr. Therefore, the damage cost in the AMB is $3.92/$m^3$ per annum at current prices. The corollary is that every m^3 of storm water retained or percolated into the aquifer is valued at $3.92/$m^3$ annually[23]. These annual benefits will occur over a 50-year life cycle, while construction costs are immediate. In order to determine the present value of the benefits from the Apopa and Santa Tecla interventions, a discount rate can be applied. The lowest rate that the Central Bank of El Salvador charges for long term operations, defined as

[22] Based on the pre-feasibility and cost-effectiveness analysis undertaken as part of this proposal preparation.

[23] This calculation can be conducted exclusively for extreme storm events, yielding the following results. Volume of water from severe storm events/yr = 0.0917m/yr, or 4,310,000 m^3/year in the MASS. Estimated damage = $127,746,000. Damage cost = $29.6/$m^3$ per year.

longer than one year, was 7.53% for July, 2011. For these calculations, applied to a longer 50-year period, the rate is set conservatively at 9% (present value multiplier = 11). Present value calculations for the proposed Santa Tecla and Apopa interventions are summarized below in Table 6.

Table 6. Present value calculations of the cost and benefit streams at Apopa and Santa Tecla over 50 Years (based on generalized damage costs in the past).

Project	Apopa	Santa Tecla
(1) Capital Cost	$ 2,333,178	$ 1,016,402
(2) Life Cycle Flood Waters Retained/Detained	115,608,372 m^3	34,104,389 m^3
(3) Annual Flood Water Retained/Detained	2,312,167 m^3	682,088 m^3
(4) Annual Benefit Stream at $3.92/m3	$ 9,063,696	$ 2,673,785
(5) Present Value of Benefits over 50-Year Life Cycle	$ 99,394,015	$ 29,321,176
(6) = (5) - (1)	$ 97,060,837	$ 26,589,268
(7) = (5)/ (1)	41.6	27.1

(6) Present value of benefits over 50-Year life cycle, minus capital cost.
(7) Present value of benefits over 50-Year life cycle per dollar of capital cost.

Likewise “severe storm event” values can be calculated

(8) Annual “Severe Storm” Flood Water Retained/Detained	286,709 m^3	84,784 m^3
(9) Annual Benefit Stream at $29.6/m3	$ 8,486,587	$ 2,509,606
(10) Present Value of Benefits over 50-Year Life Cycle	$ 93,352,450	$ 27.605.670
(11) = (10) - (1)	$ 91,019,272	$ 28,304,774
(12) = (10)/ (1)	40.0	27.8

(11) Present value of benefits over 50-Year life cycle, minus capital cost.
(12) Present value of benefits over 50-Year life cycle per dollar of capital cost.

73. These values (generalized damage cost estimates, based on volumes of water; Table 6) are very similar to the beneficiary analysis presented in Section 2, in which the economic value of the project can be assigned specifically to the direct and indirect beneficiaries. Assuming a total of 34,000 people who will benefit from the project, this represents a cost of about US$ 100 per beneficiary, with an average return of US$970 just with savings (repairs not required) in the first extreme rainfall event (and then a total return of about US$ 3,800 over 50 years). The very high present value presented in Table 6 demonstrates the cost-effectiveness of the proposed decentralized approach for the Apopa and Santa Tecla interventions and the attractiveness of the selected options.

74. While the proposed interventions in Apopa and Santa Tecla can be justified in their own right (based on the expected benefits and the cost-effectiveness of the proposed investments), the true incremental value of the project lies in the possibility of replication throughout the MASS area (Apopa and Santa Tecla are important for flood management, but evidently they cannot solve all the storm water management issues in the MASS). It is therefore useful to look at the value of scaling up the demonstration activities. This can be done by considering the requirements for 100 hectare blocks of the city, but assuming that not all storms can be detained/retained in a Master Plan for the MASS (no storm water management system can

retain/detain and/or percolate all the precipitation from a full hurricane; the best that can be done is to minimize damage by reducing the peak flow).

75. For the scaled-up analysis, the following assumptions for four scenarios were made, to help define the most realistic and affordable solutions for storm water management in the MASS area:

- the mix of technical options should attempt to detain/retain and percolate all of the storm water from the following storms: 40 mm/day, 71 mm/day, 131 mm/day, and 272 mm/3 days;
- the solutions will be based on minimal costs; and,
- the area considered in the analysis is a typical 100 ha section of the city.

76. The relative proportions of buildings, roads, parking areas, sidewalks, and parks/green space are based on typical urban areas. Four separate possible interventions, using 100 ha sites to allow comparisons, show the relative costs on a scale that will impact flood damage. The principal means to reduce damage requires that a sufficient amount of the storm water run-off be retained/detained or percolated, to reduce the hydrograph at the lower, restricted end of any watershed reach. For example, as noted previously, in the Arenal de Montserrat watershed, reducing the total peak flow by any significant percentage during a severe storm will reduce both the water level in drainage structures and the energy that causes the flood damage. Using techniques developed for Apopa and Santa Tecla, various options were selected based on the assumptions above. The four scenarios, based on increasing intensity of storm events, are as follows:

- A = impact of a minor storm (40 mm/day);
- B = impact of a major storm (71 mm/day);
- C = impact of a severe storm (131 mm/day); and,
- D = impact of 3 day storm/hurricane (272 mm/3 days).

77. Table 7 shows the present value calculations for the four scenarios over 50 years with a discount rate of 9%.

Table 7. Comparisons of four scenarios for 100 ha regions.

Scenario	**A**	**B**	**C**	**D**
Capital Cost ($)	1,052,454	1,124,705	1,336,673	16,570,332
Storm water volume retained/event (m^3)	34,900	49,800	91,550	188,100
Annual Benefit Stream ($)	30,985	126,387	2,363,301	4,854,348
Present Value of Benefits (50 years)	339,648	1,385,414	25,905,754	53,211,818
Net PV = PV-Capital	**- 712,806**	**+ 260,709**	**+ 24,569,081**	**+ 36,641,486**

88. From the summary table, it is clear that Scenario A does not warrant investment, since small storms cause little damage in relationship to bigger ones, and the investment in technical measures does not have any return. Addressing Scenario B is only just viable. Investments in addressing Scenarios C and D would be extremely viable, although investments in addressing Scenario C are clearly more affordable in terms of capital. Addressing Scenario D (3 day hurricane) costs 12.4 times more than Scenario C for twice the storm water volume retained. Investments in Scenario C are clearly the most efficient in terms of $/$m^3$. The main conclusion here with the scaling up is that it is possible to install technical measures to address the most

frequent storm events; the rate of return is very good. The most extreme events can also be addressed, but will require huge capital investment if *all* storm water is to be detained/retained. Even investments that are designed for 131 mm/day will help reduce the peak flows from hurricane events, and therefore reduce the severity of damage, so these are optimal measures when scaling up beyond the Apopa and Santa Tecla demonstrations. It is important to note that, while the infrastructure in options A,B, and C cannot retain water volumes above a specific design flow, this does not mean that precipitation exceeding this flow will permanently damage the infrastructure. The calculations presented here assume a 50 year infrastructure lifespan, with a capacity to resist any rainfall event expected in this time period. What differs between each option is the capacity to retain a water under events of different intensity.

79. The high potential of replicability throughout the MASS of the cost-effective measures that will be implemented in Santa Tecla and Apopa offers a large prospect of return on investment of the funds invested in the project.

4. CONSISTENCY WITH NATIONAL OR SUB-NATIONAL SUSTAINABLE DEVELOPMENT STRATEGIES

80. The 5-Year National Development Plan (2010-2014) for El Salvador identifies climate change as a serious challenge for national development. It recognizes the importance of reducing social and urban vulnerability to natural hazards. The plan places emphasis on risk reduction and proposes the strengthening of the National Civic Protection System, the creation of Technical Civic Protection Commissions at the departmental and municipal level, and improving the National Early Warning System. These are important steps to increase the protection of the population in a country exposed to extreme climatic events. Furthermore, the "National Programme of Ecosystem and Landscape Restoration" (PREP) a national program promoting climate change adaptation, was launched formally on 07 of May 2012 by the Ministry of Environment (MARN) jointly with the Ministry of Public Works (MOP), the Ministry of Agriculture (MAG) and the Technical Secretary of the Presidency (STP), and has four components; the promotion of sustainable agriculture, the restoration and conservation of critical ecosystems such as mangroves, forests and wetlands; the development of physical infrastructure in combination with natural infrastructure; and the joint work of government entities with local actors. In addition to these institutional risk reduction strategies and actions, it is necessary to take additional fundamental technical steps to build resilience and adaptation to climate change, creating the substance that the various proposed systems and commissions can develop and promote. The Project will therefore assist the government of El Salvador in revising its approach, to incorporate more integrated strategies and technical measures in priority areas, leading to a higher level of resilience in the most vulnerable communities. The MOP and the MARN have specifically requested this support.

81. The 5-year National Development Plan also includes as a priority the reduction of poverty and income inequality in the country and an efficient reduction of environmental risks with results in the short and long-term. It also promotes citizen participation in the creation of public policies. These are strategies consistent with the objectives and strategies of this project, especially as low-income vulnerable communities are targeted in the demonstration activities and will be involved in design, construction, and maintenance of the various structures.

82. The project recognizes that adapting to climate change is not dissociated from the development challenges of society in El Salvador and in general. The reduction of vulnerability to climate change is related to strengthening livelihood alternatives of lower-income social groups and multidimensional strategies to reduce environmental stress, which in turn help to create security in communities and social cohesion. Building communities that are resilient to climate change requires institutional strengthening, which is considered in detail in Component 3 of this project.

83. The National Development Plan also calls for the implementation of a social urban programme (Comunidades Urbanas Solidarias) to reduce poverty and improve the livelihoods of marginalized groups in the country. One of the sites selected for this pilot social programme is the Municipality of Apopa, where the demonstrative cases of Santa Carlota I, Santa Carlota II y Campo de Oro are located (Output 1.4). The second case (La Cruz) in the municipality of Santa Tecla, will also help strengthen an important development project for the municipality and the Vice-Ministry of Housing.

84. The MOP has recently created a new direction for climate change adaptation and strategic risk management (DACCGER). 18 new specialized professionals have been contracted. The project will serve as an important vehicle to strengthen this newly formed department and help prepare valuable tools to enhance their capacity. Additionally, the MARN is in the preparation process of a National Climate Change Plan that integrates mitigation and adaptation strategies. The project will provide consistent inputs for the implementation of this Climate Change Plan in vulnerable urban areas. El Salvador is currently in the process of finalizing the Second National Communication on Climate Change to the UNFCCC. The adaptation to climate risks, in particular extreme rainfall is established as a principal priority, considering the vulnerability of the country to the new climatic conditions. The project will respond with concrete adaptation actions to this priority.

85. In October 2011, after the passage of the Tropical Depression 12 E and its disastrous effects on Central America, in particular on El Salvador, the presidents of the region emitted the Declaration of Comalapa which states that the countries in the region decide “to develop as a permanent practice the transformation of techniques in the process of construction and reconstruction of the physical infrastructure of [the countries in the region] taking into account the increasing and acute changes in the parameters used, due to the consequences of the climatic variability and climate change that recurrently prejudice the countries of [the] region”. El Salvador has taken a leadership role in that process through the strong alliance between the MOP and the MARN. The project will strengthen the capacity of El Salvador to respond to this declaration by the identification and implementation of concrete adaptation actions that reduces the impact of extreme rainfall in a cost-effective manner.

86. The sustainability of the project is ensured through the following means:

a) Infrastructure investment. Appropriate operation and maintenance mechanisms will be established at the municipal level. Community involvement will also be fostered as good use of facilities is essential maintain drainage infrastructure operating. Likewise, misuse of facilities easily causes damage such as clogging, which can have a major impact on infrastructure. Hence, local capacity building will be essential.

b) Government commitment. The severe damages caused by intense rainfall events in recent year have ensured that the issue of minimizing infrastructure damage is a top priority. The main

contribution that this project provides is technical assistance for planning, coordination, and preventive response. National capacities will be strengthened to improve the country's capacity to prepare for such events by minimizing peak water flows which cause the post damage. This includes the incorporation of preventive measures into infrastructure designs, the development of an integrated water flow analysis for the MASS, and the revision of construction standards, amongst others. These are systemic changes to analyzing infrastructure investment that will last beyond the project lifetime.

c) Community involvement – Stakeholder participation is a key factor to ensure the project sustainability. As citizens further understand the preventive measures they can take to reduce their vulnerability, the resilience of communities increases substantially. As such, the project will foster active citizen engagement in both the construction and the management arrangements of water retention facilities. The visible impact of the measures to be implemented by the project will be shared across communities to demonstrate the feasibility of relatively simple solutions. For this reason, component 3 of the project is considered essential as it fosters such knowledge sharing and capacity development.

5. HOW THE PROJECT MEETS RELEVANT NATIONAL TECHNICAL STANDARDS

87. The project will be consistent with all national, as well as UNDP, social and environmental safeguards and It will meet national and sub-national standards related to the development of infrastructure. The reduction of social and urban vulnerability is consistent with the standards established in the 2005 Law for Civil Protection and the Reduction of Environmental Emergencies. The project is also in line with the new regulation of MASS (OPAMSS 2009) requiring water harvesting in new housing developments in the upper basins. It is also consistent with current building codes and standards in the MASS (baseline). However, it is important to note that, under Component 2, the project will seek to update national construction and infrastructure standards to increase the country's resilience to climate change.

88. Under article 21 of El Salvador Environmental Law, all new urbanization and construction projects or works that can cause negative environmental impacts requires an Environmental Impact Study (EIS). However, this law was modified in 2006, granting an exception to projects that impact a land area of less than 7,000 m3 in urban areas. The municipality of Santa Tecla has confirmed that they do not need to perform a full EIS for the urbanization project of La Gran Manzana since it meets the criteria for the exception

89. The proposed measures consist of small decentralized interventions and do not require EIS, since they are considered "Category A" interventions with low environmental impact. However, for each specific measure an assessment will be performed jointly between the MOP and the MARN prior to construction to evaluate and mitigate the potential environmental impacts.

90. UNDP-supported donor-funded projects are required to follow the mandatory requirements outlined in the UNDP Programme and Operational Policies and Procedures (UNDP POPP). This includes the requirement that all UNDP development solutions must always reflect local circumstances and aspirations and draw upon national actors and capabilities. Moreover, all UNDP-supported donor-funded projects are appraised before approval. During appraisal, appropriate UNDP representatives and stakeholders ensure that the project has been designed with a clear focus on agreed results. The appraisal is conducted through the formal meeting of the Project Appraisal Committee (PAC) established by the UNDP Resident Representative.

The PAC representatives are independent in that they should not have participated in the formulation of the project and should have no vested interest in the approval of the project. Appraisal is based on a detailed quality programming checklist which ensures, amongst other things, that necessary safeguards have been addressed and incorporated into the project design.

6. DUPLICATION WITH OTHER FUNDING SOURCES

91. There is no duplication with other funding sources. El Salvador currently has no other funding sources for reducing the vulnerability of communities in the MASS to flooding and water stress and for building resilience and climate change adaptation capacity. The project builds upon national urban infrastructure development investments to ensure the incorporation of cost-effective, state-of-the-art adaptation measures, thus ensuring the complementarity of national investments with the financing provided by the Adaptation Fund.

92. The project will be closely coordinated with the Millennium Development Goal Achievement Fund (MDGF) Joint Programme "Productive and Sustainable Dwelling and Urban Settlement" implemented jointly by UN-Habitat, UNIDO and UNDP with the Vice Ministry of Housing and Urban Development. This programme is also supporting the urbanization projects in Santa Tecla and Apopa and has three specific outcomes:

a. Improve the life conditions of the poorer population through the provision of new housing and housing improvements financed by the public and private sector by credits or subsidies. (This outcome is oriented to the creation of institutional, technical, normative, social, economic and financial conditions for the construction and improvement of housing in poor urban settlements, not directly in the housing construction.)

b. Strengthen the social housing construction value chain, offering services and products accessible for low income population.

c. Sustainable and integrated productive urban settlements. (Generation of social and economic opportunities for the population of the settlements)

There is no duplication of funding between both projects. The MDGF programme do not finance infrastructure nor housing The Adaptation Fund intervention will incorporate in the targeted urbanization the essential dimension of building climate resilient urban settlements through the implementation of decentralized cost-effective extreme rainfall management measures. Thus both projects are very complementary.

93. The MOP has received a donation from the government of Japan of 142 heavy machineries (equivalent to approximately US$ 16 million) to increase and enhance its operative capacity to respond to damages caused by extreme climatic events due to climate change. Additionally, the Government of Japan is supporting the newly formed Climate Change Unit of the MOP (DACCGER) through a three year technical assistance agreement that will offer technical assistance of Japanese experts for the preparation, revision and actualization of the inventories for the prevention of disaster on public infrastructure; revision and actualization of the evaluation of risks on public infrastructure; the establishment of priorities and elaboration of medium and long term plan for public infrastructure improvement works to prevent disasters, as well as donating specialized equipments and developing technical capacity of the staff of the

DACCGER. There is no duplication of funding with the Adaptation Fund proposed project as the technical expertise provided by Japan will be fully integrated into the project executing agency, and will therefore support the AF project implementation. The Japanese contribution consisting of equipment and staff and does not have an additional "project execution" budget that could overlap with the AF project. As such, the planning and prioritizing exercise to be conducted with Japanese technical assistance can be fully integrated to the AF project.

94. The MOP has requested a loan of US$ 50 million to the IDB which form parts of the support provided by the IDB for El Salvador Social Policy. The objective of this programme is to reduce the vulnerability and improve the condition of life of families that lives in precarious urban settlements exposed to flooding risks and landslide in the MASS. This programme will combine intervention for the improvement of neighborhoods, the mitigation of local risks, investments in structural solutions for the management of water and extend the access to social services. The loan will be divided in 3 components: (i) Integral improvement and risk mitigation of precarious urban settlements in the MASS (US$28.1 million); (ii) Reduction of the vulnerability of precarious urban settlements in the MASS through structural inversion in the MASS (US$ 20.7 million); Strengthening of capacity for the management of the operation (US$ 1.2 million). This loan programme has been approved. Thus the Adaptation Fund intervention offer the opportunity to prepare a conducive environment for the investment of large amounts of public funds into climate resilient infrastructure and demonstrate the complementarity between the proposed decentralized rainfall management measures in Santa Tecla and Apopa (AF intervention) and larger scale centralized downstream investments (IDB loan). Please refer to the table below for more detail on the complementarity between both initiatives.

Table 8 – Complementarity between key IDB and AF project activities

IDB Project Activities	**AF Project Complementarity**
Master drainage plan. Assessment and modeling studies for the primary and secondary systems as well as culvert projects in the AMSS, for purposes of formulating a structural drainage management plan.	Output 1.3 consists in the Development of a 5-year storm water master plan for the MASS that accounts for a likely range of water flows that includes increased intensity due to climate change. This plan is complementary to the IDB Master Drainage plan as it will focus on identifying and planning decentralized upstream interventions that will reduce peak flow to the primary and secondary drains. This plan will allow to design a more cost effective master drainage plan as it will ensure a more gradual discharge of storm water to the drainages. The product of output 1.3 will feed into the master drainage plan. Coordination will be ensured by the DACCGER who will be managing both interventions.
Detention basins and repair of culverts. Construction of a series of detention basins in selected watersheds in the AMSS	The approach proposed for the AF intervention will be complementary with the IDB proposal. The AF intervention will focus on decentralized actions which will have an effect in retaining storm water. The IDB loan proposal is focusing

	on a more traditional approach of detention basins. Both actions reinforce each other. The single approach of detention basins would not be feasible to retain storm water for the MASS as the area needed for detention would be too large. However, in combination with upstream decentralized measures, the detention basins will be more effective in reducing downstream peak flow. The AF intervention will demonstrate the results that can be obtained in an innovative decentralized approach, where all the elements of the urbanization are used to retain water reducing the area necessary for the detention basin.
A subset of at least 8 informal urban neighborhoods will be selected to implement actions to reduce their vulnerability. The actions and specific sites are not yet determined.	The AF intervention proposes concrete intervention in selected sites where the government is formalizing informal urban settlements. The measures implemented through the AF proposal will provide a range of options that can be replicated through the IDB loans.

7. LEARNING AND KNOWLEDGE MANAGEMENT COMPONENT TO CAPTURE AND DISSEMINATE LESSONS LEARNED

95. The appropriation of knowledge generated by the project by stakeholders is an important function of the project that will assist communities in El Salvador in better responding to the challenges of climate change. The project will make use of several instruments as part of its strategy to disseminate knowledge and information to the different actors involved in the project and to other potential users in El Salvador. These comprise Component 3 (funding of US$ 100,000), described in paragraphs 57-60. These details are summarized again below.

96. Dissemination of the lessons learned from the constraints and opportunities encountered during the implementation of the project will occur through workshops with local governments and stakeholders. The objective will be to accelerate the dissemination of project-based experiential information from the earliest days of the project, rather than waiting until its completion; this will also permit stakeholder reflection and observations that may help refine project activities that remain to be done. It is hoped that the workshops will also foster similar initiatives in other communities in El Salvador, thus leveraging the project activities, and building trust and understanding among stakeholders and public officials involved in their development. The project will carry out one-day workshops, every six months with relevant government officials and private sector stakeholders. The workshops will bring together project participants with mayors, public officials and decision makers from other municipalities, together with representatives from professional associations, the private sector, community-based organizations, NGOs, and academia. This will constitute an open forum to ensure broad-based

and varied perceptions in exploring adaptation solutions required for the development of sustainable infrastructure in El Salvador.

97. To increase knowledge and awareness of the requirements for climate change adaptation and the use of sustainable infrastructure, a communication campaign will be designed and implemented. The campaign will be disseminated through the media, professional forums, community events, and schools. The communication strategy will be based on the linkages between current urban and environmental problems in the MASS and the increasingly evident impacts of climate change. The campaign will be designed to keep the communities informed about climate change and the benefits of constructing resilient and sustainable communities through adaptive measures, as well as how individual measures and behaviors may have positive and negative impacts on infrastructure. Examples and lessons learned from the project will be used to illustrate the opportunities and benefits from appropriate adaptation responses. The intention is to target the communication campaign at vulnerable communities within the MASS area. The principal focus will be on how individual action can produce adaptation (or maladaptation, if poorly informed). For example, solid waste management is a serious problem in El Salvador and indiscriminate disposal contributes to flooding by clogging drains and canals with trash. For the proper functioning of the concrete actions in Output 1.4, it will be necessary to induce behavioral changes in parallel with the infrastructure solutions; the long-term benefits of proper respect for and maintenance of the technical measures will be clarified for all immediate beneficiaries. This communication campaign will be implemented throughout the lifetime of the project.

98. Building resilience and adaptation to climate change is a process that requires the development of new approaches and ways of thinking about growth and development. Incorporating the challenges posed by climate change into the training of new professionals will facilitate the process towards sustainability in El Salvador. This output will ensure the dissemination of the planning guidelines and norms, construction standards, building codes and tools prepared by the project through technical workshops noted previously. The workshops will be oriented to public officials from the national and municipal governments, and professional associations working with infrastructure planning, development management and maintenance in El Salvador.

8. THE CONSULTATIVE PROCESS DURING PROJECT PREPARATION

99. During the development process for this Project proposal, the MOP, the MARN, and UNDP jointly organized an international conference on infrastructure climate proofing in El Salvador. International experts from prestigious International Universities presented on the challenges that climate change poses on infrastructure development and its repercussions on society, including possible solutions for adaptation. Over 300 people, representing the public and private sector, civil society, the media, and academia participated. High-level representatives of the Ministry of Public Works and the Ministry of Environment of Guatemala, Honduras, Nicaragua, Panama, and Dominican Republic also participated. This event demonstrated the importance of climate change adaptation in relation to infrastructure in El Salvador, and the Central American region in general.

100. Following the conference, a workshop for the preparation of the project proposal was organized to define national adaptation priorities and receive inputs. This workshop included the participation of high-level representatives and their technical counterparts from the MOP,

MARN and SNET, Civil Protection, CEPREDENAC, the Association of Salvadoran Engineers and Architects (ASIA), the Salvadoran Chamber of Construction (CASALCO), FOVIAL, Vice-Ministry of Housing and Urban Development (VMVDU), SIECA, University Of California Riverside, Yale University, the Swiss Federal Institute of Technology Zurich (ETHZ), and UNDP. Additionally, specific bilateral consultations were held during the elaboration of the proposal with the MARN and SNET, MOP, VMVDU, FONAVIPO, and OPAMSS.

101. This project will integrate climate change adaptation components with already programmed developments, such as the Apopa and La Cruz urbanization projects. For each of these initiatives, consultation processes were previously held with the local governments and the local communities by the municipality of Apopa, The Vice Ministry of Housing and Urban Development (part of the MOP), and the Santa Tecla municipality (La Cruz). Additional stakeholders consultation process have been organized jointly by the MOP, the municipalities of Apopa and Santa Tecla and UNDP, the week of the 12 of December 2011 to present the specific activities of the project and the proposed interventions with the participation of the communities. 119 representative of the communities Santa Carlota I y II, Campo de Oro and La Cruz, of which 81 are women participated and received a presentation on the project. A questionnaire was distributed to receive comments. 81 representatives responded to the questionnaire consisting of the following questions:

i. What intervention has incidence in your community:
    a. Santa Carlota I y II
    b. Campo de Oro
    c. La Gran Manzana
ii. Is your community affected during rainfalls
    a. Yes
    b. No
iii. What problems generate rainfall in your community?
iv. Explain briefly in what consist the project
v. Do you consider the project beneficial for you and your community?
    a. Yes
    b. No
vi. What are the benefits that you consider that the project development will bring to your community
vii. What aspects do you consider have not been taken into account for the project development
viii. What are your recommendations to improve the project
ix. Are you interested in participating in some activities during the implementation of the project?
    a. Yes
    b. No
x. In what activity would you be interested to participate in during the development of the project?

100 % of the participants responded that the project is beneficial for their communities and 95% responded that they were interested in participating in some activities during the implementation. A number of participants of La Cruz community requested to receive more information during the implementation of the project. The communication campaign (output 3.2) will allow to responding to this demand and ensuring good communication with the members of the community on the activities related to the project.

The supporting material is presented in a separated annex to this project document (because of the size of the file).

Figure 6. Stakeholders consultation

102. An additional stakeholder consultation process, with the participation of the community leaders, has been organized jointly by the MOP and UNDP, on the week of April 16, 2012 to present the specific activities of the Adaptation Fund Project and the interventions.
28 leaders of the communities Santa Carlota I y II, Campo de Oro and La Cruz participated and received a detailed presentation on the proposed project activities and the selected interventions in their communities. A questionnaire was distributed to receive comments. 28 representatives responded to the questionnaire consisting of the following questions:

I. What intervention has incidence in your community?
a. Santa Carlota I y II
b. Campo de Oro
c. La Gran Manzana
II. Did you participate in previous consultation?
a. Yes
b. No
III. Is your community affected during rainfalls?
a. Yes
b. No
IV. What problems does rainfall generate in your community?
V. Explain briefly the activities proposed by the Adaptation Fund Project
VI. Do you consider these activities beneficial for you and your community?
a. Yes

b. No
VII. Why or why not?
VIII. What aspects do you consider have not been taken into account for the project development?

IX. What are your recommendations to improve the AF Project?
X. Are you interested in participating in some activities during the implementation of the project?
a. Yes
b. No
XI. In what activity would you be interested to participate in during the development of the project?

103. 75% of the participants said their community had problems with rainfall, 97 % of the participants responded that the project is beneficial for their communities and 86% responded that they were interested in participating in some activities during the implementation.
In Apopa the principal interest is in terracing, because this activity has the joint benefit of reducing storm water runoff as well as supporting agricultural production. They community awaits the approval of this project with hope and enthusiasm, because it will help address the main issues they face every year: flooding and landslides.
In Santa Tecla, people are very interested in the water storage and reuse and also in the porous paving because they know and recognize the importance of filtering water not only to avoid flooding, but also to prevent runoff downstream.
The individual survey results are presented in a separate file due to their size.

9. JUSTIFICATION FOR FUNDING REQUESTED (FULL COST OF ADAPTATION REASONING)

104. Climate-related disasters have a high human, economic, social, and environmental cost in El Salvador. Given the constant "battering" that El Salvador has experienced lately, the Government and society have hardly had a chance to reflect on experiences and develop pre-emptive measures that can slow down or altogether prevent the huge level of suffering that the country has experienced due to extreme events. The default position has always been confined to reactive responses, seeking to protect human life through the evacuation of the most vulnerable population at the last minute. Dwellings and infrastructure damaged by flooding, erosion and landslides after each extreme rainfall event have been reconstructed in the same locations and with only slight modifications in their building designs. The same areas have been damaged during the following extreme event, sometimes only a few months later. Particularly critical is the loss of human life and the damage to property among the poorest groups. The situation prevails: low socioeconomic conditions in a large percentage of the population in the country and the limited financial resources of the National Government to meet the demand for housing and suitable urban space, hinders the relocation of vulnerable inhabitants located in hazardous areas.

105. The large number of inhabitants in these critical areas, and their reluctance to relocate to safe areas (as well as the lack of options, noted above), limits the alternatives available to reduce their vulnerability to extreme weather events. Furthermore, natural population growth and rural-to-urban migration continuously exacerbate the situation, now compounded by the almost certain risk of increased frequency and intensity of extreme rainfall events. The country,

and particularly MASS, cannot afford to follow the same path of growth under the current climate change scenarios. As noted previously, the National Government of El Salvador recognizes the urgent need to adapt to climate change within the context of sustainable development. Initial provisions have been included in the 5-Year National Development Plan 2010-2014), and the National Government has also strengthened and expanded the mandate of the MOP and the MARN to address risk reduction and prevention in El Salvador. Despite the political will of the government, these ministries and other agencies in the national and municipal governments need to strengthen their capacities and expertise to promote and facilitate adaptation and resilience to climate change. The country also needs to expand public awareness about climate change and to foster proactive engagement of the communities.

106. The proposed Adaptation Fund project is a critically important opportunity to step aside from the institutional inertia and difficulties of inadequate responsive action that currently define climate change management in El Salvador (the institutional baseline for this project). The project is therefore designed to assist El Salvador, and particularly the MASS, to overcome obstacles and deficiencies related to extreme rainfall events in urban areas and to increase the resilience of low-income communities in their current locations through an innovative combination of technical measures to retain storm water, supported with policy and regulatory change, and related information dissemination: this is the additionality of the Adaptation Fund project. The three components of the project will accelerate the learning curve of the public sector and society, through demonstration of appropriate technical measures in high-risk areas, necessary to build resilience in these areas and to promote their replication throughout other urban areas in El Salvador. This is discussed further below.

107. **Component 1: Infrastructure climate proofing in the Metropolitan Area of San Salvador.** The negative consequences of climatic events in MASS have demonstrated the importance and need to move beyond limited reactive responses. One of the major obstacles to improving responses to these events, and indeed preventing negative impacts from them, is incomplete information about the vulnerability to flooding, erosion, and landslides in the metropolitan area. Existing studies documenting flooding problems focus only on some of the basins. There are currently no comprehensive data and no consolidating studies that address the whole metropolitan area. The proposed integrated analysis of vulnerability to flooding of MASS would address this gap. Furthermore, existing studies do not consider the impacts of climate change in their analysis of the flooding problems; they are based on historical trends and do not included scaled-up rainfall events. There is also no study that documents social and urban vulnerability and exposure to climate change in MASS or any other urban area in the country. The lack of an integrated hydrological study of the metropolitan area compounds the current uncertainty associated with the impacts of climate change and creates obstacles to the design and implementation of adaptive actions (note that the selection of Apopa and Santa Tecla is based on a technical analysis, knowing that these areas are already impacted by flooding and that opportunities exist for pre-emptive storm water management as low-income housing development is planned in these neighborhoods).

108. The project will develop knowledge and strengthen local capacities and expertise to reduce social and urban vulnerability to climate change. The analysis of various storm water management measures and their suitability to different social and topographic situations in the MASS area will inform replication of measures throughout the upper basins in MASS to prevent flooding, erosion and other damage in the lower basin and enhance the resilience of urban communities to the negative impacts of climate change. The support from the Adaptation Fund

will be instrumental in establishing an appropriate urban planning process that recognizes the inevitability of more extreme rainfall events in the MASS area.

109. The Adaptation Fund intervention proposed in Output 1.4 will build upon the El Salvador Government's investment plans for low-income urban development and will incorporate innovative adaptation measures that will make the investments more sustainable and cost-effective. With the intervention from the Adaptation Fund, the Apopa site will gain a storm water management system that reduces storm water runoff in the village, and below, as well as agriculture areas above the dwellings. Similarly, the development project of La Cruz in Santa Tecla cannot integrate appropriate storm water management measures that can cope with climate change scenarios without the technical and financial support of the project. The project will also ensure that decentralized water management practices are implemented throughout the municipality, to retain rainwater during extreme events and diminish the peak volumes of runoff and their impacts on the lower parts of MASS. The Apopa and Santa Tecla cases will establish valuable precedents to clearly illustrate the benefits of increasing climate resilience in urban settings, without re-locating people. The whole process in Component 1 will also clarify the optimal process for identifying areas for interventions, selecting appropriate combinations of storm water management technologies, and monitoring their effectiveness, to encourage their replication throughout the MASS area. The details noted above indicate the expected transition from the current constrained situation of climate change impact in the MASS to improved climate resilience in selected urban areas with the positive impact of the Adaptation Fund project. Table 8 clarifies the additionality of the project, compared to the baseline, for Component 1.

Table 9. Component 1 - summary of justification for requested funds.

Baseline (without AF Resources)	Additionality (with AF Resources)
• The MASS only has a few isolated hydrological studies and does not have an integrated analysis of the vulnerability of its areas to precipitation. Regarding urban planning, there is a lack of comprehensive information that prevents decision-makers from implementing concrete adaptive measures to reduce the exposure of vulnerable communities in the Metropolitan Area. • Previous solutions, responding to increased precipitation in MASS, have focused principally on downstream areas and have not given satisfactory results. Previous technical mistakes are repeated. • Reflecting the points above, the selected sites for intervention have been developed with a traditional storm water management system that complies with the regulations, but does not address climate change risks. These areas are therefore likely to be vulnerable to	Outputs 1.1 – 1.4 address the information and planning deficiencies of the baseline situation, and Output 1.4 demonstrates *application* of best practices in two vulnerable areas in the MASS; as follows: 1.1 An integrated analysis of flooding and erosion vulnerability in the MASS area. 1.2 Implementation, in coordination with the Government of El Salvador, of an integrated database for flooding, including hydraulic and economic variables for 2012. 1.3 Development of a 5-year storm water master plan for MASS. • The development of an integrated analysis of vulnerability to precipitation in MASS will define the areas where the capture and retention of runoff water can be more effective to reduce the overflow of primary and secondary drains in the municipal storm water system and will assist local and national authorities and stakeholders in identifying social groups most at risk and needing attention (beyond the two areas to be addressed by the project). This will then be integrated into a flood database (for ongoing monitoring of the effectiveness of the technical measures) that can then inform the storm water master

Baseline (without AF Resources)	Additionality (with AF Resources)
extreme rainfall events expected even in the most benign climate change scenarios for El Salvador, and to generate additional risks in the lower basin. • Similarly, the status quo for the Santa Tecla water management system is inadequate, with extreme rainfall events causing excessive runoff and flooding in the lower part of MASS.	plan for the MASS area that will direct planning to priority vulnerable areas in the future, as the technical measures demonstrated in this project are replicated. 1.4 Based on the above-noted studies and master plan, resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability. • The project will incorporate climate resilient infrastructure measures in Apopa to ensure that the ongoing urbanization in this area includes a sound storm water management system that is cost effective and can cope with climate-induced extreme rainfall events over the lifetime of the investment. • With the support of the Adaptation Fund project, a decentralized storm water management system will be developed in Santa Tecla to retain water during extreme events and to diminish the peak volumes of runoff and their impacts on the lower part of MASS, as well as allowing retention of water for use.

110. **Component 2: Institutional strengthening.** Strengthening national and local capacities is an essential step in helping public institutions, and communities, become more efficient and effective in responding to the challenges inflicted by climate change. The second component of the project is designed to support institutional strengthening that will enhance preparedness for climate change in the future, and will build on the lessons learned from Component 1, especially the planning and application of measures in Apopa and Santa Tecla. Without the support of the Adaptation Fund, the three outputs included in this component and their collective outcome will not be attained, and the National and Local governments will lack planning guidelines that incorporate climate change adaptation for the development of resilient human settlements in the MASS (and throughout El Salvador). Also, it is unlikely that, without the Adaptation Fund project, building codes and standards will be updated and modified (based on the experiences in Component 1) to cope with the new climate change reality. The baseline and AF additionality are summarized below in Table 9.

Table 10. Component 2 - summary of justification for requested funds.

Baseline (without AF Resources)	Additionality (with AF Resources)
• Current infrastructure planning guidelines and norms, construction standards, building codes and decision-making tools consider only past rainfall patterns and do not properly integrate new projected risks from climate change, as well as the effect of unplanned urbanization on storm water	Outputs 2.1 – 2.3 will address the deficiencies in institutional capacity noted to the left, by incorporating the experience and innovation from implementation of Component 1 into suitable policies and guidelines, as well as building up the understanding and relationships between Government and civil society required to implement climate resilience measures, as follows:

Baseline (without AF Resources)	Additionality (with AF Resources)
management. • Lack of coordination within the public sector at the national level and between officials at the national and the municipal level, which is required to promote comprehensive adaptation measures in response to increasing precipitation, and to move away from expensive and ineffective reactive responses to emergencies.	2.1 Policy guidelines to improve the planning for climate resilient human settlements in El Salvador. 2.2 Revised and improved building codes and planning standards for climate-resilient public infrastructure. 2.3 Established coordination mechanism among public institutions and between the public sector and other stakeholders. • The Project will revise current infrastructure planning guidelines and norms, construction standards, and building codes, based on the experiences and feedback from implementation of Component 1, to integrate climate change considerations and enhance decision-making tools to address the new reality of climate change in urban areas in El Salvador. • The project will facilitate collaboration and synergies between the public and private sectors, by involving both in the planning, design, and implementation of the climate resilient initiatives in this project.

111. **Component 3: Knowledge management and dissemination.** The appropriation of knowledge generated by the project by stakeholders, who need to be aware of climate change risks and informed as to the most appropriate, practical solutions, is an important element of the project. The project will make use of several delivery methods, based on lessons learned from the design and implementation of activities. These include: workshops with local governments and stakeholders; a communication campaign to increase public knowledge and awareness of the need for climate change adaptation and practical measures that households can take; and, technical workshops for engineers and architects related to the development of planning guidelines, norms, construction standards, and building codes (in association with Component 2). Support from the Adaptation Fund is instrumental to implement these activities. It is difficult for a country with resource limitations to divert scarce funds to carry out these important adaptation activities, and furthermore, the experiences from Component 1 and the institutional strengthening addressed in Component 2 are required to inform all the knowledge management and dissemination expected in Component 3. The expectation is that the knowledge generated by the project and its communication to all elements of Government and urban society will create a solid basis to encourage new ways of thinking about development alternatives that can build climate resilience in urban areas in El Salvador. The baseline and the additionality of the proposed AF funds are summarized below.

Table 11. Component 3 - summary of justification for requested funds.

Baseline (without AF Resources)	Additionality (with AF Resources)
• Lack of understanding and limited communication, within the ranks of Government and civil society, regarding the links between current urban and	The proposed Adaptation Fund project will provide an important and unique opportunity to learn from design, implementation and monitoring of innovative combinations of technical measures, and development of related policies

Baseline (without AF Resources)	Additionality (with AF Resources)
environmental problems in MASS and the increasing frequency and intensity of extreme rainfall events. As a consequence, inability to plan appropriate (technically sound and spatially correct) measures to reduce the impacts of storm water in urban settings.	and guidelines, and expose these to all relevant stakeholders who should be involved in future climate resilience initiatives. This will be accomplished through Outputs 3.1 – 3.3, noted below: 3.1 Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders. 3.2 'Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure. 3.3 Dissemination of technical specifications, revised building codes, and relevant planning guidelines. • The most important aspect of additionality with this project is the opportunity to involve communities and Government in the design and implementation of the initiatives in Apopa and Santa Tecla, incorporate the optimal strategies into suitable policies and guidelines, and disseminate all of these in a manner which facilitates replication in other urban areas in El Salvador. Without the project experience to base the dissemination on, a communication campaign would be based solely on theoretical knowledge, which is much less compelling.

PART III: IMPLEMENTATION ARRANGEMENTS

A. ARRANGEMENTS FOR PROJECT IMPLEMENTATION

112. The Government of El Salvador will execute this four-year project with the support of UNDP under UNDP´s National Implementation modality (NIM). The Ministry of Public Works, Transport, Housing and Urban Development (MOP) will be the National Implementing Agency for the project. The MOP will be responsible for ensuring that the stated project objectives and components are delivered, and that resources are allocated and disbursed in an efficient and effective manner as detailed in the Project Document.

113. The implementation of the project will be carried out under the general guidance of a Project Steering Committee (PSC), specially formed for this purpose. It will be chaired by the Minister of Public Works, Transport, Housing and Urban Development, the Minister of Environment and Natural Resources (MARN), and the Resident Representative of UNDP El Salvador. The PSC will be responsible for ensuring effective coordination between this Project and other relevant initiatives in El Salvador. The project structure will be constituted by a National Project Director (NPD) a National Project Coordinator (NPC) and a Project Assistant (PA). The NPD will be a high-level representative of the MOP and will be responsible for

supervising the project on behalf of the MOP and orientating and advising the National Project Coordinator on Government policy and priorities.

114. UNDP will also be responsible for maintaining regular communication with the MARN, and ensuring that their priorities and interests are addressed effectively. The NPC will be located in the MOP and will be supported by a technical team. The NPC will have the authority to run the project on a day-to-day basis on behalf of the MOP within the constraints laid down by the PSC. The Project Manager will be responsible for day-to-day management and decision-making for the project. The NPC's prime responsibility will be to ensure that the project produces the outputs specified in the Project Document, to the required standard of quality and within the specified constraints of time and cost. The NPC will be contracted following the rules and procedures of UNDP.

115. In addition, a Consultative Committee will be established, comprising representatives from Local Governments (Apopa and Santa Tecla), civil society, the private sector, and academia. The Consultative Committee will provide guidance and technical feedback to the NPC with regard to project activities. The MOP will sign letters of agreement with relevant counterparts for the execution of specific components, including with the Mayors of Santa Tecla and Apopa. The Project Director, in collaboration with the Project Coordinator, will prepare an Annual Work Plan (AWP) that incorporates project activities and results to be delivered.

116. The AWP will define the execution timeframe and budget for each activity and the responsible parties for its implementation. The AWP will have to be approved by the PSC. The first AWP will be finalized and incorporated into the Project Document within 30 days of its signature. The participation of project counterparts will be essential for the success of the planning phase, during which the Annual Work Plan will be prepared.

117. Norms and procedures detailed in UNDP's Programme and Operations Policies and Procedures (POPP) will be applied. For its part, UNDP will provide support to the Implementing Partner (MOP), in order to maximize its reach and impact as well as the quality of its products. Moreover, on the request of the MOP, UNDP will administrate the resources in accordance with the specific objectives defined in the Project Document, and aligned with its key principles of transparency, competitiveness, efficiency, and economy. The financial management and accountability for the resources allocated, as well as other activities related to the execution of project activities, will be undertaken under the supervision of UNDP El Salvador Country Office. Project audit will follow UNDP Financial Regulations and Rules and applicable audit policies.

118. Once the project is approved and an operational AWP is prepared, UNDP El Salvador Country Office will be able, in those specific cases agreed with project counterparts, to charge the project directly for Execution Support Services according to UNDP's cost recovery policy. UNDP will also undertake the internal monitoring of the project and evaluation of activities, taking into account from the outset local capacities for administering the project, capacity limitations and requirements, as well as the effectiveness and efficiency of communications between ministries and other institutions that are relevant to the project.

B. MEASURES FOR FINANCIAL AND PROJECT RISK MANAGEMENT

119. Potential project risks are identified below, along with proposed countermeasures. It is assumed that all project risks are "owned" by both UNDP, as the Implementing Entity, and the MOP, as the Executing Entity, although UNDP has the ultimate responsibility with regard to all financial risks, and the right of cessation of activities, or withdrawal of funding in the event of risks that cannot be otherwise managed.

Table 12. Project risk management.

#	Description	Type	Implications: Impact (I) & Probability (P) (1=low; 5=high)	Countermeasures/ Management Response
1	Government endorsement of proposed policy changes, guidelines, and codes to improve climate resilience in El Salvador may face blocks or barriers in the administrative system (going from drafts to implementation).	Political	Wrangling over the specific meaning and implications of policies and guidelines/ codes could stall their completion and acceptance by Government and professional associations, which would hamper replication of innovative climate resilient infrastructure. P = 2 I = 5	The Project Steering Committee and various technical committees mandated with drafting these outputs will have many opportunities over several years to examine and modify the draft policies, guidelines, and codes, and clarify all their benefits, hopefully building up a consensus on the exact content of these documents.
2	Government of El Salvador commitment to climate change management could wane as development priorities or ongoing emergencies become more prominent and compete for attention.	Political	Momentum in the project and the drive to replicate the innovations demonstrated at Apopa and Santa Tecla could falter; also the case with the institutional strengthening. P = 2 I = 4	Constant reiteration of the risks of climate change and the positive net benefits of adaptation investments is required.
3	The planning construction schedules between the government funded and AF interventions may not be fully coordinated	Organizational	Delays in the design and implementation of activities at Apopa and Santa Tecla. P = 2 I = 4	Build on the government and political capital generated to date to validate and confirm Apopa and Santa Tecla as the initial demonstration sites. Extend promises to replicate activities in other locations as the technical measures are proven at Apopa and Santa Tecla.
4	There is a lack of momentum in replicating the demonstration initiatives; initial investments in innovation are resisted due to lack of understanding of the large possible returns in improved social/economic security during extreme events.	Political	The Apopa and Santa Tecla sites could remain solitary examples of climate resilience innovation, and other parts of the MASS will remain exposed to high risk extreme rainfall events. P = 1 I = 5	There is a very high return (in economic and social benefits) on the proposed climate resilience measures; these need to be constantly discussed and promoted to encourage future investment. Successes in Apopa and Santa Tecla (monitoring data) should help make the case for replication.
5	Establishing the final mix of technical measures at each of Apopa and Santa Tecla may be delayed by different specialist interpretations of feasibility and cost-effectiveness.	Organ-izational	Delays at Apopa and Santa Tecla could reduce the amount of time to construct and monitor the effectiveness of the various technical measures. P = 1 I = 4	The experimental nature in El Salvador of measures at both sites needs to be emphasized; monitoring and feedback on the effectiveness of those measures will be the best test of these approaches, rather than spending too much time on the fine details of technical measures and

#	Description	Type	Implications: Impact (I) & Probability (P) (1=low; 5=high)	Countermeasures/ Management Response
				their locations, and then delaying the most important part of the project. It´s also important to note that the proposed measures are all proven techniques and technologies that have demonstrated their effectiveness in other countries.
6	Local residents in Apopa and Santa Tecla do not assume interest in and ownership of the demonstration initiatives.	Organ-izational	The technical measures in Apopa and Santa Tecla could be assumed to be another government "service" and there is lack of community understanding of these measures, as well as possible higher risk of maintenance failures. P = 2 I = 3	There needs to be constant community input to the design and construction of the technical measures at both sites; this should be addressed by the community committees proposed for the project.
7	MOP may have limited management capacity for the project activities to be undertaken; the role of local and municipal governments may be unclear.	Organ-izational	Possible delays in the design and implementation of the demonstration activities at Apopa and Santa Tecla. P = 2 I = 4	The Project Steering Committee and UNDP can provide guidance and technical assistance to ensure that roles are clear, responsibilities are assigned, and financial resources are clearly defined for all human resource requirements.
8	There may be jurisdictional competition or lack of clarity in the responsibilities for the various guidelines and codes (monitoring and enforcement functions).	Regulatory	Delays in the final drafts of the various policies, guidelines, and codes; possible lack of enforcement as they are implemented. P = 1 I = 4	The technical committees established for this project should represent all the relevant agencies and departments and therefore allow consensus to be developed regarding specific roles and responsibilities for each guideline and code.
9	Delays in fund transfers and procurement of technical services and equipment.	Financial	Late funding (slow transfer of funds) or limited absorptive capacity for the project (UNDP/MOP) may delay some activities, and have a knock-on effect, as outputs from one component are required for the initiation of other components. P = 2 I = 5	Project activities have been designed and paced to ensure a reasonable chance of completion over four years (a timeframe less than this would be too ambitious); the Project Steering Committee will provide required oversight for management of project inputs.
10	Climate variability accelerates and extreme rainfall events occur more frequently than expected, disrupting the installation of technical measures at Apopa and Santa Tecla.	Environ-mental	Possible delays in the installation of technical measures at Apopa and Santa Tecla. P = 2 I = 5	Installation/ construction of the various technical measures should be confined to the dry season to minimize the risk of disruptions due to extreme rainfall events.

C. MONITORING AND EVALUATION ARRANGEMENTS

120. The monitoring and evaluation (M&E) scheme will be applied in accordance with the established UNDP procedures throughout the project lifetime. As an implementing partner, MOP, together with the UNDP El Salvador Country Office, will ensure the timeliness and quality of the project implementation. The M&E plan will be implemented as proposed in Table 12. Technical guidance and oversight will be provided by the UNDP's Regional Bureau for Latin America and the Caribbean (RBLAC), as well as the Project Steering Committee (PSC).

121. **Project start:** A Project Inception Workshop (IW) will be held within the first 3 months of project start with those having assigned roles in the project management (i.e., AF, UNDP El Salvador Country Office and where appropriate/feasible, regional technical advisors as well as other stakeholders). The IW is crucial to building ownership for the project results and to plan the first year annual work plan.

122. **Annual progress report:** An Annual Progress Report (APR) shall be prepared by the National Project Director, shared with the PSC and submitted to the AF. The APR will be prepared with progress assessed against set goals, objectives and targets, lessons learned, risk management and detailed financial disbursements.

123. **Mid-term evaluation of the project cycle:** The project will undergo an independent Mid-Term Evaluation (MTE) at the mid-point of project implementation (February 2014). The MTE will determine progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; it will also highlight issues requiring decisions and actions, and will present initial lessons learned about project design, implementation, and management. The findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term.

124. **Periodic monitoring through site visits:** UNDP El Salvador Country Office will conduct visits to project sites based on the agreed schedule in the project's Annual Work Plan to assess, first hand, project progress. Other members of the PSC may also join these visits.

125. **Project closure:** An independent Final Evaluation will take place 3 months prior to the final PSC meeting. The final evaluation will focus on the delivery of the project's results as initially planned and as corrected after the mid-term evaluation, if any such correction takes place. The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals.

Table 12. Project monitoring and evaluation scheme.

Type of M&E Activity	Responsible Parties	Budget US$	Time Frame
Inception workshop and report	▪ Project Manager ▪ UNDP CO, RBLAC, AF	3,000	Within first three months of project start up
Measurement of means of verification for project progress on *output and*	▪ Oversight by Project Director ▪ Project team	10,000	Annually prior to ARR/PIR and to the definition of annual

Type of M&E Activity	Responsible Parties	Budget US$	Time Frame
implementation			work plans
ARR/PIR	▪ Project Director and team ▪ UNDP El Salvador CO	0	Annually
Periodic status/ progress reports	▪ Project Director and team	0	Quarterly/Annually
Mid-term evaluation	▪ Project Director and team ▪ UNDP El Salvador CO ▪ UNDP RBLAC ▪ External Consultants (i.e., evaluation team)	30,000	2013
Final evaluation	▪ Project team ▪ UNDP El Salvador CO ▪ External Consultants (i.e., evaluation team)	34,000	2016, at least three months before the end of project implementation
NIM audit	▪ UNDP El Salvador CO ▪ Project Director and team	3,000	Annual
Visits to field sites	▪ UNDP El Salvador CO ▪ Government representatives ▪ Project Unit ▪ UNDP RBLAC	20,000	Yearly
TOTAL Indicative COST		**US$ 100,000**	

(The budget presented in this table does not include any costs of UNDP staff time and travel. Those costs are covered by the MIE fee and are not charged to the project budget.)

D. RESULTS FRAMEWORK FOR THE PROJECT PROPOSAL, INCLUDING MILESTONES, TARGETS, AND INDICATORS

130. The results framework and the detailed budget for the proposed project is presented below, with expected outputs for each outcome, performance indicators, means of verification, and responsibilities described. Activity budgets are also summarized in the summary of project components in Part 1.

Intended Outcome as stated in the Country Programme Results and Resource Framework: The Government will have formulated and implemented strategies, plans and mechanisms that promote disaster risk reduction
Applicable Key Result Area: Promote climate change adaptation
Project title: Promoting Climate Change Resilient Infrastructure Development in San Salvador Metropolitan Area
ATLAS Project ID and Award: Project ID 00081123 – Award 00064242

Outcomes	Outcome Targets	Outputs	Output Indicators	Means of Verification Outcome Level		Responsible Parties
				Method	Timing	
Outcome 1 (ATLAS Output) Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices <u>Indicators</u> • Two communities with stormwater technical measures in place and operational. • 3,000 direct beneficiaries and 31,000 indirect beneficiaries from improved	**1.** By 2016, two neighborhoods in the MASS with climate-proof water management infrastructure that provides protection and resilience to up to 3,000 people directly (with their households and land climate-proofed) and perhaps another 31,000 people indirectly (protected from flooding by the stormwater management infrastructure at the demonstration sites). Increased aquifer recharge to address possible urban water	**1.1** An integrated analysis of flooding and erosion vulnerability in the MASS area.	**1.1** Increased understanding of drainage capacity in the MASS area and vulnerability of specific neighbourhoods. Completed hydrological study with climate change scenarios incorporated. Social groups and specific areas identified for stormwater management options (no-go areas also identified). Fine-tuning of the technical details for Apopa and Santa Tecla.	**1.** Consultations with project participants in Apopa and Santa Tecla. Field visits (visual observations, before and after storm events). Field testing of water flows, particulate matter in water, etc, prior and after storm events.	**1.** Annual (first consultation at the beginning of the project, to determine expectations). Annual (at least, and after significant events). At the beginning (once operational) and after each significant rainfall event. In each of the last	**1.** MOP, MARN, relevant municipal governments, community advisory board, UNDP.

stormwater management measures. • A well-defined spectrum of technical options assigned to specific locations and social groups in the MASS area, for future replication. <u>Baseline</u> (2011) = No neighbourhoods in the MASS with adequate stormwater management infrastructure to cope with climate change induced extreme climatic events. All low-income communities exposed to extreme rainfall events. Inadequate scientific information on the interactions between hydrology and infrastructure in the MASS. Huge infrastructure damage costs and lost	shortages in the future. Adequate scientific and economic information to support replication of best practices throughout the AMSS	**1.2** An integrated database for flooding, including climate, hydraulic and economic variables.	**1.2** Data collection and analysis system in place, informing planners (weather and gauging stations). Storm damage assessments (locations and costs) done for specific weather events.	Review of the hydrological database (data collected during project period). Review of plans for climate-resilient urban development in MASS.	two years of the project.	
		1.3 Development of a 5-year stormwater master plan for the MASS that accounts for the likely range of climate change risks.	**1.3** Locations of optimal stormwater management options defined for the MASS. Stormwater management Investment options defined for future replication. Future development scenario of the MASS clarified, with climate change risks incorporated. Cost-recovery options for future investments defined.			

water resources during each extreme rainfall event.		**1.4** Resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability.	**1.4** 390 families in Apopa and 128 in Santa Tecla benefitted and involved in the installation and maintenance of stormwater management measures. Approximately 2.3 Million m^3 of annual water retention capacity infrastructure is built in Apopa Approximately 700,000 m^3 of annual water retention capacity infrastructure is built in Santa Tecla. Peak water flows in Apopa and Santa Tecla are significantly reduced in minor, major, and severe storm events Erosion is significantly reduced in the pilot locations of Santa Tecla and Apopa Soil maps and topographic site plans for Apopa and Santa Tecla. General community and Local Government involvement in intervention designs in Apopa and Santa Tecla (local community advisory board; agreements for infrastructure maintenance), with at least			

			50% female participation. Final design and implementation of stormwater management measures in Apopa and Santa Tecla. At least 50% of workforce employed in the communities during this project is female			

Outcomes	Outcome Targets	Outputs	Output Indicators	Means of Verification Outcome Level		Responsible Parties
				Method	Timing	
Outcome 2 (ATLAS Output) Increased capacity of the public sector to address climate change risks on infrastructure. <u>Indicators</u> • National and local government officials articulate an increased understanding of climate change risks and have identified possible solutions for stormwater management. • Future development plans for the MASS incorporate technical measures for stormwater management.	**2.** By 2016, increased capacity of the public sector to address climate change risks on infrastructure. Improved policy guidelines, building standards and codes, and coordination mechanisms that embody the planning and technical principles demonstrated, to facilitate their incorporation into future urban development in the MASS (and elsewhere in El Salvador).	**2.1** Development with the OPAMSS of policy guidelines to improve the planning for climate resilient human settlements in the MASS.	**2.1** Two national workshops and one regional workshop on planning urban growth with climate change risks addressed (with national and municipal decision-makers and planning officials). Website in place with relevant digital information on best practices available. Planning guidelines in place for development that accommodates climate change and specifies allowable retro-fitting of infrastructure. Zoning guidelines and regulations are updated for the MASS.	**2.** Discussions with relevant government officials. Review of draft policies, guidelines and codes. Review of MASS development plans. Interviews with practitioners (planners and developers).	**2.** Annual. In each of the third and fourth years of the project. In each of the third and fourth years of the project. In each of the third and fourth years of the project. .	**2.** MOP, MARN and UNDP in coordination with the OPAMSS

<u>Baseline</u> (2011) = Lack of understanding of the real impacts of climate change in urban areas and the kinds of measures required to address them in the future. Continuation of previous practices (responsive actions; evacuation; re-building in hazardous areas, rather than pre-emptive measures).		**2.2** Revised and improved building codes and planning standards for climate-resilient public infrastructure.	**2.2** Technical training (two days every six months) pertaining to climate change urban development and building climate resilient infrastructure (with international and regional experts). Technical committee (practitioners) in place to draft standards and codes that reflect climate resilience. Exploration of possible incentives (and enforcement measures) to encourage compliance with the new standards and codes. New standards and codes are enacted by policy making bodies..			

		2.3 Coordination mechanisms established between the MOP, the MARN, OPAMSS and other stakeholders to address climate change risks on infrastructure in the MASS.	**2.3** Appropriate case studies available on the website. Ongoing dialogue between all stakeholders (residents, constructer, and decision-makers).			

Outcomes	Outcome Targets	Outputs	Output Indicators	Means of Verification Outcome Level		Responsible Parties
				Method	Timing	
Outcome 3 (ATLAS Output) Increased public and private sector awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador. <u>Indicators</u> • Understanding of the national and local government and the communities of extreme rainfall related climate change risks and solutions for stormwater management. • Availability of market products and services for stormwater management. Baseline (2011) = Inconsistent understanding of risks	By 2016, increased public and private sector awareness of climate-related risks and technical options to create resilience, evident in planning documents and development approvals for urban areas. Local uptake of some measures by private households.	**3.1** Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders.	**3.1** Workshops for Local Government representatives and community stakeholders (one-day events every six months). At least one event focused on gender issues related to climate change	**3.** Review of urban planning documents and developer applications. Discussions with Local Government staff. Community consultations in different parts of the MASS. Consultations with technical service providers	**3.** Once at the beginning of the project and then annually in each of the last two years of the project. .	**3.** MOP, MARN and UNDP in coordination with the OPAMSS
		3.2 Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure.	**3.2** . Gender sensitive communication strategy developed to disseminate messages regarding climate change risks in urban areas. Urban communities informed about climate change risks and household and community-level technical options. Project case studies developed and disseminated (website and newsletters).			

associated with extreme rainfall events and a lack of awareness of technical options to address them. Urban planning does not accommodate these risks.		**3.3** Dissemination of technical specifications, revised building codes, and relevant planning guidelines.	**3.3** Workshops on technical specifications (development, infrastructure, and buildings) required for improved climate resilience in urban areas in El Salvador.			

Alignment of Project Objectives/Outcomes with Adaptation Fund Results Framework

Project Objective	Project Objective Indicators	Fund Outcomes	Fund Outcome Indicators
To reduce the vulnerability of selected urban areas in the Metropolitan Area of San Salvador to flooding, erosion, and landslides created by extreme precipitation associated with current climate variability and expected climate change in the near future	Number of households in the MASS protected from climate risks through adaptation measures Number of national and sub-national institutions with increased capacity to plan infrastructure and urban development with reduced vulnerability to climate risks	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses **Outcome 4:** Increased adaptive capacity within relevant development and natural resource sectors **Outcome 7:** Improved policies and regulations that promote and enforce resilience measures	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks 2.2. Number of people with reduced risk to extreme weather events
Project Outcomes	**Project Outcome Indicators**	**Fund Outputs**	**Fund Output Indicators**
1. Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices	• Two communities with stormwater technical measures in place, operational, and proved effective through ongoing monitoring (new operational database). • 3,000 direct beneficiaries and 31,000 indirect beneficiaries can demonstrate improved safety and security during the next extreme rainfall event. Increased rainwater harvesting. • A well-defined spectrum of technical options that can be assigned to specific locations and social groups in the MASS area, for future replication.	**Output 2.2*:*** Targeted population groups covered by adequate risk reduction systems **Output 4:** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	2.2.1. Percentage of population covered by adequate risk-reduction systems 2.2.2. No. of people affected by climate variability 4.1.1. No. and type of health or social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type) 4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting

			from climate variability and change (by asset types)
2. Increased capacity of the public sector to address climate change risks on infrastructure.	• National and local government officials articulate an increased understanding of climate change risks and clarity of views on possible solutions. • Future development plans for the MASS incorporate technical measures defined during this project. • Guidelines and codes in place, implemented by developers, and enforced.	**Output 7***:* Improved integration of climate-resilience strategies into country development plans	7.1. No., type, and sector of policies introduced or adjusted to address climate change risks 7.2. No. or targeted development strategies with incorporated climate change priorities enforced
3. Increased public and private sector awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador.	• Planning documents and developer applications reflect an increased understanding of climate change risks and include technical options for increasing resilience. • Long-term planning documents for the MASS area include capacity limits and infrastructure requirements to address climate change risks. • Local businesses start to market products and services that can be used at the household level to manage stormwater.	**Output 2.2***:* Targeted population groups covered by adequate risk reduction systems	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased

Project Budget

Project ID 00081123 – Award 00064242

Outcome 1	Budget Description (Atlas Code)	Amount Year 2012 (USD)	Amount Year 2013 (USD)	Amount Year 2014 (USD)	Amount Year 2015 (USD)	Total (USD)
1. Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices	71200 International Consultants	48,000	88,000	28,000	16,000	180,000
	71300 Local Consultants	59,600	112,800	48,000	16,000	236,400
	72100 Contractual Services -Workshops	17,500	30,000	25,000	9,600	82,100
	71600 Travel (flights, DSA, transportation; etc)	27,000	48,500	23,000	7,000	105,500
	72800 InfoTEchEq Special images (satellite) & Maps drafting	10,000	8,000	10,000	0	28,000
	74200 Audio visual and Printing	5,000	8,000	4,500	1,000	18,500
	72800 InformTEch Eq (Hardware data collection)	10,000	30,000	0	0	40,000
	74100 Professional Services (Technical measures inst)	0	350,000	2,000,000	1,000,000	3,350,000
	74100 Professional Services (Technicians)	20,000	40,000	0	0	60,000
	74500 Miscellaneous	6,500	11,500	7,000	2,000	27,000
	Total Outcome 1	**203,600**	**726,800**	**2,145,500**	**1,051,600**	**4,127,500**
Outcome 2	**Budget Description (Atlas Code)**	**Amount Year 2012 (USD)**	**Amount Year 2013 (USD)**	**Amount Year 2014 (USD)**	**Amount Year 2015 (USD)**	**Total (USD)**

2.Increased capacity of the public sector to address climate change risks on infrastructure.	71200 International Consultants	9,000	39,000	30,000	0	78,000
	71300 Local Consultants	15,000	84,000	49,000	0	148,000
	72100 Contractual Services -Workshops	2,000	27,500	30,500	0	60,000
	71600 Travel (flights, DSA, transportation; etc)	10,000	60,500	32,000	0	102,500
	72800 InfoTEchEq (Web site support)	0	7,500	5,000	0	12,500
	74200 Audio visual and Printing	1,000	11,000	7,000	0	19,000
	74500 Miscellaneous	1,000	10,000	6,000	0	17,000
	Total Outcome 2	**38,000**	**239,500**	**159,500**	**0**	**437,000**
Outcome 3	**Budget Description (Atlas Code)**	**Amount Year 2012 (USD)**	**Amount Year 2013 (USD)**	**Amount Year 2014 (USD)**	**Amount Year 2015 (USD)**	**Total (USD)**
3.Increased public and private sector awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador	71300 Local Consultants	0	5,000	27,000	18,000	50,000
	72100 Contractual Services -Workshops	0	2,000	14,000	16,000	32,000
	71600 Travel (flights, DSA, transportation; etc)	0	1,000	1,000	1,000	3,000
	72100 Contractual Services - Communication Strategy	0	0	10,000	0	10,000
	74200 Audio visual and Printing	0	0	0	4,000	4,000
	74500 Miscellaneous	0	250	250	500	1,000
	Total Outcome 3	**0**	**8,250**	**52,250**	**39,500**	**100,000**
Project Management	**Budget Description (Atlas Code)**	**Amount Year 2012**	**Amount Year 2013**	**Amount Year 2014**	**Amount Year 2015**	**Total (USD)**

		(USD)	(USD)	(USD)	(USD)	
PMU Setting and running	71400 Contr. Ser Individual Project Coordinator	26,600	45,600	45,600	45,600	163,400
	71400 Contr. Serv IndivualProject Assistant	8,400	14,400	14,400	14,400	51,600
	72800 IT equipment	6,000				6,000
	72200 Office furniture	5,000				5,000
	71600 Transport	2,000	2,500	2,500	2,500	9,500
	Total PM	**48,000**	**62,500**	**62,500**	**62,500**	**235,500**
	Total Project & Execution Costs	**289,600**	**1,037,050**	**2,419,750**	**1,153,600**	**4,900,000**
	Monitoring & Evaluation	**10,500**	**38,500**	**8,500**	**42,500**	**100,000**
	Grand Total Project Cost	**300,100**	**1,075,550**	**2,428,250**	**1,196,100**	**5,000,000**

Budget Summary

Total Project	**Total (USD)**
Project Costs	4,664,500
Project Execution Costs	235,500
Monitoring & Evaluation	100,000
Total Project Cost	**5,000,000**
Project Cycle Management Fee	425,000
Total	**5,425,000**

Detailed Project Budget (Output level)

Project ID 00081123 – Award 00064242

Outcome 1	Outputs	Budget Description	Amount Year 2012 (USD)	Amount Year 2013 (USD)	Amount Year 2014 (USD)	Amount Year 2015 (USD)	Total (USD)	Budget Notes
1. Reduced run-off in selected vulnerable areas of the MASS, through the implementation of alternative upstream water management practices	1.1 An integrated analysis of flooding and erosion vulnerability in the MASS area.	International Consultants	30,000	24,000	-	-	54,000	1
		Local Consultants	35,000	25,000	-	-	60,000	2
		Workshops	10,000	7,000	-	-	17,000	3
		Travel (flights, DSA, transportation; etc)	15,000	10,000	-	-	25,000	4
		Special images (satellite) & Maps	10,000	-	-	-	10,000	5
		Printing	3,000	1,000	-	-	4,000	6
		Miscellaneous	3,000	2,000	-	-	5,000	
		Sub total 1.1	**106,000**	**69,000**	**-**	**-**	**175,000**	
	1.2 An integrated database for flooding, including climate, hydraulic and economic variables.	International Consultants	10,000	14,000	-	-	24,000	7
		Local Consultants	14,600	17,800	-	-	32,400	8
		Technicians	20,000	40,000	-	-	60,000	9
		Hardware for data collection	10,000	30,000	-	-	40,000	10
		Workshops	5,000	10,000	-	-	15,000	11
		Travel (flights, DSA, transportation; etc)	5,000	15,000	-	-	20,000	12
		Printing	1,000	2,500			3,500	13
		Miscellaneous	2,500	2,500			5,000	
		sub-total 1.2	**68,100**	**131,800**	-	-	**199,900**	
	1.3 Development of a 5-	International Consultants	-	30,000	18,000	-	48,000	14

	year stormwater master plan for the MASS that accounts for the likely range of climate change risks.	Local Consultants	-	43,000	33,000	-	76,000	15
		Maps drafting	-	8,000	10,000	-	18,000	16
		Workshops	-	5,000	20,000	-	25,000	17
		Travel (flights, DSA, transportation; etc)	-	10,000	13,000	-	23,000	18
		Printing	-	2,500	2,500	-	5,000	19
		Miscellaneous	-	5,000	5,000	-	10,000	
		Sub -total 1.3	-	**103,500**	**101,500**	-	**205,000**	
	1.4 Resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability.	International Consultants	10,000	18,000	10,000	16,000	54,000	20
		Local Consultants	15,000	22,000	15,000	16,000	68,000	21
		Technical measures inst.	-	350,000	2,000,000	1,000,000	3,350,000	22
		Workshops	5,500	5,000	5,000	9,600	25,100	23
		Travel (flights, DSA, transportation; etc)	10,500	10,000	10,000	7,000	37,500	24
		Printing	1,000	2,000	2,000	1,000	6,000	25
		Miscellaneous	1,000	2,000	2,000	2,000	7,000	
		Sub -total 1.4	**43,000**	**409,000**	**2,044,000**	**1,051,600**	**3,547,600**	
	Total Outcome 1		**217,100**	**713,300**	**2,145,500**	**1,051,600**	**4,127,500**	
Outcome 2	**Outputs**	**Budget Description**	**Amount Year 2012 (USD)**	**Amount Year 2013 (USD)**	**Amount Year 2014 (USD)**	**Amount Year 2015 (USD)**	**Total (USD)**	**Budget Notes**
2.Increased capacity of the public sector to address climate change risks on infrastructure.	2.1 Development with the OPAMSS of policy guidelines to improve the planning for climate resilient human settlements in the MASS.	International Consultants	9,000	9,000	-	-	18,000	26
		Local Consultants	15,000	17,000	-	-	32,000	27
		Workshops	2,000	5,000	-	-	7,000	28
		Travel (flights, DSA, transportation; etc)	10,000	37,500	-	-	47,500	29
		Website support	-	2,500	-	-	2,500	30
		Printing	1,000	4,000	-	-	5,000	31
		Miscellaneous	1,000	4,000	-	-	5,000	

		Sub total 2.1	**38,000**	**79,000**	**-**	**-**	**117,000**	
	2.2 Revised and improved building codes and planning standards for climate-resilient public infrastructure.	International Consultants	-	30,000	30,000	-	60,000	32
		Local Consultants	-	36,000	30,000	-	66,000	33
		Workshops	-	15,000	23,000	-	38,000	34
		Travel (flights, DSA, transportation; etc)	-	20,000	29,000	-	49,000	35
		Printing	-	4,500	4,500	-	9,000	36
		Miscellaneous	-	4,000	4,000	-	8,000	
		Sub total 2.1	-	**109,500**	**120,500**	-	**230,000**	
	2.3 Coordination mechanisms established between the MOP, the MARN, OPAMSS and other stakeholders to address climate change risks on infrastructure in the MASS.	Local Consultants	-	31,000	19,000	-	50,000	37
		Workshops	-	7,500	7,500	-	15,000	38
		Website support		5,000	5,000		10,000	39
		Travel (flights, DSA, transportation; etc)	-	3,000	3,000	-	6,000	40
		Printing	-	2,500	2,500	-	5,000	41
		Miscellaneous	-	2,000	2,000	-	4,000	
		Sub total 2.1	-	**51,000**	**39,000**	-	**90,000**	
	Total Outcome 2		**38,000**	**239,500**	**159,500**	**-**	**437,000**	
Outcome 3	**Outputs**	**Budget Description**	**Amount Year 2012 (USD)**	**Amount Year 2013 (USD)**	**Amount Year 2014 (USD)**	**Amount Year 2015 (USD)**	**Total (USD)**	**Budget Notes**
3.Increased public and private sector awareness of climate-related risks and technical options to create resilience in the face of increasing frequency and severity of extreme rainfall in El Salvador	3.1 Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders.	Local Consultants	-	5,000	7,000	6,000	18,000	42
		Miscellaneous	-	250	250	500	1,000	
		Workshops	-	2,000	4,000	2,000	8,000	43
		Travel (flights, DSA, transportation; etc)	-	1,000	1,000	1,000	3,000	44
		Sub total 3.1	**-**	**8,250**	**12,250**	**9,500**	**30,000**	

	3.2 Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure.	Local Consultants	-	-	20,000	-	20,000	45
		Communication strategy	-	-	10,000	-	10,000	46
		Workshops	-	-	10,000	-	10,000	47
		Sub total 3.2	-	**-**	**40,000**	**-**	**40,000**	
	3.3 Dissemination of technical specifications, revised building codes, and relevant planning guidelines.	Local Consultants	-	-	-	12,000	12,000	48
		Printing	-	-	-	4,000	4,000	49
		Workshops	-	-	-	14,000	14,000	50
		Sub total 3.2	-	-	-	**30,000**	**30,000**	
	Total Outcome 3		**-**	**8,250**	**52,250**	**39,500**	**100,000**	
	Total Project Costs		**255,100**	**961,050**	**2,357,250**	**1,091,100**	**4,664,500**	

	Budget Description	**Amount Year 2012 (USD)**	**Amount Year 2013 (USD)**	**Amount Year 2014 (USD)**	**Amount Year 2015 (USD)**	**Total (USD)**	**Budget Notes**
Project Execution Costs:	Project Coordinator	26,600	45,600	45,600	45,600	163,400	51
	Project Assistant	8,400	14,400	14,400	14,400	51,600	52
	IT equipment	6,000				6,000	53
	Office furniture	5,000				5,000	54
	Transport	2,000	2,500	2,500	2,500	9,500	55
	Total	48,000	62,500	62,500	62,500	**235,500**	

	Amount Year 2012 (USD)	Amount Year 2013 (USD)	Amount Year 2014 (USD)	Amount Year 2015 (USD)	Total (USD)
Total Project Costs	289,600	1,037,050	2,419,750	1,153,600	**4,900,000**
Monitoring & Evaluation	**10,500**	**38,500**	**8,500**	**42,500**	**100,000**
Grand Total Project Cost	**300,100**	**1,075,550**	**2,428,250**	**1,196,100**	**5,000,000**

Detailed Project Budget

Total Project	**Total (USD)**	**Budget Notes**
Total Project Costs	4,900,000	
Monitoring & Evaluation	100,000	56
Grand Total Project Cost	**5,000,000**	
Project Cycle Management Fee	425,000	57
Total	**5,425,000**	

Disbursement Schedule:

	Upon Agreement signature	1st disbursement (received at the same time as signing the agreement)	One Year after Project Start[a/]	Year 2	Year 3	Total
Scheduled Date	*Sept-12*		*Sept-13*	*Sept-14*	*Sept-15*	
Project Funds		300,100	1,075,550	2,428,250	1,196,100	5,000,000
Implementing Entity Fee	170,000	15,305	54,853	123,841	61,001	425,000
Total	**170,000**	**315,405**	**1,130,403**	**2,552,091**	**1,257,101**	**5,425,000**

[a/]Use projected start date to approximate first year disbursement

[b/]Subsequent dates will follow the year anniversary of project start

[c/]Add columns for years as needed

Project ID 00081123 – Award 00064242

Budget Notes

Item	Budget Notes
1	International consultancy services and expertise for developing the integrated analysis of flooding and erosion vulnerability in the MASS area and transferring knowledge
2	Local consultancy services for developing the integrated analysis of flooding and erosion vulnerability in the MASS area
3	Technical workshops and meetings with relevant stakeholders for the preparation of the integrated analysis of flooding and erosion vulnerability in the MASS area
4	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
5	Acquisition and preparation of satellite images and maps necessary to prepare the integrated analysis of flooding and erosion vulnerability in the MASS area
6	Printing of necessary material (maps, images, studies and final document)
7	International consultancy services and expertise for the development of the integrated database for flooding, including hydraulic and economic variables
8	Local consultancy services or the development of the integrated database for flooding, including hydraulic and economic variables
9	Technicians services for the gathering of data and on-site assessments and measurements
10	Hardware technology to collect data (Gauging and weather stations, GPS)
11	Workshops and meetings for the preparation of the integrated database
12	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
13	Printing of material
14	International consultancy services and expertise for the development of a 5-year stormwater master plan for the MASS
15	Local consultancy services for the development of a 5-year stormwater master plan for the MASS
16	Preparation of maps for the stormwater master plan
17	Workshops and consultation for the design of the master plan
18	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
19	Printing of material and maps
20	International consultancy services and expertise for the design, supervision and implementation of resilient infrastructure measures
21	Local consultancy services for the design, supervision and implementation of resilient infrastructure measures
22	Installation of technical measures. See table 4 and 5 for the breakdown of costs
23	Workshops and consultation with the communities during the final design and implementation of the resilient infrastructure measures

24	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
25	Printing of material
26	International consultancy services and expertise for the preparation of policy guidelines to improve the planning for climate resilient human settlements
27	Local consultancy services for the or the preparation of policy guidelines to improve the planning for climate resilient human settlements and the design of a website
28	Consultation workshop and workshop for the presentation of the guidelines
29	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
30	Technical support for the maintenance of the website
31	Printing of material
32	International consultancy services and expertise for the revision and improvement of building codes and planning standards for climate resilient public infrastructure and the technical workshops and training
33	Local consultancy services for the revision and improvement of building codes and planning standards for climate resilient public infrastructure and the technical workshops and training
34	Technical workshops and consultations
35	Traveling costs and daily substance allowances (DSA) for international consultants and local transportation
36	Printing of material for the technical workshops
37	Local consultancy services for the design and facilitation of the coordination mechanism
38	Coordination meetings and consultations
39	Inputs and information for the web based platform for the coordination mechanism
40	Local transportation
41	Printing of material
42	Local consultancy services to gather lessons learned
43	Workshop to disseminate lesson learned with project participants and stakeholders and receive feedback
44	Local transportation
45	Local consultancy services for the design of the communication campaign
46	Implementation of the communication strategy
47	Community meetings
48	Local consultancy services for the dissemination of technical specifications, revised building codes, relevant planning guidelines and other tools and information generated by the project
49	Printing of material
50	Workshop to present the products and results of the project
51	Project Coordinator salary

52	Project assistant salary
53	Computer and IT equipment for the Project Coordinator and Assistant
54	Office furniture for the Project Coordinator and Assistant
55	Local transportation
56	See table 32 for cost breakdown
57	See annex A

Implementation Schedule/Gantt Chart

Implementation schedule:

Particulars	Schedule															
Years	2012				2013				2014				2015			
Quarters	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Output 1.1: An integrated analysis of flooding and erosion vulnerability in the MASS area.																
Output 1.2 An integrated database for flooding, including climate, hydraulic and economic variables.																
Output 1.3: Development of a 5-year stormwater master plan for the MASS that accounts for the likely range of climate change risks.																
Output 1.4: Resilient infrastructure measures implemented in the selected municipalities of the MASS (Apopa and Santa Tecla), to reduce flooding and water stress vulnerability.																
Output 2.1 Development with the OPAMSS of policy guidelines to improve the planning for climate resilient human settlements in the MASS.																
Output 2.2: Revised and improved building codes and planning standards for climate-resilient public infrastructure.																

Particulars	Schedule															
Years	2012				2013				2014				2015			
Quarters	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Output 2.3: Coordination mechanisms established between the MOP, the MARN, OPAMSS and other stakeholders to address climate change risks on infrastructure in the MASS.																
Output 3.1: Lesson learned from the successes, obstacles, and opportunities encountered through the implementation of the project, disseminated to local governments and stakeholders.																
Output 3.2: Communication Campaign' implemented, to increase the knowledge and ownership by the communities of public climate resilient infrastructure.																
Output 3.3: Dissemination of technical specifications, revised building codes, and relevant planning guidelines.																
Project Management Unit established and operational																

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A.RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT

(Provide the name and position of the government official and indicate date of endorsement. If this is a regional project, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s)with this template; add as many participating governments if a regional project/programme). Please note that each party shall designate and communicate to the Secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Herman Rosa Chávez, Minister of Environment and Natural Resources, Ministry of Environment and Natural Resources
Date: January, 11,2012
(See Annex B for a copy of the endorsement letter)

Antonio Cañas, Minister's Office Advisor, Ministry of Environment and Natural Resources
Date: October, 19,2010
(See Annex B for a copy of the endorsement letter)

B. IMPLEMENTING ENTITY CERTIFICATION

(Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project contact person's name, telephone number and email address)

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, understands that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

Yannick Glemarec
Director
Environmetnal Finance
UNDP

Date: May 22, 2012	Tel and email: yannick.glemarec@undp.org
Project Contact Person: Oliver Page	
Tel and Email: +507-302-4548; oliver.page@undp.org	

Annex A

UNDP Fees for Support to Adaptation Fund Project: *PIMS 4585 Promoting climate change resilient infrastructure development in San Salvador Metropolitan Area*

The implementing entity fee will be utilized by UNDP to cover its indirect costs in the provision of general management support and specialized technical support services. The table below provides an indicative breakdown of the estimated costs of providing these services. If the national entity carrying out the project requests additional Implementation Support Services (ISS), an additional fee will apply in accordance with UNDP fee policy regarding ISS and would be charged directly to the project budget.

Category	Indicative Services[24] Provided by UNDP[25]	Estimated Cost of Providing Services[26]
Identification, Sourcing and Screening of Ideas	Provide information on substantive issues in adaptation associated with the purpose of the Adaptation Fund (AF). Engage in upstream policy dialogue related to a potential application to the AF. Verify soundness and potential eligibility of identified idea for AF.	$21,250
Feasibility Assessment / Due Diligence Review	Provide up-front guidance on converting general idea into a feasible project/programme. Source technical expertise in line with the scope of the project/programme. Verify technical reports and project conceptualization. Provide detailed screening against technical, financial, social and risk criteria and provide statement of likely eligibility against AF requirements. Determination of execution modality and local capacity assessment of the national executing entity. Assist in identifying technical partners. Validate partner technical abilities. Obtain clearances from AF.	$63,750
Development & Preparation	Provide technical support, backstopping and troubleshooting to convert the idea into a technically feasible and operationally viable project/programme.	$85,000

This is an indicative list only. Actual services provided may vary and may include additional services not listed here. The level and volume of services provided varies according to need.

[25] Services are delivered through UNDP's global architecture and 3 tier quality control, oversight and technical support system: local country offices; regional technical staff; and headquarters specialists.

[26] The breakdown of estimated costs is indicative only.

Category	Indicative Services[24] Provided by UNDP[25]	Estimated Cost of Providing Services[26]
	Source technical expertise in line with the scope of the project/programme needs. Verify technical reports and project conceptualization. Verify technical soundness, quality of preparation, and match with AF expectations. Negotiate and obtain clearances by AF. Respond to information requests, arrange revisions etc.	
Implementation	Technical support in preparing TORs and verifying expertise for technical positions. Provide technical and operational guidance project teams. Verification of technical validity / match with AF expectations of inception report. Provide technical information as needed to facilitate implementation of the project activities. Provide advisory services as required. Provide technical support, participation as necessary during project activities. Provide troubleshooting support if needed. Provide support and oversight missions as necessary. Provide technical monitoring, progress monitoring, validation and quality assurance throughout. Allocate and monitor Annual Spending Limits based on agreed work plans. Receipt, allocation and reporting to the AFB of financial resources. Oversight and monitoring of AF funds. Return unspent funds to AF.	$191,250
Evaluation and Reporting	Provide technical support in preparing TOR and verify expertise for technical positions involving evaluation and reporting. Participate in briefing / debriefing. Verify technical validity / match with AF expectations of all evaluation and other reports Undertake technical analysis, validate results, compile lessons. Disseminate technical findings	$63,750
Total		***US$425,000***

ANNEX B – ENDORSEMENT LETTER

MINISTERIO DE MEDIO AMBIENTE Y RECURSOS NATURALES

MARN-DM-32-2012

San Salvador, May 22, 2012

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Promoting Climate Change Resilient Infrastructure Development in San Salvador Metropolitan Area.

In my capacity as designated authority for the Adaptation Fund in El Salvador, I confirm that the above national project proposal is in accordance with the government´s national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in El Salvador.

This project is very important for El Salvador due to high vulnerability in the country, and, therefore, I request to prioritize our proposal.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the United Nations Development Program, (UNDP) and executed by Ministry of Public Works, Transport, Housing and Urban Development (MOP).

Sincerely,

Herman Rosa Chávez
Ministry

Km. 5 ½ Carretera a Santa Tecla, Calle y Col. Las Mercedes, Edificio MARN (instalaciones del ISTA)
Tel. 2132-6276 Fax 2132- 9420

Annex C – Ministerial Declaration on Adapting Infrastructure to Climate Change