United Nations Development Programme

Countries: Ecuador and Peru

PROJECT DOCUMENT[1]

Project Title:	Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins
UNDAF Outcome(s):	**Ecuador: UNDAF Outcome 5**, By 2014 relevant public institutions and local stakeholders foster – and stakeholders (men and women) have strengthened skills and tools to ensure their rights to a healthy and safe environment and environmental sustainability, including biodiversity conservation, integrated natural resource management and environmental management. **Peru: UNDAF Outcome** 4: The state, with the participation of civil society, the private sector, scientific and academic institutions, will have designed, implemented and/or strengthened policies, programs and plans focusing on environmental sustainability, for the sustainable management of natural resources and biodiversity conservation

UNDP Strategic Plan Environment and Sustainable Development Primary Outcome:

Outcome 2: Citizen expectations for voice, development, the rule of law and accountability are met by stronger systems of democratic governance.

Output 2.5: Legal and regulatory frameworks, policies and institutions enabled to ensure the conservation, sustainable use, and access and benefit sharing of natural resources, biodiversity and ecosystems, in line with international conventions and national legislation.

Indicator 2.5.2: Number of countries implementing national and local plans for integrated Water Resource Management.

UNDP Strategic Plan 2014-2017 Secondary Outcome: Outcome 5: Countries are able to reduce the likelihood of conflict and lower the risk of natural disasters, including from climate change.

Expected CP Outcome(s): Ecuador: UNDAF Direct Outcome 5: CPD Component: Sustainable and Equitable Management of the Environment: Authorities and other entities possess greater abilities to formulate adaptation/mitigation responses to climate change, and to develop renewable energy sources and promote energy efficiency

Peru: UNDAF Direct Outcome 4: CPD Component: Environmental Sustainability. The state, with the participation of civil society, the private sector, scientific and academic institutions, will have designed, implemented and/or strengthened policies, programs and plans focusing on environmental sustainability, for the sustainable management of natural resources and biodiversity conservation

Expected CPAP Output (s) Ecuador: UNDAF Direct Outcome 5: CPAP Direct Outcome 5: Expected output 4.1.: National and local development plans, as well as national and community-based volunteer organizations, incorporate adaptation to climate change strategies, plans and projects and possess greater knowledge, skills and tools to respond to this phenomenon.

Peru: Expected Output 4.4.: Management tools to improve environmental quality are developed, agreed upon and under implementation at the national, regional and local levels.

[1] For UNDP supported GEF funded projects as this includes GEF-specific requirements

Executing Entity/Implementing Partner: The National Water Secretariat of Ecuador (SENAGUA) and The National Water Authority of Peru (ANA)

Implementing Entity/Responsible Partners: UNDP

Brief Description

The project objective is strengthening the institutional, policy, legal and scientific-technical capacities to implement Integrated Transboundary Water Resources Management in Puyango-Tumbes, Catamayo- Chira and Zarumilla River Basins and Aquifers, integrating climate variability concerns. The project aims to enhance binational efforts of Peru and Ecuador for Integrated Transboundary Water Resources Management (ITWRM) in the three main aquifers and basins shared by the two countries in the Pacific Ocean drainage basin - Puyango-Tumbes, Catamayo-Chira and Zarumilla. It will give special attention to integrating groundwater concerns and opportunities and extreme manifestations of climate variability and change in the area. The aquifers and linked river basins "Zarumilla", "Puyango-Tumbes" and "Catamayo-Chira" contain an important, but often highly variable, water supply that is essential to the region´s socio-economic development and to the integrity of its ecosystems. These resources are threatened by overexploitation, pollution and inefficient management, as well as by climate variability and change.

The project will follow a three-pronged approach consisting of improving the common understanding of these shared water resources and their environmental and socioeconomic status; strengthening institutional capacities and cooperation mechanisms between the two countries sharing these aquifers and basins; and applying and disseminating IWRM demonstrations in targeted site interventions. The project has a strong emphasis on capacity development and, through the TDA/SAP process, will support countries in the identification of the required legal, policy and institutional reforms that can deliver global, regional and national environmental benefits. The project will apply the most recently validated GEF International Waters Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) methodology to achieve project objectives and outcomes.

Source of Funding	**Ecuador**	**Peru**	**Regional Component (administered by lead country office Ecuador)**	**Total**
GEF	1,335,000	1,335,000	1,290,000	3,960,000
Sub-total GEF	**1,335,000**	**1,335,000**	**1,290,000**	**3,960,000**
National financing	10,000,000	10,000,000		20,000,000
Other financing	236,600	247,000		483,600
Sub-total co-financing	***10,236,600***	***10,247,000***		20,483,600
Total	**11,571,600**	**11,582,000**	**1,290,000**	**24,443,600**

ECUADOR (LEAD COUNTRY OFFICE)

Programme Period:	2014-2019	Total allocated resources (Ecuador)	11,571,600
Atlas Award ID:	00083398		
Project ID:	00091894	GEF (US$)	1,335,000
PIMS #	4402		
Start date:	March 2015	Co-financing	
End Date	March 2019	• SENAGUA (US$)	10,000,000
Management Arrangements	NIM	• UNDP Ecuador (US$)	104,100
PAC Meeting Date	TBD	• UNDP Cap-Net(US$)	132,500

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

PERU

Programme Period:	2014-2019
Atlas Award ID:	00083826
Project ID:	00092113
PIMS #	4402
Start date:	March 2015
End Date	March 2019
Management Arrangements	NIM
PAC Meeting Date	TBD

Total allocated resources (country)	11,582,000
GEF (direct administration) (US$)	1,335,000
Co-financing	
• ANA (US$)	10,000,000
• PNUD Peru (US$)	114,500
• UNDP Cap-Net(US$)	132,500

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

Table of Contents

Acronyms 6

Environmental context 9

Socio-economic context 18

Legal and policy context 24

Institutional Context 30

Threats 32

Long-term solution and barriers to achieving the solution 37

Baseline projects 42

Stakeholder Analysis 43

Project rationale and policy conformity 47

Country ownership: country eligibility and country drivenness 48

Design principles and strategic considerations 48

UNDP Comparative advantage 52

Project objective, outcomes and outputs/activities 53

Incremental reasoning, global environmental benefits and socio-economic benefits 62

Key indicators, risks and assumptions 65

Project Results Framework: 76

Total budget and workplan 87

Management Arrangements 99

PART VI: Monitoring and Evaluation 102

Part VII: Legal Context 109

Annex: Pilot project profiles (see separate file) 111

Annex: International Waters Tracking Tool (see separate file) 111

Annex: Social and environmental screening (see separate file) 111

Annex: Co-financing letters (see separate file) 111

Annex 1: Maps of Basins 112

Annex 2: Criteria to Select Pilot Projects 118

Annex 3: Stakeholder involvement Plan 121

Annex 4: Risk Matrix 126

Annex 5: Terms of Reference for Key Project Staff 129

Annex 6 - Preparation of the Preliminary and Definitive TDA 132

Acronyms

AME	Association of Munipalities of Ecuador (Asociación de Municipalidades de Ecuador)
ANA	The National Water Authority of Peru
ART	ART Initiative (Articulación de Redes Territoriales)
COSUDE	Swiss Development Agency
CSO	Civil Society Organization
EAP	Economically Active Population
ENSO	El Niño-Southern Oscillation
ESS	Environmental and Socioeconomic Status
FAO	Food and Agriculture Organization of the United Nations
GAD	Autonomous Decentralized Government (Ecuador) (Gobierno Autónomo Descentralizado)
GEF	Global Environment Facility
HQ	Headquarters
IDB	Interamerican Development Bank
ICM	Integrated Coastal Management
IUCN	International Union for the Conservation of Nature
IW	International Waters
ITWRM	Integrated Transboundary Water Resource Management
IWRM	Integrated Water Resource Management
KM	Knowledge Management
MAE	Ministry of Environment (Ecuador) (Ministerio del Ambiente)
MAGAP	Ministry of Agriculture, Livestock, Acuaculture and Fisheries (Ecuador) (Ministerio de Agricultura Ganadería, Acuacultura y Pesca
masl	metres above sea level
M&E	Monitoring and Evaluation
MICSE	Coordinating Ministry of Strategic Sectors (Ecuador) (Ministerio Coordinador de Sectores Estratégicos)

MINAG	Ministry of Agriculture and Irrigation of Peru (Ministerio de Agricultura y Riego del Perú)
MINAM	Ministry of Environment (Peru) (Ministerio del Ambiente)
MRE	Ministry of External Relations of Peru (Ministerio de Relaciones Exteriores del Perú)
MREMH	Ministry of External Relations and Human Mobility (Ecuador) (Ministerio de Relaciones Exteriores y Movilidad Humana)
NSAP	National Strategic Action Plans
NTU	Nephelometric Turbidity Units
PIF	Project Identification Form
PPG	Project Preparation Grant
SAP	Strategic Action Program
SENAGUA	National Water Secretariat of Ecuador (Secretaria Nacional de Agua)
SENPLADES	National Secretariat of Planning and Development (Secretaría Nacional de Planificación y Desarrollo)
SERNANP	National Services for State Protected Areas (Peru) (Servicio Nacional de Áreas Naturales Protegidas por el Estado)
SIWI	Stockholm International Waters Institute
SNGRH	National Water Resources Management System
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TDA	Transboundary Diagnostic Assessment
ToRs	Terms of Reference
UBN	Unmet Basic Needs
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WOGP	Water and Ocean Governance Programme

List of Tables and Figures

Table 1: Land Uses in Catamayo-Chira basin 12

Table 2: Land Uses in Puyango-Tumbes basin 14

Table 3: Economically Active Population by category of economic activity in Catamayo-Chira 20

Table 4: Economically Active Population by category of economic activity in Puyango-Tymbes 22

Table 5: Economically Active Population by category of economic activity in Zarumilla 24

Table 6: Water resource management standards in Peru. 26

Table 7: Transboundary problems, threats and environmental impacts in the Catamayo-Chira basin 34

Table 8: Transboundary problems, threats and environmental impacts in Puyango-Tumbes basin: 35

Table 9: Transboundary problems, threats and environmental impacts in the Zarumilla basin: 37

Table 10: Summary of implementation role of main project stakeholders 44

Table 11: Summary of pilot projects 50

Table 12: Main project indicators and targets 66

Table 13: Risks and mitigation strategies 68

Table 14: Summary of M&E activities and budget 105

Figures:

Figure 1: Transboundary basins between Ecuador and Peru draining into the Pacific ocean 9

Figure 2: Maps of rivers in Catamayo-Chira basin 10

Figure 3: Map of land uses in Catamayo-Chira basin 12

Figure 4: Map of rivers in Puyango-Tumbes basin 13

Figure 5: Map of rivers in Zarumilla basin 16

Figure 6: Map of land uses in Zarumilla 17

Figure 7: Project implementation structure 100

Figure 8: Hydrogeology of Catamayo-Chira basin 110

Figure 9: Main pollution hotspots in Catamayo-Chira basin 111

Figure 10: Hydrogeology of Puyango-Tumbes basin 112

Figure 11: Main pollution hotspots in Puyango-Tumbes basin 113

Figure 12: Hydrogeology of Zarumilla basin 114

Figure 13: Main pollution hotspots in Zarumilla basin 115

Environmental context

1. In Peru, approximately 312,000 km^2, or 25% of its territory, is found in transboundary river basins, of which 57% or 178,000 km^2 are located in basins shared with Ecuador. These transboundary river basins constitute around 61% of the surface of continental Ecuador, of which 95% corresponds to the 10 transboundary water systems shared with Peru. Seven of these are sub-systems of the great Amazon basin and constitute the Ecuadorian Atlantic Ocean's drainage basin. The other three systems, i.e., the "Zarumilla", "Puyango-Tumbes" and "Catamayo-Chira" transboundary basins each drain into the Pacific Ocean and are the focus of this project.

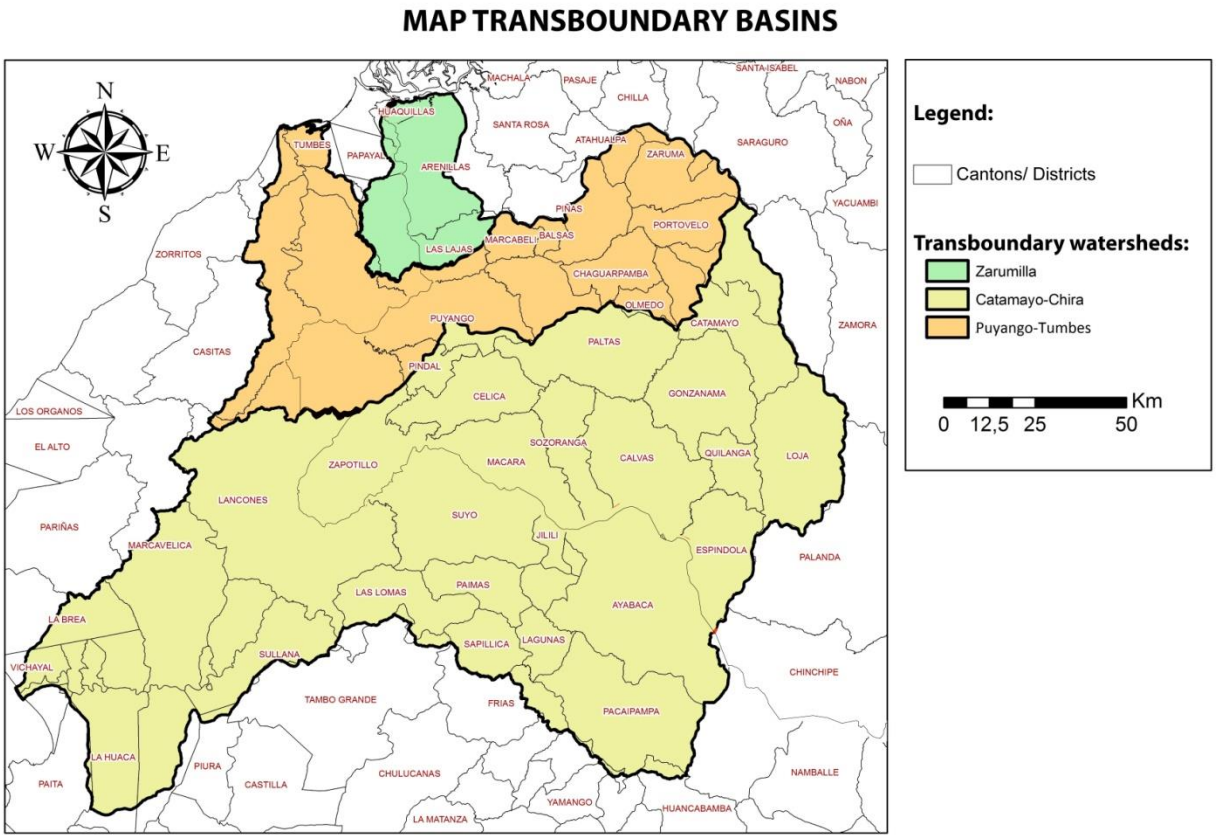


Figure 1: Transboundary basins between Ecuador and Peru draining into the Pacific ocean[2]

[2] Sources: Instituto Geográfico Nacional del Perú; Instituto Geográfico Militar del Ecuador

Catamayo-Chira Basin

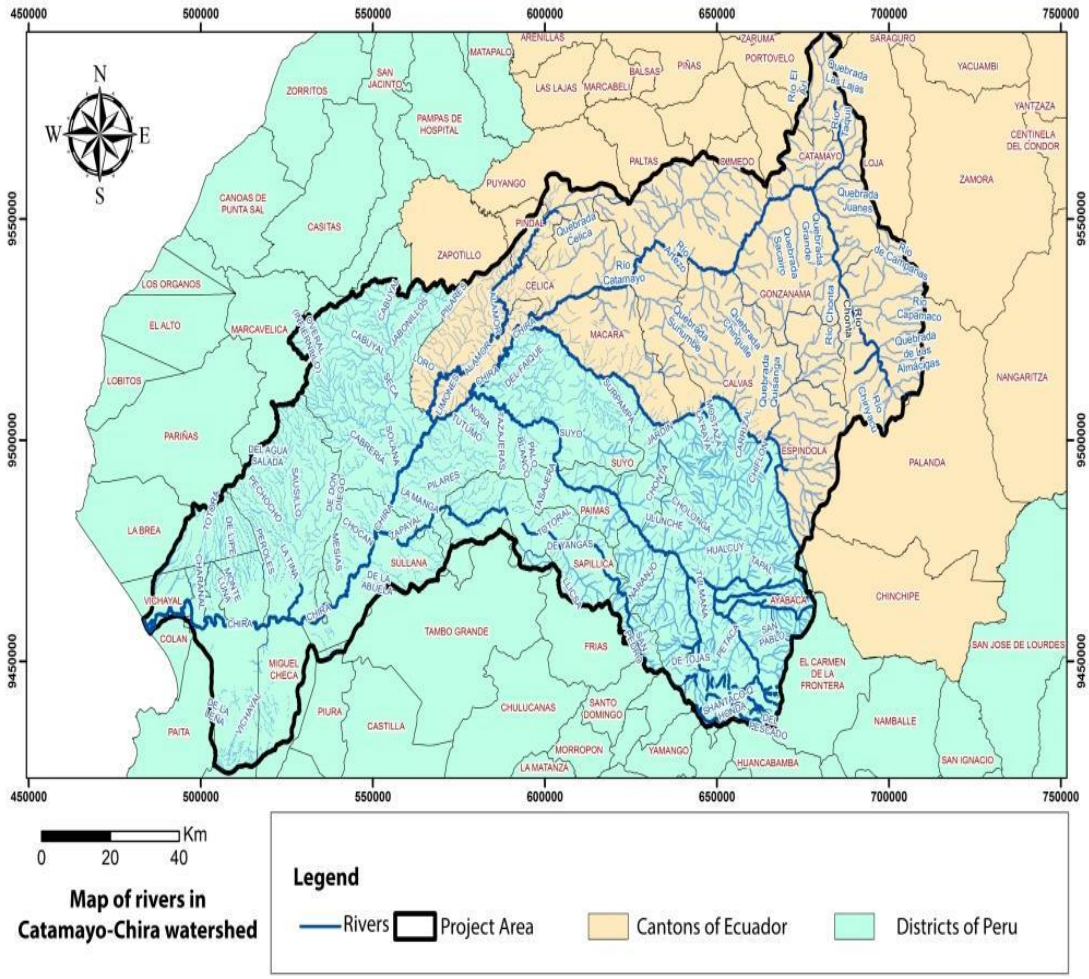


Figure 2: Map of rivers in Catamayo-Chira basin[3]

2. The Catamayo-Chira basin covers an area of 17,740 km², of which 7,210 km² or 41% is found in Ecuador, corresponding to two-thirds of the Loja Province (cantons of Celica, Pindal, Macara, Sozoranga, Calvas, Espindola, Gonzanamá, Quilanga, and some portions of the cantons of Loja, Catamayo, Paltas, Olmedo, Puyango and Zapotillo. In Peru, this basin covers an area of 10,530 km², which corresponds to

[3] Technical associates, Universidad Nacional de Piura, Universidad Nacional de Loja. 2003. Caracterización hídrica y adecuación entre la oferta y la demanda en el ámbito de la cuenca binacional Catamayo-Chira. Volumen III Estudios básicos. Loja – Piura

59% of the total basin area (Department of Piura, Provinces of Sullana, Ayabaca, Huancabamba, Morropón, Paita, Talara and Piura).

3. Precipitation values in this basin from 10 to 80 mm are observed annually in the lower basin (between 0 and 80 masl), with the rainfall being concentrated in the months of January to April. There are high levels of rainfall variability due to the significant influence of the El Niño phenomenon, with levels reaching over 20 times the normal precipitation amounts. In the mid- basin rainfall ranges from 500-1000 mm, with rainfall concentrated from December to May, while in the upper basin, average rainfall exceeds 1000 mm, and falls mainly between October and May. Climate studies show that there will be a tendency toward increased rainfall in the wettest areas, and a decrease in rainfall in areas of low rainfall, in addition to a gradual increase in sea level. Temperatures vary from 24°C in the lower regions to 7°C in the upper parts of the basin, with an average temperature of 20° C.

4. The altitude varies from 0 to 3700 masl, with the topography ranging from valleys and plains to hills and mountain slopes with lakes. The soils in the area are susceptible to wind and water erosion and are appropriate for agricultural and forest use. The dendritic drainage system in the basin provides good drainage. The main water course is the Catamayo Chira River, whose total length from the source to its mouth at the Pacific Ocean is 315 km, of which 196 km are located in Ecuador and 119 km in Peru. The average monthly flow of this transboundary basin 2.54m³/s, which is the lowest compared to the other two basins and values below the minimum ecological flow are often recorded, with a minimum value of 0.11 and a maximum of 10.66m³/s , while the minimum ecological flow for the basin is 5m³/s. Turbidity levels are 100 to 1500 NTU (Nephelometric Turbidity Units) as a result of the transport of sediment in the rivers, which is causing high levels of turbidity (the maximum permissible limit is 100NTU).

5. Water demand by use is classified as follows: 94% is for agricultural activity, 2% for population uses and the rest for other uses. The total estimated water demand for all the sub-basins is 3,827,569 millions of m³, which must be obtained from surface water, groundwater and precipitation. Of this water demand, 20.6% comes from the Peruvian territory and 79.4% from the Ecuadorian territory. In the entire basin, 64,900 ha are under irrigation out of a total of 72,039 ha dedicated to crops.

6. The total exploitation of groundwater in Ecuador and in Peru is 13.8 hm³/year (13,856,914 m³). Greater levels of groundwater availability can be found in the lower basin and this is where there is higher exploitation, with both superficial and deep wells. The groundwater reserves are estimated at 493 hm³.

7. As outlined in the Threats section, the main environmental issues in the basin include contamination from domestic waste water, solid waste and agrochemicals, as well as decreased surface and groundwater reserves due to deforestation, agricultural demand, climatic and other factors. In terms of water quality, three critical areas of contamination (pollution hotspots) have been identified on the Ecuadorian side of the basin: Hotpot 1.- In the initial part of the Catamayo river, in the mouths of the Vilcabamba and Malacatos rivers, there is obvious contamination and there are odors being generated from domestic effluents discharged directly into the river. Hotpot 2.- At the mouth of the Guayabal river, the waters are black and highly polluted as a result of direct discharges from the sugar industry present in the Catamayo valley. Hotspot 3.- Political boundaries of the Celica, Sozoranga and Macara cantons, downstream of the Santa Rosa Bridge, where discharges are generated by the artisanal mining sector (with chemicals such as mercury being dumped directly into the river). On the Peruvian side, the main pollution hotspots are centered around small-scale mining in the upper to middle part of the Chira River basin and its tributaries, the Quiroz and Chipillico rivers (districts of Montero, Las Lomas and Suyo); agricultural discharges in the lower part (mainly in the Chira valley and San Lorenzo valley); and uncontrolled dumps and domestic and industrial discharges in the main urban centers (Ayabaca, Montero, Paimas, Las Lomas, Suyo, Querecotillo and Sullana) (see map in Annex 1).

8. Table 1 illustrates the main land uses in this basin, with forests, especially dry forests, and pasture being the predominant uses. Studies indicate that 35% of the basin is characterized by appropriate land uses

(land uses that are consistent with the soil's capacity) (612,986 ha), while 30% is underutilized (e.g., presence of pastures when agricultural activities could be carried out) and the remaining 33.53% of the land is overutilized (576,659 ha), an issue of concern because this can lead to land degradation.

Table 1: Land uses in Catamayo-Chira basin[4]

Type of land use (land cover)	Area (ha)	%
Crops	177,731.4	10.33%
Pasture	501,639	29.17%
Forest	698,602	40.62%
Shrub vegetation	232,277.5	13.50%
Andean 'paramo'	25,740.4	1.5%
Other uses (eroded areas, urban areas, water, islands, etc.)	83,927	4.8%
Total	*1,719,918*	*100%*

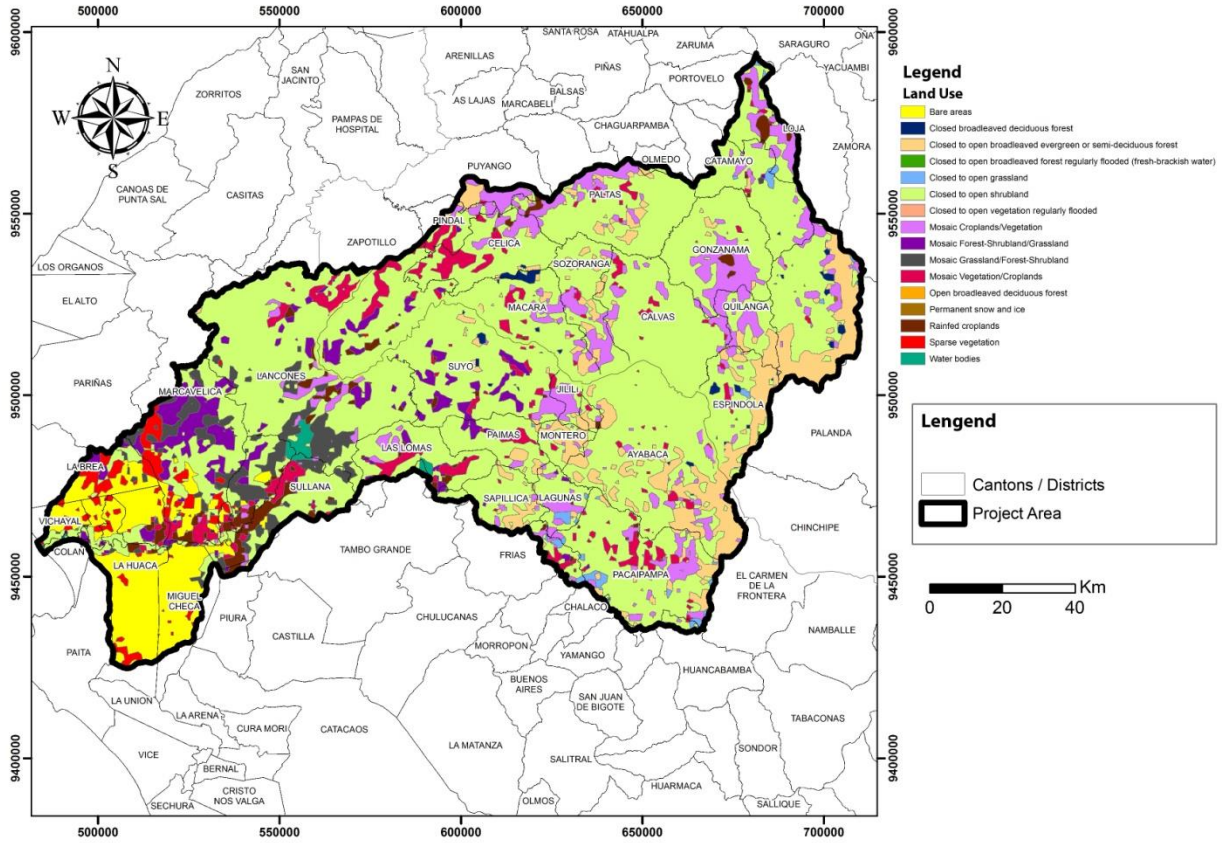


Figure 3: Map of land uses in Catamayo-Chira basin[5]

[4] Source: Proyecto Binacional Catamayo-Chira. 2003. Caracterización Biofísica. Cuenca Catamayo – Chira.

[5] GlobCover. 2009. Global Land Cover Map.

9. The most predominant ecosystems in the basin are Montane Cloud Forests of the Eastern Andes, Lower Montane Evergreen Forest of the Amazon, Humid Montane Shrubland of the Southern Andes, and the Lower Montane Evergreen Forest of South Eastern Andes, among others. The remnant cloud forests play a key role in conserving unique areas and endemic species as well as genetic resources. Examples of endemic and threatened species include the ochre-bellied dove (*Leptotila ochraceiventris*), rufous-necked foliage-gleaner (*Syndactyla ruficollis*), and blackish-headed spinetail (*Synallaxis tithys*), among many others. Among the different ecosystems, it should be noted that the equatorial dry forest is very threatened and contains high levels of endemic and threatened species, such as the white-winged guan (*Penelope albipennis*) and the Peruvian plantcutter (*Phytotoma raimondii*), endemic species of the Northwest of Peru. Protected areas include the Yacurí National Park and the Podocarpus National Park in Ecuador, and the Biosphere Reserve of the Northwest and Cerros de Amotape National Park in Peru, among others. Threats to key ecosystems in the basin undermine the provision of ecosystem services such as climate regulation, provision of water, basin and soil protection, carbon storage, provision of food and medicines, among others.

Puyango-Tumbes basin

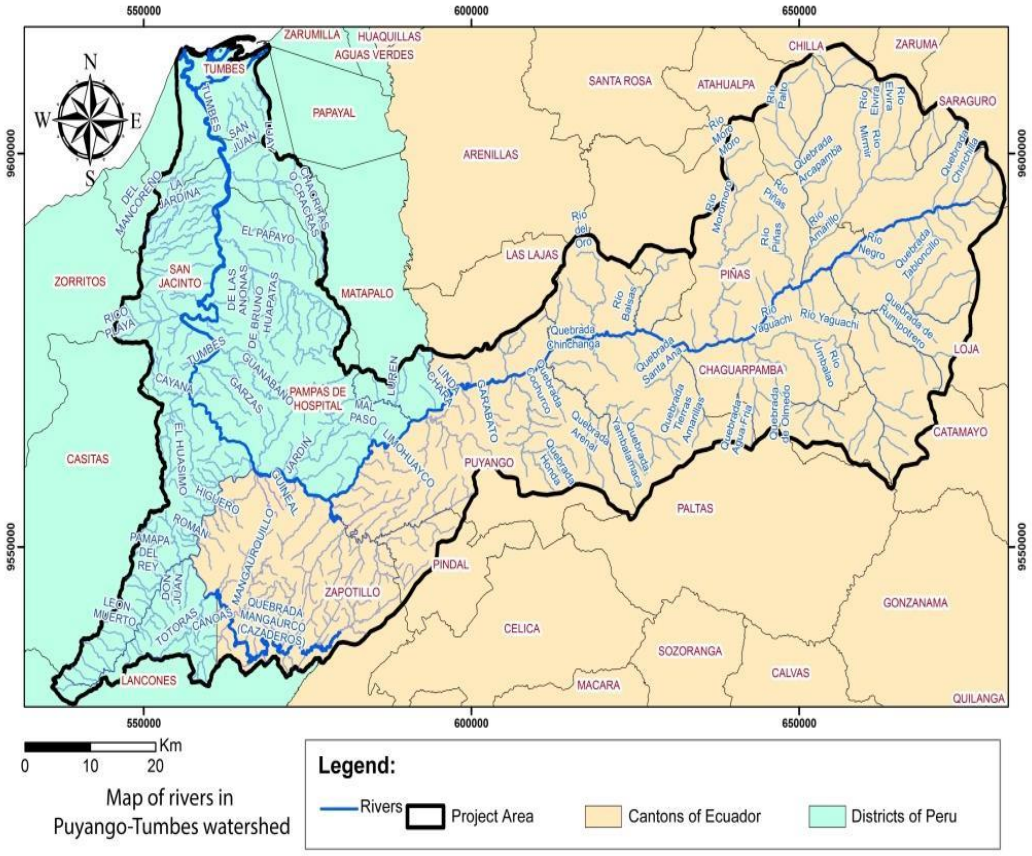


Figure 4: Map of rivers in Puyango-Tumbes basin[6]

[6] Ministerio de Vivienda, Construcción y Saneamiento República del Perú, Instituto Nacional de Desarrollo Proyecto Especial Puyango-Tumbes, octubre de 2002. Plan de Gestión de la Oferta de Agua en las Cuencas del Ámbito del Proyecto Puyango Tumbes, Volumen II TOMO 2.1

10. The Puyango-Tumbes river basin covers an area of 4,800 km², of which 2,880 km² (60%) lies within Southeastern Ecuador (in El Oro and Loja Provinces) and 1,920 km² (40%) is found in Northern Peru (Tumbes Department). The Puyango-Tumbes river originates at 3500 masl, in the Portovelo zone where it is called Pindo river, in the Chilla and Cerro Negro mountain range of Ecuador.

11. The basin includes a coastal plain and hilly/ mountainous region, with an altitudinal range of 0 to 3500 masl. The hills/ mountains range from 50 masl to close to 3000 masl where they form the Tahuín, Celica and Chilla mountain ranges, characterized in parts by steep slopes in the hilly/ mountainous areas.

12. The average annual precipitation in the Puyango-Tumbes basin is 1231.30 mm with pronounced annual variations from 100 mm to 2700 mm and important periods of drought and high precipitation. The maximum precipitation occurs from January to March, which averages 250 mm / month. As of June these values decrease dramatically, and decrease to near 0 in the months of August and September. Rainfall recommences in November-December, when it reaches 50 mm / month, to begin a new rainy season. The region of Tumbes is very dynamic, and annual precipitation is characterized by unpredictable variations due to the El Niño phenomenon, cloud migration and other factors. The climate of the basin is subtropical. The annual average temperature in the plains is 24.5°C and 22° C in the mountainous area. During El Niño events, daily temperatures can reach 35°C in the plains and 30°C in the mountainous area. The El Niño Phenomenon is the meteorological phenomenon that causes the most risks and damages in the basin.

13. In the upper catchment in Ecuador, there are several streams and rivers, with Pindo river being the principal one, which then becomes Puyango and finally Tumbes River in Peruvian territory. The total length of the Pindo-Puyango-Tumbes river is 230 km. In the upper region, the main tributaries are the Ambocas, Luis, Amarillo and Calera rivers. The average monthly flow in the Puyango river on the Ecuadorian side in the upper part of the watershed is 24.79 m³/s (minimum of 2.28 and maximum of 118.84 m³/s); in the middle of the basin, it is 87.57 m³/s (minimum of 9.3, maximum of 478.74 m³/s), while on the Peruvian side in the Tumbes River, the average monthly flow rate is 111 m³/s. This is well above the defined ecological flow rate of 5.8 m³/s. It should be noted that turbidity levels are above the maximum permissible limit of 100 NTU at times, with registers of between 21-270 NTU.

14. The water demand (surface and groundwater) in the year 2000 was 388.7 hm³ and groundwater demand (based on 1978 data) was 7.19 hm³. On the Peruvian side, a total of 150 wells were registered in 2007 of which 31 are wells were being used (operational); the total volume of exploited groundwater from the aquifer through wells was 1, 829,055.90 m³ (1.83 hm³), of which 0.65 hm³ was for agricultural use and 1.18 hm³ was for domestic use. On the Ecuadorian side there are no specific data on surface water and groundwater demand in the Puyango-Tumbes basin. Furthermore, there is very little hydrogeological information on the Zapotillo aquifer, which has been identified as of potential interest.

15. The main land uses include vegetation cover (50%), pastures (30%), agricultural land (2%) and urban areas (0.79%), based on 2002 data.

Table 2: Land uses in the Puyango-Tumbes basin[7]

Current soil use and cover	*Area (ha)*	*Area (%)*
Agricultural use	16,400 ha	2%
Vegetation cover (desert scrub, very dry forest, dry forest, savannah dry	409,738 ha	50%

"Diagnóstico Consolidado"

[7] Nuñez, S., Zegarra, J. Ingemmet. 2006. Estudio Geoambiental de la Cuenca del Río Puyango-Tumbes Boletín Nº32 Serie C Geodinámica e Ingenieria Geológica.Lima, Perú.

forest, dense dry forest, rainforests, spiny thickets, mangrove		
Pastures	250,612 ha	30%
Other uses (desert, urban area, 'salitral', 'cauce'	148,850	18%
Total	*825,600*	*100%*

16. As described in the Threats section, the main threats facing the Puyango-Tumbes basin are pollution of surface and groundwater (sewage, solid waste, mining-related effluents, agrochemicals), erosion and soil degradation (deforestation, overgrazing, etc.); flooding from lack of maintenance and management of drainage systems; and decreased water reserves linked to deficiencies in irrigation infrastructure, inadequate operation and maintenance. A map of the primary pollution hotspots in the basin is found in Annex 1.

17. The basin has nine main life zones: premontane semi-arid desert, tropical desert matorrales, premontane desert matorrales, tropical spiny scrubland, premontane spiny scrubland, very dry tropical forest, dry tropical forest, premontane dry forest and subtropical humid forest. The range of associated ecosystems harbour a great deal of biodiversity, including areas of high bird endemism, and species such as *Crococylus acutus*, threatened mammal species, such as *Felis colocolo, Tamandua mexicana*, and flora, such as ebony (*Ziziphus thrysiphlora*) and guayacan (*Tabebuia billbergi*). Various protected areas have been established within the basin such as Parque Nacional Cerro de Amotape, Tumbes National Reserve, Los Manglares de Tumbes National Sanctuary and the Angostura Facial Regional Conservation Area.

Zarumilla basin

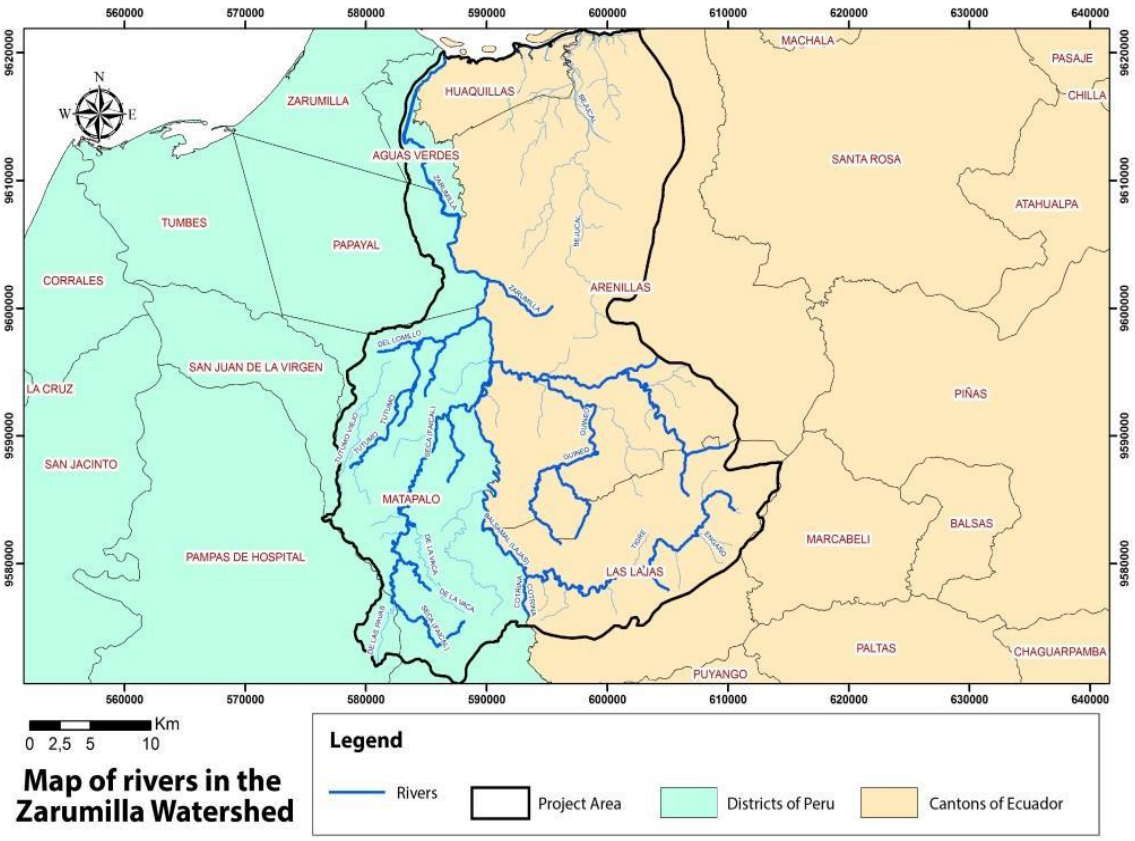


Figure 5: Map of rivers in Zarumilla basin[8]

18. The Zarumilla River transboundary basin covers an area of approximately 880 km², of which 510 km² (58%) is found in Ecuador, in the El Oro Province, including the cantons of Las Lajas, Arenillas and Huaquillas. The other 370 km² (42%) are located in Peru, in the Department of Tumbes, Zarumilla Province, in the Districts of Aguas Verdes, Zarumilla, Matapalo and Papayal. The Zarumilla aquifer represents an important transboundary aquifer, with an approximate area of 917 km², of which 544 km² are found in Ecuador and the remaining 373² km in Peru. While the aquifer has elevated salinity levels in some sections, it is nevertheless an important source of water for the development of the border area.

19. The Zarumilla river basin originates in the mountains of Ecuador, at 800 masl and flows into the Pacific Ocean. It has a drainage area of 912 km² (to the Puente Internacional) and its water course has a length of approximately 100 km. It has a low water yield due to the dry climate and remains dry for most of the year, with a small runoff during the months of January to March that does not reach the ocean.

20. The estimated monthly average flow in Ecuador is 6.99 m³/s (minimum: 0, maximum: 67.145 m³/s) and in Peru, the average flow is 4.80 m³/s. The months with the lowest flow are June to December, with values ranging from 3.2 to 6.1 m³/s.

21. A large part of the basin is arid or semi-arid, with an estimated annual precipitation of 735 mm (1200 mm per year in the upper reaches of the basin). Low levels of precipitation and drought occur between June and December in the long, dry season, while 85% of the annual precipitation occurs in the short rainy season from January to May. Average temperatures are 25° C in the plains and 22° C in the mountainous areas. The basin's climate is influenced by the Intertropical Convergence Zone and by the Humboldt

[8] Coello, X. 2006. Characterization of the Zarumilla transboundary aquifer between Peru and Ecuador.

Current. This contributes to substantial variation between years in terms of precipitation, with some periods of pronounced drought. In rainy seasons and exceptional years such as when the El Niño phenomenon occurs, Zarumilla river overflows, flooding areas and affecting populations living near the river banks. Generally, water resources in the Zarumilla drainage basin are scarce. In the dry season, Zarumilla river runs dry with zero flow, which makes the use of surface water impossible. At that point the only source of water for different uses is the groundwater found primarily in the middle and lower catchment. Groundwater demand was estimated at 42.4 million cubic metres (2006).

22. The altitude ranges from 0 to 800 masl. The basin is represented by a coastal plain and a chain of hills and mountains oriented in the NE-SW direction. The main land uses are closed to open broadleaved evergreen or semi-deciduous forest (80%), grassland (1%), croplands (5%), water bodies (4%), and 10% other uses (e.g., shrubland).

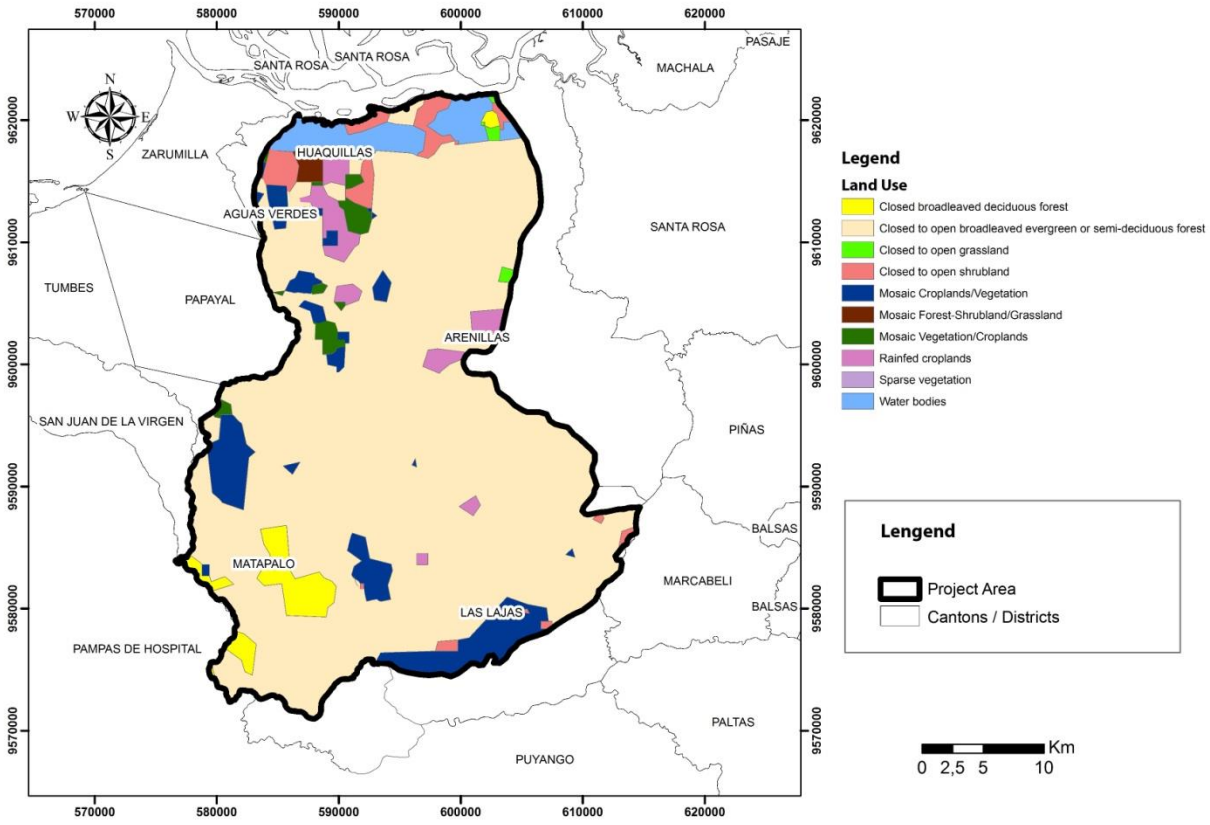


Figure 6: Land uses in Zarumilla basin[9]

23. As highlighted in the Threats section, the main threats to this basin include contamination of surface water from domestic wastewater, solid waste and agrochemicals; erosion and sedimentation; and decreasing groundwater reserves, related to increased extraction rates or an increase in the number of pumping wells. Please see Annex 1 for a map of the main pollution hotspots.

24. Several protected areas are contained within the basin, including the Arenillas Ecological Reserve in Ecuador, as well as the Tumbes mangroves, the Tumbes National Reserve and the Cerros de Amotape

[9] GlobCover. 2009. Global Land Cover.

in Peru. High levels of biodiversity are contained within many of these areas. For example, The Arenillas Ecological Reserve contains a large area of dry forest, with towering cactus and tall mangroves, 153 bird species, including 55 that can only be found in the dry forests of Ecuador and Peru, and four endangered mammal species.

Socio-economic context

25. Ecuador is a small country with an area of 256,370 square kilometers and with a great biotic, geographic and ethnic diversity. The 2014 population is estimated at 16,027,466 inhabitants (63% urban population and 37% rural). The Gross Domestic Product for 2013 was 93.7 billion USD[10], with the per capita GDP being $5,615. In the last five years (2009-2013) Ecuador's GDP growth has averaged 4.22%. The country's economy is based on three sectors; the first is the export sector based on oil and a group of agricultural products whose share in the GDP is around 20%, state public works contributes around 12% and trade with 11%; industry currently accounts for 9% of GDP and remittances from migrants bring an average of 3-5% of the GDP. The performance of the economy in combination with a series of policies aimed at income distribution have allowed the country to reduce the poverty level from 36.03% in 2009 to 25.55% in 2013. It should also be highlighted that rural poverty declined from 49.07% in 2012 to 42.03% in 2013. The Human Development Index calculated by the UNDP in 2012 was 0.724 which places the country in the list of high human development countries, although below the regional average of 0.741.

26. Peru is the third largest country in South America with an area of 1,285,216 km², and an estimated 2014 population of 30,814,175 inhabitants (76% urban versus 24 % rural). The country's Gross Domestic Product in 2013 was estimated at 210.3 billion USD[11] and GDP per capita at $6,825. The most important sectors of the economy based on their contribution to the GDP are the services sector (63%), agriculture , mining and fishing (15%) and manufacturing (4%). Based on the good performance of these sectors, the GDP growth rate has been over 6% per year during the 2008-2012 period, which has reduced the national poverty level from 36.20% in 2008 to 23.9% in 2013. The Human Development Index for the country has also shown significant progress, according to the last measurement (UNDP 2012), Peru's HDI was 0.741 which places it in the group of countries with a high HDI. However, poverty is more pronounced in rural areas.

27. The Pacific drainage basin is of very high socioeconomic interest to both countries, since it contains the largest part of the population and its productive activities. The environmental problems of water quality and availability in Ecuador´s Southwest Pacific basin and the whole Peruvian Pacific basin have contributed to a deficit of available water which has seriously limited local socioeconomic development and raised the levels of poverty in the region. Nonetheless, there are sectors where water resource availability has led to intensive socioeconomic activity. The economy of these areas, however, is highly dependent on water availability, and is therefore vulnerable to mismanagement, overexploitation and pollution of the resource as well as to the effects of climate variability and change. The following paragraphs will provide more detail on the socio-economic context of each of the three transboundary basins.

Catamayo-Chira Basin

28. The estimated population of the basin for 2014 is 783,569 inhabitants, with 74% of the population living on the Peruvian side. The population growth rate is -0.31% in Ecuador and 0.42% in Peru, with an average population density of 35 inhabitants per km². At the basin level, the urban population exceeds the

[10] This is referred to as 93.746 million USD in Latin America.

[11] This is referred to as 210.300 million USD in Latin America.

rural population at 52%, with the population on the Ecuadorian side being predominantly rural while on the Peruvian side mainly urban (high urban population in the Province of Sullana). The population structure indicates a young population with 33% of the population children (0-14 years) and 25% youth (15-29 years). Only 0.25% of the population defines itself as indigenous, with the majority of the population considering itself mestizo. In total 51% of the population is male, 49% female and the proportion of female-headed households is 28% in Ecuador and 23% in Peru[12].

29. On both sides of the border, there are various issues that are undermining quality of life. Overall, the percentage of the population with one basic need unmet is high at 54%, and this Index reaches close to 90% in some cantons of Ecuador. This is one of the factors contributing to high levels of migration.

30. Inadequate housing conditions affect the lives of 23%-39% of inhabitants on the Ecuadorian side and 5%-29% on the Peruvian side. On average, the population has completed 8.4 years of schooling (representing completed primary school and two years of high school). Many inhabitants do not have access to the social security system, including medical attention, particularly on the Ecuadorian side. While almost three-quarters of all households have electricity, there are some areas with very low coverage (for example, there are areas with only 27% of the population having electricity in Peru). It should also be noted that almost half the population still uses fuelwood for cooking purposes. This has negative health impacts, particularly for women and children, who are exposed to the toxic smoke that can cause a series of illnesses including lung cancer.

31. A total of 59% of the population has access to safe water. This figure is relatively low and must be addressed as it is essential to preventing diseases and to transforming agricultural practices for consumption or sale, which could provide increased income for women. The percentage of the population that is supplied with water through piping connected to a public system varies significantly throughout the basin (31%-81%), with the highest percentages corresponding to the more urban cantons/ provinces. On average 66% of households are connected to public sanitation systems, with higher levels in Ecuador than Peru. As a result, there are many households that are likely releasing wastewater in creeks and rivers, contaminating them, and contributing to infectious diseases.

Economic activities by sector

32. In total, 54% of the population is economically active and 46% inactive[13]. As can be seen in Table 3, the greatest percentage of the economically active[14] population is involved in primary sector activities. In some cantons/ provinces up to 50%-60% of the population is involved in agricultural activities.

Table 3: Economically Active Population by category of economic activity in Catamayo-Chira basin

Activity grouping	*Ecuador (%)*	*Perú (%)*	*Entire basin (%)*
Agriculture, livestock management, forestry, fishing	28%	31%	30%
Commerce	14%	15%	15%
Construction	8%	5%	5%
Manufacturing industry	6%	7%	6%

[12] Female-headed households are at a higher risk of becoming poor or of poverty levels increasing for the following reasons: (i) the potential for income generation is limited to one household member, (ii) barriers to access the labour market are higher for women and (iii) the time spent caring for the family does not allow women to maximize their working time.

[13] The age of insertion in the labour market/Economically Active Population is considered 10 years or more in Ecuador and 14 years or more in Peru, based on the official indicators in each country (http://www.inec.gob.ec/estadisticas/index.php?option=com_content&view=article&id=278&Itemid=57&lang=es http://www.inei.gob.pe/preguntas-frecuentes/).

[14] This refers to individuals who are working or actively seeking employment.

Teaching	8%	6%	6%
Transport, storage and communication	4%	8%	7%
Subtotal	*68%*	*70%*	*70%*
Others[15]	32%	30%	30%
Total of the EAP	100%	100%	100%

Primary sector

33. This is made up of the subsectors of agriculture, including livestock; forestry; mining; and aquaculture, with the first two having the most significant impact on the family economy.

Agriculture

34. Agriculture, including livestock management, is carried out on 679,370 hectares or 40% of the basin. Given the large number of people involved in the agricultural sector, farmers play an important role in the food security of the region and the practices they employ in relation to natural goods such as water, forests and fauna have a direct impact on the environmental sustainability of the area. Short-cycle crops (such as corn, rice and beans) predominate over permanent crops (coffee, sugar cane, lemon and banana) and overall irrigation coverage is 25%.

35. In the upper parts of the basin where conditions are more difficult in terms of topography, soil and climate, small-scale agriculture for subsistence is primarily practiced using family labour. In general the crops are rainfed because (public and private) irrigation systems have very low coverage. This type of agriculture is therefore very vulnerable to the effects of climate change such as prolonged periods of drought and/or periods of intense precipitation. Animals husbandry is focused on extensive cattle rearing in the upper basin, characterized by low yields and use of the same sources of water as those used for irrigation and drinking water. In the mid basin family agriculture is practiced by small and medium producers who also sell surplus production to local and regional markets. In the lower basin, higher levels of irrigation and more favorable topography have led to the planting of monocultures of rice, corn, sugar cane and banana, among other crops, with high water requirements, which is generating conflicts in terms of distribution. This is even more problematic when water availability in reservoirs and environmental flows are reduced by sedimentation. This agriculture is destined for national, regional and international markets. Overall, there is a low level of public and private irrigation in the basin with only 20% coverage, such that most crops are dependent on the calendar of rains. In addition, flood irrigation is usually employed with high inefficiency in water usage (84% wastage). In addition, it should be noted that the lower basin is highly vulnerable to the effects of climate change; its geographic position near Ecuador signifies that the tropical temperatures tend to exceed the requirements of plants and animals; furthermore, its closeness to the coast where the El Niño phenomenon occurs means that it is exposed to intense rains.

36. Livestock management of beef in the upper basin and goats in the lower basin is generally based on low producing native species and extensive systems (the average density is 1.33 heads per ha).

Mining, Forestry, aquaculture

37. Artisanal mining of metals (gold, copper, iron, silver and zinc) and non-metals (gravel, barite, limestone, etc.) is practiced, particularly on the Peruvian side of the basin. Small-scale, open pit systems are mainly employed with limited use of techniques to prevent contamination of water bodies. While less

[15] This includes mining, which makes up a very small percentage of the EAP in each country (0,35% in Ecuador and 0,71% in Peru).

than 1% of the economically active population (EAP) is employed in this sub-sector, the environmental impacts can be significant, in terms of river contamination due to direct discharges or infiltration of heavy metals and due to sedimentation.

38. An area of 698,600 ha of forest is present. Some primarily informal forestry activities are being carried out for both timber and non-timber products. However, timber production predominates and this often implies the total removal of the forest. Aquaculture activities are still limited in the basin.

Secondary and tertiary sectors

39. The manufacturing of food products, metallic products, and furniture etc. in the secondary sector generates relatively little employment (15% of the EAP), and occurs primarily in the lower parts of the basin. Most of the small businesses do not have waste management plans and dispose of the by-products of their production in the open, which are then washed by the rain to creeks and rivers. Construction also generates some seasonal employment in the secondary sector. In terms of the tertiary sector, the substantial proportion of the population involved in providing services suggests that they may be seeking alternatives to traditional productive activities. The main services include commerce (related to the area's main products and binational commerce at the border), transport, and relatively limited tourism.

Puyango-Tumbes Basin

40. The estimated population of this basin for 2014 is 374,134 inhabitants, with an average populational density of 28 inhabitants per km². As in the Catamayo-Chira basin, the population on the Ecuadorian side is primarily rural and on the Peruvian side more urban. The population growth rate is slightly negative in Ecuador at 0.16% and 1.2% on the Peruvian side. It should be noted that there is a large young population with 31% of the population being comprised of children and 24% of youth. A slightly higher percentage of the population is male versus female, particularly on the Peruvian side. Just under a quarter of the households in this basin are headed by females. The indigenous population of the basin is 2%, primarily living in the Canton of Saraguro in Ecuador.

41. Over half of the population can be considered poor in terms of Unmet Basic Needs in the areas of housing, basic services, education or employment. Poverty levels are higher on the Ecuadorian side where there are some cantons classified as having almost 100% poverty levels.

42. A significant proportion of the population does not have appropriate conditions to ensure an adequate quality of life. Households with deficient conditions in terms of unavailability of basic services within the household and inadequate housing material make up an average of 33% of all households in the basin (ranging from 29%-45%). The average percentage of households using fuelwood for cooking is 25% but this varies from 2% and 58%, creating significant pressures on forests in some areas. Overall, in both countries, there is a significant segment of the population without access to social security, though Peru has somewhat higher levels. As with the other basins, adults over 24 years of age on the Ecuadorian side have had an average of 10 years of schooling, while in Peru this is 9.6 years for the population over 25. Access to electricity is generally good at 88%. Access to potable water on the other hand varies greatly in the basin, with levels ranging from 28%- 92% for an average of 71%. The fact that 30% of the population does not have access to potable water for their domestic needs implies additional efforts to obtain this resource (including purchase). Given the cultural distribution of roles in families, it is women who take on this additional responsibility of obtaining water for drinking and cooking and of walking to streams to wash clothing, which exposes them to greater risk of accidents, animal attacks or sexual attacks. In addition, water quality issues can lead to health problems and result in lost working days as well as medical expenses. Approximately 80% of the households have access to sanitation systems, though there are some areas on

both sides of the border where wastewater is discharged directly into rivers and creeks. Half of the population is economically active. The following table provides a breakdown of employment per category of activity.

Table 4: Economically Active Population by category of economic activity in Puyango-Tumbes basin

Economic activity grouping	*% of EAP in Ecuador*	*% of EAP in Peru*	*Average % of EAP*
Agriculture, hunting, forestry and fishing	27.2%	20.3%	25%
Mining	3.0%	0.2%	2%
Industry and manufacturing	6.3%	6.4%	6%
Construction	7.7%	4.9%	6%
Commerce	14.2%	18.2%	16%
Teaching	7.1%	6.5%	7%
Transport and storage	4.5%	10.8%	8%
Subtotal	70%	67.3%	70%
Others	30%	32.7%	30%
Total	100%	100%	100%

43. Despite these averages, it should be noted that there are some regional differences. For example, in three cantons of Ecuador, mining is carried out by 24%, 32% and 15% of the EAP, and in the urban areas, commerce captures a large segment of the EAP.

Primary sector (agriculture and mining)

44. As can be seen in Table 4, 27% of the EAP is employed in the primary sector involving the direct exploitation of natural resources. Agriculture, including livestock management, is carried out over an estimated area of 446,273 ha, the largest part of which corresponds to the Ecuadorian side of the basin. In the upper basin, Andean grains, vegetables, fruits and tubers are produced with little investment, limited irrigation and family labour, primarily for food security. Despite being close to sources of water, the topography and the lack of infrastructure limit the access to irrigation systems, such that agriculture is often practiced seasonally, and families must find other means to make a living, including migration. In the mid and lower basin, there are higher levels of irrigation (irrigation of surface water and drilling of wells to access groundwater). In this part of the basin commercial production of crops such as coffee, sugar cane, banana, corn, rice and peanuts takes place. Rice production is associated with flooding of large areas, which can create health concerns in terms of the propagation of mosquitoes that can transmit malaria or dengue. Water management for agriculture is characterized by the use of irrigation for commercial crops from superficial canals and underground sources (wells), as well as by actions to prevent flooding from El Niño events. The maintenance of appropriate flow levels in the Tumbes river as well as of water quality are crucial for water resource management. In this respect, there are several aspects of concern: i) deforestation for agriculture and livestock activities in the upper basin and sediment transport; ii) discharge of metals used in mining to affluents of the Puyango river; and iii) pollution from sewage discharged into river channels. Agricultural activities in the mid and lower basin is affected by the presence of chemical and organic pollutants from the upper basin, and in the lower basin is also vulnerable to flooding particularly as a result of El Niño events.

45. Cattle, goats, pigs and poultry are reared using traditional systems, local species and extensive pasture systems. Various impacts ensue, such as bare soil in the case of goat rearing. Shrimp production takes place on the Ecuadorian side and langoustine and fishing are carried out primarily on the Peruvian side.

46. Women play a key role in agricultural systems, and are generally in charge of the subsistence products (along with small animals) and for grading, sorting and packaging of products destined for the market (family labour or hired work).

47. Mining is carried out principally in the cantons of the Oro province, Ecuador. Gold, silver and copper are mined (20,000 ha of concessions) as well as non-metals (extraction of stony material from the rivers). The related discharge of chemicals from the mining of metals to the tributaries of the Puyango river has affected the quality of water for human and animal consumption and for irrigation. The extraction of stones, gravel and other non-metallic material is leading to sedimentation issues.

Secondary and tertiary sectors

48. The secondary sector is poorly developed and is made up primarily of construction and industry (artisanal transformation of agricultural products such as coffee and sugar cane, packing and freezing of products for export such as shrimp). In terms of the tertiary sector, commerce, transport, activities and services for the local population and for visitors in the border area predominate with 56% of the EAP involved in the provision of services.

Zarumilla Basin

49. The estimated population of this basin for 2014 is 152,627, with 59% concentrated in Ecuador. The average population growth rate is 1.52% and average population density is 47 inhabitants/km², though there are some urban centres with a much higher density. In fact the basin is predominantly urban with 83% of the population falling into this category as a result of the presence of two urban centres in Peru at the border (Aguas Verdes and Zarumilla) and one in Ecuador (Huaquillas). There is a slightly higher percentage of men to women, particularly on the Peruvian side of the basin where 55% of the population is male. In terms of the population distribution by age, 32% of the population is comprised of children (0-14 years of age) and 29% of youth (15-29 years). Indigenous people make up less than 0.5% of the population.

50. The quality of life in the basin was assessed by examining several factors including housing conditions, education levels, access to social security, water and sanitation systems and the percentage of the population with Unmet Basic Needs (UBN). Overall, 51% of the population of the basin can be classified as having Unmet Basic Needs in terms of housing, education, basic services or income, with a higher number of individuals on the Ecuadorian side falling in this category.

51. A total of 37% of the housing units lack basic services or have physical deficiencies, with the Ecuadorian side presenting a higher number of such cases. The average education level for the population over 24 years of age in Ecuador and 25 in Peru is 9.18 years, indicating that most inhabitants have completed basic schooling. The figures on access to social security are of concern, with only 26% of the population having access, with the population of the Ecuadorian side being particularly vulnerable in this sense. A total of 83% of the population has access to an acceptable (though not optimal) supply of water[16]. In addition, 84% of the basin's inhabitants have sanitary measures in the household, with the Ecuadorian inhabitants generally having better access; however, there is a significant segment of the population (about 25%) that does not meet this requirement. The percentage of the population with access to means of eliminating sanitary waste ranges from 67%-92%, with more limited connections of housing to sewerage systems on the Peruvian side.

52. In total, 53% of the population of age to work in the basin is economically active, with the following table showing the breakdown by activities:

[16] The percentage of the population with access to safe water refers to the number of people who obtain their water for consumption from a public network, water delivery truck, or public tap or other source by tubing as a percentage of the total population.

Table 5: Economically Active Population by category of economic activity in Zarumilla basin

Economic Activity Grouping	Ecuador	Peru	Percentage
Agriculture, animal husbandry, hunting and forestry, fishing	22%	19%	20%
Commerce	23%	17%	19%
Transport	7%	13%	11%
Industry	6%	6%	6%
Construction	7%	5%	6%
Restaurants, hotels	4%	5%	5%
Sub-total	69%	66%	67%
Others	31%	34%	33%
Total	100%	100%	100%

Primary sector

53. Primary sector economic activities are focused on agriculture, followed by fish farming and a small level of mining. As shown in Table 5, 20% of the population works in this sector. Approximately 74,526 ha are dedicated to agriculture, in particular production of pasture for livestock, and 20% of the population is employed in this sector. Agriculture is practiced both with irrigation and with rain-fed systems, with about 12,200 ha of irrigated area in the basin using superficial canals or water extracted from wells (out of a total of 23,868 ha dedicated to crops), particularly for the production of commercial crops such as banana, rice, coffee, and cacao. Agricultural activities are vulnerable to flooding, which is more severe during El Niño events, and are affected by water quality issues as a result of pollution from chemicals used in mining, among other pollutants. Livestock production includes primarily extensive cattle and goat rearing (associated with inefficiency and negative environmental impacts), as well as production of pigs and chickens. Pig production is an economically important activity on the Ecuadorian side and is principally carried out by women. There is also extraction of fish, crustaceans and mollusks from the open ocean as well as shrimp and langoustine production. The latter is associated with several environmental concerns, including the cutting of mangroves to increase the production area, the discharge of chemical and organic contaminants generated in the productive cycle of shrimp, and impoverishment of the mangroves as a result of extraction of larvae from mangroves. Finally, mining activity is very limited in the upper basin, however, it has already begun to affect water quality.

Secondary and tertiary sectors

54. The secondary sector occupies 14% of the EAP and is comprised mainly of construction activities and basic transformation of primary products through small businesses. The tertiary sector includes mainly commercial activity and transportation, particularly along the border between Ecuador and Peru, and some tourism and involves the largest percentage of the EAP.

Legal and policy context

Peru

National Environmental Management System and National Water Resource Management System

55. The National System of Environmental Management was set up to guide, integrate, coordinate, monitor, evaluate and ensure the implementation of policies, plans, programs and actions to protect the environment and to contribute to the conservation and sustainable use of natural resources. The National Water Resource Management System is a component of this larger environmental management system. It consists of the set of institutions, principles, standards, procedures, techniques and tools by which the Peruvian state works toward the integrated and multi-sectoral management of water resources, their sustainable use, conservation, preservation of quality and increase in quantity. The National Water Authority (ANA) is the governing body of this system and is responsible for its functioning. The system is comprised of representatives of the public sector, user organizations, sectoral and multisectoral operating entities of hydraulic sectors, and communities among others.

National Water Resources Policy and Strategy (2009)

56. The specific objectives of the National Water Resources Policy and Strategy (2009) in relation to transboundary basins include: "[enabling] increased cooperation with neighboring countries, particularly in regard to the transboundary management of surface and groundwater resources." The strategic actions identified in the Policy and Strategy include: seeking a common approach to make decisions in the context of the conditions in place; assessing key challenges and opportunities for improving the management of transboundary water resources; promoting the joint action of governments and societies to mitigate the undesirable effects of climate variability and reduce vulnerability and risks associated with extreme weather phenomena; preventing conflicts, managing existing ones and solving formal disputes that may arise between countries; and finally, promoting the signing of bilateral agreements to implement water resource development plans in shared river basins.

Water Resources Act (2009) and associated regulations

57. In 2009, the Water Resources Act was approved in Peru and the integrated management of water resources was declared to be a public necessity of national interest that is vital for efficiency and sustainability in the management of water resources in basins. Integrated water management will be carried out to ensure water conservation, increased availability and quality assurance to meet the demands of current and future generations. In relation to transboundary basins, the Act states that "the National Authority will coordinate with the Ministry of Foreign Affairs for the entry into multinational agreements related to the integrated water resource management of transboundary basins".

National Agreement which led to adoption of the State Policy on Water Resources (2012)

58. The main objective of this policy is to ensure universal access to water through integrated water resource management, strengthening governance and sustainable development.

59. The table below provides a summary of key relevant standards in Peru related to water resources management.

Table 6: Water resource management standards in Peru.

Year	Standard	Responsible entity
2014	Water User Organizations Law- Law 30157	ANA
2013	Supreme Decree No. 005-2013-AG modifies the Regulation of the Water Resources Act No. 29338, with reference to the creation of Interregional Basin Councils	ANA
2013	Arrangements for Formalizing Water User Boards as operators of water infrastructure- Supreme Decree 05 2013	Ministry of Agriculture
2011	Economic Compensation for Water Use- DS 014 2011	ANA

2010	Regulation of the Water Resources Act- Supreme Decree 001-2010-AG	ANA
2010	Rules on the Organization and Functions of the National Water Authority, approved by Supreme Decree No. 006-2010-AG	ANA
2009	Law on Water Resources- Law No. 29338	MINAG- ANA

Environmental quality standards for water resources and other relevant regulations

60. In Peru, environmental quality standards and maximum permissible limits serve as environmental management tools to regulate and protect public health and environmental quality. In terms of water resources, maximum allowable limits have been established for liquid effluent discharges from metal mining and for the effluents from domestic or municipal waste water treatment plants. In addition, provisions have been established for the implementation of National Environmental Quality Standards for different water uses (e.g., recreation, coastal marine activities, irrigation of vegetables, water for livestock, conservation of the aquatic environment).

61. There are several other tools related to the sustainable management of water resources, including standards for environmental impact assessment. These must adhere to several criteria, including the protection of the environmental quality of water. Regulations on ecological flows have not yet been developed. Finally, there are additional standards for the management of water resources in various sectors such as mining, forestry, health, and sanitation.

62. It is worth noting that a series of ordinances have been developed by the Regional Government of Tumbes (which includes the provinces of Tumbes, Zarumilla and Contralmirante Villar Zorritos) to establish a regional environmental management system for the region, create the Tumbes Regional Environmental Commission and the Tumbes Multisectoral Technical Group.

Ecuador

63. The *Law on Prevention and Control of Pollution (1976)* aims to safeguard the proper use and conservation of Ecuador's natural resources for the individual and collective welfare, while the *Environmental Management Act (1999)* establishes the basic rules for the implementation of environmental policies. The *Unified Text on Environmental Legislation (TULSMA) (2002, updated in 2003)* regulates the application of Articles 28 and 29 of the Environmental Management Act. Its provisions are the basic parameters by which all state institutions that make up the National System of Environmental Management, delegates and organizations with concessions must abide. TULSMA includes the standard on environmental quality and effluent discharge for water resources, which aims to protect the quality of this resource, establishing the permissible limits, provisions and prohibitions for discharges into water bodies or sewage systems; water quality criteria, and methods for determining the presence of contaminants. It also includes a standard on environmental quality management and disposal of non-hazardous solid waste, which provides rules to prevent the pollution of water, air and soil. The *National Environmental Policy* of 2009 includes the basic tenets of environmental sustainability; as well as gender, generational, intercultural and territorial equity.

Constitutional Regulations of 2008

64. The Constitution of the Republic establishes that the human right to water is fundamental and indispensable and that this resource is a strategic national heritage for public use that is inalienable, imprescriptible, indefeasible (i.e., cannot be forfeited) and essential for life. Furthermore, the regulations indicate that the State, through the sole water authority, is directly responsible for the planning and management of water resources for human consumption and irrigation to ensure food sovereignty, ecological flows and productive activities, following this order of priority. The State shall also ensure the conservation, restoration and integrated management of water resources, basins and ecological flows associated with the hydrological cycle, and as such any activity that could affect the quality or quantity of water, and the balance of ecosystems is regulated, in particular at water sources and recharge areas.

65. Decentralized autonomous governments have the mandate to carry out environmental management, land use planning, protection of rivers and streams. As such, the Constitution and the Territorial Planning Code establish the exclusive jurisdiction of provincial GADs (second category of GADs), in coordination with the regional government, to carry out construction works in basins and sub-basins, provincial environmental management and planning, as well as the construction, operation and maintenance of irrigation systems. The municipal GADs (third category of GADs) have among their exclusive powers development planning at the level of cantons and the formulation of land use plans, in coordination with planning at the national, regional, provincial and parish levels, in order to regulate the use and occupation of urban and rural land, and provide public drinking water, sewerage, sewage treatment, solid waste management, environmental sanitation activities and those established by law, among others.

Water Resources Act

66. The recently passed Water Resources Act (2014), which replaces the 1972 Water Act, regulates the use of maritime, surface, ground and atmospheric waters of the country. The Act promotes the appropriate use of water resources and establishes control mechanisms to prevent the contamination of the resource. The Law establishes the institutional framework, with a single Water Authority responsible for the stewardship, management, regulation and control of the integrated and comprehensive management of water resources, based on an ecosystem approach and integrated water management in basins and systems. This Authority should coordinate its actions with the decentralized autonomous governments according to their competencies/ mandates. The Act applies to both surface water and groundwater. The human right to water is defined within the Act as the right of all people to have water, safe, accessible and affordable water for personal and domestic use, in terms of quantity, quality, continuity and coverage.

67. The new Act creates the strategic national water system, which is the set of processes, institutions and instruments that enable the interaction of different stakeholders from civil society and institutions to organize and coordinate the comprehensive and integrated management of water resources. This system will consist of: a single water authority that directs it: the Intercultural and Plurinational Water Council; institutions with executive functions that will carry out mandates related to the integrated management of water resources; the Agency for the Regulation and Control of Water, under the single water authority; Autonomous Decentralized Governments; and water resource basin councils.

68. The new Act states that the single Water Authority will control discharges to water bodies through the Hydrographic Demarcations (nine decentralized entities that represent SENAGUA's executive arm), in coordination with the national environmental authority, the national health authority and the decentralized autonomous governments exercising jurisdiction over the control and prevention of environmental pollution. The Act covers authorizations for the use of water resources for domestic activities, irrigation, hydroelectricity, industrial and mining purposes.

69. There are two ways of dealing with offenses related to pollution of water resources: the administrative route for which the Ministry of Environment and SENAGUA have jurisdiction through the Hydrographic Demarcations; and the criminal route established in the Comprehensive Criminal Code

(effective as of August 2014), which is exercised by the Attorney General and the courts of violations. The new law establishes a new institutional model for the management of water resources, which will require substantial efforts over the next two or three years to implement policies and put in place management models (requiring the definition of exclusive or concurrent powers) and to develop regulations to meet the objectives of the Act. These will need to be taken into account for the successful implementation of the project.

70. The new Act aims to promote the sustainable use of aquifers and groundwater, stressing the responsibility of users in their protection and conservation; and to significantly control water pollution and ensure prior water treatment before discharge into the environment. Various other disparate pieces of legislation also relate to the use of groundwater.

Environmental quality norms

71. The environmental quality standards issued by the Ministry of Environment are the legal regulations in force to protect natural resources, including ecosystems, plant and animal species, as well as water and soil resources. The Ministry of Environment's norm on environmental quality and effluent discharge for water resources sets the allowable limits, the provisions and prohibitions for effluent discharges into water bodies or sewage systems, as well as the water quality criteria for different uses, and methods and procedures for determining the presence of contaminants in water.

72. Other relevant norms include procedures for the registration of those generating, managing or transporting environmental waste prior to environmental licensing (discharge permits for emissions and discharges are applied to water bodies, sewage systems, air and soil) and the environmental technical standard for the prevention and control of environmental pollution for infrastructure sectors (electricity, telecommunications and transport).

73. As is the case of Peru, Ecuador has legislation in place for environmental impact assessments of activities that may pose an environmental risk, and complementary regulations in place for the forestry, mining and other sectors. In terms of the issue of ecological flows, the national water authority is directly responsible for the planning and management of water resources to ensure that the approved flows are maintained.

Regional policies, commitments and institutional structures to address ITWRM

74. Peru and Ecuador have signed various agreements within the context of the Andean Community of Nations[17] (Bolivia, Colombia, Ecuador, and Peru) and have made several declarations that signal their commitment to promote the joint management of transboundary basins. The following paragraphs provide more detail on these agreements and declarations.

Integrated Water Resources Strategy (2011)

75. In 2011, the member countries of the Andean Community adopted the Andean Strategy for Integrated Water Resources Management in order to promote joint actions for the development, sustainability and strengthening of IWRM in member countries. Proposed actions include creating tools to promote IWRM in transboundary basins for the implementation of joint projects, and promoting agreements among member countries for IWRM in transboundary basins. Subsequently an Environmental Agenda for 2012-2016 was agreed upon for the Andean Community which lays out a roadmap that supports the Integrated Water Resource Strategy, among other policies involving environmental issues.

[17] A customs union/ trade bloc consisting of Ecuador, Peru, Colombia and Bolivia.

Relevant Presidential Declarations

76. With the joint presidential declaration of 2012 in Cuenca, the Ministers of Environment of Ecuador and Peru are urged to make efforts to establish contiguous ecological protection zones to promote the sustainable use of biodiversity and sustainability of shared ecosystems. New commitments for the adoption of integrated management plans in transboundary basins were taken on. In the joint presidential declaration of October 2010, the presidents of Ecuador and Peru highlighted the recent entry into force of the Binational Agreement for the "Establishment of the Binational Commission for Integrated Water Resources Management of the Zarumilla Transboundary River Basin" and the start of operations of the Zarumilla Canal (supervised by the Binational Permanent Commission for the Administration of the Zarumilla Canal and Water Use). This Joint declaration also considered the adjudication of the "Feasibility study for hydraulic works of the Puyango-Tumbes River Basin" and the "Final Design and Implementation of Common Works of the Binational Puyango-Tumbes project". Acknowledging the serious environmental and socioeconomic impacts from informal mining and other sources of pollution of the transboundary rivers, the joint declaration appointed the competent authorities to address these issues in the Puyango-Tumbes and Catamayo-Chira basins. The Ecuador-Peru Presidential Meeting (2007) agreed upon: "the creation of the Binational Authority on basin management with the coordination of the foreign ministries of both countries."

Other Binational Agreements of Relevance

77. In 1998, the Peru-Ecuador Broad Agreement on Border Integration, Development and Neighbourly Relations was signed. The Binational Plan for the Development of the Border Region of 2007 came out of this agreement and was created to "increase the quality of life of the populations of the South and West of Ecuador and of the North and Northwest of Peru". The institutional structure to implement the Plan is comprised of an Assembly (the Good Neighbours Commission), a Binational Board, and National Chapters. The role of the national chapters is to promote the implementation of national programmes for the construction and improvement of the productive and social infrastructure and to address environmental issues in the border regions. In addition, they are responsible for ensuring the smooth running of the national components of bilateral projects and the sound implementation of private investment on each side of the border. The National Planning Secretariat (SENPLADES) was designated in 2008 as responsible for the Binational Plan (Ecuador chapter).

78. The Ecuador-Peru Neighbours Commission is a political mechanism to encourage, support and coordinate programs, projects, and activities in order to strengthen relations and interests between the two countries. It is responsible for establishing general guidelines for bilateral cooperation, the implementation of the border regime and the smooth running of the Binational Development Plan for the Border Region.

Binational Commission for Integrated Water Resources Management of the Zarumilla Transboundary Basin

79. In 2009, the presidents of Ecuador and Peru signed the Agreement between the Republic of Peru and the Republic of Ecuador for the Establishment of the Binational Commission for the Integrated Water Resources Management of the Zarumilla Transboundary Basin, whose objectives include: (i) strengthening cooperation within the framework of a bilateral relationship, (ii) promoting integrated water resources management (IWRM) with an ecosystem-based and sustainable vision, fostering the establishment of mechanisms of communication, coordination and participation, (iii) promoting the development, conservation and management of transboundary water resources generating a positive impact on the quality of life of the population, and (iv) promoting the participation of the Binational Development Plan of the Peru-Ecuador Border Region and implementing projects related to the proper and sustainable utilization of water resources in the Zarumilla transboundary basin.

80. In 2010 the Statute of the Binational Commission for the Integrated Water Resources Management of the Zarumilla transboundary basin was signed. The structure of the Binational Commission involves both

political and technical levels. In 2011, the Binational Commission for Zarumilla was installed and protocols, a plan and a monitoring network for water quality were established. To date, Terms of Reference have been agreed upon to carry out studies for the development of the Integrated Water Resources Management Plan for the Zarumilla basin. Unfortunately, due to several factors including lack of funding, consultants have not yet been hired to develop the plan.

Binational Commissions for Catamayo-Chira and Puyango-Tumbes

81. There have been several national technical meetings to promote the establishment of a Binational Commission for Puyango-Tumbes. Additionally, a binational meeting took place between ANA and SENAGUA in order to define mechanisms that would lead to the creation of the binational institutional framework for ITWRM in the Catamayo - Chira and Puyango - Tumbes basins. Further actions are required to build on this work.

Institutional Context

Peru

82. The *Ministry of Environment (MINAM*) is the lead agency in the environmental sector in Peru and the authority responsible for the formulation of national environment policy applicable to all three levels of government. It is the head of the National System of Environmental Management. Through the General Directorate on Climate Change, Desertification and Water Resources, MINAM develops the national policy on water resources. The *Ministry of Agriculture* has jurisdiction over water use in agriculture, irrigation and water resources in general since the *National Water Authority (ANA)* forms part of its structure. ANA is the governing body on water resource management and the highest technical-regulatory authority at the national level for the National Water Resource Management System. It sets the policies and establishes the procedures for achieving integrated water resource management. It is active across the country through its decentralized organs, i.e., Water Management Authorities and Local Water Administrations (at the basin level). ANA's goal is to manage conserve, protect, and make use the water resources of the different basins in a sustainable manner. The Governing Board of ANA is composed of key representatives of the public and private sectors. The *Tribunal on Water-related Issues* is a body within ANA with functional autonomy, and makes the ultimate decisions concerning administrative complaints and appeals against decisions issued by the Water Management Authorities. *Water resource basin councils* are permanent bodies within ANA, created at the request of regional governments, to carry out planning, coordination and cooperation for the sustainable use of the water resources in their respective area. There are two types of water resource basin councils: 1) regional water resource basin councils, when the area of the basin is located entirely within one single regional government. In the project area, the Water Resource Council of Tumbes Basin was created in 2012 and is involved in the integrated and multi-sectoral management of water resources in Tumbes. There is also a basin council for Piura; and 2) interregional basin councils.

83. In keeping with Peru's state policy of decentralization and the balanced exercise of power by the three levels of government, in relation to the three basins, ANA works with regional and local governments on the development of water resource management plans in the basins, the management of water resource basin councils, and control and monitoring actions to ensure the sustainable use of water resources. *Water user organizations* are associations set up to promote the organized participation of water users in the multisectoral management and sustainable use of water resources. They include user committees, commissions and boards.

84. As it relates to binational basins, the *Ministry of External Relations* is a key stakeholder for binational actions and agreements.

Ecuador

85. The *Ministry of Environment of Ecuador (MAE)* is the governing body, coordinator and regulator of the National Decentralized System of Environmental Management and is responsible for proposing national standards for environmental management and environmental impact assessment. It is the authority responsible for the monitoring of compliance with environmental quality standards related to air, water and soil resources, and is in charge of the national program for the integrated management of solid waste, among other programs.

86. *The National Water Secretariat (SENAGUA)* was created in 2008 as a result of the reorganization of the National Water Resources Council. This Secretariat is under the Presidency of the Republic, and has its own assets and budget as well as technical, operational, administrative and financial independence. SENAGUA is charged with guiding water resource management processes in an integrated and sustainable manner at the level of basins, sub-basins, micro-basins, hydrographic and hydrogeological demarcations. It is responsible for regulating environmental flows; water management, planning, regulation and control; and cooperating and coordinating with the environmental authority to ensure that water management is carried out using an ecosystem approach. SENAGUA's competencies include basins, dredging, hydraulic fills, cleaning of rivers, estuaries and other aspects related the integrated management of basins and it may exercise these powers concurrently with (provincial, canton-level or parish-level) autonomous decentralized governments. Since 2013, SENAGUA has also been responsible for potable water and sanitation.

87. The *Water Regulation and Control Agency (ARCA)* was founded in 2014 and is a technical-administrative body under SENAGUA. It has administrative, technical, economic, and financial independence, with jurisdiction over the entire national territory. It is responsible for the regulation and control of the comprehensive and integrated management of water resources, management of the quality and quantity of water at source and recharge areas, the quality of public services related to the water sector and all uses of water. At the same time as ARCA was created, the *Public Water Company (EPA*) was established under SENAGUA to: a) carry out the contracting, managing and monitoring of water infrastructure projects under the jurisdiction of the central government in the design, construction, operation and maintenance phases; b) technically and commercially advise and assist providers of public and community water services; and, c) carry out the commercial management of the use and exploitation of water. The work of the Public Water Company is limited to the powers of the central government and it does not deal with autonomous decentralized governments.

88. In 2009, it was determined that integrated water resource management would be carried out in a decentralized fashion by river basin districts, basins or sub-basins through the agencies managing water resources for the basins. As a result, in 2010, SENAGUA agreed to establish and define the limits of nine river basins and to establish the same number of decentralized administrative units (to deal with financial and administrative aspects) through which SENAGUA would carry out the planning and integrated management of water resources throughout the country. These are called *Hydrographic Demarcations*. After the approval of the Water Resources Act in 2014, the single water authority was created, which will define the decentralized management structure and define the administrative limits of hydrographic units. This authority must still establish the mechanisms of coordination between SENAGUA and the autonomous decentralized governments in relation to the provision of the public services of irrigation and drainage, potable water, sanitation, sewage treatment, and others.

89. The *autonomous decentralized governments (GADs)* have different mandates over water resources. The provincial GADs are responsible for environmental management, construction of roads and management of irrigation and drainage infrastructure in rural parishes. The canton-level GADs have responsibilities for planning development at that level and producing the respective land use plans in order

to regulate the use of urban and rural soil and providing the public services of potable water, sanitation, sewage treatment, and management of solid waste. The parish-level GADs are responsible for planning parish-level development, producing land use plans and promoting the implementation of productive community activities, conserving biodiversity and protecting the environment.

90. The Citizen Council for the Water Sector was created in 2012 and provides a forum for dialogue and monitoring of SENAGUA's public policy in the water sector as well as a mechanism for discussing guidelines and monitoring the evolution of institutional policy. This Council serves as a network of civil society participants that interact with SENAGUA. In addition to this Council, the 2014 Water Resources Act established the Intercultural and Plurinational Water Council as part of the national strategic water system, with responsibilities for the formulation, planning, evaluation and participatory monitoring of water resources.

91. Other Ministries in Ecuador with a role to play in IWRM include the Ministry of Agriculture, Livestock, Aquaculture and Fisheries (MAGAP), which is responsible for water use in the agricultural sector, excluding irrigation and drainage; the Ministry of Health, responsible for potable water quality; and the Ministry of External Relations and Mobility, which is responsible for establishing the guidelines for binational cooperation, and the smooth functioning of the Binational Development Plan, among other duties. This Ministry is part of the Peru-Ecuador Neighbour Commission which promotes and coordinates programs, projects and activities that reflect the interests of the two countries.

Threats

92. Both the quality and quantity of water resources in the three transboundary basins are threatened by a number of factors. Three main threats to water quantity/ water supplies were identified. Firstly, there is intense exploitation of water for agriculture, which is an important productive sector at the binational level. This is coupled with the use of inefficient irrigation systems, primarily flood irrigation. Water consumption for the agricultural sector exceeds 90% of total consumption in both countries. As a result, water volumes are beginning to decline in certain areas. For example, recent data in the Ciruelo monitoring station in Peru in the Catamayo-Chira basin found that volumes had reduced by 26-37% compared to historic averages, and recent statistics from the Tigres monitoring station in the Tumbes basin found a reduction of 26% in volumes compared to the historic average. Secondly, deforestation is a significant concern, particularly when it occurs at the mouth of rivers, streams, rivers, and aquifer recharge areas. This has led stakeholders to comment that water volume/flow has decreased. This situation may be exacerbated if climate change scenarios hold true; these predict that water deficits will be experienced in the provinces of El Oro y La Loja. Thirdly, there has been a decline over time in the use of 'tajamares' (small earthen dams constructed in river or streams) and albarradas (small ponds formed by earth dikes, laid across streams). These were used as means to conserve water either through superficial storage and/or to facilitate infiltration for aquifer recharge. This is associated with a gradual loss in the ancestral knowledge of water resource management.

93. The main threats to water quality stem from untreated waste water, inappropriate solid waste management, and discharges from the agricultural and mining sectors. Untreated wastewater discharges into rivers, streams and aquifer areas in rural and urban areas of Ecuador and Peru is a widespread problem. It can be attributed to the relatively low coverage of sewage systems and septic tanks, as well as the frequent collapse of oxidation ponds that were not equipped to handle the volumes being generated and that are not given sufficient maintenance. The dumping of solid waste into water sources is also a substantial issue. This is related to the lack of efficient solid waste disposal systems and leads to the pollution of surface and groundwater.

94. The agricultural sector constitutes an important source of pollution as a result of the use of toxic agricultural inputs, though few chemical analyses on these contaminants are available. Besides the discharge of agricultural effluents, the agricultural packaging also leads to a solid waste issue. To a lesser extent, stakeholders identified the problem of water turbidity due to the erosion associated with agricultural practices, particularly with crop production and livestock management on steep slopes and with the use of flood irrigation.

95. Mining activity to extract gold and stone material (sand, gravel) from riverbeds is also a serious threat to the quality of water resources. For example, untreated gold mining effluents discharged into rivers in the upper part of the Puyango-Tumbes basin in the cantons of Zaruma and Portovelo affect the quality of water in the mid- and lower part of the basin as a result of the transport of pollutants (heavy metals, cyanide, sediments) in the river flow. Extraction of stony material in the upper part of the Catamayo-Chira basin is affecting the mid-basin as a result of increased sedimentation in the river and in the irrigation canals, reducing their performance.

96. As a result of these threats, both surface and groundwater quality is being compromised. In terms of groundwater, it is the unconfined aquifers that are most susceptible to contamination as a result of their high permeability. In some cases for example, registers of coliform levels confirm groundwater pollution. The deeper aquifers found in the three basins generally have a lower risk of contamination.

97. The following tables provide more detail on the main threats and environmental impacts in each of the three transboundary basins that are the focus of this project:

Table 7: Transboundary problems, threats and environmental impacts in the Catamayo-Chira basin[18]

TRANSBOUNDARY PROBLEM	THREATS	ENVIRONMENTAL IMPACTS
Decreased surface water reserves and occasional flooding	Seasonal variation in the availability of water resources due to agricultural, climatic, hydrological, and biogeographic reasons 94% of the water is used for agriculture and about 5% for ecological and population use. Rice is	Seasonal water deficit Drought in the Chira system, Chipillico, Quirzo, Alamor, Macara and Catamayo sub-basins.

[18] Asesores técnicos asociados s.a., Universidad Nacional de Piura, Universidad Nacional de Loja 2003. Caracterización territorial y documentación básica en el ámbito de la cuenca binacional Catamayo-Chira. Volumen III. Estudios básicos. Tomo 3.5 Estudio de focos contaminantes. Loja – Piura
Asesores técnicos asociados s.a., Universidad Nacional de Piura, Universidad Nacional de Loja 2003. Caracterización hídrica y adecuación entre la oferta y la demanda en el ámbito de la cuenca binacional Catamayo-Chira. Volumen III Estudios básicos. Loja – Piura
Autoridad Nacional del Agua, 2012. Diagnóstico de la Gestión de los Recursos Hídricos de la Cuenca Chira-Piura. Anexo 6 Caracterización calidad de las aguas.
Ministerio de Agricultura, Autoridad Nacional del Agua. 2013.Plan de Gestión de los Recursos Hídricos de la Cuenca Chira-Piura. Informe Final. Piura, Perú.

	particularly demanding in terms of water requirements in both Peru and Ecuador. Temporal and spatial variation of rainfall (high rainfall in winter and low summer rainfall) and temperature It should be noted that local water authorities, irrigation boards and commissions are still not regulating the consumption and management of irrigation water	Droughts are not of a serious nature Floods and overflowing rivers in the Quiroz, Macara, Catamayo subbasins and the Chira System
Decrease in groundwater reserves and contamination	Deforestation in aquifer recharge areas Wastewater discharge on permeable soils that facilitate pollution Lack of cleaning or maintenance of wells and equipment Variation of the hydrogeological potential with the water in the Catamayo subbasin being mostly freshwater and in the Chira system having high salinity High electrical conductivity of the water in the lower part of the Chira system near the ocean (high salinity) Seawater intrusion	Variable groundwater reserves Erosion and sedimentation, landslides in the upper and middle basin regions due to the lack of vegetation and erosion of alluvial rivers and borders Poor water quality due to the presence of coliforms and other substances Unpleasant taste (brackish water)
Contamination of surface water	Discharge of solid waste into water bodies (the districts that generate the most solid waste are Piura, Castilla, Tambogrande and Catacaos) Discharge of untreated domestic waste directly into the Catamayo river due to discharges of untreated sewage from Sullana and neighboring districts Pollution from agricultural fertilizers and pesticides (high levels of agricultural activity), including direct discharges from the sugar industry in the Catamayo valley affecting the mouth of the Guayabal river The mining sector is not very active in the basin although impacts are still being felt from informal and formal mining (phosphates). These threats are associated with the poor management of waste collection systems and landfills; deficiencies in the sewer system and wastewater treatment in the lower basin (Sullana and Las Lomas) and deficient water treatment infrastructure with collapse of oxidation ponds, among other issues.	High values of turbidity, heavy metals, mercury, cadmium and lead in the upper part of the basin Heavy metals from artisanal mining affecting the area downstream of the Santa Rosa bridge within the political boundaries of the cantons of Celica, Sozoranga and Macará Many communities without access to water apt for human consumption, odour issues, release of coliforms and nutrients (phosphorous and nitrogen) Samples have found various compounds to be above the maximum permissible limits, such as iron, ammonium, oils, arsenic, coliforms, mercury and copper, as well as values for BOD and turbidity.

	In the case of the upper basin, the rural and urban areas of the Quiroz subbasin have recently built water and sewer systems	

Table 8: Transboundary problems, threats and environmental impacts in the Puyango-Tumbes basin[19]

TRANSBOUNDARY PROBLEM	THREATS	ENVIRONMENTAL IMPACTS
Erosion and soil degradation	Deforestation of natural flora (logging) and irrational exploitation of the dry forest - Burning of vegetation - Excessive grazing for goat breeding Underlying these threats are: Uses of land for agricultural activities, including monocultures, short cycle crops, or for crops that are unsuitable for the agrological capacity of the soil; and Inappropriate agricultural and irrigation techniques and poor management of agriculture and irrigation systems	Reduced agricultural productivity of soils Reduced soil fertility Impact on the landscape Drainage problems and soil salinity Sedimentation in irrigation canals and rivers which has reduced water flow by 50% in some sectors
Pollution of surface water and groundwater	Direct disposal of solid waste into rivers and creeks. Wastewater discharge in the lower part of the basin. Direct discharge to water sources in the areas of Zaruma, Portovelo, Piñas, El Pache in Ecuador and in Peru to Villa Puerto Pizarro. The San Jose storm drain is used for wastewater discharge Pollution from gold mining in the upper part of the basin by the Zaruma-Portovelo mining districts (Ecuador) as a result of the mineral processing plants, tailing ponds (mining waste deposits in pulp) and culm dumps (solid mining waste deposits)	Pollutant load of effluents is organic and bacterial causing decrease in aquatic species in the Tumbes river (such as 'corvinas' (*Cilus gilbert*), robalos (*Centropomus* spp), sábalos' (*Allis shad*), river shrimp, etc.). The fish known as "raspa" has disappeared completely from the mid-section of the river (Rica Playa) Sedimentation in rivers In times of drought the degree of contamination is greater

[19] Autoridad Nacional del Agua, 2012. Resultado del tercer monitoreo participativo de la calidad del agua superficial en las cuencas de los ríos Tumbes y Zarumilla lado peruano.
Ministerio de Agricultura, Autoridad Nacional del Agua. 2013. Plan de Gestión de Recursos Hídricos de la cuenca Tumbes. Diagnóstico Tumbes.
Ministerio de Vivienda, Construcción y Saneamiento República del Perú, Instituto Nacional de Desarrollo Proyecto Especial Puyango-Tumbes, octubre de 2002. Plan de Gestión de la Oferta de Agua en las Cuencas del Ámbito del Proyecto Puyango Tumbes, Volumen II TOMO 2.1 "Diagnóstico Consolidado"
Nuñez, S., Zegarra, J. Ingemmet. 2006. Estudio Geoambiental de la Cuenca del Río Puyango-Tumbes Boletín Nº32 Serie C Geodinámica e Ingenieria Geológica.Lima, Peru.

	Agricultural and aquaculture activity being carried out in the lower basin (Peru) These threats are associated with: poor management of the sewage system (lack of coverage of the sewer system) and of the oxidation ponds; poor solid waste management practices (landfills) in Portovelo and Piñas; problems with design and poor management of tailings ponds; little control of environmental impacts of mining	Concentration of heavy metals and free cyanide in the tributaries of the Puyango river, including Calera and Amarillo rivers as a result of mining activity in Zaruma, Portovelo and Atahualpa. Anomalous levels of lead, iron, manganese and arsenic. Various chemical elements have been found to be above the Maximum Permissible Limit, such as ammonium,oils, arsenic, total coliforms, phosphorous, cyanide, mercury, copper, lead, cadmium, arsenic, thermotolerant coliforms, BOD, turbidity.
Floods	Lack of maintenance and management of drainage systems Natural causes due to the El Niño phenomenon and seasonal heavy rains	Deteriorating irrigation infrastructure, road infrastructure, irrigation areas, shrimp farm infrastructure Damage to ecosystems
Decreased water reserves	Inefficient and illegal water usage for human consumption and agricultural activities. 90% of the groundwater extracted is for agriculture and 10% is for human consumption. Exploitation of surface water is primarily for irrigation and electricity This threat is related to deficiencies in irrigation infrastructure, inadequate operation and maintenance	The Puyango ecosystem is being affected because sufficient ecological flow is not guaranteed in water courses to preserve the natural habitat Salinization of soils

Table 9: Transboundary problems, threats and environmental impacts in the Zarumilla basin[20]

TRANSBOUNDARY PROBLEM	THREATS	ENVIRONMENTAL IMPACTS
Contamination of surface water and groundwater	Agricultural activities (rice and other crops), sewage and domestic solid waste. - Toxic agricultural inputs including insecticides, herbicides, fungicides and fertilizers are applied without sufficient controls and are released into rivers	Overall there are no major surface water quality problems according to 2006-2011 monitoring results, but there are sporadically high values of iron, aluminum and manganese and presence of total

[20] Autoridad Nacional del Agua, 2012. Resultado del tercer monitoreo participativo de la calidad del agua superficial en las cuencas de los ríos Tumbes y Zarumilla lado peruano.
Coello, X. 2006. Characterization of the Zarumilla transboundary aquifer between Perú and Ecuador.
Ministerio de Agricultura, Autoridad Nacional del Agua. 2013. Plan de Gestión de Recursos Hídricos de la cuenca Tumbes. Diagnóstico Tumbes.

	- Collapsed oxidation ponds and untreated discharges dumped into Aguas Verdes and Zarumilla districts. - Large number of uninventoried sources of pollution, such as garbage dumps - Stakeholders also report erosion and sedimentation problems The main environmental issues are found in the mid- to lower part of the Zarumilla basin where the agricultural and urban zones are concentrated The threats are related primarily to the inadequate management of municipal waste (solid and liquid) High salinity of the aquifer originating from marine sediments and seawater intrusion	coliforms and thermotolerant bacteria (from wastewater discharges to the river and discharges from oxidation ponds) In samples taken from the Zarumilla river, estuary and canal, the following elements exceeded the standard environmental quality value for water in categories 3 and 4 (destined for use in the irrigation of vegetables, water for livestock and conservation of the aquatic environment): total lead , total nickel, ammoniacal nitrogen, total iron, and total aluminum. This shows the high levels of organic pollution in the estuaries and the canal, as well as the presence of metals arising from the geochemistry of the area (natural origin from the rocks in the area) In general, groundwater is of good quality but the elements that constitute the biggest threat are sodium and chloride. There is also the presence of total coliforms, with the upper aquifer having a higher level of coliforms than the lower confined aquifer
Decreasing groundwater reserves	The water level in the aquifer formed from sand and gravel deposited by the river is decreasing, probably due to increased extraction rates or an increase in the number of pumping wells. Most groundwater extraction occurs in the unconsolidated sand and gravel aquifer (river deposits) because it can be easily extracted for agricultural activities. The aquifer formed from marine sediments is the second most exploited aquifer as a result of the shrimp ponds found near the coastline. The confined aquifer is being exploited to provide drinking water for the cities of Huaquillas, Chakras, Aguas Verdes and Zarumilla	Decreased levels of groundwater and possible changes in flow The recharge zone of the upper aquifers is being affected, where infiltration occurs by direct precipitation or runoff. In the deep aquifer, the recharge occurs in the basin upstream of the weathered granite

Long-term solution and barriers to achieving the solution

98. The long-term solution sought by the project is to ensure the conservation, restoration and integrated management of surface and groundwater resources, including maintenance of ecological flows,

and to achieve associated socio-economic benefits in the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins. This solution is currently hampered by the following barriers:

1) Insufficient information on transboundary basins and aquifers and on their environmental condition

99. There is a lack of full understanding on the characteristics of surface and groundwater resources and on the associated transboundary implications, particularly in the case of freshwater aquifers. Stakeholders do not sufficiently appreciate the need to integrate groundwater concerns into management of surface water systems and to take into consideration factors related to vulnerability to climate variability and change. The assessment of water quality and water resource availability and threats from sectors such as agriculture and mining remains incomplete. For example, in relation to agriculture, there is currently little if any monitoring of toxic agrochemicals in use and their effects on water quality.

100. Another problem is that the information that has been produced through different studies or consultancies is often not consolidated and remains scattered, with limited information sharing. Moreover, the lessons learned from different initiatives carried out in Ecuador and Peru in water resource management are not always disseminated.

101. In general, there is a high density of meteorological stations to monitor and gather climatic information, but much fewer hydrological and water quality stations to monitor surface water. Furthermore, a hydrogeological monitoring network is virtually non-existent for groundwater. In the stations that do exist, the instruments in use are often incomplete or obsolete. This situation does not allow for the timely analysis of all components of the water balance and of the quality of surface and groundwater.

102. It is also evident that almost all studies have focused on surface water, which is reflected in the limited information available on transboundary aquifers. Zarumilla has comparatively more information available, while for the Catamayo-Chira and Puyango-Tumbes basins, the information is more limited, and relates to water quality, operated flow and groundwater levels, with a medium to low level of hydrogeological information and insufficient integration and interpretation of the data.

103. The level of information available on each of the aquifers is presented below:

Puyango -Tumbes basin: Tumbes aquifer (average level of hydrogeological information available) and Zapotillo aquifer (low level of hydrogeological information)
Catamayo- Chira basin: Chira alluvial aquifer (low level of hydrogeological information), Catamayo- Paltas Loja aquifer (low level of knowledge) and Alto Piura aquifer (low level of hydrogeological information)
Zarumilla basin: Zarumilla aquifer (high level of hydrogeological information), as a result of studies undertaken by UNESCO and the International Atomic Energy Agency (IAEA).

104. The information that exists for the Zarumilla, Tumbes, Zapotillo and Alto Piura aquifers is not consolidated/integrated in any one database and it is therefore difficult to access, which is made all the more difficult by the lack of homogenization of the information between Ecuador and Peru. The absence of reliable information on groundwater results in a situation in which groundwater is extracted based on need, without considering actual availability in terms of quantity or quality. Furthermore, the lack of comprehensive information on both surface and groundwater quality and quantity and on the environmental issues affecting water resources means that a shared understanding of the state of these resources does not exist.

2) Institutional capacity limitations and weak cooperation frameworks for Integrated

Transboundary Water Resource Management.

105. There are clear limitations in the local, national and regional capacities for the integrated management of shared water resources, which undermine the planning and implementation of priority programs to preserve water quality and quantity.

Weak binational cooperation frameworks for management of transboundary basins

106. Insufficient coordination of joint binational actions between Peru and Ecuador on transboundary basins is undermining the effective management of shared water resources since management programs, monitoring of water quality and quantity, and other actions need to be carried out at the basin level to have impact. As a result of this limited coordination, actions, plans and programs are often implemented in a unilateral manner to respond to particular national priorities. Moreover, the spaces for dialogue between ANA and SENAGUA on the management of transboundary basins are limited.

107. Some important steps have been taken by both countries to jointly address environmental and socio-economic issues, however, the institutional framework for the integrated management of binational basins requires further strengthening. A Binational Commission for Zarumilla was established in 2011, however, the effectiveness of this Commission is undermined by the fact that its structure does not allow it to carry out priority ITWRM actions to address water quality and quantity. While it carries out planning, it is not an established legal entity nor does it have access to financial resources, through a trust fund for example, to provide it with a sustainable source of funds. In turn, the national sections of the Zarumilla Binational Commission have had trouble accessing funding to carry out the required actions. In the case of the Puyango-Tumbes and Catamayo-Chira basins, no binational commissions have been established yet, although there have been some preliminary discussions to pave the way for their formation.

National-level capacity limitations in IWRM

108. Both ANA and SENAGUA have limited technical capacity to address IWRM in terms of the number of staff that have been trained on these issues. There is a need to improve the understanding of issues such as water quality and solid waste management; the legislative framework governing pollution of water resources; the legal responsibilities of public entities and GADs; traditional water management practices; the impacts of climate change on water resources; environmental services provided by basins; and the efficient management of user organizations, among others. Institutional stakeholders also have insufficient knowledge on the prevention of pollution of water resources and on alternative means to manage discharges from the urban, rural, agricultural and mining sectors to minimize environmental impact on surface and groundwater. In addition, there is a need to improve technical capacity related to sustainable agricultural and irrigation practices, crop management and alternative wastewater management practices. Existing extension efforts are often focused on the intense use and overexploitation of water resources.

109. Local and regional administrations' capacities for developing and enforcing regulations on water quality and quantity remain weak. For example, there is insufficient control of water use permits. There is also limited understanding of how to integrate groundwater concerns/opportunities into local/regional development plans. Furthermore, the use of GIS technologies for land use planning is virtually non-existent.

110. Inadequate inter-agency coordination and consultation, confusion and overlapping of mandates at the national level can lead to duplication of efforts and inefficient use of resources and can undermine IWRM. In Peru, the functions related to the management of water resources versus environmental aspects are not sufficiently coordinated, which can limit the involvement of ANA in binational projects and activities, given that various government institutions are involved. ANA must work directly with agencies such as the Ministry of Agriculture and the Ministry of External Relations, which can impede processes

and affect the time to implement projects. While ANA is responsible for the rational utilization of water resources, it has no powers related to pollution prevention. Also, the powers related to sanitation, drinking water and water pollution are scattered in other entities and ministries. As a technical body with a complement of officials and technicians with some knowledge of IWRM and management plans, this has an impact on its ability to make direct decisions in the various fields of IWRM.

111. It should also be noted that there are no formalized interagency collaboration networks to facilitate the integrated transboundary water resources management in either country. In general the public and private agencies and water user organizations carry out their activities in an isolated manner, and the type of inter-sectoral coordination necessary for IWRM is lacking.

112. In both countries, insufficient dialogue between the National Water Resource Authorities and local governments takes place, in accordance with decentralization policies and legal mandates. There is an urgent need to increase the involvement of relevant local institutions (such as decentralized and regional autonomous governments in Peru) and local organizations in the basins, so that they are aware of and directly involved in IWRM through monitoring and control activities. In addition, the spaces for dialogue at the local level need to be created for the resolution of socio-environmental conflicts over water resources.

113. As a result of legislative and other changes, institutional transitions are ongoing, which may have an impact on actions related to IWRM. The recent adoption of the Water Resources Act in Ecuador will affect mandates related to IWRM and the coordination of activities at the local level. The single water authority will have a variety of functions and it will take time before these are fully assumed, particularly because there are limited trained technical staff to facilitate this process. In Peru, there are still delays associated with the establishment of water resource basin councils and implementation of basin management plans.

114. Institutional capacity weaknesses also limit the provision of technical support and training to stakeholders, such as potable water and irrigation boards and water resource basin councils, as it relates to organizational, administrative, financial, and technical water management issues. Many of these water user organizations suffer from weak administrative, financial and technical management and organizational structures, in particular for the application of environmental standards for water resources. The existing organizations require strengthening, and there is also a need to form additional water user organizations.

115. While different training activities are being carried out in both Ecuador and Peru on IWRM to strengthen institutional capacities, there is no consolidated training plan at the national level in either country with strategic lines of action.

3) Insufficient demonstration of appropriate practices and technologies.

116. Few approaches and technologies for reducing the negative impacts of mining, agriculture and livestock management in the basins and aquifers have been tested for their effectiveness in producing environmental benefits nor in terms of their financial feasibility. Initiatives such as consolidating mining tailings in specific geographic locations, reducing illegal mining, and promoting more sustainable practices have not been widely implemented, and as a result tangible environmental impacts have been limited. Work with small-scale producers to reduce the use of agrochemicals, increase the efficiency of irrigation and promote more sustainable practices has also been very limited to date. In terms of the management of wastewater and solid waste, municipalities have found it difficult to provide the appropriate maintenance to structures such as oxidation ponds and landfills, due to limited human and financial resources, leading to a lack of functioning and feasible models of appropriate waste management. Institutions also lack a

holistic vision to integrate groundwater concerns/opportunities into the management of surface water systems.

117. As a result, producers and other stakeholders have insufficient information and have received insufficient training on the appropriate use of water resources to carry out IWRM. The level of environmental education is limited with the result that there are serious problems in terms of implementation of appropriate solid waste and wastewater management and sustainable production practices in agriculture, mining and other sectors. There are also very limited programs to raise the awareness of local populations on the need to value, conserve and appropriately manage water resources. Pilot projects must be implemented in these basins to demonstrate attractive technological packages to local inhabitants and technical assistance provided to facilitate their implementation.

4) Legal gaps

118. In Peru, the legal framework related to IWRM, which is based on the Water Resources Act of 2009, is considered ample and comprehensive. Most recently, an Act for User Organizations was approved. However, as previously mentioned, there is a dispersion of legal mandates in various ministries related to mining management, agricultural production, environmental management, solid waste management, sanitation, complementary permits and licenses, and environmental regulations that are mainstreamed in various public entities. This undermines the implementation of IWRM actions and affects the management of nascent water resource basin councils. It also affects the role of ANA (the National Water Authority under the Ministry of Agriculture and Irrigation), a role that must be strengthened to reach consensus and take the lead on IWRM actions.

119. In Ecuador, the new Water Resources Act was approved in August 2014 and provides a framework for IWRM. However, it contains gaps related to the lack of regulations on some important issues, which will still need to be developed. For example, there are no defined procedures for approving the specific delineation of basins, water sources or water protection zones near aquifers. As for the standards to ensure the safety and quality of irrigation water and monitoring of its supply, the new law requires that the single water authority and the National Environmental Authority issue these standards, in coordination with the governing authority of the national agricultural policy (MAGAP).

120. The Act also states that the single water authority should establish mechanisms of coordination and complementarity with the decentralized autonomous governments, with regard to the provision of the public services of irrigation and drainage, potable water supply, sanitation, wastewater treatment and others established by law. For water resource basin councils, which still need to be established, regulations need to be developed to define issues such as their composition and funding. Regulations are also needed to define the structure and functioning of water user organizations. In general, the analysis carried out during the project preparatory phase underscored legislative gaps in both Ecuador and Peru relating to the management and administration of potable water and irrigation boards in terms of labour, administrative, financial and fiscal issues. Furthermore, there is an absence of norms to guide the establishment and effective functioning of Binational Commissions for watersheds.

5) Financial barriers

121. At the level of the national water authorities in both Ecuador and Peru, financial limitations undermine the implementation of different management instruments such as water resource basin management plans. In addition, investments in basic services such as wastewater, drainage systems and stormwater management need to be prioritized, as they constitute one of the main sources of pollution. Funding for the provision of support, training and implementation of practices to manage discharges from the productive sectors of agriculture and mining is also insufficient. This is critical as water pollution stems from urban and rural populations and from the agricultural and mining sectors, so it is necessary that

stakeholders have the knowledge and funding to manage these discharges using alternative management practices in order to minimize the environmental impact on surface and groundwater resources.

122. The established water tariffs for potable water and agricultural uses are often too low to cover the costs of operation and maintenance. Furthermore, the environmental cost of groundwater (and surface water) is often not taken into consideration.

123. At the local level, the adoption of systems that optimize water use for irrigation often requires investments that families are not equipped to make, particularly for crops that are not especially profitable and will not generate sufficient cash flow to justify the investments required. Producers also face financial constraints in terms of the drilling, equipping and operation of wells to access groundwater. In this context, the organizational weaknesses of many community water systems undermine their ability to implement such projects and to financially sustain their operations.

- *Stakeholder and baseline analysis*

Baseline projects

Ecuador

124. The *Tahuin Multipurpose Project Studies* in the canton of Arenillas, province of El Oro, includes several lines of action, including flood control, potable water for Arenillas and Huaquillas, irrigation for 5,000 ha of crops, hydroelectric generation, environmental management and ecotourism to benefit 75,000 inhabitants. The studies began in July 2014 and will be carried out over a period of two years (expected investment of 3.67 million for the studies and 70 million for the actual project). With regard to the *hydrogeological studies of the Zarumilla River aquifer*, the National Meteorological and Hydrological Service of Ecuador has completed three relevant studies. Building on these, INAMHI and the Regional Office for Latin America of the International Union for the Conservation of Nature (IUCN) signed an agreement in January of 2014 to carry out *hydrological monitoring* of the Zarumilla and Catamayo-Chira river basins within the framework of cooperation between IUCN and the national government of Ecuador.

125. In the Jubones Hydrographic Demarcation, planned projects for 2015 include studies on deep and shallow wells in Arenilla, capacity building and training for potable water boards, capacity building and training for irrigation and drainage boards, workshops to strengthen water user organizations, and support for a monitoring network, among others. In the Puyango-Tumbes Demarcation, projects carried out in 2014 were focused on increasing the recuperation, conservation and protection of watersheds through their integrated management, increasing access to good quality water and promoting appropriate water use for different purposes, among others, with the initiatives as of 2015 building on achievements in 2014.

126. The *National Comprehensive and Integrated Water Resources Management Plan*[21] is under development in Ecuador and includes as one of its main goals the assessment of water resources by basin and sub-basin on the mainland and insular regions for the effective use and conservation of the resources. The Changjiang Institute of Survey, Planning, Design & Research (CISPDR) of China is carrying out the consultancy to develop and implement this plan over a period of 30 months for a value of USD 15,607,220.

[21] Plan Nacional de Gestión Integrada e Integral de los Recursos Hídricos de las Cuencas y Microcuencas Hidrográficas del Ecuador

Peru

127. The objective of the *Water Resources Modernization Program* (PMGRH) is to strengthen the capacities of the institutions responsible for the management of water resources at the national, regional and local levels to achieve the efficient and effective management of water resources in Peru. The program is partially financed by the World Bank, the Inter-American Development Bank and the National Water Authority (ANA) and is scheduled to run for five years, beginning in 2010, with a total investment of USD 19,579,000.

128. Between 2014 and 2015, ANA is carrying out a number of water resource management projects in the three watersheds of relevance to this project. In the Chira basin, these include financing for a hydraulic irrigation system in San Lorenzo; improvement and conservation of degraded soils with agroforestry in the district of Sapillica; construction of riparian defense structures in the Santa Angelica sector in the district of Querecotillo, Sullana as well as in the sector of Bocatoma of Las Lomas; installation of potable water services and elimination of sewage in Cruz de Piedra, Las Lomas, as well as installation of such services or improvements to existing systems in the centres of Linderos, Misquis, and Nueva Esperanza de Frías, district of Frías; and a study to evaluate water resources in the Piura river basin.

129. In the Tumbes and Zarumilla basins, various projects will be implemented in 2014 and 2015 to establish systems to protect against flooding (for example in La Palma- Canario II in the districts of Papayal and Aguas Verdes and in the sector of La Rinconada); to establish riparian and other protection systems (for example, in Papayal); to provide water for irrigation systems in the districts of Tumbes and Aguas Verdes; and to strengthen the potable water and sanitation system in the district of San Juan de la Virgen, among other projects.

Binational

130. With regard to *land use planning and development of the Catamayo-Chira transboundary basin*, priority actions defined in the plan are being implemented, including improvements to the Binational Training Center in Mallares (in 2014, USD 951,028 was invested in this). Planned investments past 2014 are not yet known. In the Zarumilla basin, construction work is being carried out in the *Zarumilla Canal*, with a total investment from Ecuador and Peru of USD 32,805,190.

131. It should be noted that a few of the baseline projects mentioned in the PIF have either already been completed or have been cancelled. For example, the *Matala Casa Vieja multipurpose project* was scrapped due to technical and operational difficulties.

Stakeholder Analysis

Table 10: Summary of implementation role of main project stakeholders

Stakeholders	Project Implementation Role
Binational Commission for the Management	Entity created to implement joint actions between Ecuador and Peru for joint management of the Zarumilla River basin . Effective coordination between the Project and the Commission should be promoted to support achievement of the project's proposed objectives. The

Stakeholders	Project Implementation Role
of the Zarumilla River basin	Committee provides a forum for dialogue, coordination and validation of many actions proposed for the project.
Binational Development Plan (Plan Binacional de Desarrollo) Ecuador and Peru sections	The Binational Plan plays a key role in the project . In fact, the project developed as an initiative that was proposed within the scope of the Binational Plan for joint management of basins. It also provides a forum for feedback and political support for the project. The national sections should be informed of project progress and should be considered key strategic allies for the implementation of the project.
ANA-SENAGUA	ANA and SENAGUA are the water resource governing bodies of Peru and Ecuador, respectively and are charged with guiding the policies and procedures related to basin management. They will serve as project executing agencies in Peru and Ecuador, respectively and as such will be responsible for supervising/managing the project, including the monitoring and evaluation of project interventions, achieving project outputs, and ensuring the effective use of UNDP/ GEF resources. They will make the key technical decisions for project implementation. ANA and SENAGUA will be members of the Project Binational Steering Committee. Through the project, they will benefit from training on IWMR, environmental monitoring, and enforcement of water quality regulations, among other topics. They will strive to coordinate joint actions to maximize project impact and to encourage the creation of regular spaces for dialogue and information exchange.
Ministries of External Relations- Ecuador and Peru	As the governing bodies on foreign relations policy, they will play a key role in the coordination of actions between Ecuador and Peru for the successful implementation of the project and will be members of the Project Binational Steering Committee. They are the authorities that approve and legally define binational basin management actions. ANA and SENAGUA will need to work with these Ministries to get an agreement for the legal establishment of Binational Commissions for Puyango-Tumbes and Catamayo-Chira. They should be kept informed of project progress and be converted into strategic partners at the highest level for project implementation.
SENPLADES (Ecuador)	Governing body for planning in Ecuador. SENPLADES must approve all development projects submitted by public bodies, as per pre-established formats, and these are then sent to the Ministry of Finance for financing. The provision of co-financing by SENAGUA to the project must follow this procedure.
Secretaría Técnica de Cooperación Internacional (SETECI) (Ecuador)	Registers all projects being carried out with international cooperation. This project will be registered with SETECI.
Ministries of Environment (Ecuador and Peru): Ministry of Environment (MINAM)- Peru Ministry of Environment of Ecuador (MAE)	These are the governing entities for environmental policy, and will play a key role in supporting the various activities of the project related to environmental training , protection of forest resources, and pollution of air and soil resources. These Ministries will provide information to the project as well as technical assistance to local governments and will participate in workshops to improve solid waste management, prevent deforestation and ensure enforcement of environmental legislation. They will also serve on the Project Binational Steering Committee.
Ministerios de Agricultura	These are the respective national governing entities for agricultural policies. In the case of Peru, ANA is governed by MINAGRI, and MINAGRI will therefore be included on the Project

Stakeholders	Project Implementation Role
(Ecuador and Peru): Ministry of Agriculture and Irrigation (MINAGRI)-Peru Ministry of Agriculture, Aquaculture, Livestock Ranching and Fisheries (MAGAP)-Ecuador	Binational Steering Committee. Collaboration agreements should be entered into with these Ministries for their support to carry out actions associated with reducing pollution from agrochemicals, improving the environmental sustainability of agricultural and livestock management practices at the level of the pilot projects.
Local Governments-Ecuador and Peru	The Regional Government of Tumbes Peru , is a key player for basin management , through its Subsecretariat for Natural Resources. The project must coordinate actions with this government body which is a key strategic ally in the territory. The Regional Government will participate in training activities in the project area and may approve regional ordinances related to IWRM, integrated management of solid waste, and ecosystem protection, among others. In the case of Ecuador, there are Autonomous Decentralized Governments at the provincial level (Loja) , canton level and parish level. Each has powers established by the law, and should participate in the project in accordance with the project's objectives. The provincial-level GAD includes the Public Provincial Irrigation Company, a strategic partner with which actions in the project area should be coordinated. The canton-level has jurisdiction over potable water supply, sewage and solid waste management . The project will provide training to different levels of GADs on IWRM, IWRM mandates, and enforcement of regulations, among other topics. The GADs will also be key stakeholders in the implementation of pilot projects in relation to various actions, such as capacity building, protection of water sources, irrigation, among others. The project may also coordinate actions to propose provincial or canton-level ordinances for the protection of water resources.
Water Resource Basin Councils of Peru	The Tumbes Basin Council and the Chira Piura Basin Council in Peru are organizations comprised of various stakeholders. They are in charge of the definition of strategic lines of action including tracking and monitoring of the Basin Management Plans. The project should consider them key stakeholders as they promote the integrated management of the Tumbes river. The pilot projects in Peru were specifically designed to support established lines of action in the management plans. As such, the Water resource basin councils will help monitor the implementation of the pilot projects and provide guidance.
National Institute of Meteorology and Hydrology (Instituto Nacional de Meteorología e Hidrológica) (INAMHI) Ecuador	INAMHI is the organization responsible for research and implementation of hydrogeological studies in Ecuador. It operates a system of hydrogeological stations. It has a hydrogeological map and important information related to the objectives of the project. The project may enter into agreements for cooperation and exchange of information with this organization.

Stakeholders	Project Implementation Role
Public Service for Hydrogeological Information (Servicio Público de Información Hidrogeológica) (SENAMHI) (Peru)	SENAMHI in Peru has substantial hydrogeological and groundwater information. The project may sign an agreement with the organization to facilitate cooperation and information exchange.
Water user organizations	Irrigation boards and potable water boards , among other water user organizations registered by SENAGUA and ANA , are important project stakeholders. They will receive training through the project to strengthen their management and understanding of IWRM. They will also play a role in the implementation of the pilot projects in Ecuador and Peru to improve water availability and quality.
Binational Training Centres: Centro de Formación y Capacitación Binacional Zapotepamba (Ecuador) and Sullana (Peru)	These training centers have the appropriate physical infrastructure, methodologies and tools to implement the project's capacity building plan. Agreements for collaboration and information exchange will need to be entered into for capacity building during the lifetime of the project and to promote the incorporation of the capacity building plan into their curricula to promote longer-term sustainability.
Local communities	Local communities consist of landowners , farmers, ranchers, youth and women's groups, among others, These local communities are beneficiaries of the project in terms of improved water quality and quantity. They will also be involved in the on-the-ground pilot projects and will benefit from the training provided by the project to ensure sustainability.
Private sector	The private sector in the project area is represented primarily by farmer and rancher associations. They will promote project actions and enhance sustainability, particularly in terms of the pilot project work related to sustainable agriculture and livestock management. In addition, relevant private sector organizations will be consulted for their input into the formulation of the TDA/ SAPs. By way of example, such organizations include the Regional Council of Labour and Employment Promotion of Tumbes (Consejo Regional de Trabajo y Promoción del Empleo de Tumbes) in Peru, which includes livestock management and fisheries associations, as well as the Water Users Board of the Tumbes Irrigation District, among its members.
NGOs	Various NGOs working in the project area promote conservation and the appropriate use of water resources. These organizations will contribute expertise and existing connections with various communities and local authorities. particularly for the implementation of the pilot projects. The project should coordinate its actions with NGOs to avoid duplication. NGOs working in Ecuador include Naturaleza y Cultura, Colinas Verdes, Swiss Contact, Doctors without Borders, and in Peru include Asociación para la Investigación y Desarrollo Integral AIDER, Inca Terra Asociación, Cooperative for Assistance and Relief Everywhere Inc.
UNDP	UNDP will serve as the Implementing Agency of the Project and will also provide direct project services. It will also provide technical assistance and oversight of all project activities, ensuring the effective use of resources, ownership among stakeholders and replication of results. UNDP

Stakeholders	Project Implementation Role
	will be a member of the Project Binational Steering Committee. The Lead UNDP Country Office for this binational project still needs to be determined.

1. STRATEGY

Project rationale and policy conformity

132. The project aims to enhance the binational actions undertaken by Peru and Ecuador to achieve Integrated Transboundary Water Resources Management (ITWRM) in the three main aquifers and basins shared by the two countries in the Pacific Ocean drainage basin - Puyango-Tumbes, Catamayo-Chira and Zarumilla. It will give special attention to integrating groundwater concerns and opportunities with the management of surface waters and manifestations of climate variability and change in the area, including the cyclicality of *El Niño-Southern Oscillation* (ENSO).

133. The Puyango-Tumbes, Catamayo-Chira and Zarumilla aquifers and linked river basins (Figure 1) contain an important, but often highly variable, water supply that is essential to the region´s socio-economic development and to the integrity of its ecosystems. These resources are threatened by overexploitation, pollution and inefficient management, as well as by climate variability and change.

134. The project will follow a three pronged approach consisting of improving the common understanding of these shared water resources and their environmental and socioeconomic status, strengthening the cooperation mechanisms between the two countries sharing these aquifers and basins, and applying and disseminating IWRM demonstrations in targeted site interventions with the aim of replicating them in other areas. The project has a strong emphasis on capacity development and, through the TDA/SAP process, will support countries in identifying the required legal, policy and institutional reforms that can deliver global, regional and national environmental benefits. The project will apply the most recently validated GEF International Waters Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) methodology to achieve project objectives and outcomes.

135. Under the GEF-5 Focal Area Strategies for International Waters, the Project is consistent with GEF Strategic Objective IW-3: “Support foundational capacity building, portfolio learning, and targeted research needs for joint, ecosystem-based management of transboundary waters systems”. In accordance with this strategic objective, the project will support the development of a Transboundary Diagnostic Analysis to facilitate agreement on key transboundary concerns for basins, supporting necessary studies to fill information gaps in the process; enable the development of Strategic Action Programs for each of the basins, which serve as high-level political agreements on shared commitments for joint, ecosystem-based actions and cooperation mechanisms; and help fund local pilot demonstrations addressing priority transboundary issues. As per the focus of GEF-5, the project will integrate groundwater considerations in surface water management and take into consideration climatic variability and change. The project will also increase national and binational capacities in IWRM, facilitate the establishment of National Interministerial Committees, establish/strengthen Binational Commissions for collective management of the three shared basins and promote information sharing.

Country ownership: country eligibility and country drivenness

136. This project emerged as a result of a request from both governments to tackle ITWRM and the project development process has been highly participatory. It will contribute to the achievement of objectives set out in national development strategies and relevant policies in both participating countries.

137. In Ecuador, the Constitution of 2008 calls upon the state to ensure the conservation, restoration and integrated management of water resources, basins and ecological flows associated with the hydrological cycle. As outlined in the legal and policy context section, the project fully supports the purpose and provisions of the new Water Resources Act, approved in 2014 and is consistent with the National Water Policy, which aims to promote international commitments and agreements for the management of transboundary water resources. The project is also fully consistent with the national development plan, entitled the "National Plan for Good Living" (2013-2017). This national plan establishes the need to manage the country's water assets in a sustainable and participatory manner, with a focus on basins and ecological flows to ensure the human right to water and promotes the comprehensive management of water resources and resolution of socio-environmental conflicts. Finally, the project also contributes to "Plan for Good Living on the Border", specifically its fourth goal, which proposes: "the promotion of a healthy environment, sustainable and secure access to water, air and soil". This plan's strategy calls for projects to improve environmental quality, environmental services and management of basins and micro basins.

138. In Peru, the project embodies the objectives enshrined in the National Water Resources Policy and Strategy, which aims to increase cooperation with regard to the transboundary management of surface and groundwater resources, and the State Policy on Water Resources, which strives to promote the integrated water resource management and strengthen governance. It is also consistent with various policies described in the legal and policy context section of this document. In addition, the project has been designed to contribute fully to the specific lines of actions itemized in the Management Plan for the Tumbes basin (2014-2018), Peru, which aims to promote the sustainable use of water resources and increase the availability of water resources. The Jequetepeque-Zarumilla water administration authority, with the support of the Water Resources Council of the Region of Tumbes, will guide the implementation and monitoring of the plan. The project will also contribute to achievement of the management plan for the Chira-Piura basin (as the Catamayo-Chira basin is called in Peru), in terms of capacity building, identification of funding, and other elements. These management plans were developed through a highly participatory process involving all relevant stakeholders.

139. In the binational context, as described in the legal and policy context section, the governments of Ecuador and Peru have signed various agreements and commitments that signal their commitment to integrated transboundary basin management and regional development, such as the Broad Agreement on Border Integration, Development and Neighbour Relations; and the Binational Border Region Development Plan. In addition, a Binational Commission for the Zarumilla basin has been established and preliminary steps have been taken to develop the binational structures for the Puyango-Tumbes and Catamayo-Chira basins.

Design principles and strategic considerations

Selection of pilot sites and pilot project actions

140. Workshops were held in Ecuador and Peru with stakeholders, such as government technicians and officials, members of irrigation and water user boards, NGOs and others to come to consensus on the pilot project sites (see Annex 3, Stakeholder Involvement Plan, for more details). Political approval was then

sought and obtained to confirm the choices. Given differences in the prior level of planning of IWRM actions and in the availability of information, the criteria used for the selection of pilot projects in the different watersheds and countries were distinct. Nevertheless, in all cases, the pilot projects were selected to identify those areas in which there would be the greatest chance of success as well as strong chances of replication.

141. Annex 2 provides a detailed description of the criteria used for the different basins in Ecuador and Peru and the weighting factors. To summarize, criteria used in Ecuador assessed social and environmental dimensions, such as number of water users and dependence on water resources, state of contamination of the water resource/ threats to the water resource, prior implementation of actions addressing water management and conservation and pollution, local institutional structures and the level of Basic Unmet Needs. In Peru, a detailed and highly participatory planning exercise had been carried out to develop the management plans for the Tumbes basin and Chira-Piura basin (as Catamayo-Chira basin is called in Peru). Given that these management plans already defined strategic lines of action and priorities, ANA decided to identify pilot sites and actions in accordance with these management plans, rather than carrying out workshops with all stakeholders during the PPG phase.

142. Once the pilot sites were defined, the decision on which actions to carry out in each (described in Outputs 3.1-3.2 and in Annex 7) was based on consideration of the following aspects:

- Ensuring that the primary threats of relevance to the three binational basins are addressed, including contamination from solid and liquid waste and reduction of water availability, among others, so that the pilot projects address all the main problems facing the three basins and contribute to integrated water resource management.
- Selecting actions that will improve the understanding of how to integrate groundwater management with surface water management.
- Maximizing the replication potential of the actions to be carried out in the pilots.
- Ensuring that the pilot project actions contribute to country priorities, for example, in the case of Peru, to the priorities established in the management plans for the Tumbes and Chira-Piura[22] basins.

Pilot sites and focus of activities in each of the three basins in Ecuador and Peru:

Table 11: Summary of pilot projects

Pilot Project	**Parishes Canton/district, country**	**Size (ha)**	**No of bene-ficiaries**	**Main project objectives**
Pilot Project 1 (Upper Catamayo-Chira basin)	*Parishes*: Yangana, Quinara, Vilcabamba, San Pedro de Vilcabamba and Malacatos *Canton*: Loja Ecuador	85,048	16,820	Establish a land use planning process that links territorial and canton-level planning with the integrated management of water resources. Develop instruments and capacities to enable the identification and declaration of priority water protection zones.

[22] The Catamayo-Chira basin is referred to as Chira-Piura in Peru.

				Implement environmentally-friendly alternatives to reduce pollution stemming from wastewater. Promote the adoption of agricultural systems/practices that reduce contamination and promote the efficient use of water
Pilot Project 2 (Mid Catamayo-Chira basin)	*Parishes*: Yamana, Casanga and Guachanamá *Canton*: Paltas Ecuador	35,259	5,037	Strengthen water management through the recovery of traditional practices and the establishment of water protection zones in strategic locations of water catchment and recharge Incorporate new water sources to increase the water flow available, to meet the growing needs of the population. Implement a model of integrated farming with an agroecological approach that will enable the reduction of water pollution from intensive use of agrochemicals.
Pilot Project 3 (Lower Catamayo-Chira basin)	*Parishes*: Teniente Maximiliano Rodríguez, Sabanilla and Cruzpamba *Canton*: Célica Ecuador	20,062	4,397	Establish water protection zones for surface and groundwater, through the development of the regulatory aspects and tools to make this legal tool operational Improve management of wastewater as a mechanism to control the pollution of water for human , agricultural and animal consumption Reduce water pollution caused by intensive application of agrochemicals in agriculture
Pilot Project 4 (Zarumilla basin)	*Parishes*: El Paraíso, La Libertad, La Victoria, San Isidro *Canton*: Lajas Ecuador	29,800	5,020	Develop appropriate tools and infrastructure for improved management of liquid waste Promote the adoption of good agricultural practices to prevent water pollution.
Pilot Project 5 (Chira basin)	*Districts*: Suyo and Paimas *Province*: Ayabaca *Departament*: Piura Peru	140,407	22,589[23]	Design and construct a wastewater treatment plant to reduce pollution of the rivers in the selected districts and take advantage of the treated water for irrigation of crops.
Pilot Project 6 (Chira basin)	*District*: Paimas *Province*:Ayabaca *District*: Las Lomas *Province*: Piura *Department*:Piura Peru	84,214	37,205	Encourage participation and dialogue of key stakeholders on sustainable use of water resources Develop a communications campaign and build capacity for efficient water use in agriculture

[23] Note that there are some districts that overlap in pilot projects 5-8. The total number of beneficiaries and total area of intervention presented in Strategic Results Framework and the socio-economic benefits section takes this into consideration (i.e., the beneficiaries and area have not been double counted).

Pilot Project 7 (Tumbes basin)	*Districts*: San Jacinto, Corrales y Tumbes *Province*: Tumbes *Department*: Tumbes Peru	88,916	142,655	Design and construct a wastewater treatment plant to reduce pollution of the rivers in the selected districts and take advantage of the treated water for irrigation of crops.
Pilot Project 8 (Zarumilla basin)	*Districts:* Pampas de Hospital, San Jacinto, San Juan de La Virgen and Corrales *Province:* Tumbes *Department*: Tumbes Peru	157,678	43,354	Encourage participation and dialogue of key stakeholders on sustainable use of water resources Develop a communications campaign and build capacity for efficient water use in agriculture

Gender and social inclusion

143. The project will mainstream gender issues as a strategy to ensure that the concerns and experiences of women, as well as men, are an integral part of the development, implementation, monitoring and evaluation of the project so that both can benefit equally. The involvement of women and men in the integrated water management actions to be carried out will strengthen the effectiveness and efficiency of the project as well as its performance. Furthermore, it increases the likelihood of sustainability of impact. The gender issue is being taken into consideration both in the design phase of the project and in its implementation. In the initial phase of project implementation, the project will support training workshops with SENAGUA and ANA on how to mainstream gender in all aspects of the project and how to promote the participation of women, men and youth.

144. Gender issues will be taken into consideration in the development of the Transboundary Diagnostic Assessment by assessing the differential impact of threats to the basins on both men and women. The Strategic Action Programs and National Strategic Action Plans will also mainstream gender by ensuring that proposed priority actions meet the needs and expectations of both men and women.

145. The participation of female technicians from both SENAGUA and ANA will be promoted in all the training and information events to achieve a closer dialogue with women's groups in the project area. Specific training for family groups will lead to a thorough understanding of different roles in the management of natural resources and basins. In order to track the participation of men and women in the project workshops, attendance sheets will be used for all project information and training events to identify the sex, age and place of employment of participants. The attendance sheets will identify the number of women and men trained in IWRM in terms of community members, water user boards, technicians from ANA and SENAGUA, institutional representatives and representatives of municipal and parish-level GADs, and local government officials. Surveys will also be employed with workshop participants with specific questions included to assess if the workshop contents met the expectations of both women and men.

146. In terms of the pilot projects, a mapping exercise will be carried out to identify youth and women's groups in each pilot site and to promote their participation. This will include the identification of the male/female membership of user organizations located in the pilot sites. Special care will be taken to involve female heads of households whose husbands are migrant workers, given that some areas involved in the project, such as Loja, have high rates of migration. In addition, the project will take into account the role of women in sustainable agricultural activities, since they are often responsible for the care of cattle. Information dissemination and training will include written information with appropriate and non-sexist

content that is respectful of the socio-cultural environment in each pilot site. Sociocultural barriers that may hinder the presence and participation of youth and women in the various project activities at the pilot project level will be identified, such as: schedules, workloads, literacy levels, and other cultural factors. The views of women and men about the technological options and practices to be implemented in the pilot projects will also be sought. The results of this analysis will guide the project implementation strategy. In this way, the project will ensure that the workloads of women, men, girls and boys are not negatively affected and that there is full participation in the implementation of the pilot projects.

147. Finally, it should be noted that the logical framework includes an indicator that is disaggregated by sex, which is the number of direct project beneficiaries.

148. The participation of youth in the project is also considered important as they form a substantial proportion of the population in the area. Therefore, information dissemination and training for youth in the pilot site will be promoted.

UNDP Comparative advantage

149. UNDP's Strategic Plan for 2014-2017 includes as one of its core areas of work "Sustainable development pathways" through the effective maintenance and protection of natural capital. Support for integrated water resources management and efficient use of water is mentioned in this context. UNDP has recently updated its 2007 Water Governance Strategy through the development of Water and Ocean Governance Programme contribution towards realizing the UNDP Strategic Plan 2014–2017. This serves as a global framework for action and will guide implementation of UNDP's Strategic Plan in water and ocean governance. The programme contribution document identifies the Strategic Outcome and output within the Integrated Results and Resources Framework to which the Water and Ocean Governance Programme will contribute, namely Outcome 2: Citizen expectations for voice, development, the rule of law and accountability are met by stronger systems of democratic governance; Output 2.5: Legal and regulatory frameworks, policies and institutions enabled to ensure the conservation, sustainable use, and access and benefit sharing of natural resources, biodiversity and ecosystems, in line with international conventions and national legislation. The programme contribution document also outlines the UNDP vision on water and ocean governance.

150. The proposed project will support achievement of three of the four UNDP thematic priority areas in water and ocean resources and services, as identified in the programme contribution document:

1) Climate-resilient access to water supply and sanitation
2) Climate-resilient integrated water resource and coastal management
3) Protection of transboundary surface and groundwaters in a changing climate

151. UNDP's work on improving governance of shared water resources incorporates the important linkages between upstream water and land management and the health and integrity of downstream ecosystems. Of the GEF agencies, UNDP has the largest portfolio and associated experience in the development and implementation of TDAs and SAPs in a wide range of river, groundwater, lake and marine water bodies. UNDP's strong track record in facilitating improved transboundary water governance has been further strengthened by the integration of UNDP's 'core' Water and Ocean Governance Programme (WOGP) with its GEF International Waters cluster, and the similar full integration of the UNDP Water Governance Facility at the Stockholm International Water Institute with UNDP's corporate water and ocean governance activities.

152. In terms of international advocacy, UNDP has championed the global water crisis and stressed the importance of water for life and water for livelihoods in its 2006 Human Development Report titled "Beyond scarcity: Power, poverty and the global water crisis". UNDP's priorities within this area include:

- Improving national and local water resources management for poverty reduction and sustainable development
- Increasing access to adequate and safe water supply and sustainable sanitation for the poor
- Promoting cooperation on shared water resources and global water challenges
- Gender mainstreaming in water governance
- Capacity development for Integrated Water Resources Management (IWRM)

153. In managing its transboundary waters programme, UNDP's Water and Ocean Governance Programme (www.undp.org/water/ocean-coastal-governance.shtml) draws on a wide range of staff expertise in water resources management at HQ, in its Regional Centers, and through its network of Country Offices. In terms of implementing GEF IW projects, UNDP has consistently delivered results through a broad range of international transboundary water interventions, including the strengthening or establishing of 20 multi-country river and lake basin and marine/coastal management agencies or commissions. In addition, it should be noted that UNDP Ecuador has experience implementing multi-country projects and will be implementing the 'Global Sustainable Supply Chains for Marine Commodities' project at the same time as the IW project (involving the four countries of Indonesia, Costa Rica, Philippines and Ecuador).

154. UNDP builds also on both its field presence in the two countries participating in this project, Ecuador and Peru, and on its partner organizations in the two countries. In Ecuador, the UNDP Country Office includes a Specialist in the Environment, Energy and Disaster Risk Management area, who will provide political support for project implementation, a Technical Expert in the Environment and Energy area who will provide technical support to the project, and a Program Associate to provide administrative/ financial support. In Peru, the UNDP Country Office includes a Technical Advisor in Ecosystems and Climate Change, who will provide overall guidance for the achievement of project goals; a Program Officer/Expert in Energy and Environment, who will provide political support for project implementation; a Technical Assistant in the Environment and Energy area who will provide technical support to the project; and a Program Associate to provide administrative/ financial support. In addition, the project will be directly supported by the UNDP Regional Technical Advisor based in Panama City at the UNDP-GEF Regional Services Centre and by the UNDP Principal Technical Advisor at UNDP Headquarters with responsibility for global oversight of the UNDP Water and Ocean Governance programme.

Project objective, outcomes and outputs/activities

155. The GEF intervention will cover the incremental costs of actions to contribute to ITWRM in the three shared water basins, in coordination with ongoing unilateral national baseline activities in the two countries and a few binational initiatives. The Project Objective is strengthening institutional, policy, legal and scientific-technical capacities to implement Integrated Transboundary Water Resources Management in Puyango-Tumbes, Catamayo- Chira and Zarumilla River Basins and Aquifers, integrating climate variability concerns. The project design includes three main Outcomes that will play a vital role in addressing the transboundary issues facing these shared resources:

Outcome 1. Transboundary Diagnostic Analysis developed for the integrated management of transboundary water resources in the binational Puyango-Tumbes, Catamayo-Chira & Zarumilla aquifers and basins.

156. This Outcome will lead to the development of a systematic, comprehensive assessment of the binational Puyango-Tumbes, Catamayo-Chira & Zarumilla basins and aquifers permitting a common understanding between Ecuador and Peru on the current issues affecting water resources in these river basins and groundwater systems. Based on available information and using different tools and procedures, a diagnosis of the current state of the basins and aquifers will be carried out. A technical-scientific TDA document focusing on water resources issues will be prepared and its results disseminated through networks and partners, with a wide participatory process of stakeholder involvement at the local, national and regional levels. Special emphasis will be given to the assessment of hydrogeological aspects in order to address information gaps relating to the state of groundwater resources. In addition, baseline data for a set of indicators related to the conservation and sustainable use of surface and groundwater in the binational basins will be collected and a database created to facilitate access to the available environmental and socio-economic information.

157. Co-financing from ANA, SENAGUA and UNDP will support achievement of this Outcome primarily through the active participation of government staff in the provision of the data required for the development of the TDA and in the confirmation of the validity of the draft TDA, as well as technical assistance in the hydrogeological studies.

Output 1.1: Hydrogeological and hydrological studies provide updated information on groundwater and surface water quality and quantity in the Puyango-Tumbes, Catamayo-Chira & Zarumilla aquifers.

158. Research carried out during the project preparation phase showed that hydrogeological information on the aquifers of relevance to this project is incomplete. Aquifers with limited available information and/or aquifers deemed critical to the national counterparts were prioritized. These include the aquifers of a) Alto Piura; b) Catamayo-Loja, and c) Zarumilla. The hydrogeological studies to be undertaken with GEF resources will include monitoring; inventory of wells; identification of hydrogeological units and their geometry; definition of aquifer recharge zones; hydrodynamic behaviour (water levels, 'isopiezas', flow exploitation, porosity, transmissivity), hydrochemistry and water quality, and estimate of reserves.

159. The hydrogeological data will facilitate the integrated management of surface and groundwater resources, the conservation of aquifer recharge areas/reserves and conservation of ecosystems. The data will provide information on groundwater quality and will also help determine hydrological balances (supply and demand), thus improving the understanding of the level of availability of groundwater for human consumption, irrigation and other uses.

160. In addition, existing hydrological information on surface water quality and quantity will be gathered to feed into the preparation of a comprehensive TDA. This will include, among others, information collected and included in the Water Resource Management Plans prepared by ANA for the Chira-Piura and Tumbes river basins.

Output 1.2: TDA serves as scientific-technical document on state of water resources and primary transboundary problems related to water resources in the three basins and aquifers.

161. During the PPG phase, a preliminary TDA was developed to describe the main transboundary threats in the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins as well as the environmental and socio-economic impacts. Information gaps were identified related to hydrogeology and to a lesser extent hydrology. The preparation of the definitive TDA during project implementation will involve a more detailed assessment of the current state of the three basins, the threats facing them, and a prioritization of these threats. The information gathered under Output 1.1 on hydrogeology will be integrated into the TDA, as well as studies on hydrology carried out by the national counterparts. Additional information will be gathered and consolidated from a variety of sources including maps and available published and

unpublished material. Workshops and meetings will be held with relevant actors to support information gathering. Baseline data on key environmental and socio-economic status indicators (to be agreed upon under Output 2.3) will be collected for incorporation in the TDA to provide an accurate assessment of the current status of the three basins. The preparation of the TDA will take into consideration available climatic variability and climate change data and the ways in which these factors are likely to impact the quantity and quality of water in the three basins.

162. The draft TDA will be presented to key institutions involved in ITWRM, including for Ecuador: SENAGUA, MAE, MAGAP, GADs, MICSE, SENPLADES, SETECI, and MREMH, and for Peru ANA, MINAM, MINAG, MRE to share the information gathered and to confirm the accuracy of the content of the TDA. In addition, the TDA will be shared with relevant private sector organizations in both countries (particularly, those with an interest in the project and with corporate social responsibility policies related to the environment). Adjustments will be made to the TDA based on feedback from stakeholders. The final TDA will be disseminated at the national, regional, local and community levels to relevant government and non-government institutions and will be made available through the project website.

163. The TDA will include an identification and prioritization of the transboundary problems/threats; the environmental impacts and socio-economic consequences of these problems; as well as the immediate, underlying and root causes of each problem, including the identification of specific practices, sources, locations and sectors leading to environmental degradation or the threat of degradation. It will serve as the factual basis for the subsequent formulation of SAPs for each basin. In addition, it will play an important role in facilitating a process of engagement and consultation between Ecuador and Peru with key stakeholders.

164. An additional commitment that was made during project development is the creation of a database incorporating GIS and other data that will incorporate the information gathered on the three basins and aquifers during the development of the TDA. A protocol for the database to define specific use and access issues will be prepared, with the idea being that it will facilitate open access to the wealth of available environmental and socio-economic information and thus strengthen data sharing between the two countries. The host organization for this data sharing mechanism will be defined during project implementation. The data sharing mechanism will be publicized through existing binational bodies such as the Binational Zarumilla Commission and the Binational Plan.

Outcome 2. Strategic planning and capacity building carried out to strengthen governance of transboundary water resources in the binational Catamayo-Chira, Puyango-Tumbes, and Zarumilla basins and aquifers.

165. This Outcome will build upon the assessment of the main transboundary problems identified in the TDA by developing Strategic Action Programs for each of the basins as well as National Strategic Action Plans that identify the priority actions required to address the main threats. The groundwork will be laid for the establishment of a Binational Commission(s) to facilitate joint action in the Catamayo-Chira and Puyango-Tumbes basins. In addition, the existing Zarumilla Binational Commission will be strengthened. Training for key stakeholders, including ANA, SENAGUA, water user boards and water resource basin councils, will be provided through the implementation of a carefully designed capacity building plan. Topics to be covered will include the concept of IWRM in general, water resource regulations, the efficient management of water resources, the integrated management of groundwater and surface water resources, and environmental monitoring systems to monitor water quality and quantity, among others. This capacity building will provide the necessary human resources to convert the SAPs from mere plans of action to actual change on the ground.

166. Co-financing from ANA and SENAGUA will complement GEF funds, through the active participation of government officials and technicians in all Outputs under this Outcome, including in the formulation of the SAPs and NSAPs, agreement on M&E indicators and joint workplan, strengthening of binational institutional framework and training elements. UNDP Cap-Net will support capacity building on IWRM through national workshops and information sharing. UNDP will also provide technical support for project implementation.

Output 2.1. Strategic Action Programmes (SAPs) provide a framework for ITWRM actions in the three basins

167. Firstly, a SWOT analysis (strengths, weaknesses, opportunities, and threats) of ITWRM will be carried out in the three basins. This analysis will help identify the strategic actions that are required and that should be included in the Strategic Action Programmes and the National Strategic Action Plans to facilitate ITWRM. One key element of the SWOT analysis will be an examination of institutional capacity and governance issues, with a view to strengthening stakeholder participation in ITWRM. The SWOT analysis will also enable the identification of opportunities to integrate planned project actions with institutional plans and priorities.

168. Binational Strategic Action Programs (SAPs) for each of the three basins and National Strategic Action Plans (NSAPs) will be developed to outline the regional, national and local policy, legal and institutional reforms as well as key investments required for the sustainable integrated management of the shared aquifers and basins. The SAPs will define the mutually agreed upon priorities for action to address the key transboundary problems identified in the TDA and promote ITWRM. It should be noted that besides extensive consultations with government stakeholders, the private sector will also provide feedback for their formulation. The SAPs are negotiated policy documents that should be endorsed at a high level (the level of Ministers) in the key sectors of government, including but not necessarily limited to, the National Water Secretariat (SENAGUA) and the Ministry of Environment (MAE) for Ecuador, and the National Water Authority (ANA) and Ministry of Environment (MINAM) for Peru. This high-level endorsement is necessary to obtain the political commitment to facilitate implementation of the SAPs.

169. The National Strategic Plans will outline each country's priority actions for the management of the transboundary basins. They will guide the establishment of National Inter-Ministerial Committees to facilitate the implementation of national actions on ITWRM and will define the structure and responsibilities of these committees. They will also outline funding requirements to implement the plans.

Output 2.2- Environmental and socioeconomic indicators enable monitoring and evaluation of groundwater and surface water in the three basins and aquifers

170. Monitoring processes for the three basins have not been adopted formally. Some meteorological and water quality monitoring does take place (for example, there are some water quality control points in the Zarumilla basin), but there is no comprehensive program for the regular monitoring of environmental and socio-economic indicators in key spots. The project will facilitate the necessary discussions, analysis and agreement on an appropriate set of Monitoring and Evaluation indicators. These will include river basin and aquifer process, stress reduction and environmental and socioeconomic status (ESS) indicators, including a gender component, following the GEF IW indicators framework (Process, Stress Reduction).

171. The monitoring of these indicators will enable long-term assessment of the use and state of surface and groundwater resources in these three binational basins. They will also enable the future implementation of the SAPs and NSAPs to be tracked and adaptively managed. Beyond the identification of common indicators for monitoring, the project will support the development of a workplan for joint monitoring

between Ecuador and Peru of key indicators. To this effect, workshops will be carried out to enable agreement to be reached. The monitoring data will feed into the database to be developed under Output 1.2.

2.3. Binational institutions for ITWRM facilitate cooperation and joint action in the three transboundary basins

172. Given the transboundary nature of the threats to the three basins, binational structures to facilitate the coordinated actions required to address these threats are vital. For the Zarumilla basin, a Binational Commission already exists, having been created in 2011. At a technical level, it is able to define priority actions and has developed ToRs for the development of a management plan for the basin but has not yet secured the required funding. Legal and financial constraints have undermined its ability to go beyond the planning of actions to actual implementation. The project will therefore support the strengthening of the Zarumilla Binational Technical Commission. The project will fund a legal and financial analysis to analyze how to do so, including possible restructuring needs and mechanisms/ structures to provide it, or the national sections of the Commission, with sustainable sources of funds. High-level discussions will then be carried out to prioritize the actions that need to be taken to enable the Zarumilla Commission to function more effectively and increase its impact. In addition, given the issue of high turnover in membership on the Zarumilla Binational Commission, the project will develop an induction process for new members of the Commission.

173. For the Puyango–Tumbes and Catamayo-Chira basins, discussions will be held to examine how to build on previous experiences of cooperation in these basins and how to address any existing barriers. Specifically, at project outset, the stakeholders will define how the new proposed structures for Catamayo-Chira and Puyango Tumbes will build on and relate to existing institutional structures, such as the Zarumilla Binational Commission and the water resource basin councils established in Peru for Tumbes and Chira-Piura basins. The discussions will be held in the context of a working group to be formed for this purpose comprising all relevant stakeholders. The project will then provide support for the establishment of binational technical commission(s) to facilitate ITWRM in these two transboundary basins. Legal analysis and working group discussions will lead to the definition of a proposed structure and mode of operation of one Commission for the two basins (or one Commission for each). This proposal will then need to be agreed upon between the two countries and negotiated through the Ministries of External Relations. Following agreement, draft statutes and regulations will be developed to define the governance structure. Project support toward the establishment of the Commission(s) will enable the implementation of plans, programs, projects and investments in the future (the time period of the project would not necessarily lead to the legal approval of the Commission(s) but will lay down the groundwork for this to happen).

174. Finally, draft operating rules/ regulation(s) will be developed to guide the creation and functioning of basin binational commissions in general to maximize impact.

Output 2.4. Targeted capacity building for national and local stakeholders strengthens implementation of ITWRM and related decision-making.

175. The project will support activities to enhance local, national and binational technical capacities on the sustainable use of water resources, which in turn will permit educated decision-making on relevant issues. This Output will require hiring a consultancy to develop a targeted IWRM capacity-building plan, which will identify the training activities being carried out by ANA and SENAGUA in the project area and recommend additional training activities. A curriculum will be developed for different technical fields with various modules, incorporating gender considerations. The profile of the required instructors will be developed. In addition, agreements will be negotiated to facilitate collaboration in the implementation of the plan, including for the use of physical infrastructure. This could include possible alliances with universities and training centres, such as the two existing binational training centres, to promote the

incorporation of the capacity building plan in their training programs. This will increase project impact and enhance the sustainability of capacity building efforts. Instructors will be hired to provide the training sessions to stakeholders, including officials from relevant government institutions, such as SENAGUA and ANA, local government technicians, members of water user organizations, water resource basin councils, producer organizations, youth and women's groups. The implementation of the plan will be monitored to assess the number of beneficiaries, relevance of the training material and profile of the instructors.

176. During the PPG phase, discussions were held with SENAGUA and ANA and other stakeholders to enable them to prioritize their capacity building needs. The topics for the training are dependent on the organization to be trained. Capacity building for ANA and SENAGUA will be focused on the following topics: (a) The concept of integrated water resources management, including the integration of groundwater and surface water management and the mainstreaming of climate variability and change in IWRM; (b) Land-use planning and GIS, particularly for decision makers. Adequate land use planning will support conservation of water quality and quantity; (c) Environmental impact assessments, to ensure that these procedures adequately address threats to basins and aquifers; (d) Set-up and operation of environmental monitoring systems to monitor water quality and quantity; (e) Law enforcement/compliance with water quality regulations; (f) Socio-economic implications and benefits of ITWRM and community-based management, including through local water user boards; (g) additional topics that may be identified during project implementation based on stakeholders' perceived needs.

177. The implementation of the capacity building plan will also involve specialized training for potable water and irrigation boards, water resource basin councils and water users on the concept of IWRM, including its socio-economic benefits; water resource regulations/ standards; efficient management of water resources; operation and administration of potable water and irrigation boards and water resource basin councils; and traditional means of water conservation and management. This training will help strengthen these bodies and will also facilitate the formation of new water user boards and water resource basin councils. This is a very important issue as the majority of water user boards are currently ill equipped to handle their responsibilities and must play a greater role in community-based management to complement the oversight and enforcement role of government authorities.

178. To support these training workshops, exchanges will be organized between government officials and water user board members in Ecuador and Peru to promote dissemination of information and lessons learned. A total of four exchanges over a period of two years will take place.

179. It should also be noted that at project outset, training workshops will be provided to SENAGUA and ANA on how to mainstream gender in all aspects of the project and how to promote the participation of women, men and youth.

Outcome 3. Pre-SAP demonstrations in IWRM implemented and investment needs identified in the Puyango-Tumbes, Catamayo-Chira and Zarumilla aquifers and basins

180. This Outcome entails a suite of targeted interventions aimed at demonstrating technologies and approaches for applying ITWRM in specific sites, to facilitate replication of ITWRM actions. These pilots will seek to demonstrate the feasibility of protecting water sources –located at channel formations, rivers, streams, creeks, ponds– and surface and groundwater resources in general through the control of pollution from sewage, agriculture and other economic activities, and will promote more efficient water use, among other actions. Gender issues will be mainstreamed throughout all the pilot work (see section on strategic considerations). Committees at the pilot project level may be formed or existing committees utilized, as the case may be, to guide local-level actions and facilitate coordination among relevant stakeholders. In addition, technicians will be hired to provide oversight for the implementation of the pilot projects.

Adaptive management will be employed so that the monitoring results inform corrective actions. Lessons learned during pilot project implementation (e.g., on stakeholder engagement, difficulties encountered, opportunities, etc.) will also inform the SAP process as the development of the SAPs and implementation of the pilot projects will occur concurrently. These pilots will be coupled with pre-feasibility studies on the priority investments required for ITWRM in the three basins and aquifers in the SAP implementation phase.

181. Co-financing from ANA and SENAGUA will come in various forms including the provision of government office space for the pilot project technicians, technical support in the implementation of the pilot projects, and others. UNDP co-financing comes in part from various linked projects being managed by UNDP, through sharing of information and best practices.

3.1 Pilot projects established in Ecuador to promote ITWRM by controlling pollutionl from multiple sectors and increasing water access in Catamayo-Chira & Zarumilla river basins

Pilot Project 1: Establishing synergies between land use planning and integrated water resource management in the upper Catamayo-Chira watershed

182. This pilot project is focused on the parishes of Yangana, Quinara, Vilcabamba, San Pedro de Vilcabamba and Malacatos in the canton of Loja, Ecuador, in the upper Catamayo-Chira basin. To address the prevailing environmental problems, the pilot will: 1) Establish a land use planning process linking territorial and canton-level planning with the integrated management of water resources; 2)Develop instruments and capacities to for the declaration of priority water protection zones; 3) Implement environmentally-friendly alternatives to reduce pollution stemming from wastewater (includes development of liquid waste management plan and manual of best practices); 4) Promote agricultural systems/practices to reduce contamination and promote efficient water use.

183. The project has several innovative elements as it will enable the generation of policy and institutional processes for the establishment of water protection zones, which do not yet exist in Ecuador, but which are encouraged in the recently passed Water Resources Act. In addition, the implementation of a land use planning process will complement the pilot project actions on IWRM. Finally, the project addressed threats from multiple sectors, when interventions have tended to be focused on only one sector, such as agricultural pollution. This will enable stakeholders to gain experience in integrated water resources management. The various elements of the pilot project are highly replicable, such as the declaration of water protection zones.

Pilot Project 2: Ensuring water availability in the mid Catamayo-Chira basin, Ecuador

184. This pilot project will be carried out in the parishes of Yamana, Casanga and Guachanamá of the canton of Paltas in the mid Catamayo-Chira basin in Ecuador. Its main objectives are to: 1) strengthen water management through the recovery of traditional practices (e.g., construction of 'tajamares' or small earthen dams in rivers or streams) and the establishment of water protection zones in strategic locations of water catchment and recharge; 2) Incorporate new water sources to increase the water flow available (including hydrogeological studies and drilling of wells); and 3) Implement integrated farming with an agroecological approach to reduce water pollution from intensive use of agrochemicals. The recovery of traditional practices to maintain water availability is highly relevant as these practices can be put in place quickly and cost-effectively and can be upscaled with the support of civil society organizations present in the rural area. The project will also strengthen methodologies and provide experience in the incorporation of groundwater resources in the water supply, highlighting the importance of considering both groundwater and surface water resources to meet the growing needs of the population. Experiences in this regard are currently limited in the basin.

Pilot Project 3: Integrated water resource management to ensure water quality and availability in the Lower Catamayo-Chira basin

185. This pilot will be implemented in the parishes of Teniente Maximiliano Rodríguez, Sabanilla and Cruzpamba, canton of Célica, in the lower Catamayo-Chira basin of Ecuador. It will 1) establish water protection zones for surface and groundwater; 2) improve management of wastewater as a mechanism to control the pollution of water for human, agricultural and animal consumption. This includes formulation of a wastewater management plan and construction and start-up of a wastewater treatment plant. 3) Reduce water pollution caused by intensive application of agrochemicals in agriculture, through the development of environmental protocols on agrochemicals and capacity building of producers. The pilot project promotes IWRM by tackling various issues simultaneously, including pollution from sewage and agrochemicals and insufficient protection of water sources. The experiences to be generated with the pilot project in terms of the declaration of water protection zones and development of environment protocols for agrochemical use can be applied throughout the basin.

Pilot Project 4: Effective management of wastewater from households and agricultural activities in the Canton of Las Lajas

186. The focus of this pilot project is on the parishes of El Paraíso, La Libertad, La Victoria, San Isidro, canton of Lajas, in the Zarumilla basin in Ecuador. The project's objectives are twofold. 1) Firstly, it will develop appropriate tools and construct infrastructure for improved management of liquid waste, including development of a management plan and building of wastewater treatment plant. The liquid waste management plan will not only consider domestic and industrial effluents, but also agricultural effluents, given the high levels of pollution arising from the latter, and will be supported by the development of an ordinance. 2) Secondly, the pilot project will promote the adoption of good agricultural practices to reduce water pollution. Workshops will be held with producers in the main pollution hotspots to increase awareness of the negative impacts of inappropriate practices with pig rearing and crop cultivation on water resources, integrated farms will be designed and implemented and technical assistance provided. The implementation of solutions to key threats in the basin and coordination with a multitude of stakeholders will enhance the replicability of the actions.

3. 2 Pilot projects established in Peru to promote IWTWRM by reducing pollution from multiple sectors and increasing water access in Catamayo-Chira, Puyango-Tumbes and Zarumilla river basins

Pilot Project 5: Reducing pollution from sewage in the Suyo and Paimas districts and promoting appropriate use of the treated water

187. This project involves the design and construction of a wastewater treatment plant to reduce river pollution in the districts of Suyo and Paimas, province of Ayabaca and take advantage of the treated water for the irrigation of crops. Several studies will be carried out to characterize the effluents, analyze different options for wastewater treatment plants and designs, and carry out environmental impact assessment. A site in one of the districts will be prioritized and wastewater treatment plant constructed, followed by the development of an operational manual and training. A plan for the appropriate use of the treated water in irrigation will be developed and training will be provided on associated best practices. While there is some experience in Peru in terms of the reuse of treated water, there is very little adoption of this tool in this region. The combination of wastewater treatment and water reuse for appropriate applications in irrigation will enhance water use efficiency and will serve as a replicable model to simultaneously address issues of water quality and water availability.

Pilot Project 6: Capacity building for integrated management of water resources and efficient water use in agriculture in Chira Basin, with an emphasis on the districts of Paima and Las Lomas .

The project to be implemented in the district of Paimas and in the district of Las Lomas, Peru will: 1) Encourage participation and dialogue of key stakeholders on sustainable use of water resources. This involves strengthening interinstitutional coordination for IWRM, and supporting the functioning of working groups of Water Resource Basin Councils to achieve the objectives of the Water Resource Management Plan for the Chira river basin; 2) Develop a communications campaign and build capacity for efficient water use in agriculture. This will include a targeted print and broadcast media campaign, complemented with capacity building on efficient water use through workshops, information exchanges and training with groups of producers in each district. To complement these activities, ANA will validate and apply various instruments in this watershed to promote efficient water use, including parameters of efficiency for each water user, certification of efficient water use by users and Adaption Plans for water users.The project will play an important role in creating the spaces for multiple actors to reconcile different interests around the use of water resources and will support the definition of a shared vision on IWRM. The inclusion of training activities to complement the communication campaign will enable the message that are transmitted to be implemented in practice and will help generate a critical mass of agents to disseminate best practices in terms of water use efficiency.

Pilot Project 7: Reducing pollution from sewage in San Jacinto, Corrales and Tumbes districts and promoting appropriate use of the treated water

188. This project involves the design and construction of a wastewater treatment plant to reduce river pollution in the districts of San Jacinto, Corrales and Tumbes, province of Tumbes and take advantage of the treated water for the irrigation of crops. It follows the design of pilot project 5.

Pilot Project 8: Pilot Project 6: Capacity building for integrated management of water resources and efficient water use in agriculture in the Zarumilla Basin, with an emphasis on the districts of Pampas de Hospital, San Jacinto, San Juan de la Virgen and Corrales

189. The project to be implemented in the district of Pampas de Hospital, San Jacinto, San Juan de La Virgen and Corrales and in the province of Tumbes, Peru. It adheres to the design of pilot project 6, focusing on: 1) Encouraging participation and dialogue of key stakeholders on sustainable use of water resources; and 2) Developing a communication campaign and building capacity for efficient water use in agriculture.

Output 3.3 Knowledge management and dissemination increase uptake of best practices

190. The project will document best practices and share these with other projects throughout the world. The project will make use of the IW:LEARN information sharing tool established for the GEF International Waters program. A total of 1% of the project grant will be allocated toward IW:LEARN related activities. In addition, the project will fund the participation of the project's binational coordinator and a designated participant from each of the two countries in biannual International Waters Conferences in 2015 and 2017.

191. A project website will be set up based on the IW:LEARN guidance to share project results, lessons learned, documents and other outputs produced (such as the TDA and SAPs), maps and awareness materials, among others. Links will be included to the websites of relevant institutions such as SENAGUA and ANA, and others to increase access to project resources.

192. Another important element of this output is a mass communication campaign using radio, given that radio is a key means of information dissemination and education, particularly in rural areas. Radio spots will be developed and aired to: i) disseminate information about the project, its benefits and the role of local stakeholders, and ii) deliver key messages about IWRM, such as how to protect water production areas and reduce the use of agrochemicals. In order to maximize the effectiveness of the radio campaign, specific goals will be set, the target audience will be identified, and the intervention areas will be defined. Collaboration with two existing binational training centres will also support information sharing.

Output 3.4 Pre-feasibility studies identify investments required for ITWRM in the three shared basins during SAP implementation.

193. With a view to facilitating the future implementation of the SAPs after the project concludes and putting in place sustainable funding mechanisms to facilitate ITWRM, pre-feasibility studies will be carried out to identify the costs associated with specific priority actions defined in the SAPs. This will involve short-term consultancies with the aid of experts in financial and economic analyses and in hydrological resources. The consultants will be charged with determining, in a preliminary manner, the costs of priority investments as well as co-financing opportunities/ baseline funding that could be reoriented to support ITWRM implementation. As such, synergies with other national and local processes will be identified in these studies to facilitate implementation of ITWRM actions in the three basins during the SAP implementation phase. In Ecuador, a preliminary analysis of possible pre-feasibility studies was carried out during the PPG phase and this identified the need to design a wastewater disposal and treatment system for the cantons of the Puyango-Tumbes Hydrographic Demarcation. The final selection of studies will be confirmed during project implementation, based on the priority actions established in the Strategic Action Programs.

194. In the case of Peru, a study will be carried out to identify funding opportunities for the implementation of the water resource management plans that have been developed for the Tumbes and Chira-Piura basins. This will involve several steps, including but not limited to: development of the methodology for the study; elaboration of respective ToRs in coordination with the water resource basin councils for the Tumbes and Chira-Piura basins and ANA; hiring of consultants; and realization of the study, which will involve a technical analysis of the capacities and funding potential of the relevant technical and financial institutions to contribute to the implementation of the management plans, an analysis of the perceptions of stakeholders in terms of the funding of the management plans and workshops with relevant stakeholders. In addition, a consultancy will be carried out to identify possible financing models for the basins, taking into consideration the current situation and identifying at least three possible future desired outcomes. As part of this assignment, the most appropriate financing models will be identified by running the models, and a workplan will subsequently be developed.

Incremental reasoning, global environmental benefits and socio-economic benefits

195. Without the GEF project, Ecuador and Peru will continue to work individually on water resource management projects and on strengthening their associated legal and institutional framework (please see baseline section for details). However, this type of unilateral management of transboundary basins is inefficient and not effective in the context of shared water resources. While some studies and information gathering will be carried out, there will continue to be insufficient focus on groundwater and aquifers and on how to integrate groundwater and surface water management. Furthermore, it is unlikely that the two countries will identify common monitoring indicators to assess environmental impacts or to set up systems to consolidate the available information on transboundary environmental and socioeconomic issues. Some training activities will take place in each country on IWRM, however, these scattered actions

will not likely have significant transformative impact in the promotion of ITWRM and are not part of a strategic, comprehensive and coordinated capacity building plan. At a national level, inter-ministerial cooperation will be limited due to the lack of inter-ministerial structures to facilitate coordination on IWRM.

196. Under the baseline, some joint discussions and coordination will take place through the Binational Commission on Zarumilla. However, the effectiveness of this Commission is limited by the fact that the body does not have a legal mandate to implement actions or to manage financial resources. Without an adequate institutional framework for binational cooperation on the three basins, it is unlikely that Ecuador and Peru will come to a common agreement on the transboundary problems facing the three basins nor will they have the impetus or funding support to establish a common plan of action, through the identification of clear priorities.

197. On-the-ground actions to put in place practices to promote integrated water resource management will continue to be insufficient (for example, practices to reduce contamination from sewage, and promotion of agricultural practices that lessen the contamination of soil and waterbodies). Furthermore, information sharing among initiatives to promote IWRM will continue to be restricted, thus limiting the usefulness of demonstration actions as models for upscaling and replication elsewhere in the two countries.

198. Therefore it is evident that under the baseline scenario, substantial sustainable development challenges would be faced by the two countries: transboundary issues related to pollution and ecosystem degradation would worsen and the existing pressures on the transboundary basins would continue to be felt. In combination with anticipated climate variability and change (including extreme weather events related to ENSO cyclicality) and the lack of a bilateral cooperative framework, the aforementioned pressures are likely to reduce economic and ecosystem productivity and resilience with detrimental consequences for the communities of the region, including reduced food security and regional stability, as well as increased desertification and poverty levels.

199. With the GEF increment, Ecuador and Peru will jointly identify the principal problems facing the three priority basins through the development of a Transboundary Diagnostic Analysis. Furthermore, they will come to agreement on priority actions to be undertaken through Strategic Action Programs for each of the three basins, to be approved at the highest level in each country. National Interministerial Committees will be established to facilitate the kind of intersectoral coordination that is vital to achieving the integrated management of water resources and to guide the implementation of National Strategic Action Plans. A targeted capacity building plan will be developed and implemented to strengthen key aspects related to IWRM in both countries and this will be integrated into existing capacity building structures and programs to enhance sustainability. Carefully selected pilot projects will provide demonstrations of effective actions to be carried out on the ground to enhance IWRM. Throughout the project, sharing of lessons learned and project outputs, through the IW: LEARN platform and other means, will strengthen impact and replicability. Pre-feasibility studies will assess the financial requirements to implement the SAPs and Peru's basin management plans.

200. The pilot projects will provide direct environmental benefits, by promoting uptake of practical measures to reduce water pollution and conserve water, such as liquid waste management, less contaminating agricultural practices, efficient irrigation techniques and protection of aquifer recharge sites, among others. The environmental impacts of these in-situ interventions will be measured using stress reduction and process indicators and will lead to measurable improvements in the following, among others:

- Municipal wastewater pollution reduction in terms of levels of coliforms, nitrogen, phosphorous, and other contaminants
- Agriculture pollution reduction practices

- Conserved habitat with the establishment of water protection zones, including around aquifers and surface water (please see the strategic results framework and Annex on pilot projects for specific targets).

201. Beside these in-situ environmental benefits, the proposed project includes actions that will contribute to global environmental benefits related to maintaining the interconnectedness of the global hydrologic cycle that links the basins and aquifers shared between Peru and Ecuador. Expanding the GEF portfolio experiences on capacity building for governance of mixed water systems (i.e. aquifer-surface water) within a geographical area with a very strong incidence of the ENSO phenomenon (and providing opportunities for replication of good practices identified by the project) highlights the importance of the project in terms of its overall positive environmental and demonstration impact. Additionally, the integrated management of transboundary water resources will contribute to the ecosystem integrity and biodiversity conservation of the associated dry forests, which are located in the binational river basins and have global significance.

202. By promoting the development, conservation and sustainable management of transboundary water resources in a region of significant socioeconomic importance to both countries, the project will generate a positive impact on the quality of life of populations living in the Zarumilla, Puyango-Tumbes and Catamayo-Chira basins. At the binational level, improved institutional frameworks and capacities for cooperation will benefit ITWRM. National benefits will be realized from improved surface water and groundwater management, increased capacities of local/regional authorities and stakeholders to sustainably manage and use water resources, and improved coordination. At the community level, capacities will be enhanced to sustainably manage water resources, with increased community and ecosystem resilience to climate change.

203. Strengthening transboundary management of shared basins will lead to improved benefit-sharing of water-related goods and services in both Ecuador and Peru. This will serve as a means to enhance regional development and economic integration. Improved and integrated management of surface and groundwater resources will also contribute to local and regional sustainable development, improve natural risk prevention and reduce vulnerability to climate change. Gender mainstreaming throughout the project will ensure that men and women both benefit from the project and that relevant concerns and opportunities for each sex are recognized. The equitable access to water for sustainable livelihoods will also play a role in reducing poverty in a region marked by high levels of people with Unmet Basic Needs.

204. The project will improve knowledge on the social, economic and environmental impacts resulting from the non-integrated management of water resources. This will be coupled with knowledge on policy responses needed to prevent such approaches and high-level agreement on the priority actions that need to be undertaken to address these impacts. The project will also contribute to the identification of the financial requirements to implement priority ITWRM actions in the three shared basins.

205. Furthermore, this project will bring the following specific socioeconomic benefits:

- Increased access to good quality potable water through capacity building of potable water boards and water resource authorities in each country, reduction of contamination from various sectors, and improved monitoring. This is associated with health benefits for families living in the basins, reduced workloads and risks for women, and reduced household costs. Access to quality water also opens up the possibility of economic activities related to food processing and cooking, which are generally carried out by women.

- Generally less water shortages and more sustainable water supply through protection of aquifer recharge areas, establishment of water conservation areas, and more efficient water usage in households and agricultural activities;
- More efficient water use for irrigation, which could lead to increased agricultural productivity and improved standard of living, as well as protecting the quality of the soil, which is often families' only economic asset.
- Greater availability of water for agriculture allows families to extend their growing seasons, thus ensuring food and income for more of the year. It also enables the development of production chains generating direct and indirect employment
- Health benefits from cleaner drinking water and less exposure to agrochemicals which can cause various problems, such as respiratory problems, skin infections and stomach cancer.
- Improved sanitation through maintenance and/or establishment of sewage treatment plants and capacity building;
- Increased capacity for IWRM among institutions, potable water and irrigation boards, water resource basin councils and local water users through the training of approx.700 individuals
- Improved management of information gathered on the basins, through the database to be created. This will facilitate more accurate actions and decisions for the implementation of IWRM.
- Establishment of spaces for dialogue at the transboundary basin level to raise issues, which include the participation of key stakeholders (and incorporate gender issues)
- Increased communication, coordination and implementation of joint actions between Ecuador and Peru, which could also positively impact other sectors beside IWRM, leading to beneficial impacts for both countries.

206. A total of 234,549 local inhabitants (125,335 men and 109,214 women) will benefit directly from interventions at the pilot project level.

Key indicators, risks and assumptions

Table 12: Main Project Indicators and Targets

	Objectively Verifiable Indicators	**Targets (End of Project)**
Project Objective:	Level of knowledge of SENAGUA, ANA, Water resource basin councils and Irrigation Boards and Potable Water Boards (Ecuador), and Water Resource Basin Councils on IWRM and management of transboundary basins	80% of stakeholders who have received training demonstrate application of IWRM by end of project

	Objectively Verifiable Indicators	Targets (End of Project)
	Area (ha) which IWRM practices are being implemented in the Catamayo- Chira Puyango-Tumbes and Zarumilla River Basins in Ecuador and Peru	IWRM practices will be implemented over an area of 536,385 ha in the Catamayo- Chira Puyango-Tumbes and Zarumilla River Basins in Ecuador and Peru
	Number of beneficiaries from implemenation of IWRM in pilot projects	234,459 local inhabitants (125,335 men and 109,214 women)
	Institutional framework for binational dialogue and cooperation on IWRM	Proposed norms for the establishment of two binational Commissions for Catamayo- Chira and Puyango-Tumbes (endorsed by SENAGUA and ANA); Zarumilla Commission strengthened; and Strategic Action Programmes (SAPs) for each basin receive high-level endorsement
Outcome 1:	Hydrogeological studies in important aquifers of the basins	Basic hydrogeological studies in a) Alto Piura; b) Catamayo-Loja; and c) Zarumilla aquifers, including monitoring, inventory of wells, identification of hydrogeological units, definition of recharge areas, hydrodynamics, hydrochemistry and water quality, estimation of reserve amounts, among others.
	Transboundary Diagnostic Analysis (TDA): Agreement on transboundary priorities, immediate and root causes in the Puyango-Tumbes, Catamayo-Chira and Zarumilla binational aquifers and basins.	Establishment / strengthening of a GIS database on the basins (with public access) Agreement by both Ecuador and Peru on priority transboundary issues drawn from valid effect baseline, with immediate and root causes properly determined
Outcome 2:	Strategic Action Programs for the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins respectively	Three SAPs developed in relation to transboundary issues and complemented with National Strategic Action Plans (score of 4 on IW tracking tool) (score of 4 on IW tracking tool)
	National Inter-ministerial Committees	National Inter-ministerial Committees established and functioning in both Ecuador and Peru (score of 3 on IW tracking tool)
	Proposal for establishment of Binational Commission(s) for Puyango Tumbes and Catamayo-Chira	Binational legal and policy framework for the Puyango-Tumbes and Catamayo-Chira Commission(s) proposed and harmonized for IWRM, including proposed statutes and regulations, enabling the implementation of plans, programs, projects and investments. The Commission(s) will include at least five (5) public entities, three (3) local governments and three (3) civil society organizations.
	Proposed standard to strengthen Binational Commissions	Proposal for operating rules/ regulations developed to guide establishment of Binational Commissions and to strengthen existing Zarumilla Binational Commission
	M&E indicators to measure environmental and socioeconomic	Agreement on indicators to measure river basin and aquifer processes, stress reduction and environmental and

	Objectively Verifiable Indicators	Targets (End of Project)
	status of basins and implementation of SAPs and NSAPs	socioeconomic status and level of implementation of SAPs/NSAPs. Binational work plan agreed upon for joint monitoring in the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins
	% of officials from ANA, SENAGUA, water user boards, water resource basin councils and local governments trained on IWRM (specific topics of training described in Output 2.4)	*In Ecuador:* - At least 60% of members of water user boards trained in each pilot area. - At least 60% of SENAGUA officials in the Puyango Catamayo Demarcation trained - At least 60% of SENAGUA officials in the Jubones Demarcation trained -At least two (2) parish-level Decentralized Autonomous Governments (GADs) in each pilot area involved in training activities - At least one (1) canton-level GAD involved in each pilot area in education and training activities. - At least one (1) provincial-level GAD involved in education and training activities *In Peru:* - At least 60% of officials of the Local Water Authorities (ALAs) trained in each pilot area - At least one (1) Basin Council involved in training activities in each pilot area. - At least one regional government involved in training activities in each pilot area.
Outcome 3:	*Please see Strategic Results Framework for detailed indicators for each of the 8 pilot projects*	
	Information sharing of project documents/ outputs, best practices and experiences	Functioning website in line with IW:Learn guidelines, regularly updated, and information sharing through participation in International Waters Conference 8 (in 2015) and 9 (in 2017) and other means.
	Preliminary identification of investments required for ITWRM in the three basins and aquifers	Pre-feasibility studies on priority investments required for ITWRM in the three shared basins and aquifers completed

Table 13: Risks and mitigation strategies

Risk	Rating	Risk Mitigation Strategy
Insufficient financial commitment to implement the SAPs,	L-M	The project will fund pre-feasibility studies to determine the investments required for ITWRM implementation and to identify existing budget lines that are aligned with IWRM actions. To address the risk that national governments

Risk	Rating	Risk Mitigation Strategy
NSAPs and ITWRM actions in general at the level of each country		do not provide sufficient financial support and do not prioritize the issue in their budgets, partnerships with local governments, community and civil society organizations will be promoted at all stages of project development. In particular, Autonomous Decentralized Governments (GADs) have the jurisdiction to manage international cooperation funds to finance plans and projects. Cooperation and spaces for dialogue among different GADs in the adoption of a basin approach and in the alignment of budgets will be promoted. Municipal associations, associations of parish boards, and other associations will be key stakeholders. In addition, the private sector (both the people who use water for their food security and those who use water for agro/exportation or agro-industry) will be informed of the benefits of investing in IWRM, by demonstrating the links between sustainable environmental management and the sustainability of agrofood chains. In addition, external funding will be sought after the completion of this project to facilitate implementation of the SAPs and NSAPs. It should also be noted that proposed project actions respond to priorities identified at the national level by the governments of Ecuador and Peru (for example, in the National Plan for Good Living 2013-2017 and constitutional norms in Ecuador and for Peru in the Constitution and National Policy on Water Resources- 2012). This increases the likelihood that government financial resources will support the achievement of the established goals established.
Limited environmental awareness, including understanding of IWRM principles, reduces participation in project	L	The level of understanding among stakeholders about the concept of IWRM in transboundary basins and aquifers varies significantly. To overcome this problem, the project will: a) promote information exchange and awareness raising, including with the use of radio; b) design a targeted capacity building plan on IWRM in line with the needs and interests of stakeholders and aligned with existing capacity building initiatives in both countries; c) implement this plan with all key stakeholders, including technicians from ANA, SENAGUA, and local governments and organizations, among others; d) promote the integration of the capacity building plan in the curriculum of relevant training centres, such as the Binational Training Centres in Catacocha, Provincia de Loja, Ecuador and in Sullana in Peru; d) promote the establishment of spaces for dialogue among key stakeholders on ITWRM, for example, through National Inter-Ministerial Committees to be set up in Peru and Ecuador.
Changes in political administrations and in staffing reduce support for project and contribute to implementation delays	M	Actions focused on the integration and development of the border area have been a top priority in both countries since the signing of the Peace Agreement in 1998. The potential risks associated with political instability and changes in government authorities cannot be fully excluded, however, the importance of water resources for development in the transboundary basin areas and the high vulnerability to phenomena associated with climate change and variability reduce this risk considerably. A highly participatory scientific-technical approach to the TDA and to the achievement of broad consensus on the priority actions to be included in the SAPs will reduce the level of risk. The Project Management Unit will fully socialize the project with new government stakeholders in the event of any changes in political administrations. For example, in October 2014, new regional and municipal governments will be elected in Peru. In addition, minutes will be taken at all key meetings and participatory processes to record decisions made on the

Risk	Rating	Risk Mitigation Strategy
		transboundary management of the three basins, which will make up for lack of institutional memory in the event of changes in personnel and decision makers. Furthermore, the project will develop a capacity building plan that will be integrated into the curriculum of training centres to support continued capacity building even when there are staffing changes.
Insufficient incorporation of climate variability and change in IWRM planning and other processes	M	Climate change and variability is a cross-cutting issue that will be integrated in all the main project activities. Climate change scenarios will be included in the TDA and the priority actions to be identified in the SAPs and the NSAPs will take into account climate change factors. In addition, the capacity building plan will include the topic of climate change and variability, its possible impacts on the basins, and appropriate measures to take climate change into account. At the pilot level, the project will seek to identify and promote solutions that facilitate adaptation and increase the resilience of ecological and socioeconomic systems. For example, various pilot projects will promote traditional systems of water storage (such as albarrales, which are small ponds formed by earth dikes, laid across streams, and reservoirs) to deal with times of water scarcity. Finally, the project will maintain contact with the relevant climate change authorities in each country during project implementation in order to obtain guidance on how to mainstream climate change issues in the project.
Insufficient labour for implementation of pilots and planned capacity building activities	L	As a result of national and international migration, there is limited labour availability in some areas. The pilot sites within the Hydrogeographic Units will be selected to ensure the presence of a sufficiently large population size for effective implementation of pilot projects and capacity building activities. Furthermore, the participation of women will be promoted as key actors in the pilot projects.
Practices promoted by project in pilot sites do not capture interest of young population	L	The process of defining the pilot sites within the Hydrogeographic Units was carried out in a participatory manner with local stakeholders in Ecuador. In Peru it was based on basin management plans that were developed after extensive consultation with stakeholders. As a result, the practices to be promoted have been selected in order to respond to the specific needs identified by the communities involved. The participation of youth and women will be promoted through pilot projects and training that respond to the interests, needs and schedules of those involved, without constituting an additional burden to their already long days. This will enable youth to find new ways to insert themselves in local productive chains.
The different political parties in power at the local versus national level prevent agreement on key project-related issues	L	The political parties at the local level may not be the same as those in power at the national level. However, SENAGUA must coordinate actions with local governments and communities in accordance with the new Water Resources Act and existing national policies. In Peru, the project actions fall within the priorities of ANA and the mandate of already established Water resource basin councils, through which dialogue and consensus among different public, private and community-based actors can be achieved. In addition, local actors will be involved in consultation and oversight activities as a strategy to support the maintenance of commitments at different levels.
The regulations and technical standards to be established in accordance with the new Water Resources Act of Ecuador take too	L	The lack of regulations and procedures would impact primarily on the process of declaring water protection zones and the development of canton-level ordinances for the prevention of water pollution, among other issues. According to the new Act, SENAGUA has two to five years to develop the respective regulations. To accelerate this process, the project will develop specific proposals outlining the procedures and required regulation for the declaration of water protection zones, based on the work to be carried out at

Risk	Rating	Risk Mitigation Strategy
long to be approved, thereby slowing down project implementation		the level of the pilot projects. This will require close coordination with SENAGUA's Puyango Catamayo and Jubones Hydrographic Demarcations.

- *Cost-effectiveness*

207. The adoption of a binational harmonized approach to addressing the threats to transboundary water basins is more cost effective, more environmentally effective and more sustainable than the exclusive implementation of individual actions by each of the countries. By developing Strategic Action Programs complemented by National Strategic Action Plans, priority actions to reduce the most pressing transboundary problems that would otherwise compromise water quality and quantity will be identified. Binational Commissions for the transboundary basins will facilitate the implementation of harmonized approaches and reduce duplication of efforts, thus maximizing the impact of the resources invested.

208. Furthermore, substantial baseline investments will be made by both Ecuador and Peru. GEF funding will build on these national investments to ensure global environmental benefits. Significant co-financing has been committed for the project in the amount of USD 20,110,773, with GEF funding being allocated strategically toward actions that lead to 1) a shared understanding of the transboundary problems facing these basins and continual monitoring, 2) binational agreements on priority actions to address these problems, 3) institutional structures and capacity to facilitate these actions, and 4) on-site pilot demonstrations to increase both country's experience with IWRM. In addition, one of the criteria used to identify the pilot projects, at least for the Zarumilla basin, was the availability of economic and logistical resources to contribute to ITWRM, thus increasing the cost effectiveness of the project interventions at the local level.

- *Sustainability*

Environmental sustainability

209. The pilot projects under Outcome 3 will lead to direct environmental benefits as measured by the impact indicators included in the tracking tool. The actions to be carried out have the full support of local stakeholders who prioritized these pilot projects. Furthermore, the sustainability of these pilot projects will be enhanced through the participation of key actors in their implementation, including canton and parish-level autonomous decentralized governments, CSOs, Ministries of Environment, Agriculture and Health, among others. It is therefore expected that they will continue work on these issues after project termination.

210. To support longer-term environmental impact, the project will fund the development of Strategic Action Programs and National Strategic Action Plans, which will identify priority actions in the three transboundary basins to improve environmental conditions, and will support studies to identify financial resources to do so. In addition, the project will strengthen/ establish Binational Commissions and increase institutional capacities. Thus, the pilot work will provide direct positive environmental impacts while the project will also contribute to longer-term harmonized actions and greater cooperation to reduce transboundary environmental pressures.

Financial sustainability

211. The availability of economic and logistical resources to contribute to ITWRM was a factor taken into consideration in the selection of pilot projects, thus increasing the likelihood of follow-up actions and sustainable impact. In addition, the successful implementation of pilot projects will increase the level of commitment of institutions to include such actions in their future operational plans. This has been shown to be the case in the past when pilot initiatives were considered to be the flagship projects of different institutions and further resources were assigned.

212. At a larger scale, at the level of each of the transboundary basins, the SAPs will identify those actions that are considered to be priority interventions by both Ecuador and Peru for IWRM in the three basins. Since these SAPs will receive high-level political approval, there is an increased likelihood of government financial allocations for their implementation. Furthermore, the project will carry out pre-feasibility studies on the IWRM investments required to implement the SAPs and basin management plans. These studies will facilitate the subsequent development of detailed feasibility studies on planned interventions outlined in the SAPs. Finally, once the project closes, further funding will be sought from external sources to support SAP and NSAP implementation, including through donor meetings to seek commitments. Partnerships with local governments and with the private sector will also be sought to strengthen financial sustainability.

Institutional sustainability

213. Institutional sustainability will be ensured through several means, most notably through institutional capacity building, the establishment of national interministerial committees, and the strengthening/ establishment of institutionalized structures for binational cooperation for all three basins.

214. Under Outcome 2, the project will develop and implement a capacity building plan on IWRM with national and local institutions and non-governmental actors. The project will strive to integrate this plan into the curriculum of binational training centres and universities to enhance the sustainability of capacity building efforts. In addition, National Interministerial Committees will be set up to facilitate the kind of inter-institutional and inter-sectoral cooperation that is necessary to achieve IWRM. Another key project element is the strengthening/ establishment of Binational Commissions for each of the three basins, since they represent the institutional basis for long-term cooperation on ITWRM. For the Zarumilla basin, the existing Binational Commission, created in 2011, will be strengthened, while for Puyango–Tumbes and Catamayo-Chira basins, the establishment of a Binational Commision(s) to facilitate ITWRM will be promoted, with draft statutes and regulations developed to set out their mechanisms of operation and the responsibilities of the parties. For these two basins, the lessons learned during the process of establishment and period of implementation of the Zarumilla Binational Commission will be taken into consideration, such as the need for a permanent technical team in the Binational Commission and the National Sections; the importance of ensuring participation of state, civil society and private organizations in the national sections of the Binational Commission; and the role that the commitment of participants plays in the planning and implementation of actions. Furthermore, the constraints that have undermined the effectiveness of the Zarumilla Binational Commission will be assessed in order to ensure that the structure and operating mechanisms for the other two basins are effective.

215. The development of policy instruments, such as Strategic Action Programs and complementary National Strategic Action Plans, will provide guidance to the relevant institutions and binational structures to orient the actions required for ITWRM.

Social sustainability

216. The pilot projects in Ecuador were selected through a participatory exercise involving various workshops with key stakeholders. In Peru, the project sites were selected based on priorities identified in basin management plans, which themselves were developed through a fully participatory consultation exercise. This ensure significant buy-in for the actions proposed in the pilot projects. Furthermore, the implementation of the pilot project work will be based on a highly participatory approach guided by local-level committees, to be comprised of key local-level stakeholders, and supported by technicians that will be hired. The work of stakeholders on these committees will provide them with valuable experience that could facilitate the future implementation of water resource basin councils in Ecuador. In Peru, the existing water resource basin councils will provide guidance for the monitoring of pilot project activities.

217. The project's capacity building, knowledge management and dissemination elements (Outputs 2.4 and 3.4) will increase the level of understanding among key stakeholders, such as potable water and irrigation boards, water resource basin councils, women's and youth groups and producer groups, on the concept of IWRM and various related aspects. This training and information sharing will be complemented with the use of radio as a means to ensure widespread transmission of relevant messages on IWRM. The resulting increase in capacity and awareness of IWRM and its socio-economic benefits will enhance the social sustainability of the project. It should also be noted that the project has mainstreamed gender considerations in its design and implementation, which will also strengthen social sustainability (please see design considerations section).

- *Replicability*

218. Capacity building under Outcome 2 will facilitate replication by providing training to key institutional and non-institutional actors involved in the issue of IWRM. The exchange of information and experiences between Ecuador and Peru will be organized to foster learning in a regional setting on the integrated management of transboundary basins. The capacity building plan will be shared with the two existing regional training centres and universities with a view to promoting its integration in their curricula, which would lead to further capacity building, upscaling and replication. This in turn would enhance the likelihood of adoption of IWRM practices post-project both at the level of the Hydrographic Units involved in the pilot projects and the level of the entire binational basins.

219. The process of developing the pilot projects under Outcome 3 took into consideration various factors maximize the potential for replication. As such, they address the main problems facing the three binational basins (such as agrochemical pollution, pollution from inappropriate sewage management, and reduced water flows), thus providing models of the types of integrated actions required to address different threats and that, in turn, can be promoted and applied throughout the basins. It should also be noted that the establishment of water protection zones in several pilot projects has high replication potential, as it is a pioneering initiative at the regional and local level. Information exchange activities among pilots will be promoted as will information exchange beyond the pilot sites to other sites where there is interest in adoption of IWRM practices.

220. Output 3.3 represents a key element of the project's replication strategy as it entails knowledge management and dissemination to facilitate the adoption of best IWRM practices. This will include development of a project website with all project documents and results as well as participation in International Waters biannual conferences and other IW:LEARN activities. Also important to the issue of national replication will be the project's use of radio spots to facilitate dissemination of information on IWRM to mass audiences.

221. The process of preparation of the TDAs and SAPs for the three basins will enable Ecuador and Peru to gain substantial experience in working together to gather and share information, come to a common

understanding of transboundary problems and reach agreement on priority areas for action to reduce the threats to the transboundary resources. This process could help pave the way for carrying out similar exercises in other key transboundary basins, such as those basins shared by Ecuador and Peru that drain into the Amazon/ Atlantic. Moreover, the SAPs will identify priority actions for replication.

Coordination with Other Initiatives

Peru

222. In Peru, the IW project will ensure coordination with five relevant UNDP implemented projects. The first is the project entitled "Towards Low-emission and Climate-Resilient Development in the regions of Piura and Tumbes in Peru" (2012- 2014). This project aims to strengthen the capacities of national and regional authorities to integrate climate change into territorial planning. The implementation of the project by the Ministry of Environment and the Regional Governments of Tumbes and Piura will lead to a territorial approach to climate change, culminating in an Integrated Regional Climate Change Plan. Of particular relevance to the IW project, the project will evaluate the potential impacts of climate change on the availability of superficial water resources in the Piura Tumbes basin and will identify priority adaptation actions. The IW project will take into consideration this information in the development of the TDAs, SAPs, NSAPs and design of pilot projects.

223. UNDP in Peru is also implementing an Ecosystem-Based Adaptation (EbA) Programme that aims to reduce the vulnerability of communities to climate change and increase their adaptive capacity through an Ecosystem based Adaptation (EbA) and Community based Adaptation (CbA) approach. In this way, strategies for sustainable management, for conservation and restoration of the ecosystem are implemented, while taking into consideration economic, cultural and social aspects of the communities involved. The project Ecosystem-based Adaptation of High Mountain areas in the Nor Yauyos Cochas Landscape Reserve (2013-2015), funded by UNEP and IUCN, is creating opportunities for experimental learning between regions and countries. Moreover, this project will perform a socio-economic assessment of the hydrological ecosystem services of basins and identification of economic tools for conservation. Although this project focuses on a different geographic area and ecosystems, the lessons learned from their activities on integrated basin management and technical studies on hydrological ecosystem services will be considered by the IW project.

224. In addition, UNDP in Peru is executing the project "Integrating Ecosystem- and Community based Management in Communal Reserves" (2013-2017), funded by the German government, focused on the Communal Reserve Amarakaeri (RCA) in Madre de Dios, and the Communal Reserve Tuntanain (RCT) in Amazonas. This EbA initiative will generate climatic scenarios, analyses of vulnerability to climate change and impacts on settlements, agriculture and infrastructure, as well as natural resource and environmental service valuation studies, with specific emphasis on pilot areas and basins. The IW project will make use of some of the methodologies developed in this process, as well as the data produced.

225. The fourth relevant UNDP implemented project in Peru is "Towards Ecosystem Management of the Humboldt Current Large Marine Ecosystem" (2012-2016), funded by GEF. The Humboldt project includes substantial capacity building on the TDA and SAP approach and production of educational material, among other elements. As a result, even though the Humboldt project is focused on marine ecosystems, improving water quality and quantity in the three river basins will have positive downstream impacts on the Peruvian coastal area and broader LME. In addition, lessons learned on TDA and SAP capacity building as well as on implementing a binational project and facilitating inter-institutional and binational agreements and joint action are of relevance to the IW project. The IW project will liaise with the Humboldt project to ensure that this inter-project learning takes place.

226. UNDP Peru continues to support the Peruvian authorities in its access and sequencing of innovative climate finance. The project: Building Transformative Policy and Financing Frameworks to Increase Investment in Biodiversity Management (BIOFIN) aims to integrate biodiversity and ecosystem services in sectoral and development policy, planning and budgeting. Furthermore, different sources of funds to meet biodiversity-financing needs will be identified, combined and sequenced. The IW Project will draw from this experience for the identification of investment needs in the three shared aquifers and basins during the SAP implementation phase.

Ecuador

227. In Ecuador the IW project will coordinate with various projects being implemented by the UNDP, including the "Adaptation to Climate Change through Effective Water Governance" Project (PACC) (2008-2014). This is being executed by the Ministry of Environment, with GEF funding from the Special Climate Change Fund. The PACC project aims to reduce Ecuador's vulnerability to climate change through efficient water resource management. The expected Outcomes of the project include: incorporation of the risks associated with climate change in key plans and programs; strategies and measures for climate change adaptation implemented at the local level (including through pilot projects); and human and institutional capacity for climate change adaptation strengthened and information and lessons learned disseminated. The PACC project is working in seven basins, including Jubones and Catamayo, which are part of the IW project. PACC has been implementing actions at the community-level including in terms of efficient water management practices (ex., water harvesting and irrigation reservoirs). The IW project will coordinate closely with this project to take advantage of the wealth of experience gained and to ensure that all ITWRM actions promoted at the local level as well as the SAPs and NSAPs take into account findings on reduction of vulnerability to CC. The IW project will also take into consideration any relevant data on climate change scenarios from the Third National Communication on Climate Change project (2014-2016), funded by GEF.

228. The IW project will coordinate with the Small Grants Program (PPD), funded by GEF, which has been in operation since 1994 and provides funding for community-based initiatives. In particular, the IW project will glean lessons learned from the work at the community-level and in conflict resolution for application to the pilot project work. While the PPD has in the past been focused on BD initiatives, many actions have been carried out to conserve basins.The PPD program has also developed a software to facilitate monitoring of projects, which has already been used in another UNDP-GEF project (PACC) and may be helpful for the IW project.

229. Coordination will also be put in place with the ART programme for El Oro Province (2009-2013). The ART programme supports development processes in the El Oro province in Ecuador, neighboring the border with Peru, by strengthening capacities to integrate local, provincial and national development agendas and plans and to align the international cooperation to these plans. The programme seeks to foster synergies to achieve progress on national and regional development goals, including those related to ensuring water security and pollution control. The IW project will take into consideration the lessons learned from this project to ensure that the appropriate linkages are made in terms of the different levels of policies and jurisdictions and to ensure that the actions carried out at the basin level through the project are consistent with higher-level plans and policies at the canton, provincial and national levels (through to the National Development Plan).

230. Likewise the project will share information with the project “BRIDGE: Water Governance in transboundary basins - Andes component” which IUCN has been implementing (2011-2016). The project is financed by the Swiss Development Agency (COSUDE) and is part of a global project under implementation in Mesoamerica and in Southeast Asia. Selected basins in the Andean region are Zarumilla

(Ecuador and Peru), Catamayo-Chira (Ecuador and Peru) and Titicaca (Bolivia and Peru). The IUCN project focuses on promoting IWRM through the development of technical tools to promote harmonized transboundary water resource management by the countries that share river basins, updating of policies and norms and institutional work.

231. UNDP CO will ensure that the SAPs developed for the three basins takes into consideration the National Biodiversity Strategy (NBD) (2012-2015) being developed through a UNDP/GEF project in terms of the conservation and sustainable use of BD. UNDP CO will also determine whether the SAPs will contribute to the implementation of the NBD through the pilot work. In addition, the project will review the main findings of the project for the Updating and Alignment of the National Desertification Plan (2014-2015), which is focused on the Southern part of Ecuador bordering Peru, to identify how IW project actions in the three basins will contribute to reduced desertification.

232. Lastly, the project will coordinate closely with UNDP Cap-Net as an established UNDP delivery mechanism to enhance national capacities in the area of integrated water resources management (IWRM). UNDP Cap-Net is a partnership of autonomous international, regional and national institutions and networks committed to capacity development in the water sector and makes available online resources, such as training materials, as well as in-person training sessions on a variety of topics related to water resource management.

Project Results Framework:

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: **Ecuador: CPAP Direct Outcome 5: Expected output 4.1:** National and local development plans, as well as national and community-based volunteer organizations, incorporate adaptation to climate change strategies, plans and projects and possess greater knowledge, skills and tools to respond to this phenomenon. **Peru: CPAP Direct Outcome 4: Expected output 4.4.:** Management tools to improve environmental quality are developed, agreed upon and under implementation at the national, regional and local levels.
Country Programme Outcome Indicators: **Ecuador:** Initiative widespread at national and international level **Peru**: Number of management instruments designed and agreed by different actors and in implementation process at national, regional and local level
Primary applicable Key Environment and Sustainable Development Key Result Area- Citizen expectations for voice, development, the rule of law and accountability are met by stronger systems of democratic governance.
Applicable GEF Strategic Objective and Program: Objective 3: Support foundational capacity building, portfolio learning, and targeted research needs for ecosystem-based, joint management of transboundary water systems
Applicable GEF Expected Outcomes: Outcome 3.1: Political commitment, shared vision, and institutional capacity demonstrated for joint, ecosystem-based management of waterbodies and local ICM principles Outcome 3.2: On-the-ground modest actions implemented in water quality, quantity (including basins draining areas of melting ice), fisheries, and coastal habitat demonstrations for “blue forests” to protect carbon
Applicable GEF Outcome Indicators: (for Outcome 3.1) Agreed SAPs at ministerial level with considerations for climatic variability and change; functioning national inter-ministry committees; agreed ICM plans (for Outcome 3.2) Measurable results contributed at demo scale

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
Project Objective: Strengthening institutional, policy, legal and scientific-technical capacities to implement Integrated Transboundary Water Resources Management in Puyango-Tumbes, Catamayo-Chira and Zarumilla River Basins and Aquifers, integrating climate variability concerns	Level of knowledge of SENAGUA, ANA, Water Resources Basin Councils (Peru), Irrigation Boards and Potable Water Boards (Ecuador) on IWRM and management of transboundary basins	Baseline institutional capacity will be measured using institutional capacity survey within 3 months of project start-up	80% of stakeholders who have received training indicate application of IWRM by end of project	Survey applied at project end to measure stakeholder knowledge and level of application of IWRM knowledge Proposed new/ updated policy(ies) on IWRM and management of transboundary basins (e.g., policy on binational commissions and/or on water protection zones)	There is sustained commitment from the governments of Ecuador and Peru to strengthen the policy framework and sector governance in relation to IWRM in shared transboundary basins and aquifers; Effective communication among public entities Staff turnover does not undermine building of stakeholder capacity
	Area (ha) which IWRM practices are being implemented in Catamayo- Chira, Puyango Tumbes and Zarumilla River Basins in Ecuador and Peru	0 ha. There are some specific initiatives to improve efficiency of water use and water quality, but integrated management of water resources is not being carried out	IWRM practices will be implemented over an area of 536,385 ha in the Catamayo-Chira Puyango-Tumbes and Zarumilla River Basins in Ecuador and Peru.	Project reports Minutes of Interministerial National Committee meetings/ Water resource basin councils	
	Number of beneficiaries from implementation of IWRM in pilot projects	0 beneficiaries, as pilot projects have not start up.	234,549 local inhabitants (125,335 men and 109,214 women)	Pilot project implementation reports Total number of inhabitants in areas of intervention	
	Institutional framework for binational dialogue and cooperation on IWRM	In the three basins, only a Binational Commission for Zarumilla has been formally established and no SAP has been developed or endorsed.	Proposed norm(s) for the formation of binational Commission(s) for Catamayo-Chira and Puyango-Tumbes (endorsed by SENAGUA and ANA); Zarumilla Commission strengthened; and Strategic	The proposed legislation for the legal establishment of binational commissions for Puyango-Tumbes and Catamayo- Chira-	

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
			Action Programmes (SAPs) for each basin receive high-level endorsement	and endorsed SAPs for each of the three basins	
Outcome 1:. Transboundary diagnostic analysis for the Integrated Transboundary Water Resources Management (ITWRM) in the Puyango-Tumbes, Catamayo-Chira and Zarumilla binational aquifers and basins.	Hydrogeological studies in important aquifers of the basins	The availability of hydrogeological information is greatest for the Zarumilla basin, while the information for the other basins of Catamayo-Chira-and Puyango-Tumbes is scattered (primarily data on water quality information, volume of flow that is exploited, groundwater levels), with a medium to low level of hydrogeological information and lack of integration and interpretation of this information.	Basic hydrogeological studies in: a) Alto Piura; b) Catamayo-Loja; and c) Zarumilla aquifers, including monitoring, inventory of wells, identification of hydrogeological units, definition of recharge areas, hydrodynamics, hydrochemistry and water quality, estimation of reserve amounts, among others.	Completed hydrogeological studies	Key baseline information is gathered in a timely manner to avoid delays in preparing both TDA and subsequent SAPs Key stakeholders are convened by SENAGUA and ANA and come together to confirm the accuracy of the information in the TDA
	Transboundary Diagnostic Analysis (TDA): Agreement on transboundary priorities and root causes in the Puyango-Tumbes, Catamayo-Chira and Zarumilla binational aquifers and basins.	Priority transboundary issues identified and agreed on but based on limited effect information; inadequate root cause analysis (score of 2 on IW tracking tool)	Establishment / strengthening of a GIS database for basins and aquifers (with public access) Agreement by both Ecuador and Peru on priority transboundary issues drawn from valid effect baseline, with immediate and root causes properly determined (score of 4 on tracking tool)	GIS database Completed TDA	
Outputs: Output 1.1: Hydrogeological and hydrological studies provide updated information on groundwater and surface water quality and quantity in the Puyango-Tumbes, Catamayo-Chira & Zarumilla aquifers Output 1.2: TDA serves as scientific-technical document on state of water resources and primary transboundary problems related to water resources in the three basins and aquifers.					
Outcome 2: - Strategic planning to strengthen governance of transboundary	Strategic Action Programs for the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins respectively	Neither Ecuador nor Peru have developed a SAP for any of the three basins. In Peru, there are water resource basin management plans for the Tumbes and Chira-Piura basins, which present agreed-upon solutions	Three SAPs developed in relation to transboundary issues and complemented with National	Three completed SAPs	Sustained commitment among the governments of Ecuador and Peru to strengthen the policy framework

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
water resources in Puyango-Tumbes, Catamayo-Chira and Zarumilla binational aquifers and basins		for the national-level management of the basins. In Ecuador there are general guidelines and a management plan for the Catamayo-Chira basin	Strategic Action[24] Plans (score of 4 on IW tracking tool). These are programs focused on water resources that will solve problems common to both countries, and will be based on the information collected in the TDA under Outcome 1.		and sector governance in relation to IWRM in shared transboundary basins; Effective communication among public entities Stakeholders from Ecuador and Peru agree on structure and operating mechanism of Puyango-Tumbes and Catamayo-Chira Binational Commissions Staff turnover does not undermine building of key stakeholder capacity
	National Inter-ministerial Committees	Neither Ecuador nor Peru have established National Interministerial Committees to address IWRM issues	National Interministerial Committees established and functioning in both Ecuador and Peru (score of 3 on IW tracking tool)	Minutes of National Interministerial Committee meetings	
	Proposal for establishment of Binational Commission(s) for Puyango-Tumbes and Catamayo-Chira basins	There is a National Sub-Committee for Ecuador for the Puyango-Tumbes and Catamayo-Chira basins, but it has not been operating since 2000. The national institutional framework for IWRM in basins is being developed in Peru through the creation of the Water Resource Commissions for the Tumbes and Chira-Piura basins. No Binational Commissions have been legally established for the Puyango-Tumbes and Catamayo-Chira basins, although there have been preliminary meetings to promote their establishment. A Binational Commission for Zarumilla was created in 2011.	Binational legal and policy framework for the Binational Commission(s) for the Puyango-Tumbes and Catamayo-Chira river basins proposed and harmonized for IWRM, including proposed statutes and regulations, enabling the implementation of plans, programs, projects and investments. The Commission(s) will include at least five (5) public entities, three (3) local governments and three (3) civil society organizations.	Proposed statutes for the legal establishment of Puyango-Tumbes and Catamayo-Chira Binational Commissions	
	Proposed standard to strengthen Binational Commissions	There are no regulations or general operating procedures to guide the establishment and operation of Binational Commissions.	Proposal for operating rules/ regulations developed to guide establishment of Binational Commissions and to strengthen	Draft standard/ operating procedures	

[24] Strategic actions will include agreed upon projects and initiatives.

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
		The Zarumilla Binational Commission has statutes, internal regulations and draft operational regulations for the Zarumilla aquifer. Some instruments have been developed but the institutional framework has not been agreed upon.	existing Zarumilla Binational Commission		
	M&E indicators to measure environmental and socioeconomic status of basins and aquifers and to monitor implementation of SAPs and NSAPs	Such indicators have not been agreed upon.	Agreement on indicators to measure river basin and aquifer processes, stress reduction and environmental and socioeconomic status and level of implementation of SAPs/NSAPs. Binational work plan agreed upon for joint monitoring in the Puyango-Tumbes, Catamayo-Chira and Zarumilla basins	Minutes of meetings of National Inter-Ministerial Committees confirming agreement on indicators Agreement between SENAGUA and ANA on parameters Monitoring reports	
	% of officials from ANA, SENAGUA, water user boards, water resource basin councils and local governments trained on IWRM (specific topics of training described in description of Output 2.4)	0 % have been trained on these issues. Isolated training has been provided on various topics (such as 'water culture').	*In Ecuador:* - At least 60% of members of water user boards trained in each pilot area. - At least 60% of SENAGUA officials in the Puyango Catamayo Demarcation trained - At least 60% of SENAGUA officials in the Jubones Demarcation trained -At least two (2) parish-level Decentralized Autonomous Governments (GADs) in each pilot area involved in training activities	Project reports	

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
			- At least one (1) canton-level GADs involved in each pilot area in education and training activities. - At least one (1) provincial-level GAD involved in education and training activities *In Peru:* - At least 60% of officials of the Local Water Authorities (ALAs) trained in each pilot area - At least one (1) basin council involved in training activities in each pilot area. - At least one (1) regional government involved in training activities in each pilot area.		
Outputs: 2.1: Strategic Action Programmes (SAPs) provide a framework for ITWRM actions in the three basins 2.2- Environmental and socioeconomic indicators enable monitoring and evaluation of groundwater and surface water in the three basins 2.3. Binational institutions for ITWRM facilitate cooperation and joint action in the three transboundary basins 2.4. Targeted capacity building programs for national and local stakeholders strengthen implementation of ITWRM and related decision-making.					
Outcome 3	**Pilot Project in Upper Catamayo-Chira basin, Ecuador** Conserved habitat (ha protected) to protect water resources	Approx. 71,554 ha of land within protected areas[25]	81,554 ha (an additional 10,000 ha incorporated in 'water protection zones')	Official declaration of water protection zones endorsed by SENAGUA and issued by municipalities with	Pilot projects are initiated in a timely basis so that environmental and socio-economic targets can be reached

[25] In the pilot site, there are approximately 12 protected areas or parts thereof that together comprise approx. 71,554 ha. In terms of their size and importance, the following three PAs stand out: Parque Nacional Podocarpus (PNP), Corazón de Oro and Colambo Yacuri.

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
				decrees supporting official declaration Management plans for water protection zones	There are no new significant sources of pollution in the pilot project areas that would undermine achievement of the environmental and socio-economic targets Key stakeholders in the implementation of the pilot projects are able to work together effectively
	Agriculture pollution reduction practices (ha of practice)	The general level of adoption of agricultural pollution reduction practices in the pilot project area will be estimated at project start-up.	Additional 500 ha on integrated farms	Pilot project reports on integrated farms Reports from Ministry of Agriculture	
	<u>For Pilot Project in Middle Catamayo-Chira basin, Ecuador</u>				
	Conserved habitat (ha protected) to protect water resources	0 ha, as there are no protected areas in the pilot project area	2,000 has protected and incorporated in water protection zones (surface and/or groundwater)	Official declaration of water protection zones Management plans for water protection zones	
	Improved water use efficiency (m^3/ha/year of water saved)	Baseline values will be estimated at project outset	Water use efficiency has increased by 20% on integrated farms (actual target in m^3/ha/year to be confirmed at project start-up once baseline established)	Reports registering volume of water use per hectare	
	<u>For Pilot Project in Lower Catamayo-Chira basin, Ecuador</u>				
	Municipal wastewater pollution in surface water, as measured by coliforms (MPN/100 ml, oils and fats (mg/l)	In the surface water, total coliforms are 9200 MPN/100 (MPL[26]: 3900 MPN/100) -Thermotolerant coliforms- 540 MPN/100	Total coliform levels of 5000 MPN/100 and concentration of oils and fats has decreased to 20 mg/l in the final discharge of the	Reports from certified laboratories	

[26] MPL: Maximum permissible limit

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
		-Average concentration of fats is 48.21 mg/l MPL:0.3mg/l)	wastewater treatment plant to be constructed		
	Levels of nutrients (nitrogen, phosphorous) in the treated effluent from the wastewater treatment plants	Baseline to be determined at project start-up	Target to be determined at project start-up	Reports from certified laboratories	
	Volume of water to be treated in wastewater treatment plant	0, as wastewater treatment plant has not been constructed	125,000 m^3 (target to be confirmed at project start-up)	Reports on wastewater treatment plant	
	Agriculture pollution reduction from agricultural effluents (organocloride and organophosphate pesticides- mg/l)	In the agricultural effluents, total organochlorine pesticides concentrations are 0.0853 mg/l (MPL 0.05 mg/l), and total organophosphate pesticide concentrations are 0.41 mg/l (MPL: 0.1 mg/l)	Total organochlorine pesticide concentrations of 0.05 mg/l or less and total organophosphate pesticide concentrations of 0.2 mg/l or less in the agricultural effluents of the integrated farms to be established	Reports from certified laboratories	
	Pilot project in Las Lajas, Ecuador				
	Municipal wastewater pollution reduction (from human or animal organic waste), as measured by levels of thermotolerant coliforms (MPN/100 ml)	The concentration of thermotolerant coliforms in the water resources is between 500 and 3500 MPN/100ml (MPL:2000NMP/100ml)	The level of thermotolerant coliforms decreases to 2000 MPN/100 ml or less in the effluent of the final discharge points of the wastewater treatment plant and in the effluents of the integrated farms to be established with the project	Certified lab reports	

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
	Levels of nutrients (nitrogen, phosphorous) in the treated effluent from the wastewater treatment plants	Baseline to be determined at project start-up	Target to be determined at project start-up	Reports from certified laboratories	
	Volume of water to be treated in wastewater treatment plant	0, as wastewater treatment plant has not been constructed	125,000 m^3 (target to be confirmed at project start-up)	Reports on wastewater treatment plant	
	Agriculture pollution reduction practices (ha of practice)	Baseline to be estimated at project start-up	To be determined at project start-up	Project progress reports Reports from extensionists, Min of Agriculture	
	Pilot project re. wastewater treatment plant in Chira, Peru				
	Municipal wastewater pollution reduction in surface water as measured by levels of thermotolerant coliforms (NMP/100ml); total iron; and total aluminium (mg/l	The concentration of thermotolerant coliforms in water resources is between <1.8 and 35000 MPN/100ml (MPL: 1000 MPN/100ml) Total iron between <0.0031 and 14.53 mg/l (MPL: 1 mg/l) Total aluminum between 0.0047 and 13.72 mg/l (MPL: 0.2 mg/l)	Reduction of 20% in the concentration of coliforms in the final discharge points of the wastewater treatment plant (specific target to be confirmed at project start-up) Reduction of 10% or more in the concentration of iron and aluminium in the effluent final discharge points (specific targets to be confirmed at project start-up)	Results of measurements of the parameters of the WWTP effluents (final discharge) , based on the Manual of Procedures (ANA- CRHC Piura)	
	Levels of nutrients (nitrogen, phosphorous) in the treated effluent from the wastewater treatment plants	Baseline to be determined at project start-up	Target to be determined at project start-up	Reports from certified laboratories	

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
	Volume of water to be treated in wastewater treatment plant	0, as wastewater treatment plant has not been constructed	125,000 m^3 (target to be confirmed at project start-up)	Reports on wastewater treatment plant	
	Pilot project re. communication in Chira, Peru Water use efficiency measures- m^3/year water saved	Baseline in m^3/ha/yr will be established a project outset	Target in m^3/ ha/yr to be determined at project outset	ANA/AAA reports	
	Total consumptive use of water	Baseline to be established at project start-up	Target to be established at project start-up	ANA/AAA reports	
	Number of users with certification of efficient water use or with Adaptation Plan in place	Baseline is 0 as these instruments will be validated and applied by ANA as of 2015	Target to be established at project start-up	ANA reports	
	Pilot project re. wastewater treatment plant in Tumbes, Peru				
	Level of municipal wastewater pollution in surface water as measured by levels of coliforms (MPN/100ml), arsenic, iron and lead (mg/l)	The level of thermotolerant coliforms in surface water resources is between 33 and 2300 MPN/100ml (MPL: 1000 MPN/100ml) Arsenic is between 0.005 and 0.2 mg/l (MPL 0.05mg/l) Iron is between 0.015 and 10.29 mg/l (MPL 1 mg/l Lead between 0.0107 and 0.24 mg/l (MPL 0.05mg/l)	Decrease in the concentration in the final discharge points of the wastewater treatment plant coliforms leading to levels less than or equal to- 1000 MPN/100 ml, arsenic 0.005 mg/l, iron 5 mg/l and lead 0.1 mg/l	Results of measurements of the parameters of the WWTP effluents (final discharge) , based on the manual of procedures (ANA-CRHC Piura)	
	Levels of nutrients (nitrogen, phosphorous) in the treated effluent from the wastewater treatment plants	Baseline to be determined at project start-up	Target to be determined at project start-up	Reports from certified laboratories	

	Indicator	Baseline	Targets- End of Project	Sources of Verification	Assumptions/ Risks
	Volume of water to be treated in wastewater treatment plant	0, as wastewater treatment plant has not been constructed	125,000 m^3 (target to be confirmed at project start-up)	Reports on wastewater treatment plant	
	Pilot project re. communication in Zarumilla, Peru Water use efficiency (m^3/yr water saved)	Baseline in m^3/ha/yr will be established a project outset	Target in m^3/ ha/yr to be determined at project outset	ANA/AAA reports	
	Total consumptive use of water	Baseline to be established at project start-up	Target to be established at project start-up	ANA/AAA reports	
	Number of users with certification of efficient water use and/or with Adaptation Plan in place	Baseline is 0 as these instruments will be validated and applied by ANA as of 2015	Target to be established at project start-up	ANA reports	
	Information sharing of project documents/ outputs, best practices and experiences	As the project has not yet started up, no sharing of project documents/outputs or dissemination of project best practices has occurred yet. Lessons learned from the work of the Zarumilla Binational Commission have been identified	Functioning website in line with IW:Learn guidelines, regularly updated, and information sharing through participation in International Waters Conference 8 (in 2015) and 9 (in 2017) and other means.	Project website with all key project documents	
	Preliminary identification of investments required for ITWRM in the three basins and aquifers	A comprehensive financial analysis of investment requirements in ITWRM has not been undertaken for the three basins.	Pre-feasibility studies on priority investments required for ITWRM in the three shared basins and aquifers completed	Completed consultancy report with pre-feasibility study	

Outputs:
3.1 Pilot projects established in Ecuador to promote ITWRM by controlling pollution from multiple sectors and increasing water access in Catamayo-Chira & Zarumilla river basins
3.2 Pilot projects established in Peru to promote IWTWRM by reducing pollution from multiple sectors and increasing water access in Catamayo-Chira, Puyango-Tumbes and Zarumilla river basins
3.3 Knowledge management and dissemination increase uptake of best practices
3.4 Pre-feasibility studies identify investments required for ITWRM in the three shared basins during SAP implementation.

Total budget and workplan

HOST COUNTRY - ECUADOR

Award ID:	00083398	Project ID(s):	00091894
Award Title:	Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
Business Unit:	ECU10		
Project Title:	Country Name: Ecuador, Peru Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
PIMS no.	4402		
Implementing Partner (Executing Agency)	The National Water Secretariat of Ecuador (SENAGUA) and the National Water Authority of Peru (ANA)		

GEF Outcome/ Atlas Activity	Responsible party	Source of funds	ERP/ATLAS Budget Description/ Input	Atlas Code	Year 1	Year 2	Year 3	Year 4	Total	Note
					US$	US$	US$	US$	US$	
1	HOST COUNTRY - ECUADOR	GEF	Local consultants	71300	117,600	39,200			**156,800**	**1**
			Contractual services- individual	71400	40,072	40,072	2,272	2,272	**84,688**	**2**
			Travel	71600	18,750	10,450			**29,200**	**3**
			Contractual services- companies	72100	135,750	45,250			**181,000**	**4**
			Materials and goods	72300	16,066	5,356			**21,422**	**5**
			Supplies	72500	500	500			**1,000**	**6**
			Information technology equipment	72800	2,000	1,000			**3,000**	**7**
			Audiovisual and print prod costs	74200	1,000	1,000			**2,000**	**8**
			Miscellaneous	74500	250	250			**500**	**9**
			Workshop costs	75705	1,500	1,500			**3,000**	**10**

	GEF Subtotal Outcome 1				**333,488**	**144,578**	**2,272**	**2,272**	**482,610**	
2	HOST COUNTRY - ECUADOR	GEF	Local consultants	71300	6,000	49,000	20,000	6,600	**81,600**	11
			Contractual services- individual	71400	4,543	21,343	71,743	54,943	**152,572**	**12**
			Travel	71600	2,000	10,783	34,283	27,034	**74,100**	**13**
			Supplies	72500	1,200	750	1250	1,000	**4,200**	**14**
			Audiovisual and print prod costs	74200	1,000	1,000	1,000	3,000	**6,000**	**15**
			Miscellaneous	74500			2,500	2,500	**5,000**	**16**
			Workshop costs	75705	2,700	15,400	19,400	13,400	**50,900**	**17**
	GEF Subtotal Outcome 2				**17,443**	**98,276**	**150,176**	**108,477**	**374,372**	
3	HOST COUNTRY - ECUADOR		International consultants	71200		25,000		25,000	**50,000**	**18**
			Local consultants	71300				10,000	**10,000**	**19**
			Contractual services- individual	71400	4,543	4,543	4,543	4,543	**18,172**	**20**
			Travel	71600	8,767	2,100	8,767	2,100	**21,734**	**21**
			Communication & Audiovisual Equip	72400	1,713	1,713	1,713	1,710	**6,849**	**25**
			Supplies	72500	1,000	1,000	1,000	1,000	**4,000**	**26**
			Professional services	74100	12,400	2,400	2,400	2,400	**19,600**	**28**
			Audiovisual and print prod costs	74200		3,333	3,333	3,334	**10,000**	**29**
			Professional services	74100		5,000		5,000	**10,000**	**30**
			Workshop costs	75705	14,100	12,450	12,450	14,100	**53,100**	**31**
	GEF Subtotal Outcome 3				42,523	57,539	34,206	69,187	203,455	
	Host country - ECUADOR	GEF	Contractual services- individual	71400	54,474	54,474	54,474	54,474	**217,896**	**32**
		GEF	Direct project costs	74598	2,916	2,917	2,917	2,917	**11,667**	**33**
	Total project management				**57,390**	**57,391**	**57,391**	**57,391**	**229,563**	
Totals					**450,844**	**357,784**	**244,045**	**237,327**	**1,290,000**	

ECUADOR

Award ID:	00083398	Project ID(s):	00091894
Award Title:	Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
Business Unit:	ECU10		
Project Title:	Country Name: Ecuador, Peru Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
PIMS no.	4402		
Implementing Partner (Executing Agency)	The National Water Secretariat of Ecuador (SENAGUA) and the National Water Authority of Peru (ANA)		

GEF Outcome/ Atlas Activity	Responsible party	Source of funds	ERP/ATLAS Budget Description/ Input	Atlas Code	Year 1	Year 2	Year 3	Year 4	Total	Note
					US$	US$	US$	US$	US$	
1	SENAGUA	GEF	Contractual services- individual	71300	5,373	5,372	5,373	5,372	**21,490**	**2**
			Travel	71600	1,200	1,200			**2,400**	**3**
			Information technology equipment	72800	1,000				**1,000**	**7**
					7,573	**6,573**	**5,373**	**5,372**	**24,890**	
2	SENAGUA	GEF	Contractual services- individual	71400	10,745	10,745	43,505	28,385	**93,380**	**12**
			Travel	71600		1,867	3,067	3,066	**8,000**	**13**
	GEF Subtotal Outcome 2				**10,745**	**12,612**	**46,572**	**31,450**	**101,380**	
			Local consultants	71300	4,683	4,683	4,683	4,683	**18,732**	**19**
			Contractual services- individual	71400	23,211	23,211	23,210	171,210	**240,842**	**20**
			Travel	71600	18,851	9,184	15,851	24,184	**68,069**	**21**
			Contractual services- companies	72100	190,813	190,813	190,813	190,811	**763,250**	**22**

3	SENAGUA	GEF	Equipment and furniture	72200	24,146	800	800	800	**26,546**	**23**
			Materials and goods	72300	2,500	2,500			**5,000**	**24**
			Supplies	72500	607	607	607	607	**2,428**	**26**
			Information technology equipment	72800	2,000				**2,000**	**27**
			Workshop costs	75705	2,125	2,125	2,125	2,125	**8,500**	**31**
	GEF Subtotal Outcome 3				268,935	233,923	238,089	394,420	1,135,368	
	SENAGUA	GEF	Contractual services- individual	71400	15,424	15,424	15,424	15,424	**61,696**	**32**
		GEF	Direct project costs	74598	2,916	2,917	2,917	2,916	**11,666**	**33**
	Total project management				**18,340**	**18,341**	**18,341**	**18,340**	**73,362**	
Totals					**305,594**	**271,448**	**308,375**	**449,583**	**1,335,000**	

PERU

Award ID:	00083398	Project ID(s):	00091894
Award Title:	Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
Business Unit:	ECU10		
Project Title:	Country Name: Ecuador, Peru Integrated Water Resources Management in the Puyango-Tumbes, Catamayo-Chira and Zarumilla Transboundary Aquifers and River Basins		
PIMS no.	4402		
Implementing Partner (Executing Agency)	The National Water Secretariat of Ecuador (SENAGUA) and the National Water Authority of Peru (ANA)		

GEF Outcome/ Atlas Activity	**Responsible party**	**Source of funds**	**ERP/ATLAS Budget Description/ Input**	**Atlas Code**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Total**	**Note**
					US$	**US$**	**US$**	**US$**	**US$**	
			Contractual services- individual	71400	5,372	5,372	5,372	5,372	**21,488**	**2**

1	ANA	GEF	Travel	71600	1,200	1,200			**2,400**	**3**
			Information technology equipment		1,000				**1,000**	**7**
	GEF Subtotal Outcome 1				**7,572**	**6,572**	**5,372**	**5,372**	**24,888**	
2	ANA	GEF	Contractual services- individual	71400	10,745	10,745	43,505	28,385	93,380	**12**
			Travel	71600		1,867	3,067	3,066	8,000	**13**
	GEF Subtotal Outcome 2				**10,745**	**12,612**	**46,572**	**31,451**	**101,380**	
3	ANA		Local consultants	71300	32,750	32,750	32,750	147,750	246,000	**19**
			Contractual services- individual	71400	38,361	38,361	38,361	43,361	158,444	**20**
			Travel	71600	18,263	8,596	22,263	23,598	72,720	**21**
			Contractual services- companies	72100	112,000	112,000	112,000	137,000	473,000	**22**
			Equipment and furniture	72200	24,104	800	800	800	26,504	**23**
			Materials and goods	72300				5,000	5,000	**24**
			Communic & Audiovisual Equip	72400				5000	5,000	**25**
			Supplies	72500	525	525	525	525	2,100	**26**
			Information technology equipment	72800	1,600				1,600	**27**
			Audiovisual and print prod costs	74200	25,000	25,000	25,000	29,000	104,000	**29**
			Workshop costs	75705	10,250	10,250	10,250	10,250	41,000	**31**
	GEF Subtotal Outcome 3				**262,853**	**228,282**	**241,949**	**402,284**	**1,135,368**	
Project management	ANA	GEF	Contractual services- individual	71400	15,424	15,424	15,424	15,424	**61,697**	**32**
	ANA	GEF	Direct project costs	74598	2,917	2,917	2,917	2,917	**11,667**	**33**
	Total project management				**18,341**	**18,341**	**18,341**	**18,341**	**73,364**	
Totals					**299,511**	**265,807**	**312,234**	**457,448**	**1,335,000**	

Budget Notes	
Outcome 1.	
1	Local consultants **Host Country:** (**USD 156,800**): Expertise to support hydrogeological studies (Output 1.1) including 1 consultant to design the monitoring network in the 3 basins, supported by local hydrogeological consultant and GIS expert, for four months. For the Zarumilla basin hydrogeological study: one consultant to

	coordinate the hydrogeological study for that basin, one expert on hydrogeology, one environmental consultant and one GIS expert, all for 3 months. For each of the other two basin hydrogeological studies: 1 coordinator, 1 hydrogeological expert, 1 geoelectrical expert, 1 GIS expert, all for 4 months. All consultants at 2800 per month.
2	Contractual services (individ): **Host country** (**USD 84,686**). Includes: support of binational project coordinator (*9086*) in oversight of outputs under this Outcome. The Binational Project Coordinator will spend 25% of his/her time on technical issues, which corresponds to a total cost of 45,432), which was divided equally among the 10 outputs (so for this Outcome, which has two Outputs, this corresponds to 9086). The amount included in the budget notes per Outcome is the sum of the amounts for each of the Outputs under that Outcome. Contract for TDA expert (*30,800*) for gathering, analysis and consolidation of information and writing of TDA; facilitation of meetings to validate accuracy of information in TDA; development of materials to summarize TDA for different stakeholders; provision of reliable data to GIS expert for inclusion in database, which includes data analysis and harmonization of information (2800 per month x 11 months). (Output 1.2) Contract for surface water expert (*16,800*)- Collection of information on environmental status of surface water resources, including baseline data on the agreed upon environmental indicators (2800 per month x 6 months). (Output 1.2) Contract for socio-economic expert (*11,200*)- Collection of socio-economic information for the three watersheds and gathering of baseline data on agreed upon socio-economic indicators (2800 per month x 4 months). (Output 1.2) Contract for GIS expert (*16,800*)- Development of GIS database to consolidate information and population of this database, as well as development of web portals (2800 per month x 6 months) (Output 1.2) **Ecuador**. Contractual services (individ) (**USD 21,490**), which covers the support of the national specialist for Ecuador (*21,490*) . Note that the national specialist for Ecuador will spend 61% of his/her time on technical issues to support achievement of the project's outputs. This corresponds to a total cost of $ 96,703. This amount was divided between 9 outputs for Ecuador (each national specialist will be involved in 9 of the 10 output as he/she will not provide oversight to the pilot project work in the other country) . **Peru.** Contractual services (individ) (**USD 21,490**), which covers the support of the national specialist for Peru (same calculation as above for Ecuador) (*21,490*)
3	Travel **Host country** (**USD 29,200**): Includes travel costs for various consultants to carry out the hydrogeological studies in the three basins (*16,600*) (Output 1.1). Also travel costs to gather baseline data and carry out consultations, meetings for preparation of TDA (Output 1.2). The latter includes travel of 4 experts (TDA, groundwater expert hired under Output 1.1, surface water expert and socio-economic expert) for 4 months at 1 trip per month at USD 700 per trip, including airfare, gas, accommodation (*11,200*). Also, 2 months of travel for TDA expert only at 1 trip per month (at 700 per 3-day trip as per previous calculation) x 2 = *1400* **Ecuador (USD 2400).** Includes travel costs (gas expenses) of national expert at $100 per month for 24 months **Peru (USD 2400).** Includes travel costs (gas expenses) of national expert at $100 per month for 24 months
4	Contractual services (companies) **Host country** (**USD 181,000**): Company to drill wells for monitoring (*138,000*); company to acquire measurement equipment (*16,000*); company for physical, chemical and bacterial analyses in each of the 3 basins at 9000 each (*27,000*)
5	Materials and goods **Host country (USD 21,422**): Materials required for hydrogeological studies under Output 1.1, including material for hydrogeological sampling for the studies in the three aquifers (Output 1.1).
6	Supplies: **Host country** (**USD 1,000**). Office stationary and other supplies such as printer cartridges, purchase of maps required for preparation of TDA (Output 1.2)
7	Information technology equipment **Host country (USD 3,000).** Includes IT equipment and software to support development and use of database (Output 1.2) (*2000)* and computer and software for binational expert *(1000)*

	Ecuador (USD 1,000) Includes computer and software for national expert **Peru (USD 1,000).** Includes computer and software for national expert
8	Audio Visual&Print Prod Costs **Host country (USD 2000**): Printing TDA for multitude of stakeholders (Output 1.2)
9	Miscellaneous **Host country** (**USD 500**): Unforeseen events related to preparation of TDA (Output 1.2), other costs related to currency conversion, etc.
10	Workshop costs **Host country (USD 3000**): Food and venue for TDA release events (1 per watershed per country x 2 countries at $500 per event or if binational events can be organized 3 workshops at $1000 each) (Output 1.2)
Outcome 2.	
11	Local consultants **Host country (USD 81,600**). This includes individual consultant to develop capacity building plan (90 days) (*15,000*); instructors to deliver capacity building plan- 50 USD per hour for 16 hours per training session for 50 sessions, given to ANA and SENAGUA, water user boards, etc. (*40,000*); trainer for 3 gender mainstreaming workshops at 2000 per event (*6000*); workshop facilitator for 4 events/ information exchanges between Ecuador and Peru at 1200 per event = 4800 + consultant to consolidate lessons learned for 1800 (*6600*) (all for Output 2.4); lawyer to prepare draft statutes/ norms for establishment of Puyango–Tumbes and Catamayo-Chira Binational Technical Commision(s), legal analysis of how to strengthen Zarumilla Binational Commission as well as drafting of norm to strengthen Binational Commissions in general. Will also develop a briefing on the Zarumilla Commission to be used in induction process for new members of the Commission at 200 per day per month x 70 days (*14,000*) (Output 2.3)
12	Contractual services- individ **Host country** (**USD 152,572**). This includes: support of binational coordinator (*18,172*) in overseeing achievement of four outputs under this Outcome over the four years of the project; Expert in hydrological resources to organize and facilitate relevant meetings, carry out the SWOT analysis and prepare the final SAPs for each watershed- one consultant for 3 SAPs at 2800 per month x 24 months (*67,200*) (Output 2.1) Legal and institutional expert to identify the institutional and legal reforms required for sustainable integrated management of shared aquifers and watersheds at 2800 per month for 12 months (*33,600*) (Output 2.1) Expert to identify indicators for M&E to track implementation of SAP and NSAPs, to get consensus on these indicators and to develop a joint binational workplan for monitoring at 2800 per month x 12 months (*33,600*) (Output 2.2) **Ecuador (USD 93,380)** Includes support of national specialist (*42,979.12*) in overseeing achievement of four outputs under this Outcome over the four years of the project; as well as national specialist to prepare National Strategic Action Plan for Ecuador at 2800 per month for 18 months (*50,400*) (Output 2.1) **Peru (USD 93,379)** Includes support of national specialist (*42,979.12*) in overseeing achievement of four outputs under this Outcome over the four years of the project; as well as national specialist to prepare National Strategic Action Plan for Peru (*50,400*) (Output 2.1)
13	Travel **Host country** (**USD 74,100**). This includes travel costs for meetings to agree upon SAPs, NSAPs, to share drafts and validate final versions. Travel costs for lead consultant at 500 per month x 24 months (*12,000*). Legal and institutional expert monthly travel costs of 500 x 12 months=*6000*. (Output 2.1); Travel costs associated with obtaining consensus on M&E indicators at 6 trip per year at 700 per trip for one year (*4,200*) (Output 2.2); Travel costs for meetings of Binational Coordinator to strengthen Zarumilla Commission and create the other two commissions. This includes 4 trips per year for 2 years at 700 per trip per person as per previous calculations = *5600*. Also financial support for participation of water user board members in SAP and NSAP workshops (*5000*) (Output 2.3); Travel costs associated with 50 training sessions at 150 per session, also 2800 for travel costs associated with consultancy to develop capacity building plan (700 per trip for 4 trips, broken down to 2 per country) (*10,300***)** (Output 2.4). Travel allowance at $50 each for 40 people to attend gender mainstreaming workshops (*2000*)

	(Output 2.4); Travel costs to facilitate information exchanges between Ecuador and Peru (for accommodation at training centres at *8,000* for 160 participants and *21,000* for travel subsidies for 160 participants) (Output 2.4) **Ecuador (USD 8000)** Travel expenses (gas) for national specialist at 100 per month for 24 months (*2400*); Meetings of national specialist to strengthen Zarumilla Commission and create the other two commissions at 700 per trip with 4 per year for 2 years (*5600)* **Peru (USD 8000)** Travel expenses (gas) for national specialist at 100 per month for 24 months (*2400*); Meetings of national specialist to strengthen Zarumilla Commission and create the other two commissions at 700 per trip with 4 per year for 2 years (*5600)*
14	Supplies **Host country** (**USD 4,200**). Stationery for meetings and workshops, office supplies, etc. for development of SAPs and NSAPs (*1,000*) (Output 2.1); paper for written training material, photocopies, etc. for IWRM workshops (*500*) (Output 2.4); supplies for gender mainstreaming workshops at $30 each for 40 people (*1,200*) (Output 2.4); supplies for information exchanges between Ecuador and Peru (*1,500*) (Output 2.4)
15	Audiovisual and print prod costs **Host country** (**USD 6,000**). This includes for the printing of SAPs and NSAPs for dissemination to different relevant stakeholders (*2,000*) (Output 2.1); publications, pamphlets, etc. for capacity building (*4,000*) (Output 2.4)
16	Miscellaneous **Host country** (**USD 5,000**)- Unforeseen events related to preparation of SAPs and NSAPs, etc, other costs such as currency conversion under Outcome 2
17	Workshop costs: **Host country** (**USD 50,900**). For food and venue costs etc associated with SAP and NSAP workshops to agree on reforms required, indicators and final SAPs and NSAPs (Output 2.1) (*4000*); Also required meetings to strengthen/ establish binational commissions. This includes 2 meetings for each of the three basins per year for each country (12 workshops/ meetings per year) x 3 years at 15 per person x 30 people = 16200 or 2 binational workshops per basin per year (total of 6 workshops per year) x 3 years at 15 per person x 60 participants (*16,200*) (Output 2.3); Workshop costs and refreshments for training (10 per person for 25 people for 50 events = 12500) + rental of venues for workshops (150 x 50 = 7500) (*20,000*) (Output 2.4); food for gender mainstreaming workshops at $30 each for 40 people= 1200 and venue rental at 500 each for 3 workshops (*2,700*) (Output 2.4); food/refreshments for information exchanges between Peru and Ecuador for 160 participants at 25 per person for two events (*8,000*) (Output 2.4)
Outcome 3.	
18	International consultants **Host country** (**USD 50,000**). International consultants to carry out Mid-Term Review of binational project (25,000) and Final Evaluation (25,000) (Ouput 3.4)
19	Local consultants **Host country (USD 10,000)** Includes national consultant for Final Evaluation (Output 3.4) **Ecuador** (**USD 18,732**): This includes for pilot project 1, local consultants to: provide training for GAD officials on technical and normative aspects related to liquid waste management (5000); for pilot project 2, provide training for community members in traditional water harvesting techniques (3000); for pilot project 3, develop environmental protocols related to agrochemicals (3000) and provide associated training to producers (7732). (Output 3.1) (*sub-total: 18,732*) **Peru (USD 246,000):** For Pilot projects 5 and 7, this includes consultant to develop ToRs for waste water treatment plant study at 2500 for each pilot project (5000); consultants to develop water reuse plan at 4000 for each of the two pilot projects (8000), consultants to provide training to local actors on efficient water use at 7000 for each of the pilot projects (14000) and to develop monitoring plan and provide training to local users at 7000 each for each of the two pilot projects (14000). For pilot projects 6 and 8, this includes 7000 for each of two pilots to support strengthening of working groups of water resource basin councils (14,000), 10,000 to develop a communication plan for each of the two pilot projects (20,000), 20,000 for each of the two projects to provide training on efficiency water use (40,000) and 8000 for each of the two projects for the evaluations of the effectiveness of the communication campaign (16000) (*sub-total 131,000*). Also includes *115,000* for financial studies.

20	Contractual services- individ **Host country (USD 18,172).** This includes support of binational coordinator in oversight of outputs under this Outcome over the four years of the project **Ecuador (USD 240,843):** This includes the support of the national specialist (*42,979.12*) and hiring of technician to guide implementation of four pilot projects (*60,608*) (Output 3.1). **Peru (USD 158,444).** This includes support of national specialist in oversight of this Outcome (*32,234*); two technicians- one for Chira basin (to oversee 2 pilot projects), one for Tumbes and Zarumilla basins (to oversee 2 pilot projects) to facilitate pilot project implementation (*121, 212*) (Output 3.2); expert in economic analyses for financial studies in Peru (*5000*) (Output 3.4)
21	Travel: **Host country (USD 21,736).** This line also includes trips to gather information on best practices and for project M&E (estimated 3 trips per year for binational coordinator at 700 per trip for 4 years= *8400*, as well as travel costs for binational coordinator to attend two biannual IW conference (*13,336.33*) **Ecuador (USD 68,069):** This includes **t**ravel costs (gas, accommodation, etc.) for technician to provide oversight to implementation of four pilot projects (*12,936*). This lines includes local travel costs for national specialist at an estimated 100 per month for 48 months for one person = *4800*) (Output 3.3). Travel costs to attend two biannual IW conferences for the designated representative of Ecuador (at USD 6,666.67 per conference for 2 conferences) (*13333.33*) (Output 3.3). Support for travel costs for participants of binational steering committee meetings, binational technical committee meetings, inception workshop and lessons learned workshop (*25,000*) (Output 3.3). At least 12 trips for two experts at 500 per trip for pre-feasibility studies in Ecuador (*12,000*) (Output 3.4) **Peru** (**USD 72,720**): This includes $2646 for each of four pilot projects to cover gas and other travel costs (*10,584*), and 7000 for each of the two communication pilot projects to support travel costs for information exchanges (*14000*) (Output 3.2). Local travel costs for national specialist at an estimated 100 per month for 48 months for one person (*4800*) for project M&E and sharing of best practices(Output 3.3). Travel costs for designated representative of Peru to attend two IW conferences at 6666.67 each (*13,333.33*) (Output 3.3). Support for travel costs for participants of binational steering committee meetings, binational technical committee meetings, inception workshop and lessons learned workshop (*25,000*) (Output 3.3). Also includes travel costs associated with financial studies in Peru (*5000*) (Output 3.4)
22	Contractual services (companies): **Ecuador (USD 763,250):** This includes for pilot project 1, the updating of land use plans (75,000), the prioritization of areas to establish water protection zones, support in development of associated regulations, management plans for these zones (26,000), constructions of automatic watering facilities for livestock and protective structures for zones (24,000), studies and development of management plan for liquid waste (15,000), development of integrated farm models, establishment in-situ, awareness raising and technical assistance for farmers (57,750). For pilot project 2, this includes establishment of water protection zones (47,500), identification of groundwater sources and construction of two wells (110,000), development and implementation of integrated farms, including training (27,000). For pilot project 3, this includes establishment of water protection zones (23,000), studies and development of liquid waste management plan (30,000) and construction of wastewater treatment plant (132,000). For pilot project 4, this includes development of liquid waste management plan (15,000) and construction of wastewater treatment plant (162,000), and establishment of integrated farms with training (19,000) **Peru (USD 473,000):** For pilot projects 5 and 7, this includes for each of the two pilots, study on effluents (15000 x 2), design and budgeting of wastewater treatment plant (20000 x 2), EIA (18,000 x 2), management plan for plant (10000 x 2); construction of the plant (135,000 x 2), operation of the plant (6000 x 2). For pilot projects 6 and 8, this includes for each 5000 to develop written and broadcast material for communication campaign, and 15000 for each to produce video on 'water culture' (30,000) (Output 3.2). Also company to carry out financial studies in Peru (*25,000*) (Output 3.4)
23	Equipment and furniture **Ecuador (USD 26,546):** Purchase of vehicle for technician to be able to monitor implementation of the four pilot projects, as well as spare parts for maintenance during the four years (Output 3.1) **Peru (USD 26,504):** Purchase of vehicle to support implementation of project activities and oversight for the four pilot projects and spare parts for maintenance (Output 3.2)
24	Materials and goods **Ecuador (USD 5,000):** Includes materials (e.g., cement) for establishment of traditional practices for efficient use of water (Output 3.1)

	Peru (USD 5,000): Materials for financial studies in Peru (Output 3.4)
25	Communic & Audiovisual Equip . **Host country (USD 6,849)**. This includes the cost of project website hosting (300 per year x 4 years= *1200*), phone, internet service (*5649*) (Output 3.3) **Peru (USD 5,000)**. Communication and audiovisual equipment for financial studies in Peru (*5000*) (Output 3.4)
26	Supplies **Host country (USD 4,000)**. Office supplies, including stationary, printer cartridges and other office supplies to document best practices (1000 per year for four years) (Output 3.3) E**cuador (USD 2,428):** Office supplies, printer cartridges, etc to support implementation of four pilot projects **Peru (USD 2,100):** USD 525 per pilot project for office supplies (Output 3.2)
27	Information technology equipment **Ecuador (USD 2,000):** 1 laptop for the technician, 1 INFOCUS projector, 1 printer (Output 3.2) **Peru (USD 1,600):** Two laptops at 800 each, one for each technician guiding implementation of pilot projects (Output 3.2).
28	Professional services **Host country** (**USD 19,600**): This includes project web design (*10,000*) and maintenance (2400 per year for 4 years= *9600*) (Output 3.3)
29	Audiovisual and print prod costs. **Host country** (**USD 10,000**). This includes printing of best practices and other project documents, radio ads for communication campaign (development of 4 radio ads at 800 each= USD 3200 + aired 5 times per day for 60 days at a cost of USD 6 per airing= USD 1800 so radio campaign total of *5000*), rest of cost for posters, project material and project reports for *5000*) (Output 3.3) **Peru (104,000):** For pilot projects 6 and 8, this includes 50,000 for production of print materials, radio spots, etc. for each project (*100,000*), and 2000 to print results of communication campaign for each of the two pilots (*4000*) (Output 3.2)
30	Professional services **Host country** (**USD 10,000**): Includes two financial audits (10,000) (Output 3.3)
31	Workshop costs. **Host country (USD 53,100).** This includes venue and food/refreshment costs associated with the following workshops/ meetings: inception workshop (150 for venue rental and $15 per person for 100 people at 1500= 1650), board meetings ($15 per person x 15 people for food= 225 x 2 annual meetings x 4 years= 1800), National Interministerial Committees ($15 per person for food x 30 people x 2 annual meetings x 4 years= 3600), Binational Technical Committee meetings (150 for venue x 8 meetings + 15 per person x 30 people x 2 annual meetings x 4 years= 4800), and final best practices workshop to identify lessons learned, discuss project replication and sustainability (150 for venue + 15 per person x 100 people for 1500= 1650). (*13,500*) (Output 3.3). This also includes IW: Learn Support activities at 1% of total GEF grant (39,600) (Output 3.3). **Ecuador (USD 8,500)**: This includes for pilot project 1, workshops to develop agreements for the land use planning process and to carry it out in a participatory manner (*3000*) and for pilot project 2, workshops/ working sessions to reestablish traditional water harvesting techniques (*2000*), workshops to identify water protection zone areas (*2500*) and to identify the areas for integrated farms (*1000*) (Output 3.1) **Peru (USD 41,000):** For pilot projects 5 and 7, this includes 1000 for workshops with local users to develop water reuse plan for each of the pilots (*2000*), 3000 for workshops related to training on efficiency water use for each of the two pilots (*6000*), 500 for workshops to explain quality monitoring methodology for the two pilots (*1000*). For pilot projects 6 and 8, this includes 10,000 for workshop costs related to promoting interinstitutional coordination for each of the two pilots (*20,000*), 3000 for workshops for working groups of water resource basin councils for the two pilots (*6000*) and 3000 for training workshops related to efficient use of water for the two pilots (*6000*) (Output 3.2)
Project Management Costs	
32	Contractual services

	Host country (USD 217,896): The Binational Project Coordinator will be paid 3786 per month for a total cost of 181,728, of which 75% of his/her time will be dedicated to project management issues (*136,296*); Cost of a binational admin/financial assistant for 4 years at 1700 per month for a total cost of *81,600*; **Ecuador (USD 61,697).** This includes national project specialist for Ecuador will be paid 3300 per month for a total of 158400, but only approx. 39% of his/her time will be dedicated to project management (*61,697*). **Peru (USD 61,697):** national project specialist for Peru will be paid 3300 per month for a total of 158,400, but only approx. 39% of his/her time will be dedicated to project management (*61,697*).
33	Direct project services **Host country (USD 11,666.67).** Direct project services provided by UNDP Country Office in Host Country. **Ecuador**: (**USD 11,666.67).**). Direct project services provided by UNDP Country Office. **Peru:** (**USD 11,666.67).**). Direct project services provided by UNDP Country Office.

Summary Budget: GEF and CoFin Resources

	TOTAL	GEF	ANA	SENAGUA	UNDP Ecu	UNDP-Ecuador	UNDP Peru	UNDP Peru	Cap-Net
Outcome1 Total	**530,998**								
Output 1.1:		402,360	1,057,908	1,057,908	3,960		5,000		
Output 1.2:		128,638	1,057,908	1,057,908	3,960		5,000		
Outcome 2 Total	**581,552**								
Output 2.1:		265,338	1,057,908	1,057,908	3,960		5,000		
Output 2.2:		64,338	1,057,908	1,057,908	3,960		5,000		
Output 2.3:		78,538	1,057,908	1,057,908	3,960		5,000		
Output 2.4		173,338	1,057,908	1,057,908	3,960		5,000		265,000
Outcome 3 Total	**2,471,161**								
Output 3.1		915,793		1,057,908	3,960	64,500	5,000		
Output 3.2		910,745	1,057,908		3,960		5,000	64,500	
Output 3.3		298,087	1,057,908	1,057,908	3,960		5,000		
Output 3.4		346,536	1,057,908	1,057,908	3,960		5,000		
Project Management	**376,290**	376,290	478,828	478,828					
TOTAL	**3,960,000**	3,960,000	10,000,000	10,000,000.00	39,600.00	64,500	50,000	64,500	26,5000

Management Arrangements

233. The project will be implemented over a four-year period, under the National Implementation Modality (NIM) according to the standards and regulations of the UNDP. UNDP will be the GEF Implementing Agency (IA) and both the National Water Authority (ANA) and National Water Secretariat (SENAGUA) will be the Executing Agencies (also known as Implementing Partners) in Peru and Ecuador, respectively. The Lead/Host Country Office (Ecuador) will take on oversight of the regional components (including oversight of the development of TDA, SAPs and knowledge management- for details, see budget for Host Country). As the respective national water authorities and executing agencies for the project, ANA and SENAGUA will assume responsibility for supervising/managing the project, including the monitoring and evaluation of project interventions, achieving project outputs, and ensuring the effective use of UNDP/ GEF resources.

234. As the GEF Implementing Agency, UNDP is ultimately accountable and responsible for the delivery of results, subject to their certification by SENAGUA and ANA as Executing Agencies. UNDP shall provide project cycle management services as defined by the GEF Council (described in Section IV Part XII), that will include the following:

- Providing financial and audit services to the project;
- Overseeing financial expenditures against project budgets;
- Ensuring that activities, including procurement and financial services, are carried out in strict compliance with UNDP/GEF procedures;
- Ensuring that the reporting to GEF is undertaken in line with GEF requirements and procedures;
- Facilitating project learning, exchange and outreach within GEF;
- Contracting the project mid-term and final evaluations and triggering additional reviews and/or evaluations as necessary and in consultation with the project counterparts.

235. At the request of the Governments of Ecuador and Peru, UNDP shall also provide Direct Project Services (DPS) specific to project inputs according to its policies and convenience. These services, and the costs thereof, are specified in the Letter of Agreement in Section IV Part XII. In accordance with GEF requirements, the costs of these services will be part of the executing entity's Project Management Cost allocation identified in the project budget. UNDP and the Governments of Ecuador and Peru acknowledge and agree that these services are not mandatory and will only be provided in full accordance with UNDP policies on recovery of direct costs. Direct Project Services will be charged annually using the Universal Price List for Direct Project Services required by the Governments of Ecuador and Peru.

236. UNDP will provide Project Assurance, supporting the Binational Project Steering Committee by carrying out objective and independent project oversight and monitoring functions. The UNDP International Waters Regional Technical Advisor in the Latin American and Caribbean Regional Service Centre in Panama and other specialists from the Energy and Environment Program Area will be involved as necessary in key project meetings, consultations, events and reviews of technical and other reports.

Project governance (BPSC) (Political and strategic support for the project)

237. A Binational Project Steering Committee (BPSC) will be formed, composed of the following seven (7) institutions:

- National Water Authority (ANA- Peru);
- National Water Secretariat (SENAGUA- Ecuador);
- Ministry of Environment (MINAM-Peru);

- Ministry of Environment (Ecuador);
- Ministry of External Relations (MRE-Peru);
- Ministry of External Relations and Human Mobility (MREMH- Ecuador);
- UNDP

238. The Project Coordinator will attend BPSC meetings as a non-voting member. The BPSC will be charged with reviewing and approving the annual POA and budget, approving any substantial changes to the project, and providing strategic guidance and political and strategic support to the project. The BPSC will also arbitrate any conflicts that might arise. The Committee will meet a minimum of two times per year for the four years of the project. The BPSC may be convened extraordinarily by the Chair, on the request of individual members. The composition and TORs of the BPSC will be finalized at the Project Inception Workshop.

239. In order to ensure UNDP's ultimate accountability for the project results, BPSC decisions will be made in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition.

Binational Technical Committee (BTC) (Technical support and binational coordination)

240. A binational project technical committee will be established to provide technical project support and facilitate the achievement of the project's objectives. The membership of this Technical Committee will be confirmed at the inception workshop but will include a broader range of stakeholders than the Steering Committee, such as Ministries of Health. In addition to supporting project planning and implementation, this committee will play a key role in promoting binational cooperation in the implementation of the project. The committee will meet at least two times per year.

National Interministerial Committees (NIC) (inter-institutional coordination during the project and implementation of Strategic Action Programs after the project)

241. NICs will be set up in both Ecuador and Peru to facilitate the achievement of project outputs in each country. It will play a very important role in keeping all the main national stakeholders apprised of the project, securing institutional commitments and facilitating inter-institutional coordination. It will also It will meet at least two times per year. The project will promote the institutionalization of these committees with a view to enhancing the sustainability of project impact. It is therefore hoped that the NIC will continue to meet after the project closes and will support implementation of the National Strategic Action Plans.

Committees for Pilot Projects and Technicians

242. Committees at the pilot project level may be created to guide project implementation; these can either take advantage of existing multi-sectoral local committees or new local committees can be established. They will be composed of the key actors involved in each of the pilots and their composition will therefore vary. They will carry out two main functions: 1) Keep the relevant institutions at the local level informed about project progress and barriers encountered; 2) provide a forum for coming to agreement and making decisions to ensure that the pilot project implementation proceeds efficiently and effectively. In Ecuador, these committees may also provide local stakeholders with relevant experience for the future establishment of water resource basin councils.

243. In addition, in order to facilitate execution, pilot project technicans will be hired with GEF funds to provide ongoing technical support for the implementation of pilot project activities.

Project Coordination Unit (PCU)

244. A Project Coordination Unit will be established to include a Binational Project Coordinator and an Administrative/Financial Assistant. National Project Specialists for both Ecuador and Peru will provide technical support for achievement of the project's outputs and some managerial support as well. The project Host Country (Ecuador) will establish the PCU including the Binational Project Coordinator and Admin/Financial Assistant and will also provide office space for the National Project Specialist from that country. The National Project Specialist of the non-host country will be based in the non-host country. SENAGUA and ANA have each committed office space and facilities for the members of the PCU to carry out their work (see Annex for letters of confirmation), as part of their co-financing contributions. In addition, incremental funding from GEF will be used to hire consultants for specific periods of time.

245. The Binational Project Coordinator (PC) will be funded by GEF and will be responsible for the day-to-day management of the project, oversight of the implementation of the activities and project reporting. He/she will have experience in project management and in the management of water resources and ideally will have prior experience working on issues related to the integrated management of shared transboundary resources. The Administrative/Financial Assistant will be charged with providing support in terms of project monitoring, reporting and financial management.

246. The National Project Directors (NPD) will be designated high-level authorities in each country from SENAGUA and ANA, who will ensure achievement of the projects results and objectives and adherence to the norms and procedures established in this ProDoc. The NPDs will be solely responsible for requesting payments in accordance with the Annual Operational Plans (AOP) to be developed for each year, and can delegate to the National Project Specialists the responsibility for hiring and acquisitions, as well as other actions necessary for the administration of the project to be undertaken in the name of the project. The National Project Specialists will work under the direction of the National Project Directors.

247. The Project Coordination Unit will develop Annual Operational Plans (AOPs) with the support of ANA and SENAGUA, annual work plans that outline the outputs and activities that are planned for the year, the implementation periods for each activity, and those responsible for carrying them out, the budget and the M&E plan. The draft AOPs will be shared with the Binational Technical Committee and National Interministerial Committees, and will be approved by the Project Binational Steering Committee.

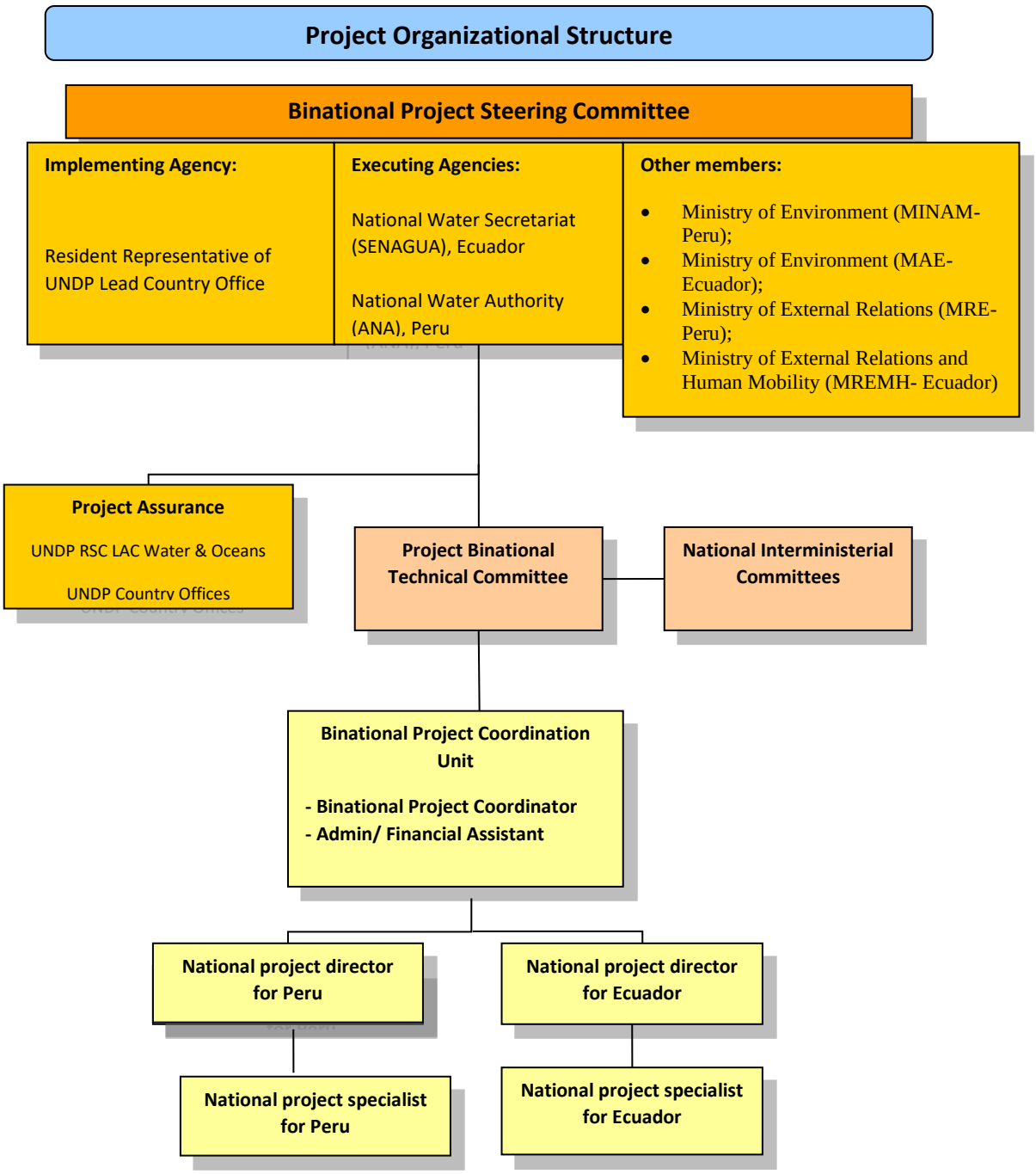


Figure 7: Project organization

PART VI: Monitoring and Evaluation

248. Project M&E will be conducted in accordance with the established UNDP and GEF procedures and will be carried out by the project team and the UNDP-CO with support from the UNDP/GEF Regional

Coordinating Unit (RCU) in Panama City. The Project Results Framework in Part III provides performance and impact indicators for project implementation along with their corresponding means of verification. The M&E plan includes an inception report, project implementation reviews, quarterly and annual review reports, a Mid-Term Review and Final Evaluation and audits. The following sections outline the principle components of the M&E plan and provide indicative cost estimates related to M&E activities. The M&E budget is provided in the table below. The project's M&E plan will be presented and finalized in the Project Inception Report following a collective fine-tuning of indicators, means of verification, and the full definition of project staff M&E responsibilities.

Project Inception Phase

249. A Project Inception Workshop (IW) will be held within the first three (3) months of project start-up with the full project team, relevant government counterparts, co-financing partners, the UNDP-COs, and representation from the UNDP-GEF RCU, as well as UNDP-GEF headquarters as appropriate.

250. A fundamental objective of this IW will be to help the project team to understand and take ownership of the project's goal and objectives, as well as finalize preparation of the project's first annual work plan on the basis of the Project Results Framework and the International Waters Tracking Tool. This will include reviewing the results framework (indicators, means of verification, and assumptions), imparting additional detail as needed, and on the basis of this exercise, finalizing the Annual Workplan (AWP) with precise and measurable performance indicators, and in a manner consistent with the expected outcomes for the project. This will also include ensuring that there is a common understanding between ANA and SENAGUA on terms such as institutional framework, institutional strengthening, and water governance, among others. Finally, the inception workshop will provide the opportunity for ANA and SENAGUA to define any necessary agreements that will need to be established to facilitate project execution.

251. Additionally, the purpose and objective of the IW will be to: a) introduce project staff to the UNDP-GEF team that will support the project during its implementation, namely the CO and responsible RCU staff; b) detail the roles, support services, and complementary responsibilities of UNDP-CO and RCU staff in relation to the project team; c) provide a detailed overview of UNDP-GEF reporting and M&E requirements, with particular emphasis on the Annual Project Implementation Reviews (PIRs) and related documentation, the Annual Project Report (APR), as well as Mid-term Review and Final evaluation. Equally, the IW will provide an opportunity to inform the project team on UNDP project-related budgetary planning, budget reviews including arrangements for annual audits, and mandatory budget re-phasings.

252. The IW will also provide an opportunity for all parties to understand their roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines and conflict resolution mechanisms. The Terms of Reference (ToRs) for project staff and decision-making structures will be discussed, as needed, in order to clarify each party's responsibilities during the project's implementation phase. The IW will also be used to plan and schedule the Tripartite Committee Reviews. A report on the Inception Workshop is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting (see details below).

Monitoring Responsibilities and Events

253. A detailed schedule of project review meetings will be developed by the project management in consultation with project implementation partners and stakeholder representatives and incorporated in the Project Inception Report. Such a schedule will include: a) tentative timeframes for Tripartite Committee (TPC) Reviews, Steering Committee (or relevant advisory and/or coordination mechanisms); and b) project-related M&E activities.

254. **Day-to-day monitoring** of implementation progress will be the responsibility of the Project Coordinator (PC) based on the project's AWP and its indicators. The PC will inform the UNDP-CO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion. The PC will fine-tune the progress and performance/impact indicators of the project in consultation with the full project team at the IW with support from UNDP-CO and assisted by the UNDP-GEF RCU. Specific targets for the first-year implementation progress indicators together with their means of verification will be developed at this workshop. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the AWP. Targets and indicators for subsequent years will be defined annually as part of the internal evaluation and planning processes undertaken by the project team. Measurement of impact indicators related to global benefits will occur according to the schedules defined through specific studies that are to form part of the project's activities.

255. **Periodic monitoring** of implementation progress will be undertaken by the UNDP CO through quarterly meetings with the project implementation team, or more frequently as deemed necessary. This will allow parties to take stock of and to troubleshoot any problems pertaining to the project in a timely fashion to ensure the timely implementation of project activities. The UNDP CO and UNDP-GEF RCU, as appropriate, will conduct yearly visits to the project's field sites, or more often based on an agreed upon schedule to be detailed in the project's Inception Report and AWPs to assess first-hand project progress. Any other member of the Steering Committee can also take part in these trips, as decided by the Steering Committee. A Field Visit Report will be prepared by the UNDP CO and circulated no less than one month after the visit to the project team, all Steering Committee members, and UNDP-GEF.

256. **Annual monitoring** will occur through the Steering Committee meetings. This is the highest policy-level meeting of the parties directly involved in the implementation of a project. The project will be subject to Steering Committee review at least two times per year. The first such meeting will be held after the inception workshop. The project proponent will prepare an APR and submit it to UNDP CO and the UNDP-GEF regional office at least two weeks prior to the Steering Committee meeting for review and comments.

257. The APR will be used as one of the basic documents for discussions in the Steering Committee. The PC will present the APR to the Steering Committee, highlighting policy issues and recommendations for the decision of the Steering Committee participants. The PC will also inform the participants of any agreement reached by stakeholders during the APR preparation on how to resolve operational issues. Separate reviews of each project component may also be conducted if necessary. The Steering Committee has the authority to suspend disbursement if project performance benchmarks are not met. Benchmarks will be developed at the IW, based on delivery rates and qualitative assessments of achievements of outputs.

258. The **Terminal Steering Committee Review** is held in the last month of project operations. The PC is responsible for preparing the Terminal Report and submitting it to UNDP-CO and to UNDP-GEF RCU. It shall be prepared in draft at least two months in advance of the Steering Committee meeting in order to allow review, and will serve as the basis for discussions in the Steering Committee meeting. The terminal Steering Committee review considers the implementation of the project as a whole, paying particular attention to whether the project has achieved its stated objectives and contributed to the broader environmental objective. It decides whether any actions are still necessary, particularly in relation to sustainability of project results, and acts as a vehicle through which lessons learned can be captured to feed into other projects being implemented.

Project Monitoring Reporting

259. The PC, in conjunction with the UNDP-GEF extended team, will be responsible for the preparation and submission of the following reports that form part of the monitoring process and that are mandatory.

260. A **Project Inception Report** (IR) will be prepared immediately following the IW. It will include a detailed First Year/AWP divided in quarterly timeframes detailing the activities and progress indicators that will guide implementation during the first year of the project. This work plan will include the dates of specific field visits, support missions from the UNDP CO or the RCU or consultants, as well as timeframes for meetings of the project's decision-making structures. The IR will also include the detailed project budget for the first full year of implementation, prepared on the basis of the AWP, and including any M&E requirements to effectively measure project performance during the targeted 12-month timeframe. The IR will include a more detailed narrative on the institutional roles, responsibilities, coordinating actions, and feedback mechanisms of project-related partners. In addition, a section will be included on progress to date on project establishment and start-up activities and an update of any changed external conditions that may affect project implementation. When finalized, the IR will be circulated to project counterparts who will be given a period of one calendar month in which to respond with comments or queries. Prior to the IR's circulation, the UNDP CO and UNDP-GEF's RCU will review the document.

261. In light of the similarities of both APR and PIR, UNDP-GEF has prepared a harmonized format for use in fulfilling the following two requirements:

- The **Annual Project Report** (APR) is a UNDP requirement and part of UNDP CO central oversight, monitoring, and project management. It is a self-assessment report by the project management to the CO and provides input to the country office reporting process and the Results-Oriented Annual Report (ROAR), as well as forming a key input to the PB Review. An APR will be prepared on an annual basis prior to the Steering Committee Review, to reflect progress achieved in meeting the project's AWP and assess performance of the project in contributing to intended outcomes through outputs and partnership work. The format of the APR is flexible but should include the following sections: a) project risks, issues, and adaptive management; b) project progress against pre-defined indicators and targets, c) outcome performance; and d) lessons learned/best practices.
- The **Project Implementation Review** (PIR) is an annual monitoring process mandated by the GEF. It has become an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from on-going projects. Once the project has been under implementation for one year, a PIR must be completed by the CO together with the project management. The PIR is prepared in June or July of each year. The PIR should then be discussed in the Project Steering Committee meeting so that the result would be a PIR that has been agreed upon by the project, the Implementing Partner, UNDP CO, and the RCU in Panama. The individual PIRs are collected, reviewed, and analyzed by the RCU prior to sending them to the focal area clusters at the UNDP-GEF headquarters.

262. **Quarterly Progress Reports** outlining main updates in project progress will be provided quarterly to the local UNDP CO and the UNDP-GEF RCU by the project team. Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform and the risk log should be regularly updated in ATLAS based on the initial risk analysis.

263. **Specific Thematic Reports** focusing on specific issues or areas of activity will be prepared by the project team when requested by UNDP, UNDP-GEF, or the Implementing Partner. The request for a Thematic Report will be provided to the project team in written form by UNDP and will clearly state the issue or activities that need to be reported on. These reports can be used as a form of lessons learned exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles

and difficulties encountered. UNDP is requested to minimize its requests for Thematic Reports, and when such are necessary will allow reasonable timeframes for their preparation by the project team.

264. A **Project Terminal Report** will be prepared by the project team during the last three (3) months of the project. This comprehensive report will summarize all activities, achievements, and outputs of the project; lessons learned; objectives met or not achieved; structures and systems implemented, etc.; and will be the definitive statement of the project's activities during its lifetime. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's activities.

265. **Technical Reports** are detailed documents covering specific areas of analysis or scientific specializations within the overall project. As part of the Inception Report, the project team will prepare a draft Reports List detailing the technical reports that are expected to be prepared on key areas of activity during the course of the project, and tentative due dates. Where necessary, this Reports List will be revised and updated, and included in subsequent APRs. Technical Reports may also be prepared by external consultants and should be comprehensive and specialized analyses of clearly defined areas of research within the framework of the project and its sites. These technical reports will represent, as appropriate, the project's substantive contribution to specific areas, and will be used in efforts to disseminate relevant information and best practices at local, national, and international levels.

266. **Project Publications** will form a key method of crystallizing and disseminating the results and achievements of the project. These publications may be scientific or informational texts on the activities and achievements of the project in the form of journal articles or multimedia publications. These publications can be based on Technical Reports, depending upon the relevance and scientific worth of these reports, or may be summaries or compilations of a series of Technical Reports and other research. The project team will determine if any of the Technical Reports merit formal publication, and (in consultation with UNDP, the Governments of Ecuador and Peru, and other relevant stakeholder groups) will also plan and produce these publications in a consistent and recognizable format. Project resources will need to be defined and allocated for these activities as appropriate and in a manner commensurate with the project's budget.

Independent Evaluations

267. **The project will be subjected to at least two independent external evaluations as follows:**

268. An independent **Mid-Term Review** will be undertaken at the mid-point of the project lifetime. The Mid-Term Review 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; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation, and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, ToRs, and exact timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The ToRs for this Mid-Term Review will be prepared by the UNDP-CO. MTR and FE draft reports will be submitted to the HQ UNDP/GEF Evaluation Office, which is in charge of reviewing these reports.. The management response of the evaluation will be uploaded to the UNDP corporate systems, in particular the UNDP Evaluation Resource Center (ERC). All GEF Tracking Tools for the project will also be completed during the mid-term review cycle.

269. An **independent Final Evaluation** will take place three months prior to the terminal Steering Committee meeting, and will focus on the same issues as the Mid-Term Review. The Final Evaluation will

also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Resource Centre (ERC). The ToRs for this evaluation will be prepared by the UNDP-CO based on guidance from the UNDP-GEF RCU. All GEF Tracking Tools for the project will also be completed during the final evaluation.

Audit Clause

270. The audit will be conducted according to UNDP's financial regulations, rules, and audit policies by the legally recognized auditor by the GoG, or by a commercial auditor engaged by the GoG.

Learning and Knowledge Sharing

271. Results from the project will be disseminated within and beyond the project intervention zone through a number of existing information sharing networks and forums, particularly GEF's IW:LEARN knowledge sharing platform. In addition, the project will participate, as relevant and appropriate, in UNDP-GEF sponsored networks, organized for Senior Personnel working on projects that share common characteristics. UNDP-GEF RCU has established an electronic platform for sharing lessons between the project managers. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. Identify and analyzing lessons learned is an ongoing process, and the need to communicate such lessons as one of the project's central contributions is a requirement to be delivered not less frequently than once every twelve (12) months. UNDP-GEF shall provide a format and assist the project team in categorizing, documenting, and reporting on lessons learned. Specifically, the project will ensure coordination in terms of avoiding overlap, sharing best practices, and generating knowledge products of best practices in the area of integrated water resource management.

M&E work plan and budget

Table 14: Summary of M&E activities and budget

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Inception Workshop and Report	▪ Binational Project Coordinator ▪ UNDP	6650 (1650 venue and food for inception workshop + 5000 support for travel costs)	Within first two months of project start up
Field-based impact monitoring including visits to sites	▪ Binational Project Coordinator ▪ National specialists ▪ UNDP	18,000	Regularly as required (at least quarterly).
ARR/PIR	▪ Binational Project Coordinator with	0	Annually

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
	support of national specialists ▪ UNDP		
Binational Steering Committee Meetings	▪ Binational Project Coordinator with support of national specialists	16,800 (1800 for food, refreshments +15,000 for support for travel costs)	Two times per year
Binational Technical Committee Meetings	▪ National specialists ▪ Binational project coordinator	29,800 (4800 for venue, food refreshments +25,000 for support for travel costs)	Two times per year
National Interministerial Committee meetings	▪ National specialists ▪ Binational project coordinator	3600 (for food, refreshments)	To be determined at project outset
Periodic status/ progress reports	▪ Binational Project Coordinator with support of national specialists	0	Quarterly
Mid-term Review	▪ International consultant ▪ UNDP ▪ Support from project staff	25,000	At the mid-point of project implementation.
Final Evaluation	▪ International consultant ▪ National consultant ▪ UNDP ▪ Support from project staff	35,000	At project end
Lessons learned final workshop and printing of report	▪ Binational Project Coordinator with support of national specialists	8650 (1650 for venue, food, refreshments, 5000 for support for travel costs, and 2000 for printing)	At least three months before the end of the project
Project Terminal Report	▪ Binational Project Coordinator with support of national specialists	0	At least three months before the end of the project
Audit	▪ Auditors	10,000 (5000 each)	Every two years
TOTAL INDICATIVE COST		**153,500**	

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
(*Excluding project team staff time and UNDP staff and travel expenses)			

Part VII: Legal Context

272. This Project Document shall be the instrument referred to as such in Article I of the Standard Basic Assistance Agreement between the government of Ecuador and the United Nations Development Programme, signed by the parties on March 8, 1989 and renewed on January 19, 2005, published in the Official Gazette N. 526 on February 17, 2005 and between the government of Peru and UNDP signed on 30 March 1956. The host country implementing agency shall, for the purpose of the Standard Basic Service Agreement, refer to the government co-operating agency described in that Agreement.

273. The UNDP Resident Representative in the lead country for the project is authorized to effect in writing the following types of revision to this Project Document, provided that he/she has verified the agreement thereto by the UNDP-GEF Unit and is assured that the other signatories to the Project Document have no objection to the proposed changes: (i) revision of, or addition to, any of the annexes to the Project Document; (ii) revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of the inputs already agreed to or by cost increases due to inflation; (iii) mandatory annual revisions which re-phase the delivery of agreed project inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility; and (iv) inclusion of additional annexes and attachments only as set out here in this Project Document.

274. This document together with the CPAPs signed by the Governments of Ecuador and Peru and UNDP together a Project Document as referred to in the SBAA [or other appropriate governing agreement] and all CPAP provisions apply to this document.

275. Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

276. The implementing partner shall:

a) Put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) Assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

277. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

278. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

Agreement On Intellectual Property Rights And Use Of Logo On The Project's Deliverables

279. In order to accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF project purchases, including among others, project hardware and vehicles purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to GEF.

List of Annexes

Annex: Pilot project profiles (see separate file)
Annex: International Waters Tracking Tool (see separate file)
Annex: Social and environmental screening (see separate file)
Annex: Co-financing letters (see separate file)
Annex 1: Maps of three basins, showing rivers, hydrogeology and pollution hotspots
Annex 2: Criteria to select pilot projects
Annex 3: Stakeholder Involvement Plan
Annex 4: Risk Matrix
Annex 5: Terms of Reference of key project staff
Annex 6: Preparation of Preliminary and Definitive TDA

Annex 1: Maps of Basins

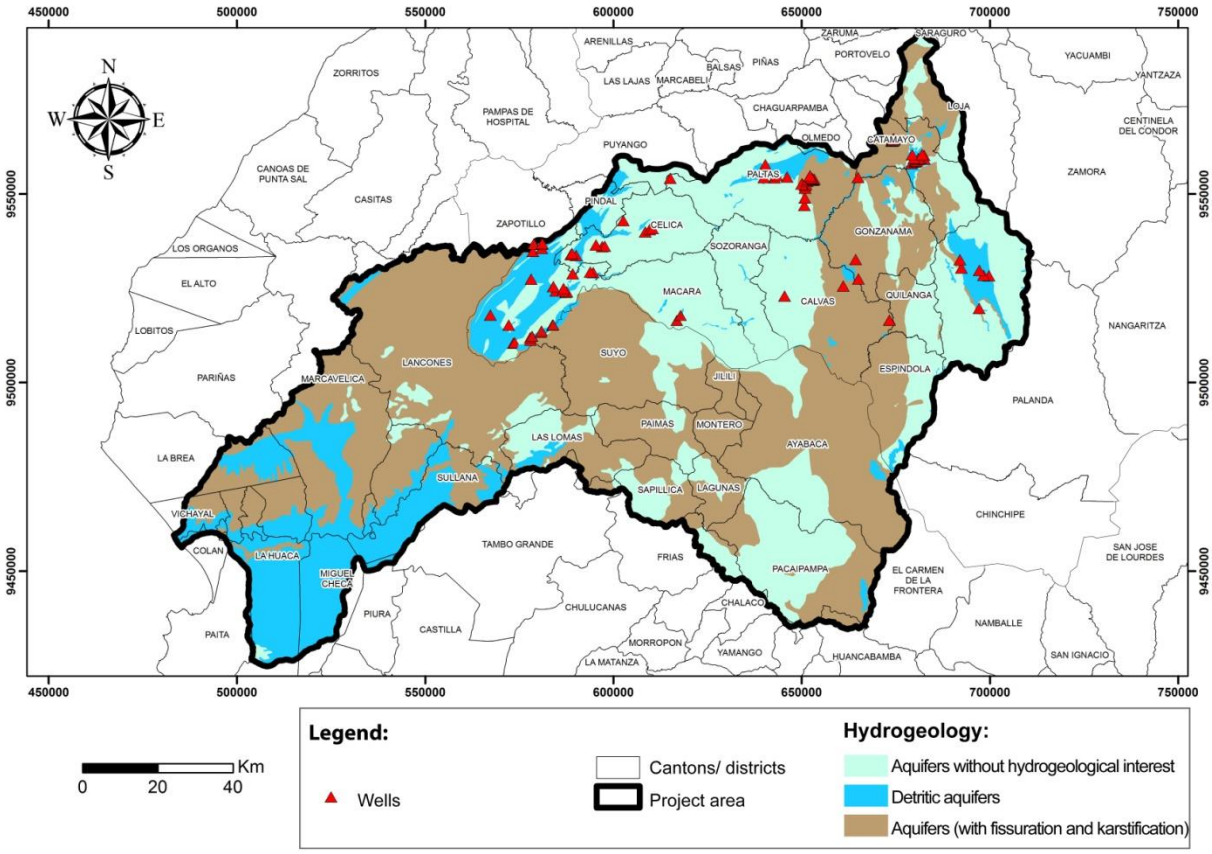


Figure 8: Hydrogeology of Catamayo-Chira basin

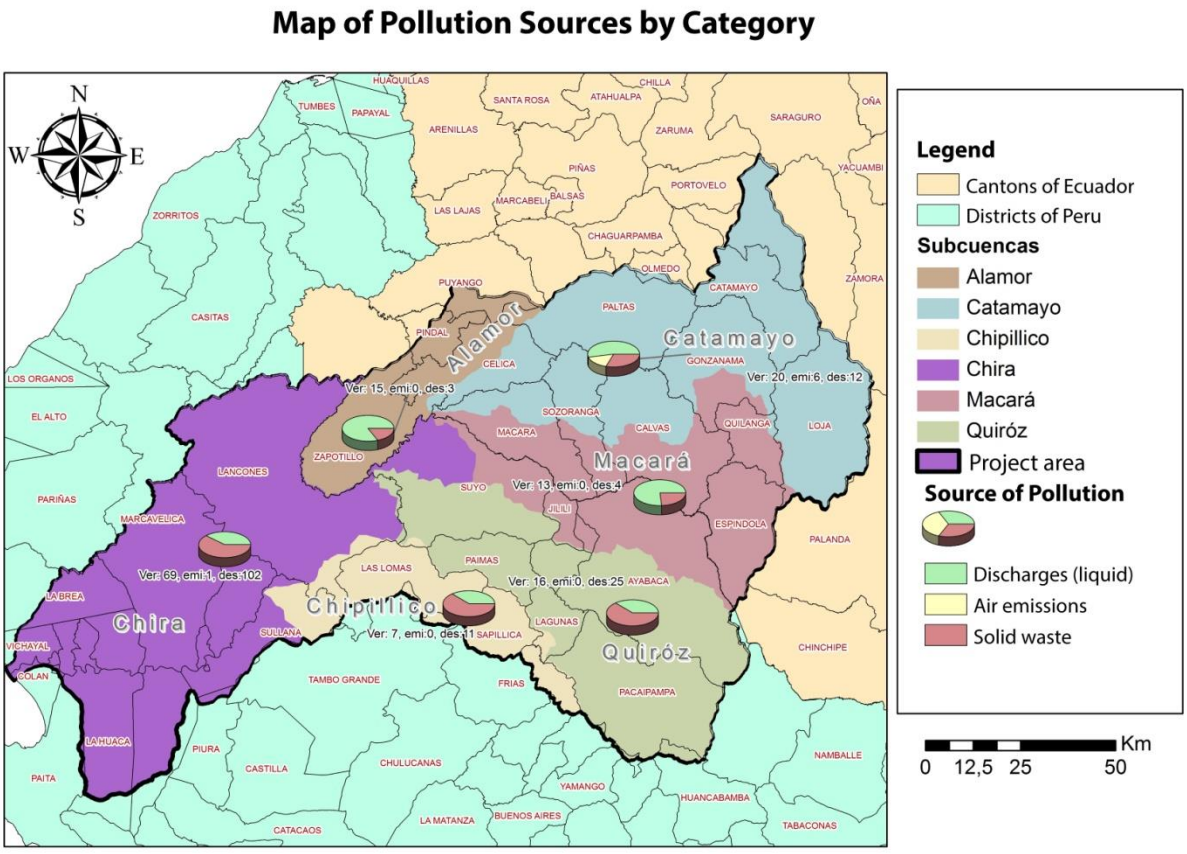


Figure 9: Pollution hotspots Catamayo-Chira

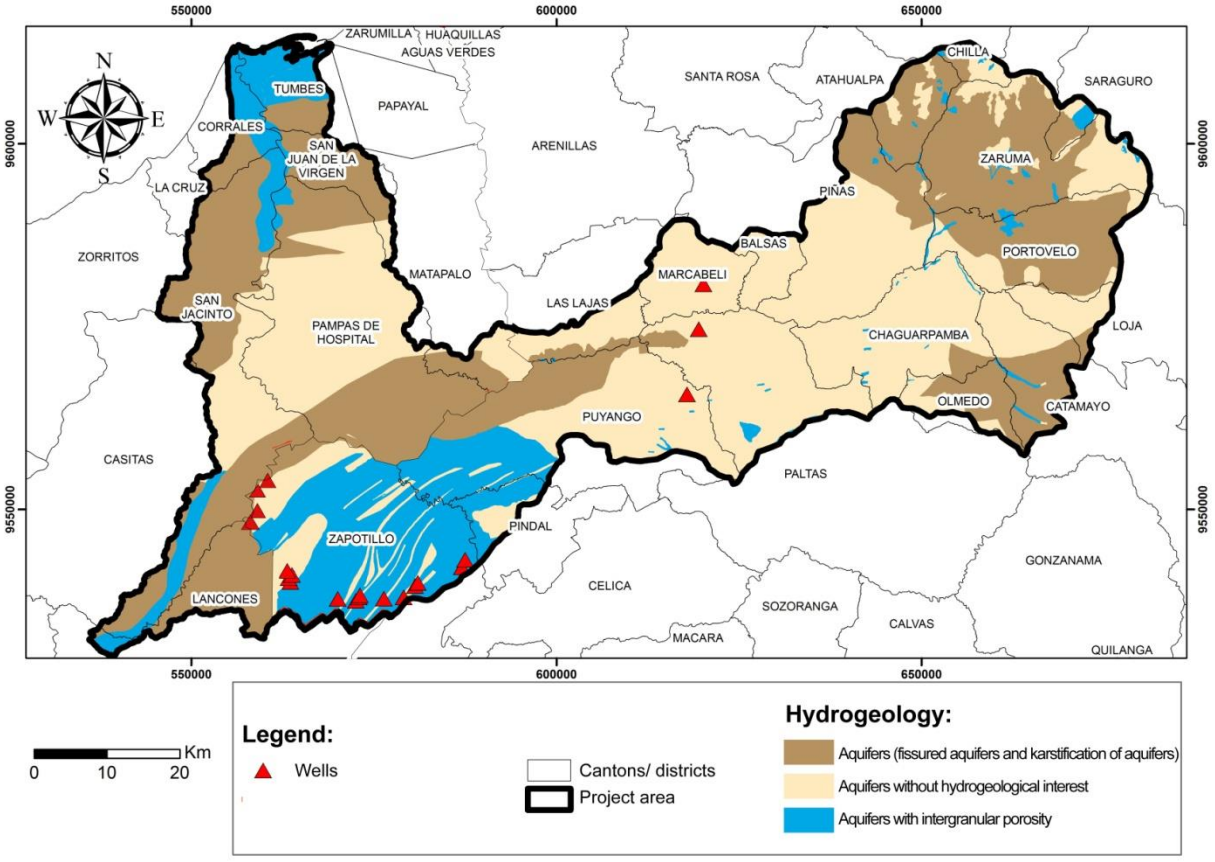


Figure 10: Hydrogeology of Puyango-Tumbes basin

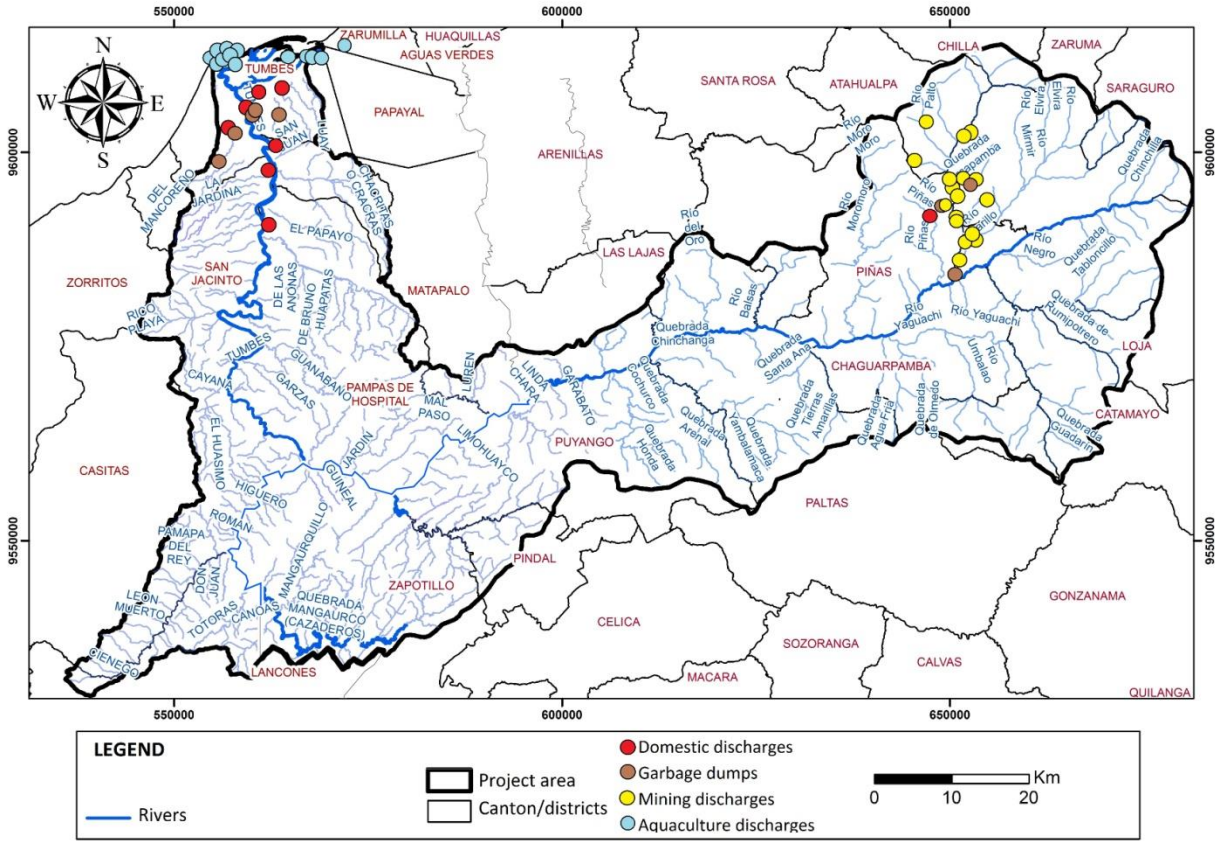


Figure 11: Main pollution hotspots in Puyango-Tumbes basin

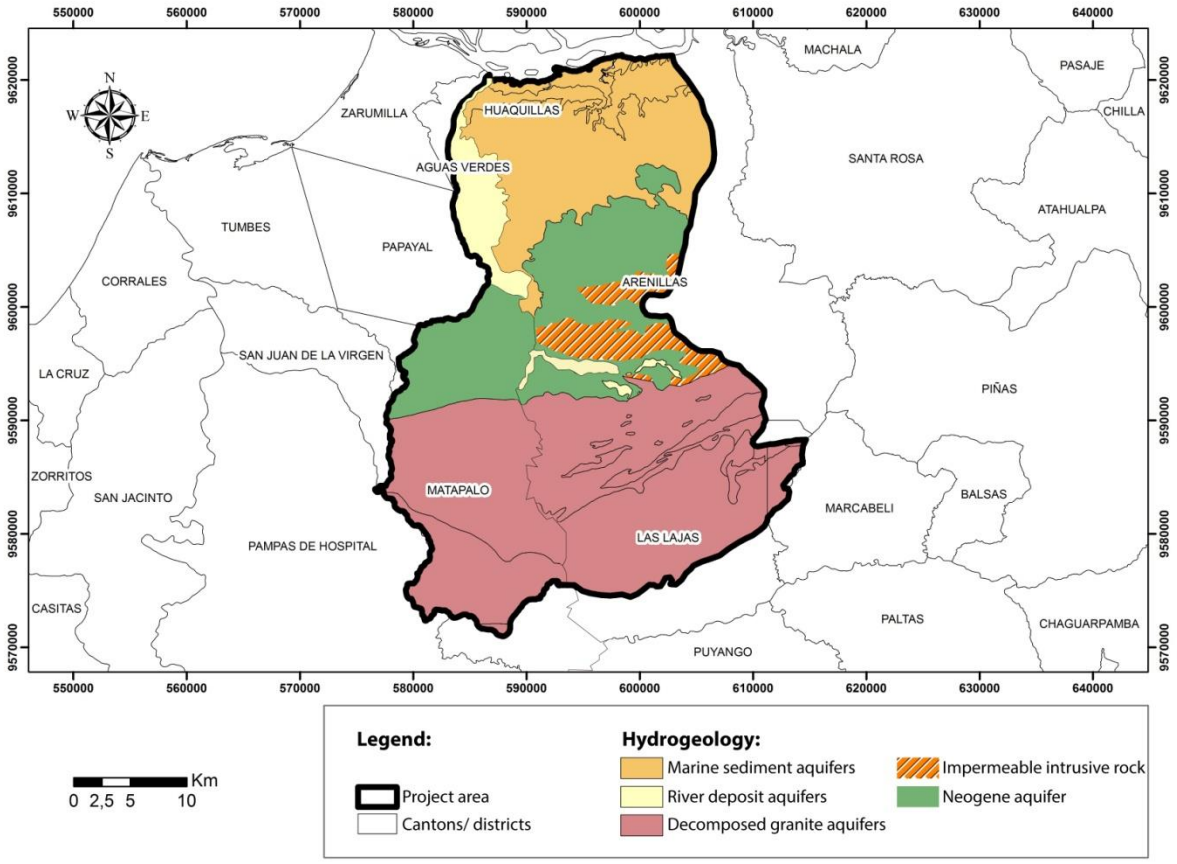


Figure 12: Hydrogeology of Zarumilla basin

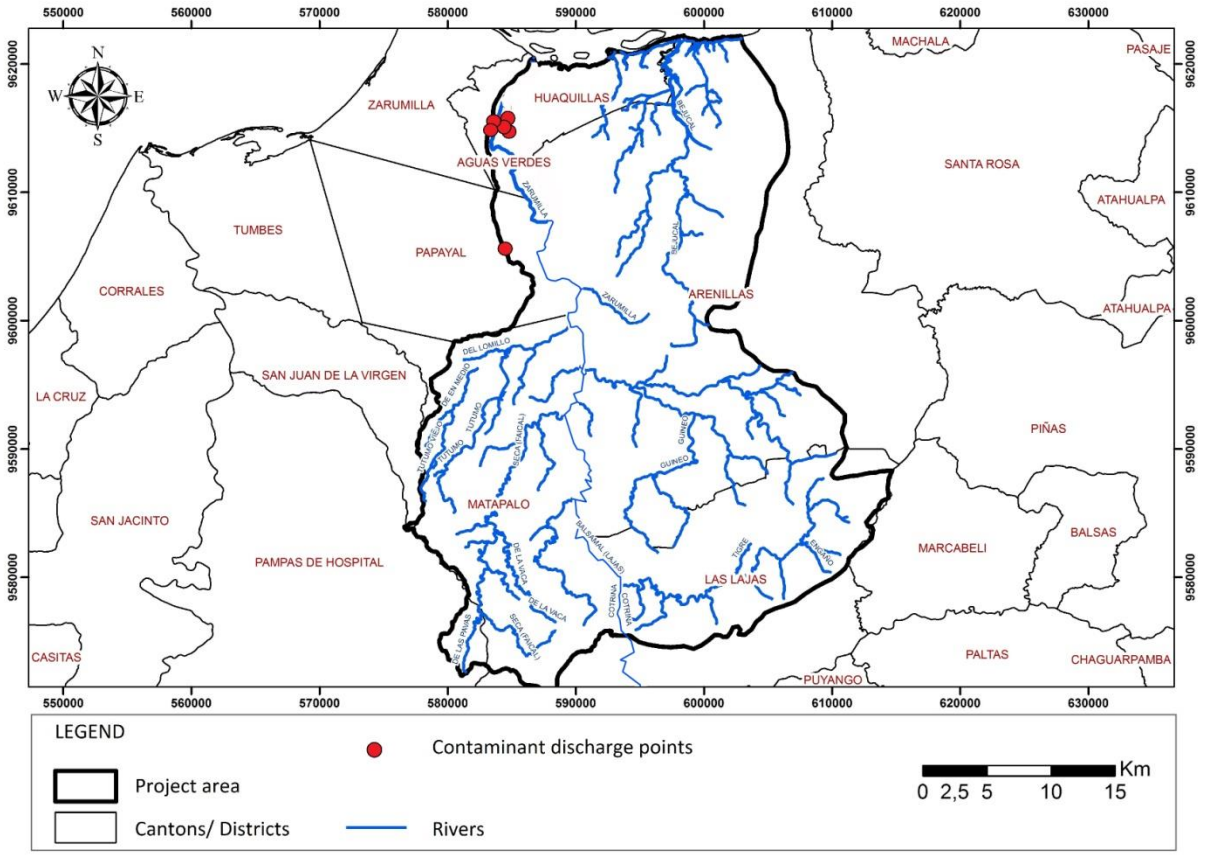


Figure 13: Main pollution hotspots in Zarumilla basin.

Annex 2: Criteria to Select Pilot Projects

Criteria used for Ecuador:

Puyango-Tumbes and Catamayo-Chira basins in Ecuador:

SENAGUA, the National Water Secretariat for Ecuador, made use of the following criteria to select pilot project sites for these two basins, taking into consideration the Hydrographic Units within Puyango-Tumbes and Catamayo-Chira basins:

DIMENSION	CRITERIA	FORMULA FOR CALCULATION	WEIGHTING FACTOR
SOCIAL	Water users per Hydrographic Unit (HU)	Number of users per HU vs total area of Unit	2.00
	Non legally established water user organizations in the HU	Number of non legally established water user organizations	4.00
	Unauthorized water users in the HU	Number of unauthorized water users in the HU vs number of users in the HU	4.00
ENVIRONMENTAL	State of contamination of the surface water per HU	State of contamination of water resources in upper, mid and low sections	20.00
	Period of water deficit	Water deficit (periodicity)	10.00
	Duration of water deficit	Water deficit (duration)	10.00
	Water demand for irrigation	Water flow demand for irrigation versus number of users in the HU	10.00
	Water demand for potable water	Water flow demand for potable water versus number of users in the HU	10.00
	Water demand for livestock	Water flow demand for livestock versus number of users in the HU	5.00
	Index of hydrological protection by type of vegetation	Levels of hydrological protection for different types of vegetation cover	20.00
SOCIAL	Index of Unmet Basic Needs	Index of Unmet Basic Needs	5.00
		Total	100.00

Zarumilla basin in Ecuador:

For Zarumilla basin, the criteria employed by SENAGUA for the other two basins could not be used because there were much less data available. The number of local-level staff available to support information gathering was also a limiting factor. As a result, the following criteria were employed:

1. Institutional structure at the local level. The level of institutional development to implement IWRM actions was assessed at the local level, in particular of the decentralized autonomous governments (provincial governments, cantons and parishes) as well as other state institutions present in the proposed area. This criteria involved an examination of the capacity of the local institutions, availability of human resources at the technical level, and availability of economic and logistical resources to contribute to ITWRM.

2. Participatory processes established for governance of IWRM at the local level.
This criteria looked at the potential to carry out binational actions at the local level in a participatory manner and the level of development of participatory processes with an approach that takes into consideration gender and intercultural issues.

3. Prior implementation of actions addressing water management and conservation and pollution
This criteria assessed prior actions carried out by local and institutional stakeholders and processes that have been carried out to mitigate or eliminate the environmental impacts in the proposed areas.

4. Level of knowledge and motivation to manage water resources at the binational level.
This criteria was focused on defining the level of knowledge and commitment of local actors to carry out activities for the transboundary management of shared basins.
5. Importance of the area for IWRM
This criteria is focused on evaluating the importance of the geographic area in the implementation of projects and/or activities for the binational management of basins.
6. Level of threats to the quality and quantity of water
This criteria saw the prioritization of areas in which natural conditions and anthropogenic activities are having significant effects on the provision of water in the quantity and quality required for the maintenance of the hydrological cycle and for the satisfaction of the population's needs. Threats from various sectors were taken into consideration, such as overexploitation of surface and groundwater, overgrazing, deforestation, discharge of domestic or industrial effluents, among others.
7. Level of dependence of the inhabitants on water resources
This criteria was used to assess the state of distribution of water resources to meet the needs of local inhabitants for drinking water, irrigation, industrial processes, and for the maintenance of ecological flows.
8. Basic Unsatisfied Needs. This criteria establishes the percentage of people who live in conditions of poverty in the area, with those considered poor (Unmet Basic Needs- UBC) those who have at least one basic unmet need in the area of housing, education or income (employment).

Criteria used for Peru:

In Peru, a detailed and highly participatory planning exercise was carried out to develop management plans for the Tumbes and Chira-Piura basins (the Catamayo-Chira basin is called Chira-Piura in Peru). Given that these management plans already defined priority actions, ANA decided to identify pilot sites and actions in accordance with these management plans, rather than carrying out workshops with stakeholders during the PPG phase.

As such, the criteria for the selection and prioritization of pilot sites stemmed from the lines of action and strategic actions identified in the basin management plans, which were related to the following strategic axes:

1. Institutional Framework for Water Resources Management
2. Use and utilization of Water Resources
3. Water Quality
4. 'Water Culture' (referring to promotion of efficient water use among local populations and recovery of traditional practices)

5. Funding for Management Plans

Annex 3: Stakeholder involvement Plan

Objectives: The stakeholder involvement plan has the following objectives: a) clearly identify the basic functions and responsibilities of the major participants in this project, b) ensure full knowledge among the participants about progress and obstacles in the implementation of the project so as to benefit from the experience and skills of the participants to improve project activities, and c) identify key instances in the project cycle when the stakeholders will participate. The ultimate goal of the stakeholder involvement plan is the long-term sustainability of the project achievements, based on transparency and the effective participation of key stakeholders.

Two phases were defined for the participation of stakeholders: a) during the preparation of the project b) during project implementation, including monitoring and evaluation

a) Stakeholder Participation during Project development

From June to August 2014, during the project preparation phase, the main stakeholders were involved in the planning and implementation of various project design workshops and work sessions in small groups. These sessions included, among others: a) workshops to identify relevant institutional and civil society stakeholders in the provinces of Loja and El Oro in Ecuador, b) Workshops to define the project pilot sites in the Cantons of Loja and Las Lajas in Ecuador, c) Workshops with technicians of SENAGUA in Quito, Ecuador to validate the results framework and project strategy; d) workshops with technicians of the National Water Authority (ANA) in Tumbes, Peru and in the city of Piura to present the project, as well as to identify and define the pilot projects. In addition, several teleconferences took place via Skype with ANA on the project strategy and with other stakeholders, and key national, regional and local stakeholders were consulted during the project preparation phase. The purpose of these meetings was to confirm the commitment of these stakeholders to the project, in addition to obtaining inputs for project design and in general to ensure that their interests were adequately reflected in the project design.

A summary of these workshops follows :
Workshops to identify relevant civil society and institutional stakeholders and their relationships in Ecuador, carried out in Alamor, Zapotebamba and the city of Loja in June 2014. These were attended by the following stakeholders: officials of SENAGUA from the Puyango Hydrographic Demarcation as well as members of the Piedra Tabla Irrigation Board, El Limo Water Administration Board, Potrerillos Potable Water Board, members of the Guapanas Canal , Pindal Potable Water Board , Santa Ana Regional Project, Binational Training Center, Fundación Naturaleza y Cultura, Regional Water Fund (FORAGUA), NGOs such as COMUNIDEC , HEIFER , Management Committee of the Catamayo-Playas basin, and irrigation and drainage technicians from RIDRENSUR (Public Provincial Company)

Workshops to define pilot sites in Ecuador. In the Puyango Hydrographic Demarcation, a meeting was held on June 24 in which SENAGUA explained the methodology it used to define pilot projects in this Demarcation, and then workshops were held in the selected Hydrographic Units. In the Jubones Hydrographic Demarcation, these workshops were held on 14 and 15 July , after which point the consultants visited La Libertad parish-level GAD and the Mayor of the Las Lajas canton-level GAD, in addition to a work session with technicians from the Jubones Hydrographic Demarcation - SENAGUA to define the pilot projects.

Workshops to define pilot sites in Peru. Several meetings were held in Lima and in Tumbes, Peru with technicians of the National Water Authority, in addition to conferences via Skype. On August 22, the UNDP consultant team met with experts from ANA in the Local Water Authority in Tumbes, Peru during which time a working session took place to define the methodology and objectives of the pilot projects. These were in accordance with the strategic lines of action of the Water Resource Management Plan for the Basin of the Tumbes River, which was developed and approved in a participatory manner by the Tumbes Basin Council. A subsequent workshop took place in the city of Chiura from August 27-28 to further define the pilot projects.

b) Stakeholder Involvement Plan for the Project Implementation Phase

The table below is based on the Stakeholder Analysis (included in the ProDoc), but includes some additional details.

Stakeholders	Project Implementation Role
SENAGUA	SENAGUA is the agency guiding the comprehensive and integrated management of water resources in Ecuador through policies, standards, and decentralized management for the efficient management of water use. It will be the project Executing Agency in Ecuador., with the direct participation of the Puyango and Jubones Hydrographic Demarcations.
ANA	In Peru, the Project Executing Agency will be the National Water Authority (ANA), with the participation of Tumbes Local Water Administration, the Jequetepeque Zarumilla Water Management Authority (AAA Jequetepeque-Zarumilla), and the Project for the Modernization of Water Resource Management.
Ministries of Foreign Relations (Ecuador and Peru)	The project will liaise with the decentralized office of the Ministry of Foreign Affairs of Peru in Tumbes. In Ecuador, the Directorate of Neighborly Relations and Sovereigns of the Ministry of Foreign Affairs and Human Mobility has jurisdiction, and is supported by the Zonal Office 7 of the Ministry located in Machala. The project should take into account the Ecuadorian Peruvian Neighborly Commission, created out of the Peace Accords signed in Brasilia in 1998, as a strategic element in the process of integration between Ecuador and Peru. This political and technical body establishes and coordinates activities that promote cooperation among the neighboring countries in order to strengthen integration and promote joint projects aimed at the development of Ecuador and Peru. Binational and border technical committees.
Binational Development Plan for the Ecuador-Peru border region	The Binational Plan with its sections in Ecuador and Peru is a key stakeholder for the project, in the promotion of specific interventions. In addition, the Binational Fund for Peace and Development Ecuador - Peru exists, which can finance actions in the pilot projects..
Ministries of Environment (Ecuador and Peru)	As the National Environmental Authorities, they carry out projects on water quality and water pollution prevention. They will be part of the National Interinstitutional Committees to align actions and ensure compliance with environmental regulations in the project area..
Ministry of Health (Ecuador and Peru)	As the national authorities to safeguard public health, they will be members of the National Interinstitutional Committees to be set up with the project They may benefit from the project training activities, as well as water quality monitoring for human consumption.
Ministries of Agriculture and Livestock	In the case of the Ministry of Agriculture of Peru, the Tumbes Regional Directorate for Agriculture will participate and in the case of Ecuador, Coordination Zone 7, which is a component of MAGAP's decentralization process, whose mission is to coordinate, plan

Stakeholders	Project Implementation Role
(Ecuador and Peru)	and monitor activities in the El Oro, Loja and Zamora Chinchipe provinces. These organizations will be in in charge of coordinating actions with associations of producers, farmers and ranchers to implement training processes.
National Hydrological and Meteorological Service of Ecuador INAMHI and the National Service of Meteorology and Hydrology (Peru)	These two entities will be responsible for developing and delivering vital information on weather, climate and water resources for IWRM in transboundary basins, as well as organizing, operating, controlling and maintaining the national network of meteorological, hydrological and agrometeorological stations, in accordance with the technical standards of the World Meteorological Organization (WMO)
Regional and municipal governments of Peru.	Peru has regional governments in Tumbes and Piura and district and provincial municipalities. The Tumbes Regional Government participates through the Natural Resources Administration and the Environmental Administration. These local governments are responsible for the implementation of public policy instruments, regional ordinances, as well as the integration in planning and zoning of integrated water management and an approach based on gender and environmental considerations. They are responsible for licensing for the exploitation of aggregate resources and for environmental impact assessments.
Decentralized Autonomous Governments (Ecuador)	The municipal Decentralized Autonomous Governments (GADs) of Ecuador of the cantons of Loja and Las Lajas as well as the parish-level GADs will be beneficiaries of the project in terms of institutional strengthening and training on IWRM and transboundary basins. The municipal GADS are directly responsible for issuing ordinances for the entire canton on IWRM, water resource protection, management of regular and hazardous solid waste, as well as exploitation and hauling of aggregate resources from water channels, among others. They are also directly responsible for the incorporation of the principles of IWRM in their land use plans while employing a participatory and gender approach.
Community water management organizations	These organizations include Water resource basin councils in Peru (Tumbes and Chira-Piura). The Tumbes Basin Council includes the Regional Management of Natural Resources and the Environmental Management of the Tumbes Regional Government, National University of Tumbes, Tumbes Users Board, Peruvian Shrimp Association (ALPE), Special Binational Puyango Tumbes Project, Ministry of Foreign Affairs , District Municipality of San Juan de la Virgen. Mancora Rural Community, College of Biologists of Peru - Tumbes Departmental Council, Municipality of Marcavelica - Piura. In addition, the Commission of Water Users of the Left Bank, Technical Bureau of the Rice Crop Production Chain of Tumbes Basin, The Chira Piura Basin Council includes the Regional Government of Piura, University of Piura, Sechura Users Board, Energy Union S.A., the Chira Piura Special Project, Piura Decentralized Office of the Ministry of Foreign Affairs, Querecotillo District Municipality, Rural Community of José Olaya of Silahua, and the College of Architects of Peru In Ecuador, there are the irrigation and potable water users, farmer associations, and coffee associations in the cantons of Loja and Las Lajas. These entities are responsible for monitoring and providing feedback on the implementation of the project, in addition to benefiting from activities related to institutional and operational strengthening and training on IWRM.
Binational Commissions	The Binational Commission for the Integrated Regional Water Management of the Transboundary Basin of the Zarumilla river, acting through the Binational Technical Secretariat seeks to promote a good standard of living in the border population, favoring the development, conservation and management of water resources and generating a

Stakeholders	Project Implementation Role
	positive impact on the quality of life of the population. It also seeks to include the participation of the Binational Development Plan for the Peru-Ecuador Border Region to raise funds and carry out projects related to the proper and sustainable use of water resources of the Zarumilla river. The Commission will participate in the project as a technical-political body to endorse project activities and will serve as a reference for the creation of binational commissions for the Puyango-Tumbes and Catamayo- Chira basins. In addition, the Permanent Binational Commission for the Administration of the Zarumilla Canal and the use of its waters deals with specific aspects of the canal and its area of influence.
Projects related to the management of transboundary water resources	The Special Binational Project for Puyango Tumbes (through the Binational Coordination Unit) and the Chira Piura Special Project can provide relevant information to the project. In addition, specific actions should be coordinated to achieve greater impact.
NGOs	NGOs promote the conservation and sustainable use of water resources and provide training. Many of their activities and projects are consistent with the objectives of the project. These organizations have the experience and acceptance of local governments, civil society organizations and water user organizations, which can help the project achieve its objectives. In particular, the NGO Naturaleza y Cultura Internacional operates in Ecuador and Peru in the area of water resources management..
Universities, binational training centres, professional associations	Universities could promote various programs and training modules on IWRM in partnership with the IWRM Project, in addition to encouraging research on IWRM in transboundary basins. The National University of Tumbes, Piura University and the National University of Loja are present in the project area. In addition there are professional associations such as the Architects of Peru and the Professional Association of Biologists, among others, which could provide technical assistance, if applicable, and there are two binational training centres.
Local communities	Local communities will directly participate and benefit from project interventions, particularly training activities and pilot project actions to reduce water pollution and increase the quantity of water. Attempts will be made to involve local leaders among the target groups to increase project impact.
UNDP	UNDP is the implementing agency for the project and will be responsible for providing technical and financial assistance for the effective implementation of the project. Technical backstopping will also be provided by the Regional Service Centre for Latin America and the Caribbean. The Lead UNDP Country Office for this binational project still needs to be determined.

Strategic alliances with actors

The various institutions / organizations listed will be directly involved in project implementation. If necessary, formal or informal partnerships will be established among institutions or with other organizations in order to collaborate on specific topics and thus support the effective implementation of the project.

Participation of women, men and youth, and indigenous peoples

As mentioned in section XYZ, a gender perspective will be integrated in the initiatives to be carried out with the project, thus ensuring the full participation of women, men and youth. The presence of indigenous people is minimal in the project area. Nevertheless, the project will take into consideration and respect cultural practices, customary norms, rules, habits and worldviews.

Stakeholder involvement in the project implementation and M & E

It should be noted that key stakeholders will also play an important role in periodic monitoring and evaluation of project progress and lessons learned. They will be invited to participate in the opening inception workshop for the project. Different stakeholders will also participate on various committees that will guide project implementation and that will provide opportunities for the exchange of ideas and lessons learned. Please see the section on implementation arrangements for further details on the membership and functions of the Project Steering Committee, National Interministerial Committees, and the local committees at the pilot sites.

The project mid-term and final evaluations will be carried out as part of the project cycle . Due to the independent nature of these assessments, the views, concerns and perceptions of the target groups and beneficiaries will be gathered during the project to provide feedback on lessons learned and assess whether the project is achieving the expected results, and if necessary, identify alternative courses of action. The project stakeholders will also be invited to attend and provide their input during the final project workshop on lessons learned.

Stakeholders will also play a key role in the implementation of project activities, including but not limited to, the establishment of binational and national priorities for the basins through the Strategic Action Programs and National Strategic Action Plans, capacity building, and pilot project implementation.

Conflict Resolution

During the start-up phase of the project, potential conflicts in the management and use of water resources will be identified, both during the inception workshop and at meetings of the local pilot project committees. Opportunities for dialogue to resolve these conflicts will be set up.

Annex 4: Risk Matrix

Risk	Rating	Type of Risk	Risk Mitigation Strategy
Insufficient financial commitment to implement the SAPs, NSAPs and ITWRM actions in general at the level of each country	L-M	Financial	The project will fund pre-feasibility studies to determine the investments required for ITWRM implementation and to identify existing budget lines that are aligned with IWRM actions. To address the risk that national governments do not provide sufficient financial support and do not prioritize the issue in their budgets, partnerships with local governments, community and civil society organizations will be promoted at all stages of project development. In particular, Autonomous Decentralized Governments (GADs) have the jurisdiction to manage international cooperation funds to finance plans and projects. Cooperation and spaces for dialogue among different GADs in the adoption of a basin approach and in the alignment of budgets will be promoted. Municipal associations, associations of parish boards, and other associations will be key stakeholders. In addition, the private sector (both the people who use water for their food security and those who use water for agro/exportation or agro-industry) will be informed of the benefits of investing in IWRM, by demonstrating the links between sustainable environmental management and the sustainability of agrofood chains. In addition, external funding will be sought after the completion of this project to facilitate implementation of the SAPs and NSAPs. It should also be noted that proposed project actions respond to priorities identified at the national level by the governments of Ecuador and Peru (for example, in the National Plan for Good Living 2013-2017 and constitutional norms in Ecuador and Constitution and National Policy on Water Resources- 2012 for Peru). This increases the likelihood that government financial resources will support the achievement of the established goals established.
Limited environmental awareness, including understanding of IWRM principles, reduces participation in project	L	Other	The level of understanding among stakeholders about the concept of IWRM in transboundary basins and aquifers varies significantly. To overcome this problem, the project will: a) promote information exchange and awareness raising, including with the use of radio; a) design a targeted capacity building plan on IWRM in line with the needs and interests of stakeholders and aligned with existing capacity building initiatives in both countries; c) implement this plan with all key stakeholders, including technicians from ANA, SENAGUA, and local governments and organizations, among others; d) promote the integration of the capacity building plan in the curriculum of relevant training centres, such as the Binational Training Centres in Catacocha, Provincia de Loja, Ecuador and in Sullana in Peru; d) promote the establishment of spaces for dialogue among key stakeholders on ITWRM, for example, through National Inter-Ministerial Committees to be set up in Peru and Ecuador.
Changes in political administrations and in staffing reduce support for project and contribute to implementation delays	M	Political	Actions focused on the integration and development of the border area have been a top priority in both countries since the signing of the Peace Agreement in 1998. The potential risks associated with political instability and changes in government authorities cannot be fully excluded, however, the importance of water resources for development in the transboundary basin areas and the high vulnerability to phenomena associated with climate change and variability reduce this risk considerably. A highly participatory scientific-technical approach to the TDA and to the achievement of broad consensus on the priority actions to be included in the SAPs will reduce the level of risk.

Risk	Rating	Type of Risk	Risk Mitigation Strategy
			The Project Management Unit will fully socialize the project with new government stakeholders in the event of any changes in political administrations. For example, in October 2014, new regional and municipal governments will be elected in Peru. In addition, minutes will be taken at all key meetings and participatory processes to record decisions made on the transboundary management of the three basins, which will can substitute for lack of institutional memory in the event of changes in personnel and decision makers. Finally, the project will develop a capacity building plan that will be integrated into the curriculum of training centres to support continued capacity building even when there are staffing changes.
Insufficient incorporation of climate variability and change in IWRM planning and other processes	M	Strategic	Climate change and variability is a cross-cutting issue that will be integrated in all the main project activities. Climate change scenarios will be included in the TDA and the priority actions to be identified in the SAPs and the NSAPs will take into account climate change factors. In addition, the capacity building plan will include the topic of climate change and variability, its possible impacts on the basins, and appropriate measures to take climate change into account. At the pilot level, the project will seek to identify and promote solutions that facilitate adaptation and increase the resilience of ecological and socioeconomic systems. For example, various pilot projects will promote traditional systems of water storage (such as albarrales, which are small ponds formed by earth dikes, laid across streams, and reservoirs) to deal with times of water scarcity. Finally, the project will maintain contact with the relevant climate change authorities in each country during project implementation in order to obtain guidance on how to mainstream climate change issues in the project.
Insufficient labour for implementation of pilots and planned capacity building activities	L	Operational	As a result of national and international migration, there is limited labour availability in some areas. The pilot sites within the Hydrogeographic Units will be selected to ensure the presence of a sufficiently large population size for effective implementation of pilot projects and capacity building activities. Furthermore, the participation of women will be promoted as key actors in the pilot projects.
Practices promoted by project in pilot sites do not capture interest of young population	L	Other	The process of defining the pilot sites within the Hydrogeographic Units was carried out in a participatory manner with local stakeholders in Ecuador. In Peru it was based on basin management plans that were developed after extensive consultation with stakeholders. As a result, the practices to be promoted have been selected in order to respond to the specific needs identified by the communities involved. The participation of youth and women will be promoted through pilot projects and training that respond to the interests, needs and schedules of those involved, without constituting an additional burden to their already long days. This will enable youth to find new ways to insert themselves in local productive chains.
The different political parties in power at the local versus national level prevent agreement on key project-related issues	L	Political	The political parties at the local level may not be the same as those in power at the national level. However, SENAGUA must coordinate actions with local governments and communities in accordance with the new Water Resources Act and existing national policies. In Peru, the project actions fall within the priorities of ANA and the mandate of already established Water resource basin councils, through which dialogue and consensus among different public, private and community-based actors can be achieved. In addition, local actors will be involved in consultation and oversight activities as a strategy to support the maintenance of commitments at different levels.

Risk	Rating	Type of Risk	Risk Mitigation Strategy
The regulations and technical standards to be established in accordance with the new Water Resources Act of Ecuador take too long to be approved, thereby slowing down project implementation	L	Regulatory	The lack of regulations and procedures would impact primarily on the process of declaring water protection zones and the development of canton-level ordinances for the prevention of water pollution, among other issues. According to the new Act, SENAGUA has two to five years to develop the respective regulations. To accelerate this process, the project will develop specific proposals outlining the procedures and required regulation for the declaration of water protection zones, based on the work to be carried out at the level of the pilot projects. This will require close coordination with SENAGUA's Puyango Catamayo and Jubones Hydrographic Demarcations.

L: Low risk; M: Moderate risk; H: High risk

Annex 5: Terms of Reference for Key Project Staff

A. Binational Project Coordinator

General Responsibilities:

The Binational Project Coordinator (BPC) shall be responsible for the overall coordination of all aspects of the UNDP-GEF IW project. He/she shall liaise directly with the project Executing Agencies in Ecuador and Peru, the Implementing Agency at both the Country Office and Regional Service Centre levels, and others as deemed appropriate and necessary by the Steering Committee or by the BPC him/her self. The BPC will be also responsible for the management of the project as well as for the delivery of a number of technical activities. The budget and associated work plan will provide guidance on the day-to-day implementation of the approved Project Document and inception report. The BPC will be responsible for oversight of the pilot projects, and will provide guidance and orientation with a view to ensuring that these are fully aligned and harmonized with work undertaken within the main project. He/she shall be responsible for delivery of all substantive, managerial and financial reports from and on behalf of the Project. He/she will provide overall supervision for staff and consultants serving in the Project Coordination Unit.

Specific Duties:

- Manage the UNDP- GEF Components of the PCU, its staff, and budget;
- Prepare an Annual Work Plan of the program on the basis of the Project Document and inception report, under the general supervision of the Binational Project Steering Committee and in close consultation and coordination with related Projects, National Focal Points, and the implementing agency;
- Coordinate and monitor the activities described in the work plan;
- Oversee the pilot project implementation;
- Oversee the development of information management tools to ensure robust evaluation, monitoring and replication activities;
- Ensure project compliance with all UNDP and GEF policies, regulations and procedures, as well as reporting requirements;
- Prepare and oversee the development of Terms of Reference for consultants and contractors;
- Oversee the implementation of a communication strategy and of training activities;
- Represent the project at meetings and other project-related fora within the region and globally, as required
- Other tasks, as required, for the effective achievement of the project objectives and expected results.

Qualifications:

- Education: Post Graduate Degree in environmental management, environmental sciences, natural resources management, or related fields. Preference will be given to those with a degree and training in watershed management.
- Work Experience: 5 years of experience or more working on integrated water resource management issues at national and/or international levels.

- At least 5 years of previous experience as project coordinator/ manager for environmental projects and experience in Results Based Management.
- Experience in implementing UN or GEF funded projects is considered a strong asset.
- Demonstrated understanding of sustainable development, including financial and institutional sustainability. Experience in promoting sustainability and environmental awareness to diverse audiences, including opinion and decision makers.
- Languages: Fluency in Spanish and English (written and oral), is a requirement.
- Other Skills: Proven leadership skills and ability to facilitate the work of multidisciplinary teams, manage change and coordinate various decision bodies associated with a large-scale project is essential. Effective oral and written presentation skills are required as well. Experience in managing budgets and human resources is also required. Good professional knowledge of main office computer applications desired.

B. Terms of Reference: National Project Specialists (NPS) (one for Ecuador and one for Peru)

Under the supervision of the Binational Project Coordinator (BPC), the National Project Specialists (NPS) shall assist the BPC primarily in the provision of technical support for project activities at the national level and to a lesser extent support project management. He/she will report to the BPC and is responsible for providing technical guidance and backstopping to the project and project partners in the execution of project activities and for ensuring high-quality technical delivery of the project's established outputs. The responsibilities of the NPS will include:

- Provide technical oversight and support for execution of all project activities at the national level, including but not limited to, the development of the TDA, SAPs, NSAPs, capacity building, pilot project implementation and pre-feasibility studies.
- Supervise the execution of the pilot projects in his/her respective country to ensure that desired outputs are achieved, to address any bottlenecks, to identify lessons learned, and opportunities for replication;
- Assist the BPC in the recruitment, coordination and supervision of national-level consultants and contractors for project activities, including preparation of Terms of Reference, tender documents, contracts and stakeholder inputs.
- Work closely with the Government and other key stakeholders to ensure their active participation in the project;
- Coordinate project activities with the various government agencies and stakeholders;
- Ensure coordination with other projects being implemented in the region with regards to relevant activities;
- Assist the BPC and the respective UNDP-CO in managing the project budget at the national levels related to activities;
- Assist the BPC in preparing and supervising the execution of the detailed annual work plan and budget related to activities;
- Lead, coordinate and supervise the execution of the M&E activities at a national level;
- Ensure adherence to the Implementing and Executing Agency's administrative and technical reporting requirements and assist the BPC with reporting;

Qualifications and experience:

- Postgraduate degree in environmental or natural resource management or basin management, or combination of qualifications and equivalent experience;
- At least 5 years working experience in his/her relevant fields of expertise or fields related to natural resource management issues at national and regional levels, and demonstrated understanding of sustainable development issues;

- Experiencing working with UNDP and on GEF projects and familiarity with these organization's goals and procedures are considered strong assets;
- Demonstrated management, interpersonal, networking and team building skills;
- Fluency in oral and written English and Spanish, are requirements;
- Other Skills: Ability to participate in and support multidisciplinary work on a large-scale project is essential. Effective oral and written presentation skills required. Good professional knowledge of main office computer applications required.

C. Terms of Reference: Binational Administrative Assistant

General Responsibilities:

As part of the Project Coordination Unit (PCU) staff, the Binational Administrative Assistant will perform a variety of secretarial, coordinating, monitoring and administrative services to ensure the efficient daily running of the PCU and to support project activities. The Administrative Assistant will work within the PCU ensuring the smooth functioning and continuity of the project and will receive directions from the Binational Project Coordinator (BPC) on technical matters.

Specific Duties:

- Coordinate the procurement activities for the PCU and support the financial control and monitoring activities of the PCU;
- Establish and maintain the filing system of technical documents and general internal and external correspondence;
- Make administrative arrangements with regard to recruitment of additional consultants / experts for the project; and
- Assist in the organization of meetings held by the PCU (Steering Committee, working groups, etc), and provide administrative and secretarial support during the meetings.
- Draft correspondence and documents of an administrative nature in consultation with the BPC;
- Other administrative and financial duties as required for the efficient management of the project.

Qualifications:

- Degree in administration, accounting or financial management;
- Specialized training in administration and in financial management, or equivalent work-related experience
- Previous experience in administration of UNDP/GEF projects is considered a strong asset
- Fluent in English and Spanish (written and oral)
- Proficiency in computerized systems and databases and sound computer skills.

Annex 6 - Preparation of the Preliminary and Definitive TDA

Development of preliminary TDA

In order to gather the required information for a preliminary assessment of the three transboundary basins, the following activities were undertaken:

Ecuador (SENAGUA)

- Development of a guide of the basic topics and products needed by the consultants for the preparation of the preliminary assessment, which was submitted for the consideration of officials and technicians at the SENAGUA headquarters and at the Puyango - Catamayo (DHPC) and Jubones (DHJ) Demarcations of SENAGUA;

- Agreement on mechanisms for information collection and submission of the available data through working meetings at SENAGUA's Puyango - Catamayo and Jubones Hydrographic Demarcations .

- Review and analysis of the information by the consultant team .

Peru (National Water Authority-ANA)

- Meetings with the National Water Authority in Lima and Tumbes and teleconferences to present the objectives and advances in project development and to request information for the development of the TDA

- Review by the team of consultants of the detailed information contained in the water resource management plans for Chira -Piura and Tumbes .

Additional sources of information:

Various sources of information were consulted in the preparation of the TDA, including, among others: data from the National Institute for Statistics and Informatics (INEI-Peru); National Institute of Statistics and Census (INEC-Ecuador) National System of Information (SENPLADES), Binational Catamayo-Chira Project (2005); Provincial governments of Loja and El Oro; Departmental Governments of Piura and Tumbes; meteorological and hydrogeological ifnromation from the database of the National Institute of Meteorology and Hydrogeology (INAMHI), National Service for Meteorology and Hydrology of Peru (SENAMHI); Management Plan of the Water Availability in the Basins Involved in the Chira-Piura and Puyango-Tumbes project from the Ministry of Housing, Construction and Sanitation, Peru; geoenvironmental study of the Catamayo-Chira and Puyango-Tumbes basin of the Geological Institute for Mining and Metallurgy (INGEMMET); Territorial characterization and basic documentation on the Catamayo- Chira binational basin ; water characterization and matching of supply and demand in the Catamayo-Chira binational basin; thesis with characterization of the Zarumilla transboundary aquifer between Peru and Ecuador , sponsored by the International Atomic Energy Agency; evaluation of the water quality monitoring results of the Puyango - Tumbes river from the Technical Department of Water Resources - DHPC; thesis from the Technical University of Loja on the quality of water resources.

Once all relevant information was gathered by the conuslting team, a preliminary TDA was prepared.

Information gaps identified

During the process of development of the preliminary TDA, the lack of homogeneity and consistency of information was evident, in addition to the lack of regular monitoring data on water quality and quantity in the three basins.

There is a great deal of meteorological information at the binational level, which permits climatic variables to be analyzed in space and time (precipitation , temperature, evapotranspiration, etc.)

There is little hydrological information that has been analyzed and integrated on a spatial and temporal level , which makes planning the integrated management of surface water in the basins difficult. This type of information would facilitate decision-making with regard to problems of flooding, erosion, conservation of water sources, and evaluation of water supply. There is a significant need for : a) easy access to information, b) organization, processing and analysis of the data obtained to facilitate its use in the management of surface water, and c) determination of water balances to identify water supply and demand to ensure the sustainable use of the resource.

Information is available from the regular monitoring of river flow rates from the different monitoring stations in the three basins, which was obtained from the web pages of INAMHI in Ecuador and SENAMHI in Peru.

Data on surface water quality were obtained from theses, primarily from the Technical University of Loja in Ecuador, and from reports on the ANA website in Peru. It should be noted that chemical tests confirm pollution from domestic wastewater and mining, but there is a lack of analysis of different types of pesticides to corroborate suspected agricultural pollution.

The main groundwater reserves are in: Zarumilla aquifer (Zarumilla basin, Tumbes Valley , alluvial of the Puyango river(Puyango -Tumbes Basin), alluvial of the Chira, Alto Piura and Bajo Piura rivers, alluvial of Macara river, alluvial of Alamor river, alluvial of Catamayo river(Catamayo- Chira basin). A greater level of information is available for the Zarumilla and Tumbes Valley aquifers. In general, there is little hydrogeological information throughout the study area , except for the Zarumilla aquifer, which was studied by UNESCO and the International Atomic Energy Agency (IAEA), for which there is detailed information on boundaries , geometry, hydrodynamic properties, hydrochemistry , isotopy and groundwater quality.

In terms of data on groundwater reserves, flows and levels, it was noted that there is some specific information in all the afore-mentioned aquifers, but little ongoing monitoring , which limits the development and analysis of possible management scenarios.

Data on groundwater quality are more focused on in situ analyses (electrical conductivity, temperature, pH, Total Dissolved Solids) and there is little chemical and bacteriological analysis, which underlies the importance of ongoing monitoring of the main water sources in terms of bacteria, pesticides and heavy metals.

Plan for Development of Definitive TDA

The process of preparation of a TDA for the basin will build on the information collected during the PPG stage. During project implementation, a more detailed assessment of the current state of the three basins and the threats facing them will be carried out. The underlying causes of existing problems will be identified and the specific practices, sources, locations and sectors leading to environmental degradation or the threat of degradation will be described. The TDA will present information on the socio-economic

and environmental impacts of these issues. In addition, existing data on upstream/downstream relationships and scenario building, including flow modelling, sediment transport and baseline determination of ecological flows, will be gathered as part of the TDA process. The results of the hydrogeological studies to be carried out with project funding will be integrated in the TDA as will the results of hydrological studies in Peru and Ecuador. Additional information will be gathered and consolidated from a variety of sources including maps, published, and unpublished material. Workshops and meetings will be held with relevant actors to support information gathering. Baseline data on key environmental and socio-economic status indicators will be collected for incorporation in the TDA to provide an accurate assessment of the current status of the three basins. The preparation of the TDA will take into consideration climatic variability and climate change data and the ways in which these factors are likely to impact the quantity and quality of water in the three basins.

The draft TDA will be presented to key institutions involved in ITWRM, including for Ecuador: SENAGUA, MAE, MAGAP, GADs, MICSE, SENPLADES and MREMH, and for Peru ANA, MINAM, MAGAP, MRE to share the information gathered and to confirm the accuracy of the information. Adjustments will be made to the TDA based on feedback from stakeholders. The final TDA will be disseminated at the national, regional, local and community levels to relevant government and non-government institutions and will be made available through the project website.

Preliminary workplan:

Main activities	**Months 1-3**	**Months 4-6**	**Months 7-9**	**Months 10-12**
Hiring of experts for hydrogeological studies	X			
Sampling and data gathering for hydrogeological studies		X	X	
Hiring of TDA expert (9-month contract)	X			
Hiring of hydrological expert (6-month contract)	X			
Hiring of socioeconomic expert (4-month contract)	X			
Systematization/organization of secondary information		X	X	
National and binational workshops with main stakeholders		X	X	
Preparation of draft			X	
Workshops to verify information contained in draft			X	
Preparation of final version of TDA and printing.				X