



Kingdom of the Netherlands



Dutch Risk Reduction Team:
Reducing the risk of water related disasters

DRR-Team Scoping Mission Report Peru

Technical assistance on early warning systems and flood risk management in relation to El Niño and advice on specific concerns near Ecuadorian/ Peruvian border.

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DRR-Team Scoping Mission Report
Peru

DRR-TEAM [Perú]

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EXECUTIVE SUMMARY

Introduction

Peru and Ecuador have always been vulnerable to water-related disasters, like floods, water scarcity, and water pollution. Like many countries across the globe, Peru and Ecuador are affected by the consequences of the recurrent natural phenomenon El Niño and La Niña. El Niño and la Niña occur both in the Pacific Ocean in front of the coasts of both countries. In Ecuador and Peru El Niño can cause strong precipitations in the coastal area, in contrary to e.g. Colombia where El Niño is causing a very strong drought.

El Niño 2015/2016 was expected to be the heaviest since 1997/1998 (however note that during February 2016 it became evident that the eastern Pacific Niño (Niño-1,2) declined causing much less impact than expected. The consequences in the years of 1997/1998 were devastating for Peru and Ecuador. Estimated damages in Peru were around € 3,250 million, of which 46.4 percent damage to agriculture fisheries, mining, industry and commerce, and 39.7 percent damage to infrastructure. In Ecuador estimated damages were estimated at USD 2,882 million. For this reason Peruvian government already announced to have reserved € 846 million for the consequences of El Niño 2015/2016. In Ecuador large emergency funds were allocated but more long-term investments on infrastructural works were made in the years before.

An official request of the Peruvian Vice-minister for Agriculture for support of the DRR-Team on flood risk management was sent to the Dutch Ambassador in Lima on the 24th of November 2015.

On the 6th of January an official request was sent to the Dutch Ambassador in Lima by the Ecuadorian Minister for Risk Reduction to ask the DRR -Team to look into integrated river management issues in the province of El Oro.

Based on the letters which were discussed between the embassy in Lima and the Autoridad Nacional de Agua (ANA) in Peru and Ministry of Risk more specifically the team was asked to:

- assess the current early warning systems in Peru,
- provide Technical Assistance (TA) and recommendations on flood risk management in the following areas: Río Huallaga, Río Piura, Laguna la Niña, Presa Poechos Dam and Río Tumbes in Peru,
- provide Technical Assistance (TA) and recommendations on integrated river management issues in the province of El Oro in Ecuador
- identify possibilities for financing.

Approach during the mission

After studying a selection of provided literature from the Pacific Disaster Center about El Niño in general and Peru's vulnerability to this phenomenon and from ANA about the different focus areas (Chosica, Río Hualaga, Ríos Chira y Piura and the Río Tumbes) the team started their mission. For Ecuador no case-specific literature was provided in advance.

In Peru the mission started on Monday 18th of February with a briefing with representatives of the Dutch embassy and ANA to discuss the scope and expectations in detail. The questions of ANA to the DRR-Team were provided on paper and explained by their respective task managers. After the meetings in the morning the afternoon and

the next five days were used for site visits to Chosica and the watersheds of the Río Huallaga, Ríos Chira and Piura, and the Río Tumbes in Peru. During these site visits we got the opportunity to speak and interact with the regional (AAA) and local water authorities (ALA) as well as with representatives from DSM, the water councils and regional government. The team was accompanied by a representative of ANA and the embassy during the trip which made it possible to have technical, financial and institutional discussions during the day. The financial specialist within the team had a 3 day side program in Lima during which she visited several authorities, financial institutes and private stakeholders related to financing of water projects in Peru.

The details of the agenda are provided in Annex D

Main results

The main results are threefold:

Knowledge Sharing

During the mission through the discussions with ANA and other stakeholders the DRR-Team was able to disseminate Dutch water expertise and help on the spot. Also in this report in chapter 4.2 – 4.5 numerous concrete recommendations on institutional, financial and technical matters on all the spots visited are shared. Peru can continue to build on these recommendations with or without Dutch help.

Not all questions of ANA to the DRR-Team are answered as the mission was a scoping mission and time was too short to solve everything. Therefore also potential follow up steps have been defined.

Insight

The mission helped the DRR-Team to obtain a clear understanding of the Peruvian context (institutional, financial and technical) with regard to water management issues. This increased understanding can serve as a strong base for further collaboration between the two countries on specific items on which the 2 countries agree. In the weeks after the mission some first ideas for further collaboration have been shared between the DRR-Team/Dutch Embassy and ANA. During this session ANA pointed out their main priorities on which Dutch expertise may be helpful (paragraph 4.6).

Added value Dutch water expertise

It became clear that the Dutch water sector (public and private) has much to offer with regard to the challenges and priorities Peru is dealing with. Seventeen follow up actions have been selected on which Dutch expertise may be helpful (paragraph 4.7.1). These actions are sector wide and offer opportunities to Peruvian and Dutch public, private and knowledge sector. The DRR-Team also included the analyses of the financial expert showing a first scan on how and with whom funding of these actions could be arranged (paragraph 4.7.2). The Netherlands would be more than happy to continue talks with Peru to see where Dutch expertise may be helpful to successfully implement one or several actions.

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LIST OF ABBREVIATIONS

DRR	Disaster Risk Reduction
ANA	Autoridad Nacional de Agua
AAA	Autoridad Administrativa de Agua
ALA	Autoridad Local de Agua
IWRM	Integrated Water Resource Management
WB	World Bank
SENAMHI	Servicio Nacional de Meteorología e Hidrología
SGR	Secretaría General de Riesgos
SENAGUA	Secretaría Nacional del Agua
U.S NOAA	United States National Oceanic and Atmospheric Administration
GDP	Gross domestic product
DSM	Dutch Company, before: Dutch State Mines
Profonampe	Peruvian Trust Fund for National Parks and Protected Areas
SNIP	Peruvian National Public Investment System
PIP's	Public Investment Projects (PIP's)
FEN	Fenómeno de El Niño
PCM	Presidencia del Consejo de Ministros/ Presidency of the Council of Ministers
MEF	Ministerio de Economía y Finanzas/ Ministry of Economy and Finances
UNISDR	The United Nations Office for Disaster Risk Reduction
FAN	Fondo Ambiental Nacional/ National Environmental Fund of Ecuador
GEF	Global Environmental Facility
SNAP	Ecuadorian National System of Protected Areas
TA	Technical Assistance

1 BACKGROUND

1.1 General introduction

Peru and Ecuador have always been vulnerable to water-related disasters, like floods, water scarcity, and water pollution. Like many countries across the globe, Peru and Ecuador are affected by the consequences of the recurrent natural phenomenon El Niño and La Niña. El Niño and La Niña occur both in the Pacific Ocean in front of the coasts of both countries. In Ecuador and Peru El Niño can cause strong precipitations in the coastal area, in contrary to e.g. Colombia where El Niño is causing a very strong drought.

Peru consists of many different climate systems¹. According to precipitation maps of Peru (source SENAMHI), the annual precipitation within the country varies greatly (inter-annual and intra-annual) meaning Peru needs to deal with extremes with regard to droughts and abundance of water in different regions of the country.

According to ANA there are over 400 locations in Peru with a high vulnerability to floods when it rains. However there is not a culture of prevention even though it was calculated that the costs of damages are 13 times higher than the required investments in preventive measures². Some of the most urgent problem locations according to ANA were visited by the DRR-Team and will be discussed in paragraph 1.3.

Like Peru, Ecuador has many different climates including the coastal area on the Pacific, the Andes mountain range and the Amazon region. However the coast in Ecuador is less dry than the Peruvian coast with precipitation ranging between 500 and 2500 mm (whereas in the Amazon it reaches above 4500mm)³. Flooding problems can be found in the whole country but on the coast the impacts are largest, particularly during the wet season, as here flat (delta) areas coincide with a high population density. Like in Peru there is no prevention culture. However during the last 10 years long-term (infrastructural) investments have been made to reduce floods in the coastal area of the country.

1.2 Extreme event

Many of the places the team visited suffer from annually recurring floods. But Peru and Ecuador are dealing with larger extremes in the years of El Niño (wet) and La Niña (dry).

El Niño is a weather phenomenon that occurs cyclically but very irregularly, with an interval of two to seven years, El Niño is defined by prolonged warming in the Pacific Ocean sea surface temperatures when compared with the average value. The U.S NOAA definition is a 3-month average warming of at least 0.5 °C (0.9 °F) in a specific area of the east-central tropical Pacific Ocean, other organizations define the term slightly differently⁴.

¹ http://www.senamhi.gob.pe/main_popup.php?obj=images/mapa_clasificacion_clima.jpg

² <http://www.ana.gob.pe/noticia/autoridad-nacional-del-agua-identifico-mas-de-400-zonas-vulnerables-ante-inundaciones-nivel>

³ <http://unesdoc.unesco.org/images/0021/002163/216357s.pdf>

⁴ Presentation of: Thomas P. Phillips Department of Aerospace Engineering, CCAR, ESOC, CIRES, University of Colorado H. E. Longenecker (University of Colorado) and J. M. Smith (University of Nevada, Reno)

The prolonged warming causes a different situation in the convective loops, with warmer sea water near the coast of Peru and Ecuador and more and intensive rain on the mainland. The images below illustrate the situation.

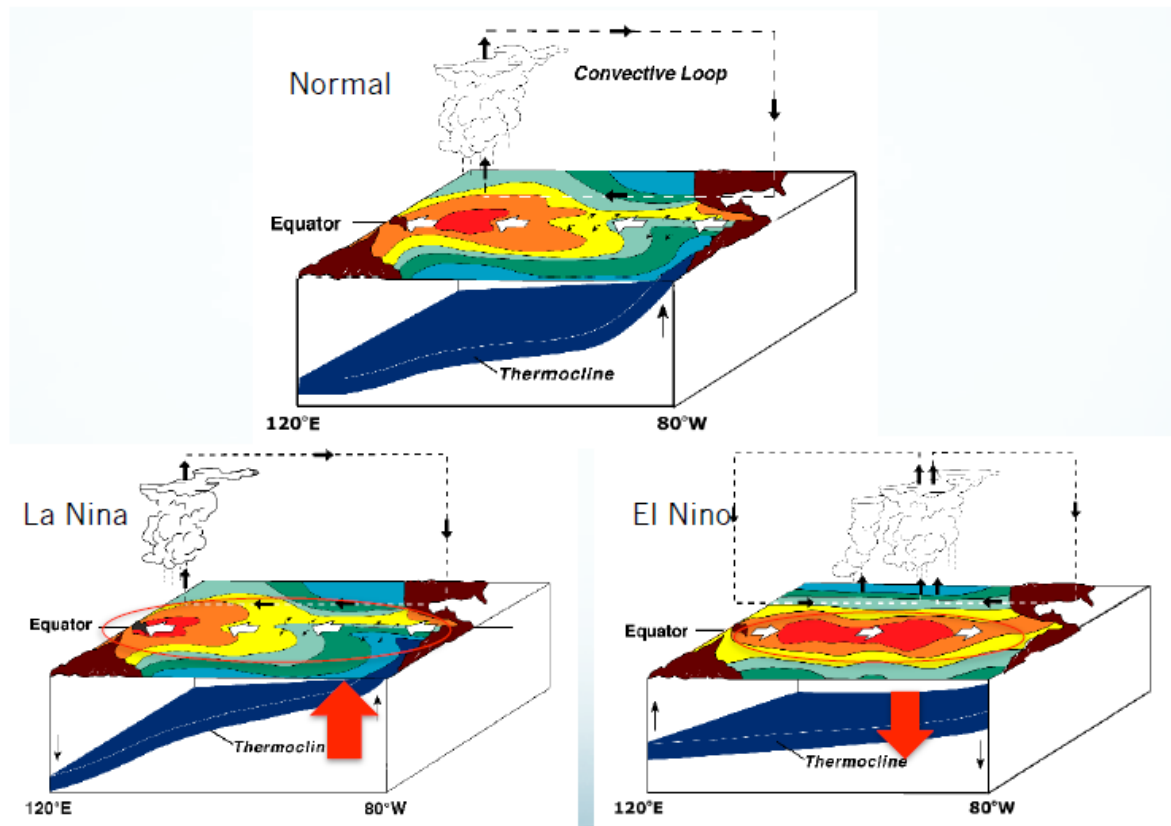


Figure 1-1 Schematic explanation of the effect of El Niño and La Niña (source⁵)

El Niño does not cause the same impact everywhere in South-America. The map below illustrates the temporary climate impacts it causes per region. Note however that the effects of El Niño can vary a lot between different occurrences and the maps gives a general perspective. Strong precipitations in Peru and Ecuador happen when the eastern part of the Pacific Ocean has a large temperature anomaly; but precipitation increases in Uruguay/ Argentina in general are caused by a 'central' Niño.

⁵ Thomas P. Phillips Department of Aerospace Engineering, CCAR, ESOC, CIRES, University of Colorado H. E. Longenecker (University of Colorado) and J. M. Smith (University of Nevada, Reno)

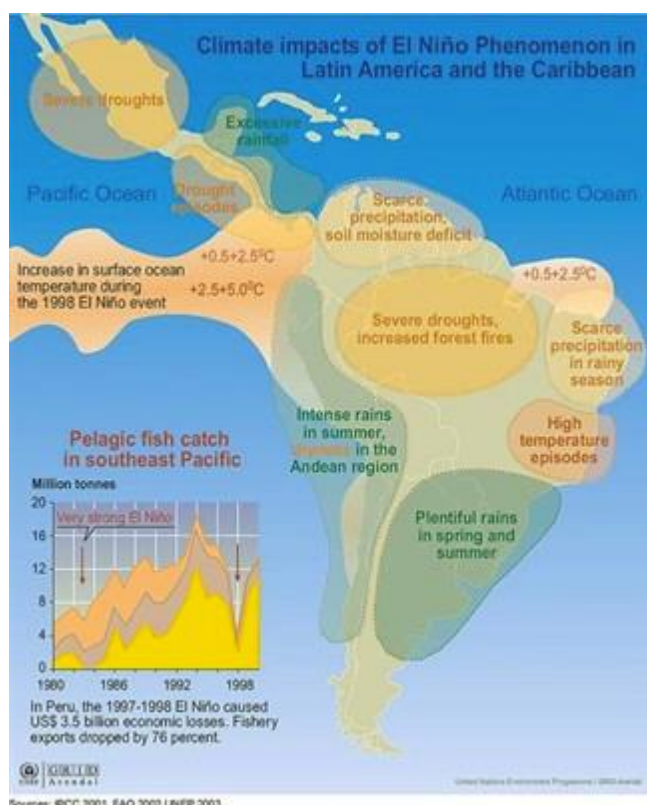


Figure 1-2 Climate impacts of El Niño In Latin America and the Caribbean

To illustrate the extremity of El Niño the amount of precipitation of the event of 1997/1998 is included in the map in annex⁶. For Tumbes this means an anomaly of 1945%, for the department of Piura – or depending on where was measured up to 26882%.

El Niño 2015/2016 is expected to be the heaviest since 1997/1998 (note however that this prognosis changed during last month, as the Niño-1,2 (coast of Pacific) was weaker than expected) The consequences in the years of 1997/1998 were devastating for Peru. Estimated damages were around € 3,250 million, of which 46.4 percent damage to agriculture fisheries, mining, industry and commerce, and 39.7 percent damage to infrastructure. The two last Niños 1982-83 y 1997-98 caused in total USD 6,800 million. The GDP of Peru in 2014 was approximately USD 200,000 million (according to the Worls Bank) meaning the direct impact of el Niño is in the range of 2% of the total GDP. For this reason the Peruvian government already announced to have reserved € 846 million for the consequences of El Niño 2015/2016.

Although Peru suffers from inundations annually, El Niño causes this issue to move up on the agenda politically and financially.

Also in Ecuador the El Niño of 1997-1998 was the strongest in the last 30 years. It caused damages estimated at USD 2.882 million, of which USD 849 million are direct costs, affecting about 14,6% of GDP and reduction in economic growth of 1,3%⁷. In Ecuador large emergency funds were allocated but more long-term investments on infrastructural works have been made in the years before, which have the potential to alleviate the negative impacts of inundations.

⁶ http://www.senamhi.gob.pe/pdf/estudios/ninio_lambayeque2.pdf

⁷ El Fenómeno El Niño 1997-1998 Memoria, retos y soluciones: Volumen IV: Ecuador (CAF)

1.3 Location specific

In this chapter the different site visit locations and their specific problems are being discussed.

1.3.1 Chosica

Chosica is located approximately 30 kilometres east of Lima. Below the risk maps of Chosica from a geological and hydrological perspective are included. The risk to which is referred is the fact that Chosica is suffering from mud and debris flows (huaycos). After and during intense rains water drains per watersheds and micro watersheds through gullies (quebradas), saturating, removing and transporting rock materials and other debris, forming mud and debris flows putting the inhabitants at risk.

In the zones with the highest risks one finds quaternary deposits formed of unconsolidated rock, with low compaction, loose, and easy to be eroded removed and transported down through the slopes. Rock materials are heterogeneous in size from sand to rocks of over 1.0m, shapes are angular or sub angular, the rocks are predominantly granodiorite. The volume of unstable stratum is large and the thickness on average 2.0m. The gullies (quebradas) are steep with gradients of over 28% in average.

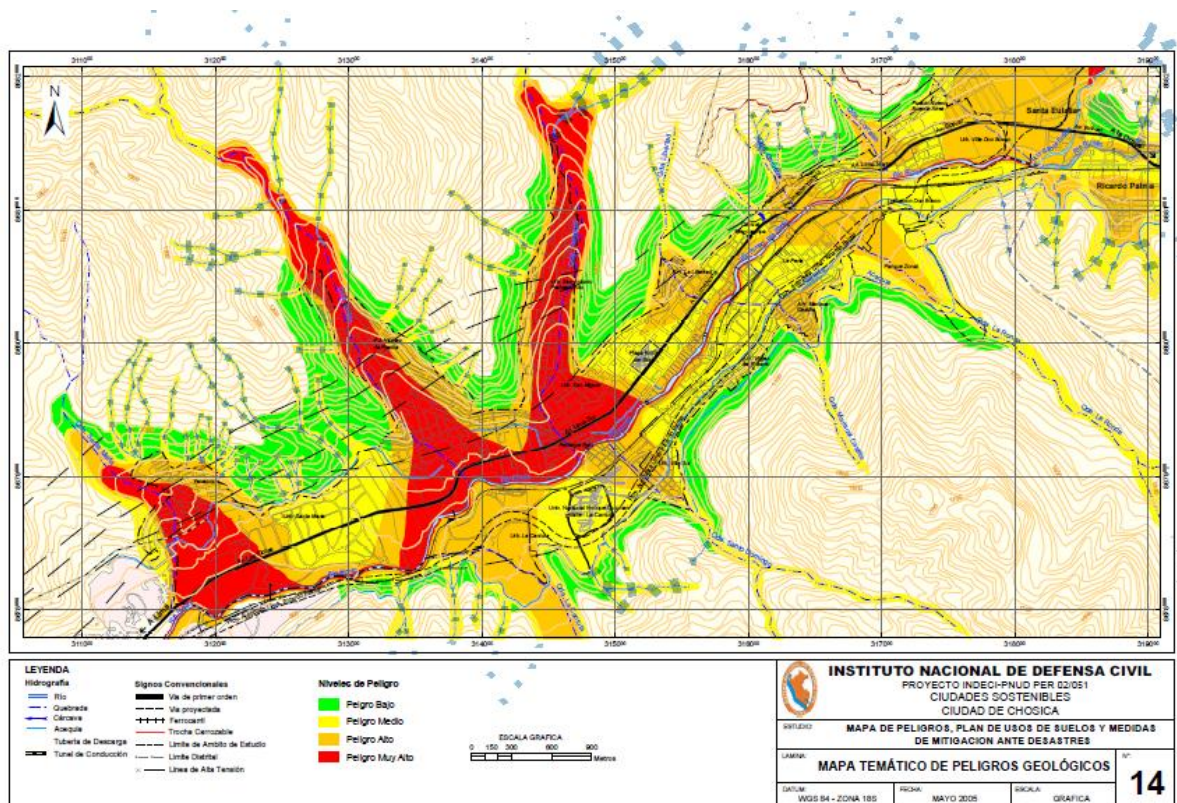


Figure 1-3 Map of the geological risks in Chosica (source: Instituto Nacional de Defensa Civil, Peru)

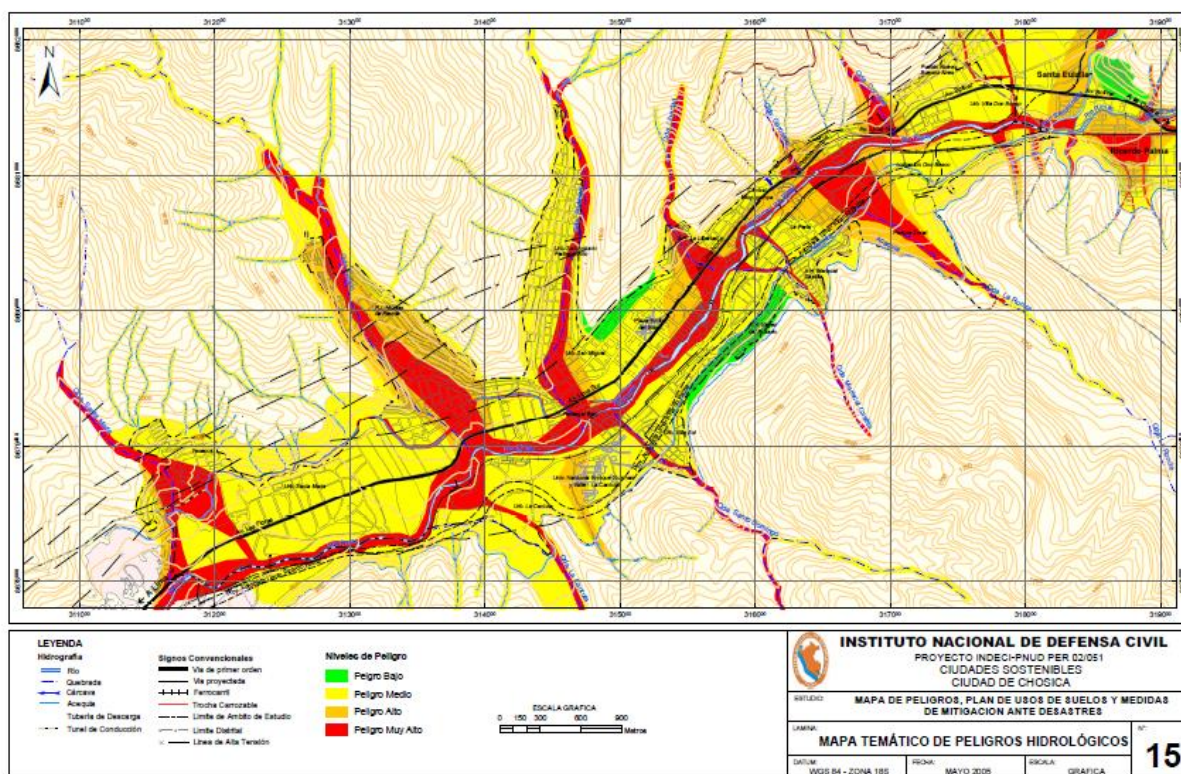


Figure 1-4 Map of the Hydrologic risks in Chosica (source: Instituto Nacional de Defensa Civil, Peru)

Below are some images included to give an idea about the situation in one of the gullies (quebrada Pedregal). The material and the steepness of the area are clearly visible.



Picture 1-1 Impression of the steepness and type of material on the slopes of the gullies

ANA is installing a combination of measures at the moment based on an early warning system with pluviometers and a system of several iron meshes per gully to collect the rocks on their way down to the urban area. These are dynamic jointed bar mesh constructions (barreras dinámicas). See also picture below.



Picture 1-2 Impression of the installed mesh and Emergency operation centre in Chosica

On this location the specific questions of ANA to the DRR-Team were:

- Assistance on how to calculate thresholds for the early warning system
- Correction of bias in the estimation of rainfall based on satellite data
- Suggest alternatives for the joint bar mesh constructions / barreras dinámicas

1.3.2 Río Huallaga

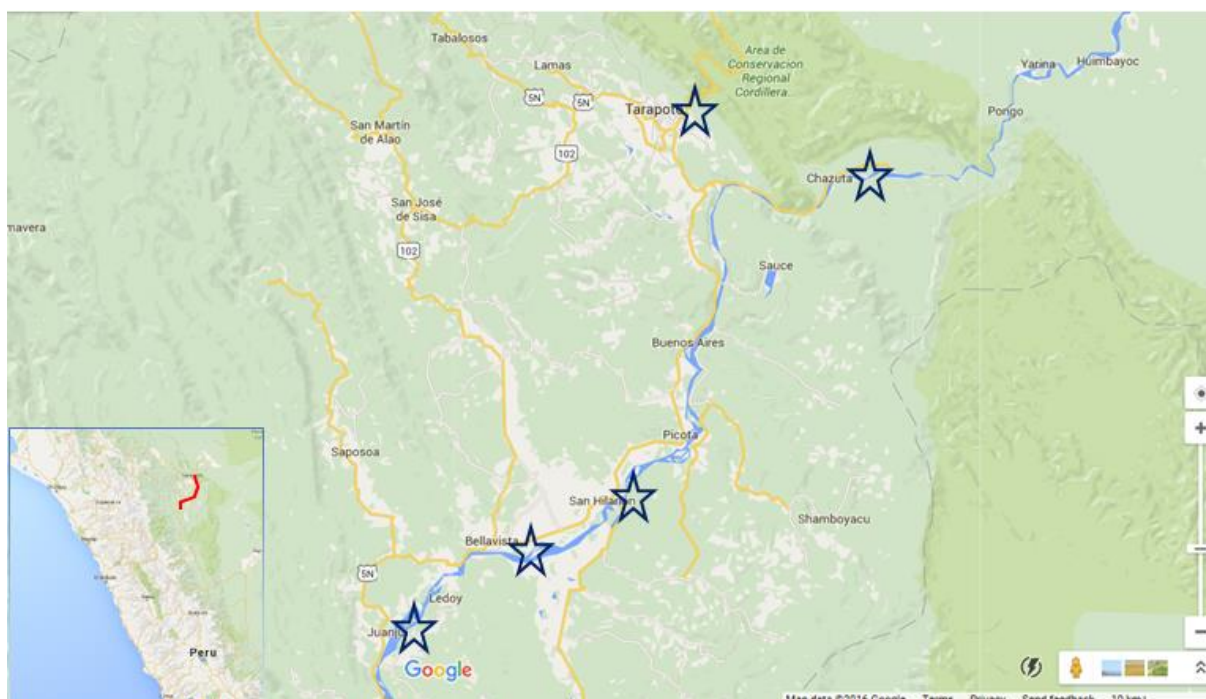


Figure 1-5 Situation of Río Huallaga (source: Google maps)

The position of the Río Huallaga is given in the figure above. The río Huallaga is a braided river with a length of 1138 km and a source at approximately 4500m above sea level with several tributaries (see below). The morphological characteristic of the Huallaga River varies over the river's course. In relation to the forms of relief, the Huallaga River basin has 31 physiographic units, depending mainly on the slope and terrain dissection. It has a steeper profile in the first 100 km coinciding with a chalky lithology which leads to Precambrian and Paleozoic units. This is a very metamorphosed area where the river flows very linear. The dynamics of a high energy stream and naturally sparse vegetation in the area causes erosion and transport of materials from the upper river to lower areas. The sedimentation processes downstream might be a contributing factor to flooding. How direct this relation is and how much it contributes is not known.

In the upper middle part of the basin of the Huallaga River slope decreases, causing the creation of meanders and sedimentation of materials on terraces and on the banks of the Huallaga River allowing agricultural use of the suitable soils. In the lower middle part of the basin, the river again increases its slope, regaining an erosive character and transporting Neogene material to the lower part of the basin. The highest values of soil loss are located along the middle and upper reaches of the Huallaga River, with maxima located in the region of San José de Sisa and Lamas. The middle and upper part of the basin have soil loss values between 50 and 200 t / ha / year.

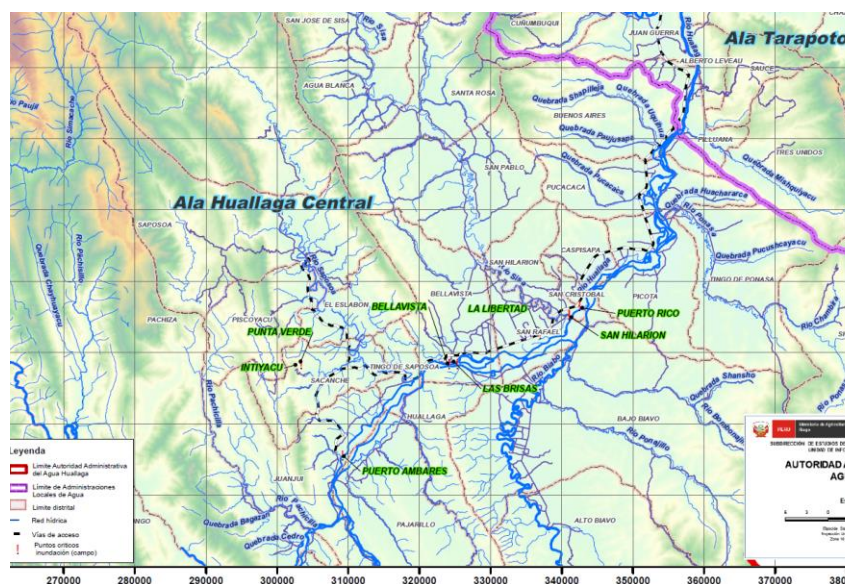


Figure 1-6 Braided character of Río Huallaga (source: ANA Tarapoto)

The origin of the sediment is partly natural wash out but for a great deal, especially during heavy rains it is the soil carried with the run-off from the unprotected deforested areas (often agricultural grounds). The progressive erosion of the embankments in combination with rains is also the triggering mechanism for landslides that are also a rich source of the sediments. As was observed along the river (see below).



Picture 1-3 Landslides along the river Huallaga

The general issue for ANA in this region is the erosion of the agricultural land and embankments of the urban areas as well the more and more frequent and worsening inundations in the small communities.

On this location the specific question of ANA to the DRR-Team was:

- Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way

1.3.3 Río Piura/Chira



Figure 1-7 Situation of Río Piura and Chira and Poechos Dam (source: Google maps)

The lower Piura River is a dry river most of the year that terminates in some lakes close to the Pacific sea. During precipitation events, in wetter or more even during Niño years, the river grows strongly and can inundate important agricultural areas. In 1998 its maximum flow reached 4,424 m^3/s (compared to: 0 m^3/s at the moment of visiting/ and a monthly average of $\pm 36 \text{ m}^3/\text{s}$ ⁸). The river takes so much sediment, that currently the river is situated a couple of meters above the surface level of the neighbouring country side. Only levees prevent the river to inundate and change course.

The Poechos dam in the Chira River close to the border with Ecuador originally had an operation volume of 885 million m^3 , which has been reduced to 400 m^3 during the last 4 decades. This causes problems both for the availability of irrigation water, its main purpose, as its capacity for flood reduction. A significant part of the basin of the reservoir lies in Ecuador.

⁸ <http://www.ana.gob.pe:8088/media/11131/anexo1ofertadeagua.pdf>



Picture 1-4 Poechos Dam (source:water-technology.net Image courtesy of Energoprojekt)

On this location the specific questions of ANA to the DRR-Team were:

Piura

- Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way, taking into account that the río Piura does not have an exit to the ocean at the moment.

Poechos

- Specific technical recommendations for assessment of the levees left and right and the main dam as well the spillway gates⁹.
- Recommendations for determination and prevention of the fast sedimentation of the dam.

1.3.4 Río Tumbes

Tumbes is located in the north of Peru near the mouth of the río Tumbes. The río Tumbes is a river Peru shares with Ecuador. The river originates in the cordillera de Chilla y Cerro Negro in Ecuador (provinces El Oro and Loja).

⁹ The levees at the right and left were not visited during the mission.

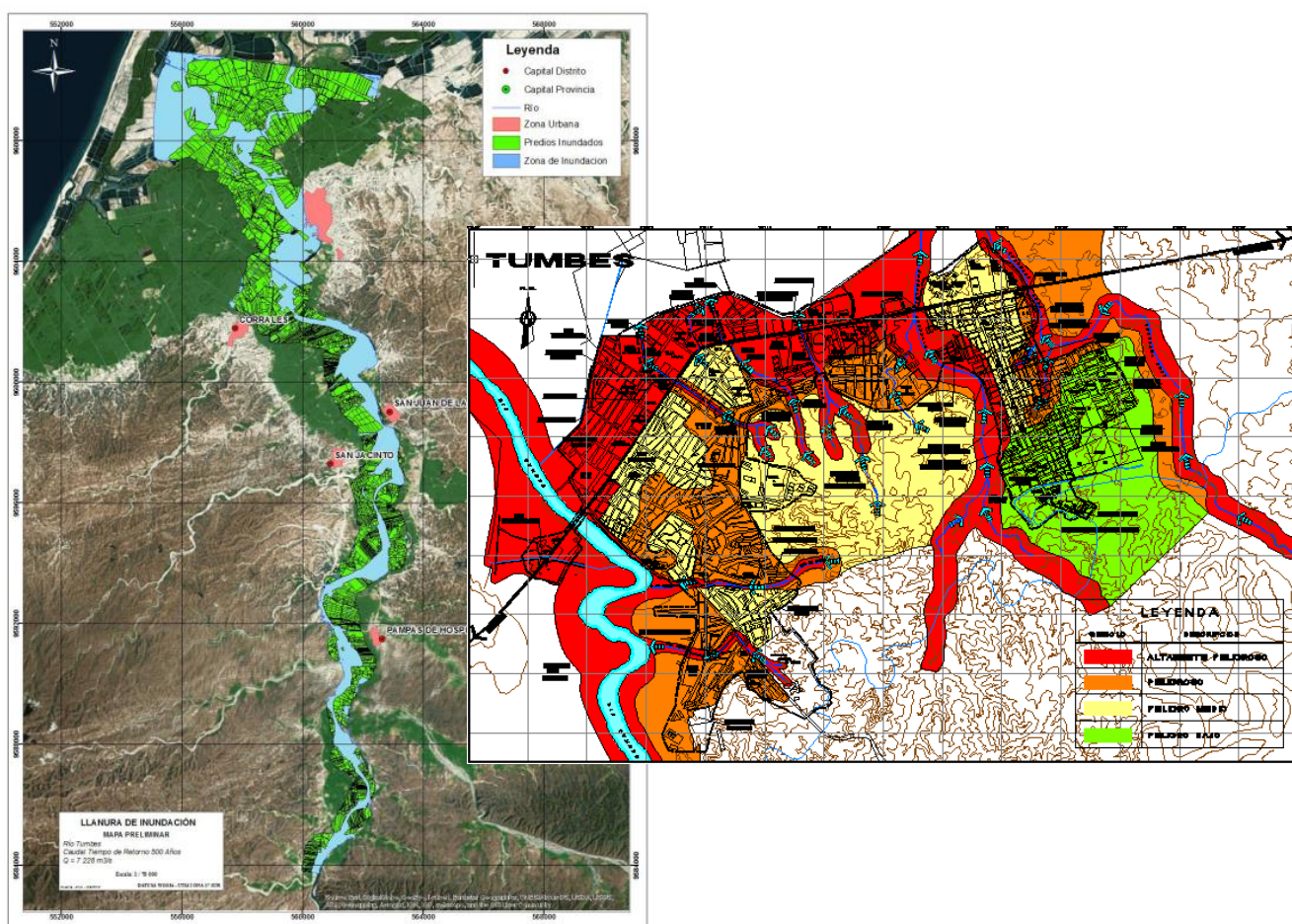


Figure 1-8 Situation of Río Tumbes with inundation zones (source: ANA)

The above images are the inundation zones of the río Tumbes in Peru for a return period of once every 500 years and the dangerous zones (exposed to inundations) in the city of Tumbes.

It was explained by the water council that the most difficult situation they are dealing with is when the tide is high in combination with high discharges in the river and intensive rains. A situation very comparable to the situation in the Netherlands with the low lying areas in the west, but with some important differences, for example the fact that Tumbes is not located below sea level and rains are more intensive.

At the point where the río Tumbes ends in the ocean a delta is developing and it's course does change over time. Due to its low gradient and low flow velocities during parts of the year sedimentation in the delta reduces the discharge capacity and leads to changing courses. In the picture below one of the shallow river mouths can be seen.



Picture 1-5 The neighborhood of the sedimented river mouth

Many water courses are being invaded after which the terrain is being used for housing or agriculture increasing the chances of flooding (because of obstacles in the river bed). Vulnerability to flooding increases not only of this people and their livelihood but to everyone because of the negative impact they cause. This is a common problem in Peru where many years after an invasion of a terrain the terrain becomes property of the invader.



Picture 1-6 Cattle in the river bed – Puente el Piojo

As in many areas in Peru also in Tumbes the last Niño's caused huge problems with loss of life and enormous damage to the economy. On Saturday the 27th of February 2016 after the DRR-Team mission parts of the Tumbes region were flooded.

On this location the specific questions of ANA to the DRR-Team were:

- Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way (the water council expressed their interest in the room for the river program);
- More specifically in the situation of high tides combined with high discharges and intense precipitation.

2 DRR-TEAM MISSION

2.1 Introduction

Peru and Ecuador have always been vulnerable to water-related disasters, like floods, water scarcity, and water pollution. Like many countries across the globe, Peru and Ecuador are affected by the consequences of the recurrent natural phenomenon El Niño and La Niña. El Niño and La Niña occur both in the Pacific Ocean in front of the coasts of both countries. In Ecuador and Peru El Niño can cause strong precipitations in the coastal area.

This year's El Niño was expected to be the heaviest since 1997/1988. The consequences in the years of 1997/1998 were devastating for Peru. Estimated damages were around € 3,250 million, of which 46.4 percent damage to agriculture fisheries, mining, industry and commerce, and 39.7 percent damage to infrastructure. For this reason Peruvian government already announced to have reserved € 846 million for the consequences of El Niño 2015/2016.

An official request of the Peruvian Vice-minister for Agriculture for support of the DRR-Team on flood risk management was sent to the Dutch Ambassador in Lima on the 24th of November 2015.

On the 6th of January an official request was sent to the Dutch Ambassador in Lima by the Ecuadorian Minister for Risk Reduction to ask the DRR -Team to look into integrated river management issues in the province of El Oro.

In the letters the following technical assistance was requested:

Peru:

- Technical assistance to improve the early warning systems in gullies (quebradas)
- Technical (geological and geotechnical) evaluation of dynamic barriers (iron mesh collecting rocks on their way down)
- Dam safety assessments
- Integrated flood management
- Flood management on rivers with tidal influence

Ecuador:

- Evaluation of possible impact of El Niño in the province of El Oro

The letters were discussed between the embassy in Lima and the Autoridad Nacional de Agua (ANA) in Peru and Ministry of Risk after which the questions were narrowed down to¹⁰:

- assess the current early warning systems in Peru,
- provide Technical Assistance (TA) and recommendations on flood risk management in the following areas: Río Huallaga, Río Piura, Laguna la Niña, Presa Poechos Dam and Río Tumbes in Peru,
- provide Technical Assistance (TA) and recommendations on integrated river management issues in the province of El Oro in Ecuador
- identify possibilities for financing.

¹⁰ For Peru it was made clear that Dutch experts would focus on items 1, 4 and 5 as on these matters the Dutch can add the most value.

2.2 Scope of Work

The Terms of Reference concern a scoping mission to address:

- Early warning systems and flood risk management in Río Huallaga, Río Piura, Laguna la Niña, Poechos Dam and Río Tumbes in Peru and
- Integrated river management issues in the province of El Oro in Ecuador.

As these questions are broad the team focussed on technical, institutional and financial aspects with regard to flood risk and river management.

2.3 Approach

After studying a selection of provided literature from the Pacific Disaster Centre about El Niño in general and Peru's vulnerability to this phenomenon and from ANA about the different focus areas (Chosica, Río Huallaga, Ríos Chira y Piura and the Río Tumbes) the team started their mission. For Ecuador no case specific literature was provided in advance.

In Peru the mission started with a briefing with the embassy and ANA to discuss the scope and expectations in detail. The questions of ANA to the DRR-Team were provided on paper and explained by their respective task managers. After the meetings in the morning the afternoon and the next five days were used for site visits to Chosica and the watersheds of the Río Huallaga, Ríos Chira and Piura, and the Río Tumbes in Peru. During these site visits we got the opportunity to discuss with the regional (AAA) and local water authorities (ALA) as well as with representatives from DSM, the water councils and regional government. The team was accompanied by a representative of ANA and the embassy during the trip which made it possible to have technical, financial and institutional discussions during the day.

In this mission an additional team member was required, to cover the additional objective of looking into possibilities of financial engineering of measures that were identified during the scoping mission. The financial specialist within the team had a 3-day side program in which she visited several authorities, financial institutions and private stakeholders related to financing of water projects in Peru.

In order to identify the possibilities for financing and implementation of the measures proposed it is key to understand the financing options (e.g. funds available) and instruments, as well as and rules of the game in the public and the private financing spheres. Additionally given the climate adaptation nature of the measures it is important to understand the local relevance of climate finance dedicated funds. The table in annex G shows the key elements that were researched – mainly via interviews- within 3 main pillars:

1. Public Finance
2. Private Finance
3. Climate Finance

In the table the elements of important within each pillar are introduced, as well as their relationship with the financing of Disaster Risk Reduction measures and the key institutions that were and/or should be interviewed to get a good overview. Based on the information gathered through the interviews findings and needs per pillar have been drafted, and recommendations are made on how to implement and finance the Disaster Risk Reduction measures proposed.

The details of the agenda are provided in Annex D

2.4 Objectives

The following objectives have been communicated beforehand with the team by the Dutch government. The mission will:

- recommend and assess the Flood risk management plans in Peru and Ecuador,
- provide to the Peruvian authorities a second opinion on the Early Warning Systems,
- recommend and assess the integrated river management plans in Ecuador.
- investigate on a general level with the government what the possibilities are to implement the advice and recommendations.
- elaborate to the Peruvian and Ecuadorian authorities a roadmap for short-medium- and long-term interventions to reduce the risks and impacts of floods.
- look into potential financial structures of the possible measures that come out of the scoping mission
- explore the added value of the Dutch water sector in relation to the water related issues in Peru and Ecuador

ANA prepared their questions to the team in more detail at the debriefing in Peru. The following specific questions have been elaborated in chapter 1, this is just a summary:

- Chosica:
 - Assistance on how to calculate thresholds for the early warning system
 - Correction of bias in the estimation of rainfall based on satellite data
 - Suggest alternatives for the dynamic mesh constructions/ barreras dinámicas
 - Getting to know structural and non-structural alternatives to reduce flood risks and the risk of huaycos in a sustainable (not a temporary) way
- Río Huallaga:
 - Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way
- Río Piura
 - Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way, taking into account that the río Piura does not have an exit to the ocean at the moment.
- Río Tumbes
 - Getting to know structural and non-structural alternatives to reduce flood risks in a sustainable (not a temporary) way
 - More specifically in the situation of high tides combined with high discharges and intense precipitation.

3 FINDINGS AND IDENTIFIED NEEDS

3.1 Introduction

In this chapter our findings on how Peru is dealing with the different issues they shared with us are presented and the needs we identified. With needs we mean for example areas where improvements can be made or gaps that were identified, applying a technical, institutional and financial perspective.

3.2 Institutional

Based on discussions the DRR-Team mapped in Peru the roles and tasks of the authorities related to the water management and asset management practices in and along the watercourses. It was not an in depth stakeholder analyses but it's based on conversations during the field visits. The results of the interviews are summarised in the table below.

	Governance	Management	Control	Implementation of the projects and Project plans and studies	Realization of projects and project contracting	Permits	Monitoring and reserach
<i>National</i>	ANA - MINAGRI	-	-	<i>studies on the system level</i>	-	ANA	<i>information system – SENAMHI (monitoring) Geophysical Institute, Universities, CAF</i>
<i>Regional</i>	ANA	<i>Operators of the hydraulic infrastructure Special projects/ Board of users/ operators or commission of the regents</i>	AAA	<i>regional government</i>	<i>Progres is controlled based on the authorisations of ANA</i>	ANA	<i>Universities</i>
<i>Local</i>	ANA	<i>Operators of the hydraulic infrastructure Special projects/ Board of users/ operators or commission of the regents</i>	ALA – process of sanctions(PAS)	<i>Municipios</i>	ALA	ANA	<i>Universities</i>
<i>Transboundary watersheds</i>	<i>Transboundary commite</i>	-	<i>Chancellery/ Cancillería</i>	<i>Regional government, or ministry</i>	?	?	<i>Studies- chancellery Monitoring - ?</i>

Conclusions that we draw from the table and the discussions are:

- ANA provides general rules/ authorisation for the conduction/ execution of the management in and around the watercourses but lack capacity and power (legal base) to control all the activities in and along the rivers/ watersheds.
- ANA is involved only in the evaluation of the projects in pre-investment phase¹¹, we think ANA should be more involved in a proactive way in project initiation and development of the projects. Is there a legal base for this?;
- The operators of hydraulic infrastructure are very diverse and scattered. There is lack of harmonisation of plans in regard to life cycle management;
- In the Peruvian water management strategy, there are no provisions for or assigned responsibilities dedicated to the maintenance of assets in a structured way;
- With regard to knowledge and awareness about sustainable management of watercourses Peru needs to invest in knowledge dissemination on the municipal level of;
- There is lack of harmonization of the governance in international transboundary watersheds;
- There is a need for leadership in the establishment of a focused agenda of applied research in water related items;
- On a positive note, we noticed that more focus is directed towards the will to invest in the preventive measures instead of rehabilitation after disasters.

ANA has a modest but stable budget to be used for research on system level. ANA still lacks capacity and knowledge to assess/evaluate the (technical) plans related to the water management, respectively lacks legal authority to override plans developed on other governmental levels that are considered non-compliant with sustainability and technical regulations or guidelines.

3.3 Financial setting

3.3.1 Findings per financing stream

Public Finance: Peruvian National Public Investment System (SNIP)

Peru has one of the most advanced general frameworks for of public investment (SNIP's) in the region, leading the way in issues such as Risk Management and offering large room to the private sector for their own initiatives. A pioneering structure is the so called "obras por impuestos" or tax swaps, which allow a companies the possibility to invest in projects proposed by local authorities and be awarded a tax-reduction in the following years until the equivalent of the investment is achieved. The private company sponsoring the project has them full freedom to realize the project or contract any other company for its realization, without the need to follow public procurement procedures. In fact the rationale for the introduction of this procedure has been to speed up the process of infrastructure development throughout the country, where often local authorities are limited in their project preparation and formulation capacity.

Law No. 29230 establishes that private companies that sign for a tax swap can fund and / or implement projects of public investment in infrastructure and receive the so-called CIPRL, a Certificate for Regional and Local Public Investment – granted by the Treasury. This new law

¹¹ The infrastructure investment process is normally divided into four phases: pre-investment, investment, operation, and ex-post evaluation. The pre-investment phase is divided into two large groups of activities. The first is the generation of project ideas, and the second covers project profile to feasibility and design studies. CBA / economic and environmental modules are part of the project feasibility study, and therefore of the pre-investment phase

has encouraged many companies to invest. Already in 2014 Peruvian companies boosted infrastructure investments by 48% under the tax swap program Obras por Impuestos.

A short summary of how the Public Investment system works is presented in annex H.

Disaster Risk Management within the SNIP : Gaps identified

The General Guide for Disaster Risk Management in Public Investment Projects (PIP's) is very advanced compared with other countries in the region. However the procedures and regulations to incorporate climate change and related risks per sector and for specific types of projects still need to be worked out in detail. It is the responsibility of each sector to develop such sectorial methodological instruments. At this moment the USAID is supporting Peru to work out such specific methodology for the water and sanitation sector, but is not yet being developed for Water Management or Delta Technology projects (e.g. dams).

The Budget Programme 068 "Disaster Emergency Vulnerability Reduction and Response (Partida 068, Prevaed) meant for decentralized governments to finance works of risk reduction shows two operational challenges:

- Firstly, the amounts invested are under complete discretion of decentralized entities, consequently these investments are not prioritized and often are sub-executed. These weaknesses became clear given the FEN, where it was found out that little has been done by local government to maintain the hydraulic profile of rivers by dredging of sediments ("descolmatacion"). Therefore a current discussion within the government that requires knowledge on DRM is on if whether a minimum investment or annual implementation goal of this budgetary item needs to be set and how this percentage should be established. In the leadership of this discussion is the Presidency of the Council of Ministers (PCM), supported by the Ministry of Finance (MEF). This discussion resembles the recent discussion in the Netherlands on the adoption of new flood protection norms for all flood-prone areas in the Netherlands. Within the context of the Dutch Delta Programme, economically efficient flood protection standards for the entire Netherlands were calculated using a recently developed methodology for cost-benefit analysis and up-to-date insights into flood risk assessment.¹²
- Secondly, another remaining challenge is the availability of appropriately scaled maps for the project study areas, historical data to better establish future risk scenarios and data to determine the magnitude and intensity of potential hazards (UNISDR 2015, p.39).

Private finance – advance and main actors

Private finance of infrastructure is a field very much advanced in Peru. Equally advanced are capital markets that allow private companies to access long term finance for infrastructure. Findings that support the advanced level are:

- Complex project finance structures can be found, for instance in the recent Olmos I Irrigation project. See details in textbox.
- Special Purpose Vehicles can easily issue Bonds- a recent metro project acquired 1.5 billion Euro by issuing bonds; often bought by Canadian pension funds

¹² More information on the approach adopted in the Netherlands can be found on the Article "Economically efficient flood protection standards for the Netherlands, which can be download at:
https://www.deltares.nl/app/uploads/2014/12/kind2014_JFRM1.pdf

- Companies issuing bonds can easily access “Guarantee” products from financiers such as the CAF
- Many banks are providing project finance for infrastructure, between them the CAF, BNP Paribas and the BCIE.

Key actors (and potential partners for Dutch firms) active in this field are:

- Brazilian and Spanish project development and construction companies, examples are Queiroz Galvao, Camargo Correa, Ode Brecht and others.
- Spanish Engineering and design firms, such as Inclam and Typsa.

Olmos I project: This PPP project is the most important Irrigation project in the history of Peru so far. The financial closure required an estimated total investment of US \$ 247 million. The capital structure of the project required that the SPV had an initial capital of US \$ 20 million (equity). Financing of the project consisted of:

- Bond issuance US \$ 100 million (debt).
- State funding of US \$ 77 million (co-financing)
- Regional Bank’s loan (CAF) of US \$ 50 million (debt) .

The money was handled through a bank trust, acting as trustee the National Bank.

Climate Finance – relative advance and main actors

One of the key players in terms of Climate Finance in Peru is the PROFONANPE, the Peruvian Trust Fund for National Parks and Protected Areas. Through the Ministry of Environment it is able to access the new Green Climate Investment Fund (GCF). Of the first 8 Green Climate Fund projects approved, one pertains to Peru: Building Resilience of Wetlands in the Province of Datem del Marañón in Peru, CF funding: USD 6.2 million.

Besides the Green Climate Fund there are other climate related funds and imitative such as:

- a) Climate Investment Fund (CIF) – channelled through the WB and the IADB a total of US\$ 50 million has been allocated by the CIF to forest investments in Peru. Of these, US\$ 20 million are grants and US\$ 30 million are loans.
- b) Partnership for Market Readiness (PMR) - coordinated in Peru by the WB. The PMR is a forum for collective innovation and action and a fund to support capacity building to scale up climate change mitigation. This is not as advanced in Peru as is the GCF.
- c) JICA (Japanese Cooperation)– River Basins Flood Protection Project in Coastal Area of Peru, ODA loan. The objective of the Project is to mitigate vulnerability of three river basins to protect agricultural lands and rural population against floods by improving flood prevention infrastructures, thereby contributing to the sustainable and stable agricultural activities.
- d) Green financing lines of credit offered by amongst others the CAF, who has more than US \$2 billion available for green financing in the coming years. So far the CAF invested in 2013 a total of US\$ 859 million in renewable energy and mitigation projects, US\$ 773 in Climate Adaptation projects and US\$ 773 in other environmental projects. They would like to expand their green financing portfolio from 25% of their total lending portfolio in 2015 to 50% in 2020.

PROFONANPE

The Peruvian Trust Fund for National Parks and Protected Areas (Profonanpe), has funded biodiversity conservation in Peru for 22 years. Across 46 protected areas and reserves, it has strengthened natural resource management and supported civil society and private sector contributions to biodiversity conservation.

The organization became a National Implementing Entity (NIE) of the Adaptation Fund in 2014 and recently became Latin America's first accredited implementing entity for the Green Climate Fund (March 2015). The Adaptation Fund was set up by the UNFCCC to provide a major source of finance for climate adaptation activities in developing countries. The Green Climate Fund – also established by the UNFCCC – is set to become one of major channels of climate adaptation and mitigation finance from rich to poor countries, which is targeted to reach US\$100 billion a year by 2020.

Source: http://unfccc.int/bodies/green_climate_fund_board/body/6974.php the 100 billion is for all countries, and is just a target at the moment! The NL already made a pledge of 1.2 billion

Now that Profonanpe is successfully accredited as an NIE with both institutions, it means that Peru can receive and disburse climate finance directly – known as 'direct access' – rather than relying on multilateral organizations such as regional development banks to disburse funds. Developing countries are strongly in favor of direct access, because of the increased autonomy and agenda-setting power it provides them (see some of CDKN's Climate Finance Advisory Service guides on this topic). The Climate and Development Knowledge Network (CDKN) aims to help decision-makers in developing countries design and deliver climate compatible development. The Climate Development Knowledge Network is managed by an alliance of organizations led by PricewaterhouseCoopers LLP (PwC), and including Fundación Futuro Latinoamericano, LEAD International, LEAD Pakistan, the Overseas Development Institute, and SouthSouthNorth.

With accreditations in place for both the Adaptation Fund and the Green Climate Fund, Peru certainly looks set on the cusp of receiving – and programming – significant resources in support of climate compatible development according to its own national priorities.

Source: <http://cdkn.org/2015/05/feature-becoming-climate-finance-ready-perus-experience/>

3.3.2 Financing alternatives for Disaster Risk Reduction measures

Financing of (infrastructure) Works – capital expenses

Direct public investments

- Government own resources – National Budget
- Loans acquired by government with Multilaterals and other IFI's (see options below)
- Donors: development cooperation funds have reduced from USD 700 million to USD 350 million per year in 2016. The most important donors are USAID, GIZ, Cooperación Española, Belgium cooperation.

Important funds for decentralized governments:

- FONIPREL which co-finance up to 99.9 % of the total amount of investment projects (PIP) and preparation of pre-investment studies submitted by regional and local governments
- Profonanpe, Peruvian Trust Fund for National Parks and Protected Areas. See more details on the Climate Finance section.

Loans to finance public Works are often asked by the MEF to:

- World Bank and IADB
- KfW (German Development Bank)
- JICA
- Caja Corporacion Andina de Fomento (CAF) – who is considered to have a much faster and less bureaucratic process than the IFI's . Peru as well as other South American countries are founding members of the Bank, and have therefore a different relationship with it than with MDB's. More information about their products and procedures can be found at: <https://www.caf.com/en/about-caf/what-we-do/products-and-services/loans/>

Private financing

Public Private Partnerships are an important element in Peru's Infrastructure Investment strategy. There are two types:

- 1) Self-sustainable: These are those financed through fees paid by users or prices, tolls or similar investment recovery mechanisms, not requiring the use of public funds for co-financing. Also qualifying as self-sustainable PPPs are those requiring financial guarantees from Government, the probability of activation of these guarantees should be minimal or non-existent. Minimum guarantees are deemed to be those not exceeding 5% of the total investment cost, which does not include operating and maintenance costs. Additionally qualifying as self-sustainable PPPs are those not requiring financial guarantees, having no or low probabilities of demanding the use of public funds in other words, that the probability of the use of public funds is not greater than 10% for each of the first five years of the project.
- 2) Co-financed: These are those requiring co-financing, or providing or retaining financial guarantees or financial guarantees with a significant probability of demanding the use of public funds (greater than 5% of total investment cost). The amount of co-financing has reached in some cases 80%, an example of such initiative are the "embalses" projects within the so called "Sistema Hidrico Integral del Valle Chancay-Lambayeque . Ministries as well as decentralized government will publish annually a window of interest signalling the types of projects they are interested to co-finance.

Additionally there are other instruments that channel private sector investment for the delivery of public services:

Tax swaps (Obras por Impuestos): a mechanism to allow private companies to carry out the public investment projects of Regional and Local Governments and universities, to then deduct the total amount of investment from their Income Tax. More details on the procedure are presented in the following pages. Additional information can be found at: <http://www.obrasporimpuestos.pe/>

The Government issues a Regional or Local Public Investment Certificate (CIPRL) for the sum of the investment made. The main objective is to promote the implementation of public investment projects and help narrow the infrastructure gap existing in the country. To do this, it is necessary, through a process conducted by a special committee, to select the private company that will

privately finance and implement the project. This process is described in the Regulations of the Law, approved by Executive Order 133- 2012-EF.5

Each year, the National Government establishes, for each Regional and Local Government of the country, a maximum amount for the issuance of the corresponding CIPRL, which is updated by the Ministry of Economy and Finance (MEF) in March of each year. At present the Regional Governments can carry out projects for an amount of up to S/.5.99 billion (approximately US\$2.14 billion) while Local Governments in the country have a total of S/.21.66 billion7 (approximately US\$7.73 billion).

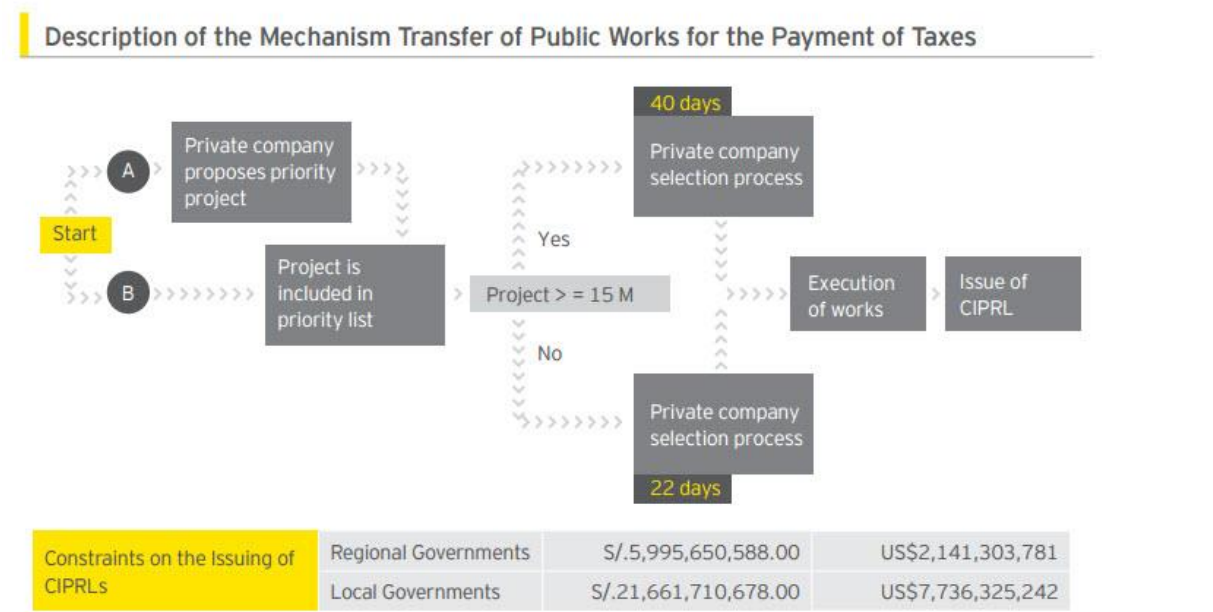


Figure 3-1 Transfer of public works for the Payment of Taxes Source: Peru Business and Investment Guide 2014-2015, p.62.)

Each government publishes an annual list of eligible projects. The private company who will pre-finance the project is then free to choose the executing firms, for which is no need of a public procurement process

Financing of Operative Expenses – operation and maintenance works

An important financier of such expenses is Banco de la Nación. This bank gives loans to regional and district governments mostly for the buying of machinery and equipment.

In general it can be observed that limited attention is given to the O&M phase of projects. An example is the dynamic barriers projects in Chosica for which a considerable investment is being done. After completion ANA will officially transfer them to the district government which in principle should continue giving their maintenance, but this is quite uncertain as it is not clear if the local district government has already included maintenance costs in their budget.

Financing of Studies

Financing of pre-investment studies : JICA, KfW, IADB and CAF can offer a grant to the MEF to cover these types of studies, given that the financing for the public works to be realized after, is to be acquired with them. Many regional governments seems to have relatively easy access to CAF Technical Assistance grants

Financing of River Basin Management studies and other analyses made at a larger scale than for a specific project could be financed either by:

- Technical Assistance required by ANA or the regional government to for instance the CAF or the World Bank
- ANA PE Water Resources Management Modernization Project / Proyecto de Modernización de la Gestion de los Recursos Hidricos: the first phase has been partially funded by the World Bank and the IADB, approved in 2009 and closed last December 31 of 2015. A second phase for the project is now under negotiation.

Financing of Institutional strengthening and capacity development/ training

A number of Disaster Risk Reduction projects that include capacity development are being coordinated by UNDP (EU funding), additionally for water issues are important players the USAID and the Modernization Project.

Funds available to ANA

ANA has two types of own resources:

Firstly, Water rights (Pagos por uso de Agua), for which key contributors are industrial and mining sectors. Important to notify is that if these funds are not implemented, they could be asked back by the MINAGRI

Secondly, Regional water funds (“Fondo regional de agua”) a first pilot of such funds is being carried out in Piura and 5 other river basins .

Other financing alternatives being used by ANA or other government entities at the moment are the:

- JICA – River Basins Flood Protection Project in Coastal Area of Peru, ODA loan. The objective of the Project is to mitigate vulnerability of three river basins to protect agricultural lands and rural population against floods by improving flood prevention infrastructures, thereby contributing to the sustainable and stable agricultural activities.
- Green Climate Investment Fund (GCF) – see more details above.

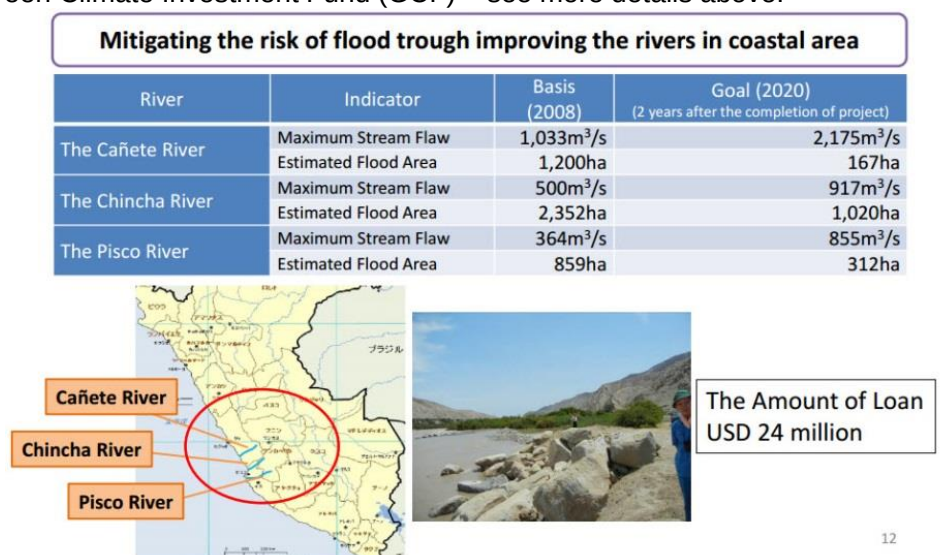


Figure 3-2 Example of mitigation of flood risk through improving rivers in coastal area (source:

http://www.mmechanisms.org/cop20_japanpavilion/files/12031000_presentation_1.pdf) More information about the project can be found at: http://www.jica.go.jp/english/our_work/evaluation/oda_loan/economic_cooperation/c8h0vm000001rdjt-att/peru_141107_02.pdf

Contingent Loans for Reaction/Rehabilitation and Reconstruction - Deferred Drawdown Option for Catastrophe risks (Cat DDO)

Given the FEN the government has negotiated a number of loans aimed at reconstruction and rehabilitation, the most important ones are negotiated with JICA and The World Bank; both under the so-called Cat DDO instrument.

A new cost efficient emergency relief instrument helps countries face natural disasters: the Development Policy Loan (DPL) with a Deferred Drawdown Option for Catastrophe risks (Cat DDO) – DPL with a Cat DDO¹³. This is a contingent loan for recovery and reconstruction. When natural disaster strikes developing countries are confronted with the urgent need to implement emergency relief processes and to reconstruct roads, hospitals, electric power supply and other crucial infrastructure facilities. This new instrument can help developing countries in this situation with a loan that provides immediate liquidity to finance these recovery and reconstruction operations. All IBRD-eligible borrowers are eligible for a Cat DDO, upon meeting pre-approval criteria.

Conditions of DPL's with a Cat DDO:

In order to draw down funds upon the occurrence of a natural disaster the borrower has to have declared a state of emergency. Disbursement occurs only after the natural disaster has taken place.

In line with the World Bank's emphasis on ex-ante disaster prevention – as opposed to ex-post disaster response – the presence of an appropriate country macroeconomic policy framework and disaster risk management program are prerequisites for making a DPL with a Cat DDO available to an eligible country. During the drawdown period, frequent monitoring by the World Bank intends to ensure and verify that the disaster risk management program is being implemented in a satisfactory manner.

The maximum amount available under a Cat DDO is 0.25% of the country's GDP or USD 500 million, whichever is smaller. This amount can be drawn down upon the occurrence of a disaster within three years from loan signing. The drawdown period can be renewed up to four times and each time for additional three years. For this instrument there are no commitment fees, so in case it is not used; there is no charge to the country.

JICA: ODA LAONS, "Stand—by Emergency Credit for Urgent Recovery (SECURE)".

¹³ [More information about Cat DDO instrument can be found at the Worldbank Official site: http://treasury.worldbank.org/bdm/pdf/Handouts_Finance/CatDDO_Product_Note.pdf](http://treasury.worldbank.org/bdm/pdf/Handouts_Finance/CatDDO_Product_Note.pdf)

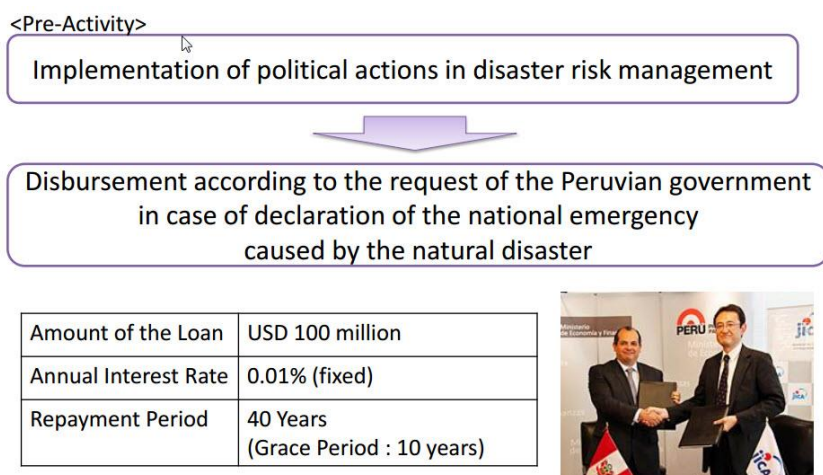


Figure 3-3 Scheme of JICA loans (Source: Toshitaka Takeuchi, presentation of JICA titled: Co-working with the Government of Peru toward mainstreaming Disaster Risk Management)

World Bank - Peru Second DPL with A Cat DDO:

Given the upcoming FEN, Peru acquired with the World Bank two Development Policy Loans (DPL), with a Draw Down Option (DDO) with Peru. Hereby the details of the first one as it appear in the World Bank website that list of Loans Peru has with the institution:

<http://www.worldbank.org/en/country/peru/projects/all>.

A second CAT DDO of 100 million was being negotiated and it was recently approved by the WB in January this year, during our visit.

PERU SECOND DPL WITH A CAT DDO

OVERVIEW

DETAILS

FINANCIALS

PROCUREMENT

RATINGS

RESULTS

MAP

DOCUMENTS

NEWS & MEDIA

Basic Information

Project ID	P149831
Status	Active
Approval Date	March 12, 2015
Closing Date	March 12, 2018
Country	Peru
Region	Latin America and Caribbean
Environmental Category	N/A

Team Leader	N/A
Borrower***	MEF MINISTRY OF FINANCE
Implementing Agency	MINISTERIO DE ECONOMIA Y FINANZAS
Total Project Cost**	US\$ 400.00 million
Commitment Amount	US\$ 400.00 million

Sectors

Central government administration	20%
General education sector	20%
Housing construction	20%
Flood protection	20%
General public administration sector	20%

Themes

Natural disaster management	100%
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Figure 3-4 Peru 2nd DPL with an ACAT DDO Source: <http://www.worldbank.org/projects/P149831/?lang=en&tab=details>

Dedicated El Niño Fund

The Peruvian ministry of Economy and Finance has established a special fund of 4.000 million soles for mitigating the risks and effects caused by the El Niño phenomenon (FEN). According to a recent declaration of Alonso Segura, the Minister of MEF (March 1, 2016)¹⁴ :

From the 4.000 million soles (equivalent to 1.142 million dollars), around 1.000 million soles have been assigned to different government departments, and they have additionally 3.000 million soles as a reserve or contingent fund.

In 2015 also 2.000 million soles (571,4 million dollars) were assigned to prevention works, of which around 90% was executed in 2015. So far, most of the government's efforts have been focused on cleaning the beds of coastal rivers, building floodwalls in vulnerable locations and making sure there is enough equipment to help in case of floods, mudslides or any other disasters.

The National government has a program on disaster risk management and emergency management to which more than 8.000 million soles (2.285 million dollars) have been assigned since the start of his government.

¹⁴ Article of Diario Las Americas, available at: http://www.diariolasamericas.com/5051_portada-america-latina/3659107_peru-tiene-un-fondo-de-1-142-millones-de-dolares-para-afrontar-los-efectos-de-el-nino.html

3.4 Location specific

3.4.1 Chosica

With the focus on developing an early warning system and installing systems of dynamic barriers (barreras dinámicas) ANA is trying to reduce the impact of the events. The image below illustrates the situation in Chosica at the moment. Damage is large and the chance of a mud and debris flows is quite significant. Chosica finds itself in the red part (unwanted situation) of the image. To get to a safer situation one can work on the likelihood of an event and on damage control. ANA is working on damage control at the moment as illustrated by the arrow.

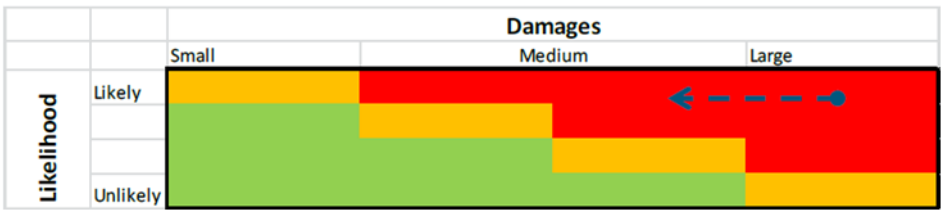


Figure 3-5 Illustration about risk management (Royal HaskoningDHV)

In the past small stone dams were constructed to reduce and slow down the discharge, this is a solution to reduce the likelihood as well. Due to a lack of time before the next El Niño it was decided to construct the dynamic barriers (barreras dinámicas). The weakest point of these meshes seems to be the anchoring as this is placed in the same, generally loose material with high risk of destabilization. The amount and depth of the anchors was however calculated and the roots of the anchors are grouted.

On the way back a part of the gully through a densely populated area was crossed (see below).



Picture 3-1 Canalized gully through the urban area in Chosica

As can be seen in the picture above the gully is completely canalized. During the visit, rocks were being cleared from the gully. From this situation it can be derived that one is focusing on fast discharge of the water to the lower parts of the village. Water with high flow velocities has more energy to transport more and bigger debris and mud.

The early warning systems being installed at the moment are based on rain gauges. The personal at emergency center explained us they are thinking to calculate thresholds based on historic precipitation causing mud and debris flows. If the amount of precipitation passes the

threshold a signal will be sent to Lima after which the signal goes to Chosica and an alarm will go off. The alarm consists of sirens at several locations in the village.



Picture 3-2 Emergency centre in Chosica

3.4.2 Río Huallaga

Currently ANA deploys a uniform protection strategy with groynes to protect the embankments. Less frequently, levee structures with protected outer slopes are also used. Frequently the choice of measures to mitigate these problems happens now without proper analysis of the system's behavior (and upstream or downstream impacts of such measures). Also measures are taken are point-wise /and are seen as isolated issues/ projects instead of choosing for an integrated or systems approach. Most measures are “hard” measures. An example of properly and wrongly used groynes is shown below.



Picture 3-3 Groynes as an effective solution against erosion (Shapaja) and in San Hilarion inflow of Sisa as wrong example

In the case of the application of the series of groynes at the inflow of the river Sisa with Huallaga is observed that most groynes are inefficient (disinvestment) and there is a prominently placed groin that dominantly influences the direction of the current. It protects effectively the specific location but most probably has negative influences on the morpho-dynamics downstream as observed in San Hilarion. The DRR-Team could analyze the impact but it was outside the scope of this mission.

The floods cause serious hinder due to the inundation of the vital infrastructure, such as roads with consecutive damages and economic losses, for example the location near the inflow of the river Mayo into the Huallaga as shown below. In this case AAA & ANA are having difficulties to

initiate and execute sustainable solutions due to the fragmentation of responsibilities (the road is the responsibility of the government at the national level) and arrangements with the currently contracted party for emergency repairs.



Picture 3-4 frequently inundated and damaged part of national road (Mayo/ Huallaga inflow)

In general, significant erosion and agricultural losses along the river (as shown below) can be observed.



Picture 3-5 Severe erosion at Puerto Rico and San Hilarion

In the city of Juanjui the DRR-Team observed a levee construction made from gabions filled with middle sized rocks to raise the current height of the river edge (approximately 0.5 m higher). It was observed, that the inhabitants of the village occasionally damage the baskets to take out the rocks for other purposes. It demonstrates low public awareness of the function or importance of the protective measures placed by ANA. Due to the increasing frequency of overflowing, ANA and the city feel the necessity to adjust the construction of the protective levee. The engineer of ANA also suggested construction of several new groynes; however the goal of such construction was not clarified to the DRR-Team.



Picture 3-6 Protective measures in Puerto Ambares/ Juanjui with in red line the inundation line

The DRR-Team also observed the presence of a culvert as a prolongation of the pluvial drainage from the village through the embankment under the levee, ending on the river side without return valves, causing direct inlet of the flood water into the village. In the above picture right the red line marks the inundation level in this part of the village.

The inhabitants meanwhile raised the mounds around the houses to protect themselves as shown below, demonstrating individual adaptation measures in absence of municipal or regional measures



Picture 3-7 High water mounds around the houses in Puerto Ambares

The authorities are working on raising public awareness with regard to flood related events (posters, information, emergency officers at the municipality level) as shown below.



Picture 3-8 Public flood awareness campaign at the municipality Juanjui

“Early” warning is now based on mobile communication between communities and based on social networks within the community.

In Bella Vista part of the community is protected by a levee with an armoring of the outer slope. There are however still places without protection causing water to enter into the community during flood situations. Locations with and without levee can be seen in the picture below. Further downstream at the suspended bridge location a bottle neck in the river is causing impoundment and higher flood risk in this area.



Picture 3-9 Bella Vista without and with flood protection and bottle neck in the river at the suspended bridge location

The engineer of the AAA discussed a plan to make a floatable drinking water source for the community directly from the river, to be treated behind the levee in an already existing facility that does not appear to be meeting current supply needs. The floatable character seems to make the facility sufficiently adaptable to the water level variations. Proposed measure will also spare the levee from perforations or other negative effects due to a structure. In the further design one should properly consider all details such as stability of the floating platform and possible effects of the anchorage to the levee. Also the reliability of the transportation tube(s) in relation to floating debris during high water levels should be considered as well as fluctuating water qualities.

During the visit AAA mentioned several unprotected wells with black water and several landfills close to the embankments that could be sources of the pollution during inundations. Protecting these sources of pollution needs to be considered.

In Bella Vista -La Libertad the DRR-Team visited a frequently inundated neighborhood. ANA has no sustainable solutions for this location yet. At this location also inundations of the agricultural area occur behind the road through the culvert shown below. It seems that the culvert is insufficient to canalize abundant water into the channel behind the road and the channel has no levees to keep the higher levels of water in the current bedding.



Picture 3-10 Bella Vista/La Libertad inundation lines visible at the houses and the culvert under the road

ANA expressed the need for advice on what structural and non-structural urgent measures can be taken regarding sustainable flood prevention, water supply protection and prevention of contamination. Respectively what restoration measures can be taken after a flood event to build a more resilient future for the vulnerable communities along the river Huallaga.

3.4.3 Río Piura/Chira

For the Río Piura different ideas exist to develop a more sustainable solution to the inundation problem, including the development of a channel to the sea and improving drainage to the lakes.

Options include improving current protection levels by dikes or compensating financial losses of the farmers. Our main observation is that the existing ideas, or alternatives, are not tested with a model to measure effectiveness. Such a model needs to include the morphological aspects of the river system, as a main problem is that the level of the riverbed is rising as a result of the sediment load.

Note that the lakes also have a social function as they provide a livelihood to poor families. It is important to consider the social aspects in evaluating alternative solutions. Contrary, it may occur that the community hinders measures that are being implemented, like recently with the creation of a drainage channel close to the lakes.

Another complementary option may be an early warning system which could help prevent or diminish losses due to floods. Currently, as is the case with the Río Huallaga, a basic system exists by which the population is warned thanks to phone calls from the upstream population.

Regarding the Poechos dam, in the upper part of the basin, an option currently being analyzed is to increment the water level of the reservoir. However this does not seem to be a viable solution as it inundates part of Ecuador; also and possibly even more relevant is that crucial base measurements of the movement of the dam are not conducted. This is a concern, considering that this means that no up-to-date knowledge is available about the safety of the dam. An integrated analysis of alternatives - to our knowledge - has not been elaborated.

3.4.4 Río Tumbes

The situation in Tumbes is very comparable to the situation in the Netherlands. In the Netherlands, we also have to find solutions to deal with floods from the sea and rivers and be able to drain our cities while the surrounding water levels are high. In the Netherlands the cities have to deal with even lower lying areas (below sea-level) but precipitation rates in Tumbes can be much higher than in the Netherlands.

'El consejo de recursos hídricos Cuenca Tumbes' the water council of the río Tumbes and ANA presented their plans for the future with regard to the río Tumbes for the DRR-Team. The water council is working in a very structured way. The various required steps are quite clearly defined and they're investing in data collection to conduct solid studies justifying future prospective measures. In general, we have observed that decisions for implementation of solutions or selection of alternatives are often based on insufficient information and minimal research. In Tumbes this is not the case. Knowledge is used and appreciated by the water council.

As is the case in many delta's worldwide, the Delta of the río Tumbes also experiences sedimentation, which is causing reduction of the discharge capacity and the river to change

course over time. We have seen dredging activities by excavators in the temporary dry river arms.



Picture 3-11 Río Tumbes dredging of upper part

The water council explained to us that they also intend to perform dredging activities in the clogged river mouth of the delta, where the river becomes very shallow. Valuable mangrove habitats can be witnessed here. As the water council does not have much knowledge about the most effective ways of dredging they are interested to discuss this further from a technical perspective with the Dutch water sector.



Picture 3-12 Delta and mangroves of the Río Tumbes

The visited area can be characterized by an economy driven by several shrimp farms along the delta and mangrove / river tourism. These economic drivers would profit from a sustainable strategy towards a healthy ecosystem and controllable water discharge in times of high water levels.

3.5 General findings

Besides the location specific, financial and institutional findings, there are various general observations on disaster risk management related to water.

Even though it was calculated for Peru that the costs of damage are 13 times higher than investing in preventive measure it seems challenging for Peru to invest sufficiently in prevention of flood related disasters. It's understandable that with an El Niño the water management issues appear higher on the political agenda, but especially in the years in between the extreme events, it is the ideal period to work on long term sustainable solutions. Implementation of sustainable preventive measures should be based on a long term vision that survives governments of different political colour. As it will mean a big investment a risk based approach: flood probability linked to the consequences of flooding expressed in terms of economic damage and potential casualties could be adopted. It will help authorities take more targeted, cost-effective measures to protect Peru from flooding.

During the mission many examples of measures, also preventive measures, have been observed. Rarely, however, the bigger picture became clear: how do the individual measures fit together and strengthen each other? Often a flood protection is as strong as the weakest link. Thinking in an integrated way and justifying the measures being taken based on data, information and solid studies is something in which should be invested. The current system does make use for example of comparison of alternatives but how differentiating are the alternatives considered and is the whole water/physical system (all relations) considered to come up with the best possible cost effective solution? For example for the Poechos Dam and the Piura river this part is missing. Just to show how far the impact of a measure in the río Chira goes the following link is interesting: <http://eltiempo.pe/?p=111615> . Assuming this relation is true in the alternatives that we have seen for the Poechos dam the beaches were never included.

Water management and planning are strongly related and many disasters can be prevented by proper planning. The current legislation in Peru with regard to the uncontrolled invasions along the vulnerable parts of the river makes it hard to keep everyone safe. We do however advise to adopt a multi-layered approach which besides emergency management and flood protection measures also focusses on addressing water management properly in spatial planning for each region.

4 RECOMMENDATIONS ON MEASURES

4.1 Introduction

Based on the DRR-Team's findings and needs identified, in this chapter our recommendations for the different locations and more generic themes are elaborated. Also, it will explain where the Netherlands could be of assistance and the priorities Peru encounter with regard to the recommendations. All together this should form a solid base for a potential future collaboration.

The chapter includes structural and non-structural measures. At this moment they have not been sub-divided in time scales as therefore further discussions with ANA are needed on priorities in time and geographically and funding and capacity available.

4.2 Institutional

The DRR-Team advises ANA (or the Peruvian authorities) to look at the current division of the tasks and roles in the perspective of the life cycle of their assets and in the perspective of the variation of the flood risk management strategies as shown in the figures below.

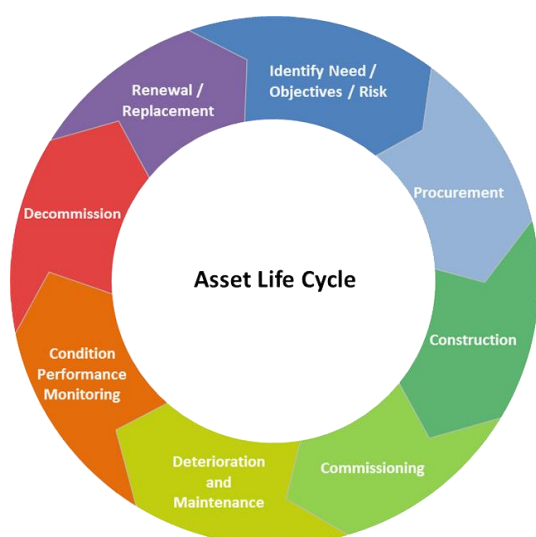


Figure 4-1 Illustration of the life cycle stages (Royal HaskoningDHV)

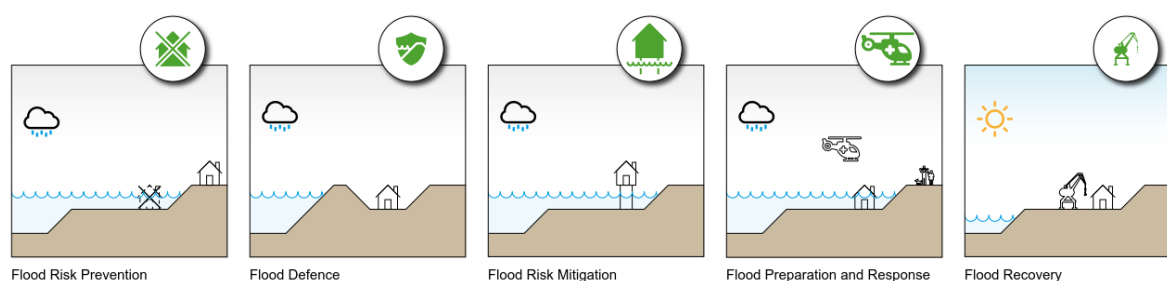


Figure 4-2 Illustration of the possible Flood Risk Management (FRM) strategies (source: Grontmij Part of Sweco)

This means that the specific tasks in the asset life cycle are assigned to actors within ANA/ ALA/ AAA, special projects or whoever owns the asset. Also ANA defines what roles and responsibilities will be taken by the organisation in every phase of the various strategies. The

choice of an adequate strategy for each location should be taken based on well-informed, transparent and objective consideration of all available options. This also means development of well-thoughtout standard procedures for the cooperation between the organisations involved. The organisation should guarantee an integrated system approach in the management of each watershed.

Another important aspect is to apply a truly integrated approach in the projects. For this is cooperation between all share- and stakeholders and good understanding of the natural and institutional system is essential. This way discussions can be based on knowledge and impact of measures/decisions will become clear. For stakeholder involvement during project preparations the following report of OECD gives appropriate suggestions:

<http://www.oecd.org/governance/oecd-principles-on-water-governance.htm>

(<http://www.oecd.org/gov/regional-policy/OECD-Principles-Water-spanish.pdf>)

As long as capacity is still being developed ANA should also try to create the opportunity to get transparent advice about project considerations. An example is the independent EIA commission of experts in the Netherlands. Such a committee can advise ANA so the ANA-guiding principles are guaranteed in every project.

4.3 Financial setting

Peru

In order to improve the Peruvian National Public Investment System (SNIP) even further in relationship to Disaster Risk Management (DRM) we make the following recommendations:

To ensure Value for Money:

- Introduce and strengthen the methodological instruments and procedures followed to make the analysis of variants or options, which is part of the procedure to build a strong Strategic Business Case of a project. These instruments would also allow a more sound process towards the prioritization of DRR-Team measures.
- Equally if the ANA as well as the regional governments, apply easy to use instruments that embody sufficient system understanding and allows them to compare the impact of alternative design and measures, they would be better equipped to analyse and reshape the unsolicited proposals offered by the private sector.
- Given the limited capacities at the regional level, we would suggest a more active role and legal base for ANA to intervene in the public investment process and support decentralized governments in their decision making process. A role that would be further-reaching than giving a Go or No Go to a project based on the granting of permits.

Equally important is to change the incentives now being experienced by the private sector in water related projects, such as hydropower generation plants. It is important to analyse the current risk allocation in PPP and concession projects and see how innovative payment mechanisms (bonuses or deductions) can incentivize these private actors to take a more active role in reducing water (flood or droughts) risks.

Last but not least it is important to think in alternative ways to speed up the project cycle taking into account the current limited capacity in decentralized governments and to a lesser extent with the ANA.

Therefore ideally instead of focussing solely on drafting master plans, one should aim at development of tools and instruments that speed up the project cycle and make sure the

“system knowledge and understanding” that is key for effective measures to be chosen is embodied in such tools. In order to speed up the process of implementation of Disaster Risk Reduction measures and the required investments a suggested approach would be:

- a process of close public and private participation where the building of a long term vision of sustainable development is facilitated (including climate risk management, Disaster Risk Reduction, wise Water management...)
- complemented by doing training on the job for the local people to adopt the instruments developed and that empower water management institutions to have an active role in Public Investment Planning and systems

All efforts focusing on having a pipeline of projects drafted (based on a sound study and comparison of alternatives) and an investment plan that takes private sector appetite into account.

4.4 Location specific

4.4.1 Chosica

We advise ANA to add a second focus on the cause in Chosica. The figure below illustrates this.

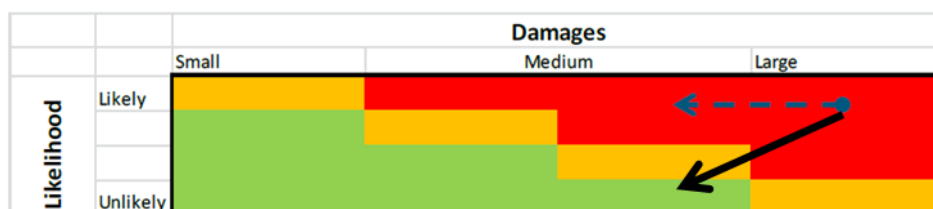


Figure 4-3 Illustration about risk management (Royal HaskoningDHV)

By focusing on the likelihood and on the impact a safer situation can be reached. The amount of precipitation is hard to reduce but one can think about reducing the speed and energy the water being discharged (delay) has and store part of the water. By doing so the peak discharge will become lower and the discharge will be spread over much time and will be reduced.

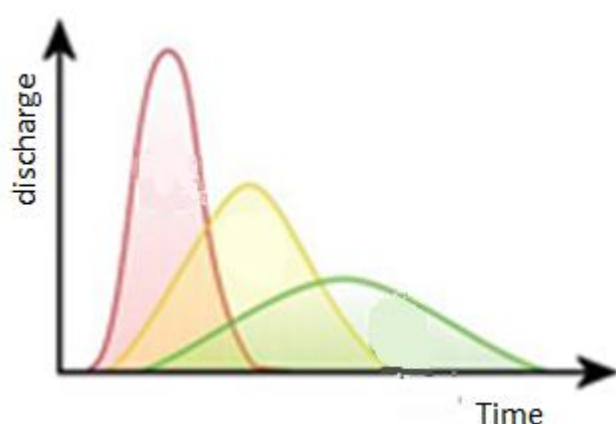


Figure 4-4 reducing and delaying discharge

In the past small dams perpendicular on the flow direction were constructed. We think it should be studied if those can be rebuilt or replaced in the best possible locations. Also it should be studied if instead of straightening the current gullies there are possibilities to design them in a way in which the speed of the water will be reduced.

We learned that Peru does not have radar images available yet to support the early warning system. Advice on correction of bias in the estimation of rainfall based on satellite data as requested therefor is a bit premature. We do however think the early warning system could be improved by building in redundancy in the monitoring (let the alarm depend on more monitoring stations) and communication (add direct connection between monitoring stations and Chosica) systems. We do think the approach of linking historic precipitation data to past mud and debris flows for establishing the thresholds in the alarm is at least for the short term a correct approach. We advise to use the data the gauges are generating as of now in the analyses as well. For the distribution of the alarms also sms text messaging or an app could be used as the density of cell phones is high. The picture below shows an example of an existing systems developed by the Dutch. Also more information for the citizens can be added as in the current situation where the sirene is taken care of warning the people.

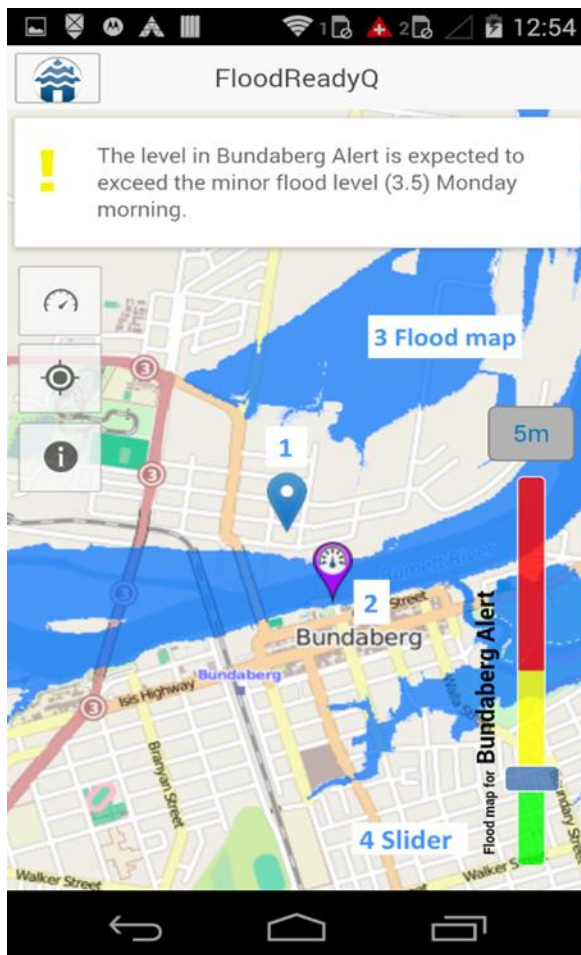


Figure 4-5 Illustration of FloodREadyQ (Royal HaskoningDHV)

With regard to unstable soils around Chosica tests are currently being conducted in the Netherlands with smart soils and bio grouts to strengthen soils. It could be interesting to see if the soils around the anchors of the dynamic barriers can be strengthened with these techniques.

4.4.2 Río Huallaga

The general and foremost improvement of the approach along the Huallaga river should be improvement of the understanding of the system with adequate monitoring of the water levels, sediment transport and currents and more detailed rainfall data. This information, after proper analysis, can be used in several sustainable strategies regarding the mitigation of floods and erosion and is:

- input for Flood Early warning systems;
- input for design and assessment of the flood protection measures such as:
 - Room for the river principles



Figure 4-6 Illustration of the Space for the river measures (source: RWS Ruimte voor de Rivier)

- levees and river training measures such as dams and groynes)

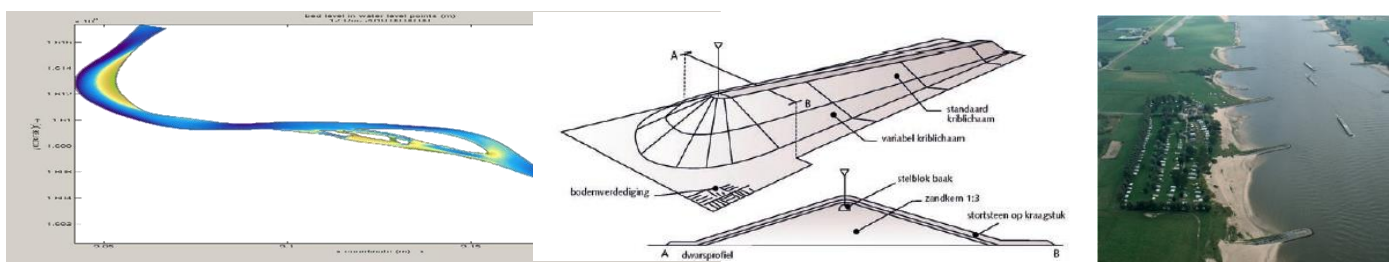


Figure 4-7 Illustration of the river modelling (Deltares) and construction of a groyne (www.helpdeskwater.nl) and river training measures (source RWS beeldbank)

With a proper understanding of the system the use of more varied and more cost effective measures is assured.

In the urban area there should be focus on limited use of hard surfaces and use of robust pluvial drainage. These measures should follow the principle of retain, store and discharge. As shown in the picture below.

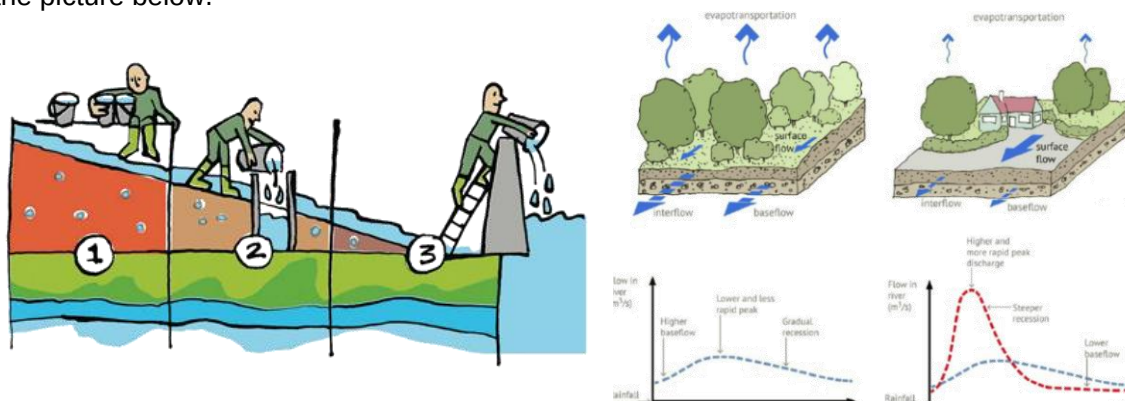


Figure 4-8 Principles of the sustainable urban water management (source: Deltares) and effects of the sustainable spatial planning

The culverts should be protected by a mesh against the trash congestion and in case of the outlet to the river we recommend to use a return valve (see below). The latest should be used with a backup system of pumps to avoid pluvial inundations.



Picture 4-1 Example of the protection against the congestion of the culvert and example of the return valves

We recommend to invest in the dissemination of knowledge to the communities regarding sustainable river management and self sufficiency in the organisation of flood protection measures. This especially regarding the better containment of sediments on the fields (erosion protection/terraces). But also regarding aspects like black waters and landfills in flood prone areas with relatively low cost solutions as for example small size remediation and sanitation of urban water as shown in the figure below.

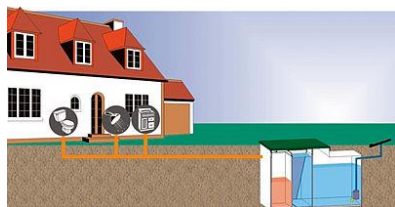


Figure 4-9 Example of a small sanitation unit

For the frequently inundated communities one can think of fast relatively sustainable measures to prevent greater damages like window/ door sized protections, or in the new developments use of the adaptive measures as shown below. The Netherlands already implemented projects with floating houses in low income countries like the Philippines.



Picture 4-2 Examples of small efficient flood protection or adaptation measures for houses

All above recommendations can be concluded in:

- a specific need for a (technical) knowledge exchange and training for the authorities (capacity building);
- Preparation of a Masterplan of the río Huallaga based on understanding of the system
- Dissemination of knowledge about the proper approach for the assessment and evaluation of the most effective flood risk mitigation measures to be implemented

4.4.3 Río Piura/Chira

Río Piura

Though it is tempting to just choose a solution and implement it, on the long term it will be much more beneficial to evaluate different alternatives based on multiple criteria as well as the participation of the local communities. The local participation will make sure that the solution fits within their reality and that its implementation will be supported. Though different plans have been evaluated we sense that they don't provide a sufficiently developed scientific basis nor a clear direction to guide policies on how the inundation problems will be resolved in the middle and long term.

In the short term we recommend the development of a forecasting and early warning system as it is a rapid and economic solution that will help to reduce the vulnerability of the population. Such a system will have a second benefit as it will promote the understanding of the hydrological and hydrodynamic system.

In the long term an integrated flood management plan ('plan integral de avenidas') is needed that will provide a sustainable solution to the flooding problems; in the Chira-Piura basins and with particular focus on the lower Piura where impacts are largest. Such a plan needs to be based on a thorough understanding of the current water system and flood risks, the effect of future scenarios including climate change and socio-economic developments, and the evaluation of possible measures. Hydrological, hydro dynamical and morphological models, as well as cost-benefit analyses, are fundamental to evaluate these aspects; only quantitative analyses will make a real comparison between alternative measures possible.

Considering the relevance of sedimentation in the lower river Piura, which already has elevated the bed level significantly, we believe it is essential to improve the monitoring of sediment loads, and analyse the sediment balance.

Local stakeholders need to have the opportunity to participate in planning processes that are relevant to them. Though the river basin committee has been a very important step (still missing in a lot of other regions) it seemed that for example stakeholders living near the lakes in the lower Piura did not participate in planning processes that have taken place, or at least their views were not considered sufficiently to get their support.

Regarding the dikes next to the river Piura it is necessary to consider technical aspects relevant for dike construction, including the dimension of the dike, height and protection against erosion. Here we observed armored outer slopes (river side) of the levee without proper toe protection. The DRR-Team advises to design levees or their improvements using the knowledge about the possible failure mechanisms and knowledge of the hydraulic loads. See for example also <http://www.leveehandbook.net/>.

Although only a short visit to the Poechos dam was made, we developed the following recommendations with regard to the dam:

- Need to develop a sediment balance assessment and possible solutions to reduce the sediment input to the reservoir. To our knowledge no actions like creating sediment traps etc. have been taken yet.
- It is absolutely necessary to recover the instruments used to observe the security of the dam; this in our opinion is a critical issue.
- Analyse the different alternatives, their implications and costs, including:
 - Flushing of the reservoir
 - Innovative dredging approaches
 - Creating alternatives for water storage, e.g. constructing new dams.
- Heightening the dam to create more storage in our opinion cannot be considered a serious option as long as no clarity exists about dam safety. Additionally, we consider it highly unlikely that Ecuador will accept the inundation of that part of its land.

4.4.4 Río Tumbes

For the situation in the city of Tumbes we advise to implement a drainage strategy based on resist, delay, store and discharge.

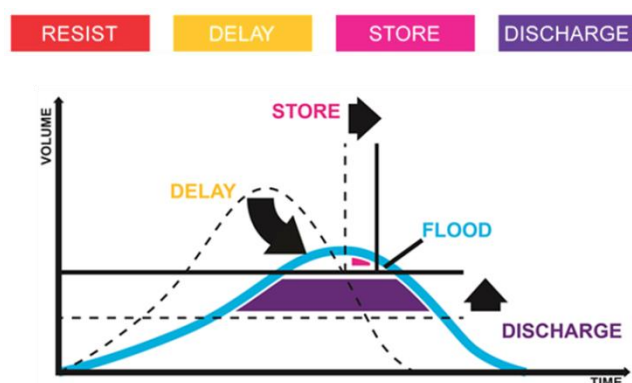


Figure 4-10 Illustration of Resist, Delay, Store and Discharge (OMA & Royal HaskoningDHV)

Resist refers to keeping the water from the rivers, delta's and sea out of the city based on a proper flood protection. After precipitation in the city itself one can slow down the discharge. By doing so the discharge will be spread over more time and peak levels in the transport system are being reduced. Also storage of water within the city is being created and the ultimate step is discharging. Currently in Tumbes from a drainage perspective one focuses on discharging precipitation as fast as possible. However in case when the water in the Delta is at a high level discharging might not always be possible (only with pumps who have a limited capacity). The figure below illustrates this strategy as well.

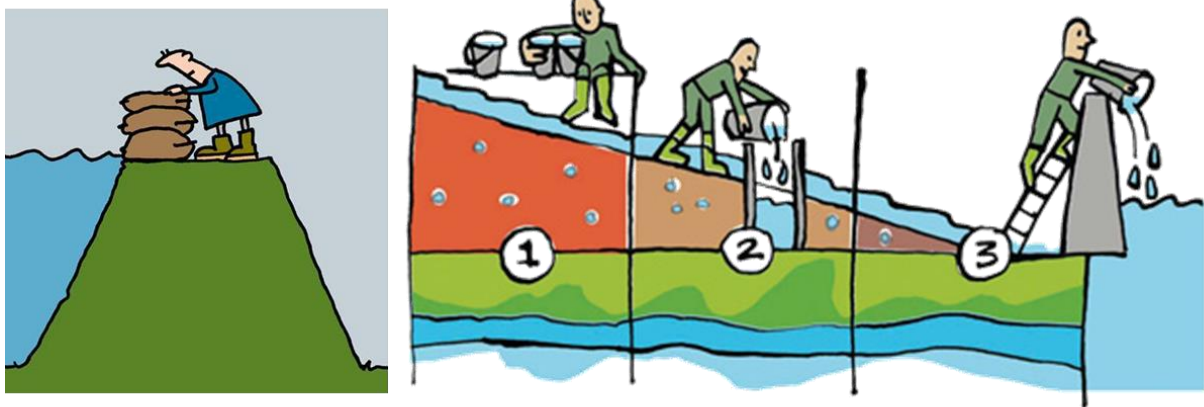


Figure 4-11 Illustration of Resist, Delay, Store and Discharge (Deltares)

There are many examples of discharge of water can be delayed and water can be stored. For Tumbes it will important to use these examples actively in their city planning. When planning ahead of time one can still easily introduce these examples. But even in already dense locations there are examples that can be applied.



Figure 4-12 Illustrations of examples to delay discharge and to store water

Besides these examples one can think about conditions: not building below a level of X^{15} m, at least X^{16} % of open space, when building in a flood plain implement compensating measures etcetera. If developing guidelines it's important to control compliance with these rules.

For the integrated flood protection plan (plan de avenidas) it's important as planned by the water council to include the different levels of protection. It's not cost-effective to protect all assets at the same level. To work cost-effectively some more attention to the opportunities, the planning process and monitoring is needed. The figure below illustrates the steps Tumbes is taking. The

¹⁵ to be established based on local context

¹⁶ to be established based on local context

steps in black are the ones usually covered well. The ones in red could get more attention. If also looking at the opportunities of flood measures sometimes different sources of money can be combined for the same purpose: one can think for example about combining infrastructure/tourism or ecology with flood protection. As discussed in 3.5 the DRR-Team is of the opinion that a wider exploration of solutions and better justification of the most effective measures could benefit Peru. The Netherlands can definitely help in this area for example based on the experience with the Room for the River program. At the moment also inspection of legislation compliance deserves significant attention.



Figure 4-13 examples of steps in the planning process with regard to flood management

For the Río Tumbes an early warning system would be a relatively cheap solution to reduce the vulnerability of the population significantly. It will be important to include Ecuador in this initiative as the upstream part of the catchment is located in Ecuador, thus this solution requires transboundary considerations. In other words, this solution, while technically feasible may encounter political obstacles.

With regard to the ideas about dredging in the Delta of the Río Tumbes we advise to explore new innovative dredging techniques and use the knowledge available in the private sector on this. There might be solutions available the water council has not considered yet. An example of an innovative technique is shown below.

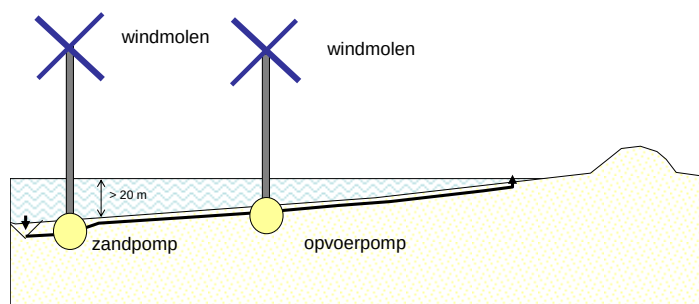


Figure 4-14 Principle of a local permanent dredging technique with windmills (source: Grontmij part of Sweco)

Also for these type of measures we advise to dredge based on knowledge of the natural system. Make sure to understand the system from a morphological perspective before investing significant amounts of money in implementation. At this moment the behavior of the delta and the morphological processes are not fully understood. This could lead to investments in sub-optimal solutions.

4.5 General recommendations

Besides the location specific, financial and institutional findings we also have some general recommendations on disaster risk management related to water.

Both Peru and Ecuador expressed interest in cross border collaboration. Especially on the items related to early warning and sediment management we encourage both countries to start a dialogue soon as well as on integrated water resource management of cross border watersheds in general.

We encourage Peru to start developing a long term vision with regard to water management that survives governments of different political colour. In the end a lot of money can be saved by a more proactive preventive strategy. It should be a risk-based approach: flood probability linked to the consequences of flooding expressed in terms of economic damage and potential casualties. It will help authorities take more targeted, cost-effective measures to protect Peru from flooding.

In the new vision, we advise to adopt a multi-layered approach which besides emergency management and flood protection measures also focuses on addressing water management properly in area planning. Water management can't be seen separately from other sectors. This might be complicated to implement but in the end through the synergies that will be found all sectors will benefit from integrated planning.

4.6 Priorities Peru for Dutch technical assistance

In Peru the team visited several locations in a short time frame and the total amount of recommendations is quite extensive. It will be difficult to start a collaboration with a focus on all these items. Therefor it was discussed at the final meeting of the mission to arrange an extra meeting between the embassy and ANA to prioritize the recommendation based on where ANA would like to get Dutch technical assistance. The results of this exercise are listed below.

Chosica

- Study the options of using radar for the early warning systems to arrange more time for evacuations;
- Assistance in the establishing of thresholds, identifying the amount of precipitation at different scales causing mud and debris flows.

Río Huallaga

- Helping with river training to keep the river at its place and create possibilities for navigation in combination with erosion control (appropriate engineering of groynes);
- Integrated evaluation of measures and risks when implemented (including costs, benefits and institutional aspects);

- Transparent evaluation of hard structures in the rivers
- Transparent evaluation of measures with regard to stability and sustainability
- Implementation of an early warning system
- Investments in sustainable measures to improve urban drainage
- Increasing knowledge about room for the river applications
- Protection of foundations

Río Piura

- Implementation of an early warning system
- An integrated flood protection plan for the watershed of Chira-Piura, especially for the lower Piura area, based on modelling (hydro dynamical and morphological) with a solid profound alternative comparison including cost-benefit
- Monitoring and an analyses of the sediments and origin of sediments
- Levee engineering

Río Tumbes

- Integration of water in urban planning
- Implementation of an early warning system (together with Ecuador)
- Analyses of the options for effective dredging in the delta based on understanding of the system (knowledge)

4.7 Added value of Dutch expertise

Based on the recommendations, priorities of ANA and strengths of the Dutch water sector we come to the following concrete set of suggestions on which the Dutch water expertise may be helpful to Peru

4.7.1 Suggestions on Added value of Dutch expertise

Chosica

1. Assistance by capacity building through an interactive approach (for example review role/ workshops) on the set up of the early warning system with a focus on thresholds. Additionally capacity building on the use of radar can be given, but at the moment Peru does not have radar images available to use for the area of Chosica.

Río Huallaga

2. For the río Huallaga there are many different questions about several river and flood related items. We think it's important to increase the understanding of these items and propose a focus on capacity building in data collection and analyses, river engineering, integrated water resources management and urban water. Local concrete issues can be built in in the course.
 - Combining capacity training with pilot projects is to be recommended to make the training less theoretical and people see immediate benefits. For example with regard to data collection we advise to combine this with the installation of equipment and using and analyzing the data.

3. Additionally we recommend the development of an integrated flood and river management plan. The process to come to this plan can be used for training as well.
4. Set up of an early warning system. This can be done from the conceptual set up until implementation, including training.

Río Piura

5. Set up of an early warning system. This can be done from the conceptual set up until implementation, including training.
6. A bit similar to the río Huallaga there are many different questions about several river and flood related items. A training would however have a bit different focus, more on alternative development (larger scale and integrated) and justification of the most effective measures. This can be combined very well with the joined development of a flood protection plan (training on the job).
7. Additional specific items for capacity building are the set up of a monitoring system and dike engineering

Chira/ Poechos dam

8. Specific for the situation with the Poechos reservoir the Netherlands can help in alternative development and analyses (wider and more in depth than currently being conducted) to recover the capacity of the reservoir including dredging techniques and reduction of inflow of sediments
9. The recovery of the measuring instruments and safety analyses of the dam would not be a typically Dutch expertise considering that it is a concrete dam, but there are a few experts who could assist on this.

Chira/Piura

10. Private sector participation in the development of river front developments including flood protection. During the meeting with DSM they expressed interest in 'obras por impuestos'. They would like to see their tax money better spend and see the 'obras por impuestos' arrangement as a potential tool to do so. The regional authorities mentioned they were interested to talk about river front regeneration as a potential 'obras por impuestos' project. River front regeneration is not on the SNIP list yet but this is something that could be further explored together with DMS and the regional authorities.

Río Tumbes

11. For Tumbes ideally an urban water plan would be developed together with the municipality and the water council including training on urban water and planning
12. Set up of an early warning system. This can be done from the conceptual set up until implementation, including training.
13. The experiences with different dredging techniques are limited in Peru therefore assistance on effective (knowledge based) dredging options in the Tumbes delta would be appreciated. This can be in the form of a study.
14. Development of alternatives for flood protection was not mentioned as a priority by ANA but it was mentioned by the local water council as a clear need. The Dutch could assist on this matter for example through workshops during the planning process while plans are being developed. Also technical justification of measures by modelling studies is something on which NL can assist.

Financial/ Institutional

15. Dutch expertise may be helpful in strengthening the Peruvian SNIP guidelines to ensure value for money in Disaster Risk Reduction measures by operationalizing the option framework in the case studies of Tumbes, Piura, Huallaga etc. The options framework is a systematic framework for the development and assessment of options. The options framework provides a simple and straightforward approach to the identification and assessment of a broad range of relevant options - the long list. It has been tested thoroughly in a wide range of public sector schemes and proven to be particularly useful in getting senior management signed-up and committed to the preferred – or indicative – way forward early on in the investment planning process. This approach has also proven to raise the quality of spending proposals, both in terms of their scoping and delivery and public value, as a result of the more effective comparison of alternative options for the achievement of objectives.

In general the DRR-Team feels an effort is needed on technical capacity building. This should be focused on the technical evaluation and justification of measures and alternatives to ensure effective investments. Besides the option framework, training based on case studies (see recommendations 3, 6, 8, 13) and training on modelling is recommended. If Peru feels comfortable with the Dutch experts a joint commission of experts could be formed for the review of complicated integrated plans.

16. G2G knowledge exchange on ongoing discussion about the budget program 068 (disaster emergency vulnerability reduction and response) on whether a minimum investment or annual implementation goal of this budgetary item needs to be set and how this should be established.
17. G2G knowledge exchange on distribution of roles, responsibilities and tasks related to Disaster Risk Reduction and water.

4.7.2 Suggestions for finance

We suggest ANA to investigate further if capacity development activities above, especially number 1,2,6,7 and 15 can be financed through the new 'Proyecto de modernización fase 2', now being negotiated. Given the focus of these activities in the Huallaga and Piura River basins – both pilot projects in the Proyecto de Modernización fase 1- and their contribution towards the strengthening of the national capacity in Integrated Water Resources Management these activities seem to match the project scope. Another option would be to let these capacity development activities become part of a larger project. Also for the financing of an IWRM Plan for Rio Huallaga the Proyecto de Modernización fase 2 seems a logic option.

For the other capacity development activities suggested such as number 15 which involve the development of new evaluation instruments and the strengthening of the national public investments system (SNIP) ANA could engage in cooperation with the MEF (DGIP department) and request together a CAF Technical assistance grant, or research the possibility of including these projects as part of the cooperation agreement with the 2030 Water Resources Group. Last but not least, measures 16 and 17 that involve a government to government exchange of knowledge may be structured using the Dutch Embassy and-or the Cooperation Program of the Dutch Regional Authorities.

As the set up and implementation of early warning (1, 4, 5, 12) is an item that comes back at many locations in Peru we propose to combine these effort. The fact that early warning in Peru is centralized in Lima at the moment also makes it possible to work on a combined approach. It is

urgent to research with the MINAGRI (Dirección de Gestión de Riesgo y Diálogo) the possibility of Financing the Implementation of early warning systems out of the remaining funds of the El Niño Dedicated Fund (around 50 million dollars from the 571.4 million dollars dedicated to prevention in 2015 could still be available) or with the Cat DDO's negotiated by Peru with the JICA and the World Bank.

For other measures that are more closely linked to significant public investments for prevention as well as productive activities, such as measure 8 and 9 related to the Poechos Dam, or measure 11 and 14 for Tumbes; the possibility of a Technical Assistance Grant from the CAF to do the necessary studies and a Loan from the same institution to finance the public works should be researched. This should be done once the support for such measures is expressed by the regional government and in close cooperation with them as they are the ones who can request such TA's. ANA could play a catalyzer role by helping the regional government to draft the strategic case for the required TA.

Last but not least there are two measures that seems ideal to incentivize a more active role of the private sector, number 10 and number 13.

The first one is number 10, river front development including flood protection measures in Rio Piura; for which DSM already expressed interest to cooperate. A logic instrument would be the so-called Obras por Impuestos.

The second one is number 13 which involves dredging works in the Rio Tumbes. After a process of knowledge exchange between technology providers and regional government where the government acquires an up-to-date overview of what is technically possible and most efficient, the most logical next step would be for the government to start a tendering procedure. Following the application of a Public-Private Comparator analysis, the government could decide if to tender the works traditionally or making use of an APP scheme. In the first case the government would tender for the acquisition of machinery, while in the second for the provision of dredging services for an X number of years.

Accordingly in the traditional model, the government could finance the machinery with a loan of the Banco de la Nación and use its own personnel to do the continuous dredging. In the APP modality the private sector could arrange the finance.

The possibility of shrimp farms and touristic sector to fund or co-fund these capital investments and continuous dredging costs should be researched. Again, depending whether a traditional or APP model is used this cofunding would take a different shape, either through additional taxes and-or flood protection fees to users.

ANNEX A – DRR-TEAM

Dutch Risk Reduction Team: reducing the risk of water related disasters

Many countries around the world face severe water threats. Often, these countries are in urgent need of expert advice on how to prevent a disaster or how to recover from a calamity. For instance, when a country has been struck by severe flooding and the first emergency relief workers have gone, the need for advice on how to build a sustainable and safer water future arises. To meet these needs with a swift response, the Dutch government has initiated the Dutch Risk Reduction Team (DRR-Team). This team of experts advises governments on how to resolve urgent water issues related to flood risks, water pollution and water supply, to prevent disasters or to rebuild after water related disasters. With climate change and a fast growing world population, water issues are becoming more urgent. As a country renowned for its' expertise on water and delta management, the Netherlands feels a responsibility to share its' knowledge worldwide. That is just what the DRR-Team does; sharing expertise with governments to come up with the best possible approach/solutions for tackling urgent water issues. Because of the unique cooperation between government and sector, the best experts can be fielded quickly. The Dutch government offers a specific number of advisory missions each year.

Advice for all water issues

The Netherlands has brought its best water experts together in the Dutch Risk Reduction Team. It consists of high level advisors supported by a broad base of technical experts who can provide top quality and tailor made expertise to governments that are confronted with severe and urgent water challenges. The Dutch are experts in adapting to water in a changing world; from delta management to water technology, from urban planning to governance, public private partnerships and financial engineering.

How does the DRR-Team work?

Governments that have to deal with an urgent water issue are encouraged to contact the Dutch embassy in their region. The embassy will liaise quickly with the Dutch government. Interventions will only take place after a request from a central government has been received by the Dutch government, and after a recent calamity or to prevent a threatening disaster. The DRR-Team does not focus on emergency relief, but on sustainable solutions. If the decision to respond to the request is made, relevant Dutch experts will be rapidly fielded to the area that is under pressure. Together with the government and local experts, the situation will be assessed and analysed after which the team will come up with a set of recommendations. For example advice on technical interventions including immediate measures and long term sustainable solutions, advice on governance and advice on financing options. The DRR-Team enables a foreign government to take action on the basis of sound advice and expertise.

ANNEX B – TEAM MEMBERS

For the Disaster Risk Reduction scoping mission the following experts went to Peru/Ecuador

Rutger Perdon: Team Leader and expert in Integrated Water Resource Management, currently involved in South America in several projects and as Business Development Director for Water for Royal HaskoningDHV

Mónica Altamirano: Finance expert for Deltares, specialist in Public-Private Partnerships working in a variety of projects in the Latin American region and around the world, whereby her focus is on the development of innovative project delivery and finance arrangements that accelerate the implementation of climate adaptation measures while ensuring its long term sustainability. Examples of such projects are the Colombian Coastal Master Plan, as well as her work in Bangladesh on developing a business case for the use of Satellite Data services for Climate Risk Management in the Agriculture Sector –including services to the financial and insurance sectors- and the drafting of an implementation vision for an improved Flood Early Warning System at the community level. Last but not least the on-going work on Water Stewardship in Action for Integrated Water Resource Management that aims at improved corporate water reporting and solid scientific understanding to develop comprehensive responses for corporates located within a watershed to adapt to climate induced water risk.

Jana Steenberg – Kajabova is senior engineering with Grontmij The Netherlands. She conducted various (primary and regional) levee assessments and levee design projects (all over the country), often as an integrated plan in combination with urban or rural development, habitat or leisure. For example design of Venlo waterfront including flood defenses in combination with solving issues of the rising groundwater due to the urban developments. Design and preparation of the plan up to the realization phase of the water retaining area for Rijnland and Delfland Water board Nieuwe Driemanspolder with levee, bridges, habitat development, recreational area and several sluices, weirs and culverts). She worked at 4 Measures in Nederrijn within Room for the River national program in role of the project director and expert on flood management and hydraulic engineering. Also as technical project leader for plan phase (EIA) of the study within the Room for the River Program - Bypass Veesen Wapenveld, senior specialist for embankment/levee and water retaining structures, flood risk safety Eiland van Dordrecht, the plan preparation and design of several km of the levee strengthening measures, including the (non) water retaining structures in the levees, habitat compensation, embankment protection, EIA and in the later stage design for preparation of realization in consortium with a contractor. She joined previously Disaster Risk Reduction missions to Uruguay and Panama with severe inundation issues and issues related to the flood risk strategies.

Otto de Keizer is coordinator Latin America for Deltares, The Netherlands, and based in Quito Ecuador. He is a hydrologist with specializations in eco-hydrology and Integrated Water Resources Management from the University of Wageningen. Currently his activities focus on flood risk management, early warning systems and Integrated Water Resources Management. His versatile knowledge on water management strengthens his capacity to contribute with innovative ideas to water management considering local culture and approaches. As he lived for more than about 10 years in Latin America, he is familiar with its culture and speaks and writes Spanish fluently. During his time in Latin America he established a regional water program for IUCN South America and has been advising national governments as well as the CAN on water and environment related issues,

including the National IWRM plans of Colombia and Peru. For Deltares he has been coordinating projects related to flood forecasting and river basin modelling in Uruguay, Argentina, Bolivia and Colombia. Also he has been active as researcher in climate change and adaptation projects for the international Meuse and Rhine basins in Europe.

ANNEX C – TERMS OF REFERENCE

ANNEX D – MISSION PROGRAMME

The agenda of the mission was as follows:

DAY	ACTIVITY	LOCATION	PARTICIPANTS
Sunday 17-1	Arrival and debrief with Embassy	Hotel	Embassy, DRR-Team
Monday 18-1	Briefing with ANA	Lima/ ANA	ANA, Embassy, DRR-Team
	Visit Chosica	Chosica	ANA, Embassy, DRR-Team
Tuesday/Wednesday 19/20-1	Visit Río Huallaga	Several locations see paragraph 1.3	ANA, AAA, Embassy, DRR-Team
Thursday/Friday 21/22-1	Visit Río Piura/Chira	Several locations see paragraph 1.3	ANA, Embassy, DRR-Team
Saturday 23-1	Visit Río Tumbes	Tumbes	ANA, AAA, Consejo de Recursos Hidricos, Embassy, DRR-Team
Sunday 24-1	Preparing presentations for symposiums and feedback session with ANA Debrief with Ministry of Risk	Arenillas	DRR-Team Representative Ministry of Risk, Embassy, DRR-Team
Monday 25-1	Visit Río Zarumilla: Chacras/ Huaquillas/ Santa Rosa and Jambeli	Several locations see paragraph 1.3	Representative Ministry of Risk, Embassy, DRR-Team
Tuesday 26-1	Meetings with the Governor, Prefectura and the Municipality and site visits	Guayaquil	Prefectura, Municipality, Governor, Embassy, DRR-Team
Wednesday 27-1	Symposium Guayaquil	Guayaquil	Broad audience

Thursday 28-1	Feedback session with ANA Symposium Lima	Lima/ ANA	ANA, Embassy, DRR-Team Broad audience
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People interviewed by the financial expert:

SNIP y Gestión de Riesgos

1. Jesús Ruiton – Director de Proyectos de Inversión Pública, MEF-DGIP
2. Adhemir Ramirez – Sectorista DRR, MEF-DGIP
3. Jorge Valverde – Especialista en Inversiones, ProInversion
4. Berta Roncal- Asesora Tecnica, Pro Inversión
5. Javier Vasques Campos- Estructuración Financiera, Pro Inversión
6. Julio Flucker – Secretario de Gestion del Riesgo de Desastres, PMC
7. Ernesto Ormeño- Director – Dirección de Gestión del Riesgo y del Diálogo, MINAGRI

Bancos Nacionales e Internacionales

8. Oliver Braedt, Program Leader Infra and DRR, Bolivia, Chile, Ecuador, Perú and Venezuela, Banco Mundial
9. Jhan S. Blas Saenz, Gerente de Riesgos, Banco de la Nación
10. Sr. Riga, CAF

APP's y Obras por Impuestos

11. Luciano Leite, Director General, Queiroz Galvao – pate de RECIFE consortium (Huallaga)
12. Jorge Carrazco, Director, DSM

ANA, Gobiernos Regionales y Municipales

13. Tomas Alfaro, Director de Estudios, ANA
14. Rosa I. Oquelis, Unidad Formuladora, Gobierno Regional de Piura
15. Fausto Diaz, Secretario Técnico, CRH, Piura
16. Nestor Fuentes, Secretario Tecnico, CRH, Tumbes
17. Desiderio Atoche, Proyecto Especial Tumbes-??

Asistencia Técnica y Donantes

- 18.** Dirk ten Brink y colegas, Biodiversity and Climate Adaptation specialists, USAID
- 19.** Edo Stork , Representante Residente Adjunto, Massimiliano Tozzi, Asesor DRR, Ana Maria Rebeza – OCHA, PNUD

PROGRAM MÓNICA ALTAMIRANO (SUPPORTED BY CORALIE GAGNARD)

Fecha	Hora	Programa	Dirección
Martes 19/01	09:00 horas	Check out hotel Hilton	Av. La Paz 1099 – Miraflores
	09:30 horas	Chofer de Manchego tours espera en hotel Hilton	
	10:30 – 11:30	Sr. Jesús Ruiton Director de Proyectos de Inversión Pública Dirección General de Inversión Pública (DGIP)	Ministerio de Economía y Finanzas Jr. Lampa 277 Edificio Universal - Piso 7
	11:45 – 12:30	Julio Pflucker Yépez Secretario de Gestión del Riesgo de Desastres	Presidencia de Ministros Jr. Cuzco 121, piso 6
	12:30 – 13:15	Lunch	
	14:00 – 15:00	USAID Dirk ten Brink	Av. La Encalada cdra. 17 Monterrico
	15:45 – 16:30	Proinversión Sr. Jorge Valverde Asesor de la Dirección servicios al inversionista	Calle Manuel Gonzales Olechea s/n Edificio Petro Perú, piso 9 San Isidro
	16:45 – 17:30		
Fecha	Hora	Programa	Dirección
Miércoles 20/01	08:00 – 08:30	Transporte del hotel Four Points al Banco Mundial	
	08:30 – 09:30	Sr. Braedt Gerente del Programa de Desarrollo Sostenible para Bolivia, Chile, Ecuador, Perú y Venezuela Banco Mundial	Av. Álvarez Calderón 185 San Isidro
	10.00 – 11.00	Sr. Jhan Blas Gerente Area de Riesgos	Av. República de Panamá 3664, piso 14

		Banco de la Nación	San Isidro
	11:15 – 12:15	Sr. Luciano Leite Gerente General RECIFE (Construtora Queiroz Galvao S.A.)	Av. Rivera Navarrete 501, int. 502 (esquina Rivera Navarrete con Amador Merino) San Isidro
	12:30 – 13:30	Lunch	
	14:00 – 14:15 tbc	CAF Eleonora Silva Pardo	Av. Enrique Canaval y Moreyra 380 Edificio Torre Siglo XXI, piso 9 San Isidro
	14:30 – 15:00	Telefonische afspraak Gabriel Monge Aguirre (TISUR) T.b.c.	
	15:15 – 16:00	Transporte a Ministerio de Agricultura	
	16:00 – 17:00	Sr. Hugo Ormeño Jefe de Dirección General de Riesgos Ministerio de Agricultura y Riego	Ministerio de Agricultura Jr. Yauyos 258, piso 7 (viniendo por Salaverry, Campo Marte, cambia nombre a Washington, primera cdra. A la izquierda).
	17:30 – 18:00	Edo Stork (PNUD)	Av. Pérez Araníbar 750 Magdalena

ANNEX E – LITERATURE

Chosica:

- Barreras Dinámicas en quebradas. Doc. de ANA, 8-1-2016
- Mapas de Peligros y plan de usos del suelo y medidas de mitigación ante desastres de la ciudad de Chosica, informe de Municipalidad de Lurigancho Chosica y INDECI, Proyecto INDECI –PNUD PER/ 02/051 Ciudades Sostenibles, mayo 2005

Río Huallaga:

- Situación de Recursos Hídricos en la cuenca Huallaga
- Informe Final con 7 anexos, ANA, Noviembre 2015
- Resumen Ejecutivo Huallaga, doc. De ANA Enero 2016

Río Piura/Chira:

- Plan de Gestión de los Recursos Hídricos de la Cuenca Chira-Piura, septiembre 2013

Río Tumbes:

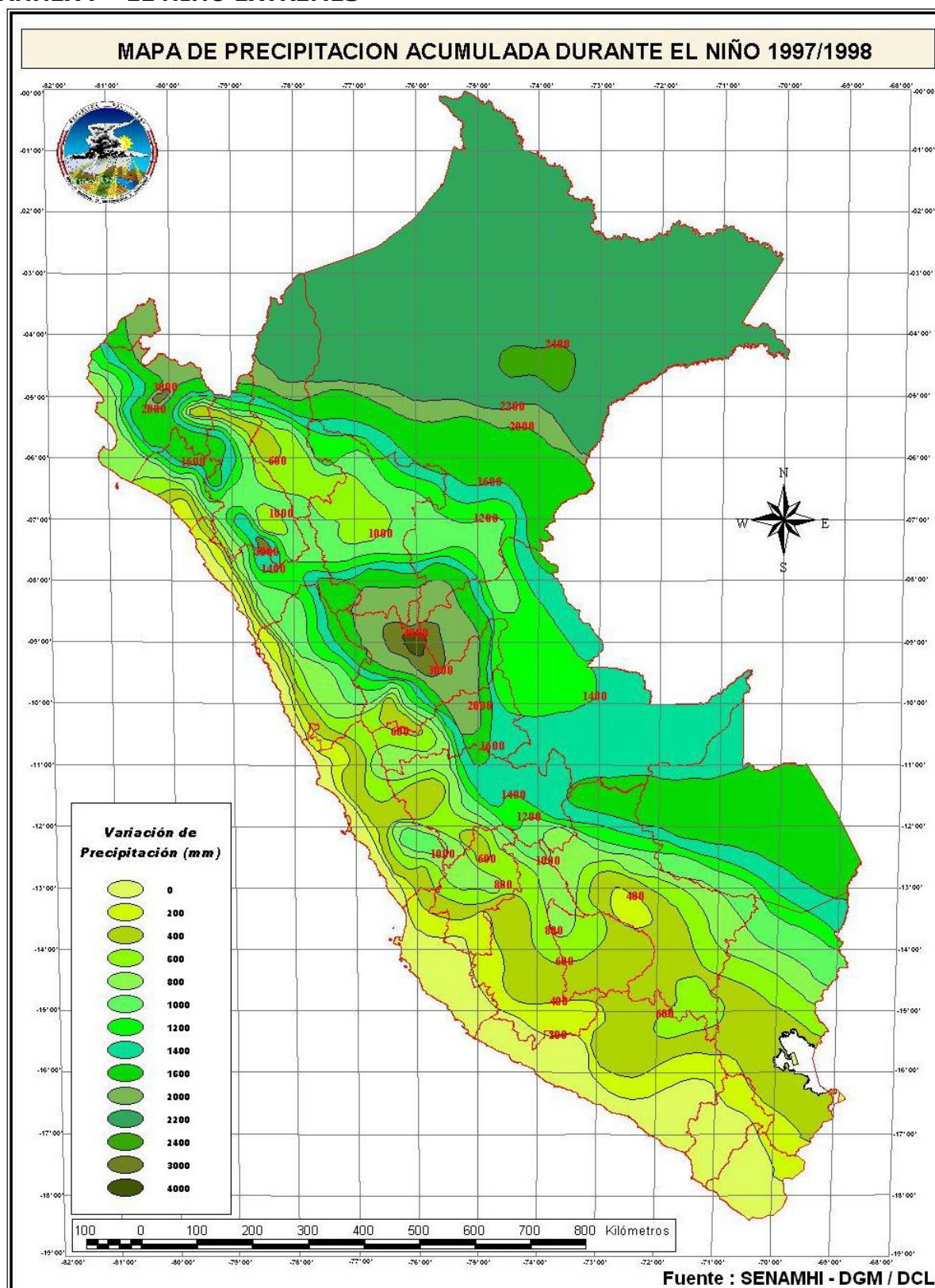
Presentaciones:

- “RIESGOS DE INUNDACIÓN EN LA CUENCA BAJA DE LOS RÍOS CHIRA, PIURA Y TUMBES”, Secretaría Técnica CRHC Tumbes;
- Mapas de riesgos
- Fenómeno el niño

Otros

- Mapas de la cuenca y las estaciones de mediciones
- Resumen de actividades
- PROGRAMA INTEGRAL DE CONTROL DE AVENIDAS EN CUENCA TUMBES Cronograma de Actividades
- Informe preliminar: MODELAMIENTO HIDRÁULICO DEL RIO TUMBES, USANDO HEC-RAS

ANNEX F - EL NIÑO EXTREMES



ANNEX G DETAILED APPROACH FINANCIAL EXPERT

In this mission an additional team member was required, to cover the additional objective of looking into financial engineering of the measures that were identified during the scoping mission. The approach applied to achieve this objective is explained below.

In order to identify the possibilities for financing and implementation of the measures proposed it is key to understand the financing options (e.g. funds available) and instruments, as well as and rules of the game in the public and the private financing spheres. Additionally given the climate adaptation natures of the measures it is important to understand the local relevance of climate finance dedicated funds. The following table shows the key elements that were researched – mainly via interviews- within 3 main pillars:

1. Public Finance
2. Private Finance
3. Climate Finance

In the table below the elements of important within each pillar are introduced, as well as their relationship with the financing of DRR measures and the key institutions that were interviewed. Based on the information gathered through the interviews findings and needs per pillar have been drafted and recommendations are made on how to implement and finance the DRR measures proposed.

Pillar	Element	Relationship to the financing DRR measures	Institutions Peru
Public Finance/ National Public Investment System (SNIP)	General SNIP procedures	Set the rules of the game on how project and project phases are financed. Who has to take the initiative, who has to endorse it and which funds and/or loans can be accessed by different actors. The system quality and transparency are good indicators for the private sector on how safe is to invest and/or participate in national tenders and projects.	Ministry of Economy and Finance (MEF) Pro-Inversion (Investments Specialist) Regional governments PProject Formulation Units (e.g. Piura) IFI's: - Banco Mundial/ World Bank Regional Banks: - Caja Andina de Fomento(CAF) Local Banks: - Banco de la Nación
	Disaster Risk Management aspects – within SNIP	How risks are managed along the project cycle of infrastructure investments (where water management is relevant) and how these risks are shared with the private sector give an indication of A) which sector – public or private- is responsible for managing these risks and therefore willing to invest in DRR measures. B) Gaps within the investment system that need to solved with DRR and system understanding expertise. Besides, the distribution of DRR responsibilities between government layers and their budgeting gives an indication of the financial feasibility (and steps towards implementation) of DRR measures.	Ministry of Economy and Finance – MEF-DGIP / - General Direction of Public Investment - DRR Specialist Ministry of Agriculture: Direction Risk Management and Dialogue Banco de la Nación
	ODA/ Development	Important to identify additional sources of funds and/or strategic partners to implement and finance the proposed	USAID UNDP

	Cooperation and Technical assistance	initiatives.	
	Disaster Risk Financing Pillar of DRR	A country with an otherwise robust disaster risk management program can still be highly exposed to budgetary shocks caused by major disasters. Disaster risk financing and insurance helps ensure that governments, businesses, and people are financially protected in the event of a disaster. Knowing the options in a country gives information on the possible funds that become available after a disaster, as well as on the incentives of different actors to prevent such risks and therefore their insurance risk premiums. A number of Dutch solutions and information services are of high potential when used in combination with insurance services (e.g. Flood Index Based insurances that make use of models as well as remote sensing data to reduce time and cost of processing of claims):	Ministry of Agriculture – in charge of the Agricultural Catastrophe Insurance (SAC)
Private Finance	PPP and private initiative modalities – Private financing of Infrastructure	Understanding of these modalities and how financing and funding for each of them is arranged completes the overview of public financing options. PPP's and private initiatives are an increasingly used option by countries within their national strategies for infrastructure Investments. The structural measures the DRR-TeamDRR-Team proposed fall within or are comparable to infrastructure investments.	ProInversion (PPP unit Peru) Regional Banks: - Caja Andina de Fomento(CAF) Local Banks: - Banco de la Nación - BNP Paribas
	Capital Markets & Project Finance	While PPP modalities give the overview of the ways a government is open to private financing and the attractiveness of these modalities to the private sector, capital markets and their depth determine if private parties are able or not to access the loans they need to (pre)finance such projects.	Large project developers: - Queiroz Galvao (4 temporal concessions in Río Huallaga)
Climate Finance and Innovative Finance	Climate Funds – for Climate adaptation projects	Climate Finance is the term given to a new set of funds and financing instruments set in place by the international community to speed up the process of implementation of climate adaptation and climate mitigation actions. Example are concessional loans, trust funds, guarantees and other instruments that improve the financial viability of projects and/or de-risk particular project phases. These funds can be accessed by public but also by private actors.	Peruvian Trust fund for National Parks and Protected Areas (PROFONANPE) – administering the GCF IFI's: - Banco Mundial/ World Bank -

ANNEX H PERUVIAN NATIONAL PUBLIC INVESTMENT SYSTEM (SNIP)

Peru has one of the most advanced general frameworks for of public investment (SNIP's) in the region, leading the way in issues such as Risk Management and offering large room to the private sector for their own initiatives.

A short summary of how the system works is presented here:

Public Investment Projects (PIPs) in Peru are part of the principles, processes, methodologies and standards established by the National Public Investment System (SNIP), an administrative system created in 2000.

The SNIP defines PIPs as “any time-bound intervention fully or partially using public resources to create, expand, improve or recover an institution's capacity to produce or supply goods and services, and whose benefits are generated during the lifetime of the project and are separate from those of other projects.” Every PIP must be a solution to a problem related to the purpose of an entity and its powers; interventions linked to the operation and maintenance costs should not be considered as PIPs; or asset replacements that occur within interventions scheduled for a viable PIP and are associated with the operation of physical facilities for the operation of the entity, or that do not involve an expansion of the productive capacity of services.

Project cycle

The system presents a 'project cycle' comprising three phases: pre-investment, investment and post-investment. Different aspects of the project are developed in each of these phases, as detailed in Figure 1 below. As shown, these phases are sequential; for example, the beginning of the investment phase requires the issuance of a feasibility report for the last study approved in the pre-investment phase. Similarly, the lessons learned and recommendations from the post-investment phase inform new study proposals for the pre-investment phase and, in general, the administration and performance of the investment (MEF and JICA, 2012)

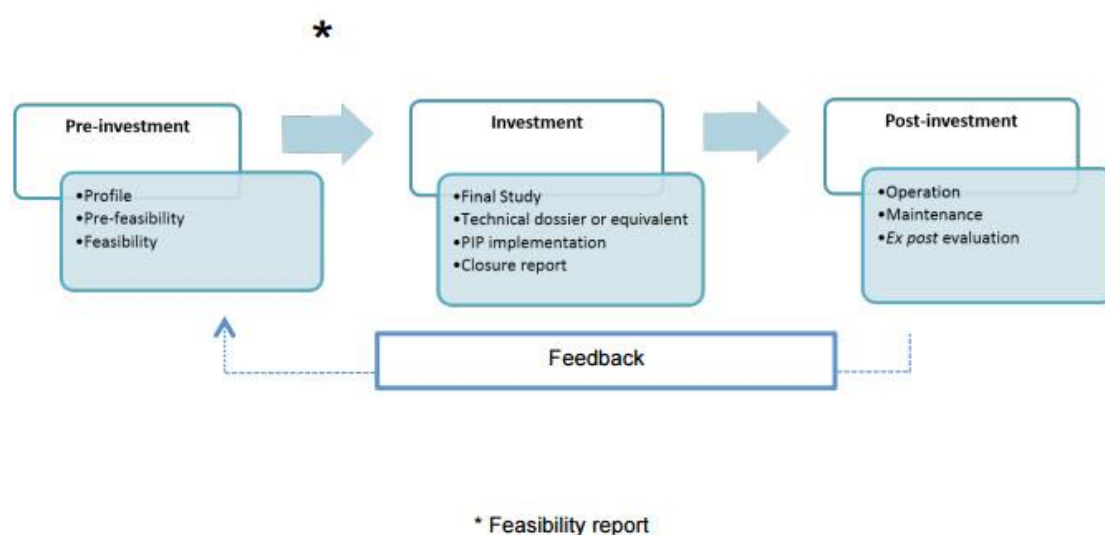


Figure: Phases of the project cycle in SNIP. Source: Directive General del SNIP, 2011, figure presented originally in UNISDR study 2015, p. 9.

SNIP rules and procedures

The image below shows how SNIP is organized. The main functions and rules are the following: The MEF is governing body of the SNIP, through the General Direction for Multiyear Programming (DGP). The system is totally decentralized so the DGPM of the MEF only declares the viability of the projects financed with loans and for which the State has to give a guarantee. Therefore there are at each level of Government (e.g. Ministries, Regional and District)

- ❑ Resolving body (OR, Organo resolutivo): 29 sectors, 26 Regional Governments and 812 in Local/District Governments
- ❑ Programming and Investment Offices (OPIS, Oficina de Programación de Inversiones): 867 OPI's
- ❑ Formulation Units (UF, Unidades formuladoras): 2,029 in total
- ❑ Executing Units (UE, Unidades Ejecutoras)

ProInversión, the largest formulation unit (UF) is also the investment promotion agency that handles transactions and promotion for PPPs in all sectors. Nevertheless after the signing of the contract, the responsibility for other stages is spread across different institutions. The following institutions are the ones officially signing and enforcing the (PPP) contracts:

- ❑ SUNAS (Drinking water)
- ❑ OCINERGMIN (Energy)
- ❑ OSITRAN (Transport)
- ❑ OSITEL (Telecom)

In this sense it is important to highlight the transversal role of Flood Risk Management, as well as the apparent difficulty to identify the regulating entity for these types of measures.

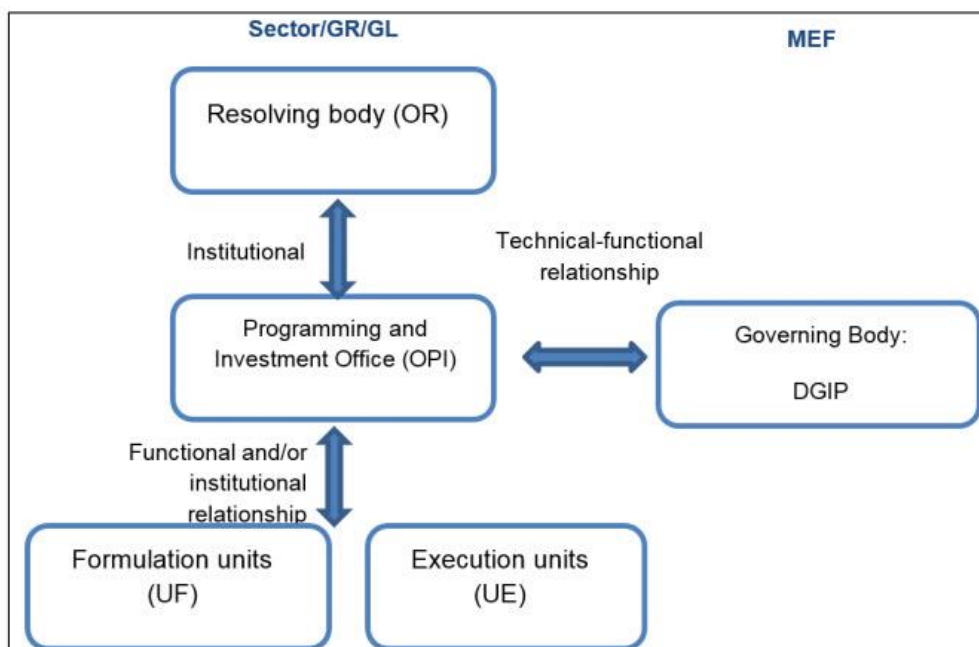


Figure: SNIP organisation. Source: SNIP General Guidelines, figure presented originally in UNISDR study 2015, p. 9.

How is a project adopted within the SNIP

For a project to be considered in the investment planning of the country and go through the whole project cycle, it must first acquire a SNIP number.

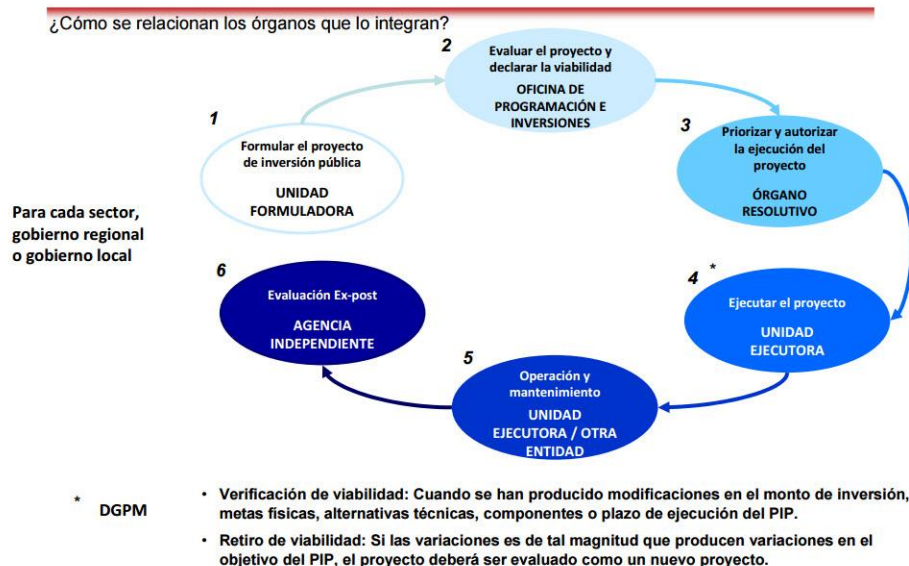
Key rules for Public Investment Projects to be adopted within the SNIP are the following:

- All Public Investment Projects (PIP) must follow the project cycle comprising the steps of pre-investment, investment and post-investment
- To achieve a number SNIP the decentralized government or sector (ministry) must require the project to the Ministry of Finance (MEF)
- decentralized SNIP, due to this regulation therefore Sectors, Regional Governments and Local Governments can declare projects within its jurisdiction viable or not.
- Only projects with debt or require the endorsement or guarantee of the state are evaluated by the MEF in consideration of their implications on macroeconomic and fiscal discipline.
- Ex post evaluation (e.g. Impact Assessment) is required for debt projects –and not always for others PIP's
- Pro-Inversion – the PPP unit- may act in project preparation only if asked by other institutions, and therefore acts on behalf

Disaster Risk Reduction measures have a multisectoral nature. For projects with multisectoral impact it is important to consider that:

- Investment Programs do combine different interventions – but they are executed separately by the responsible institutions and/or sectors
- Regional OPIS are the institutions better trained and interested in formulating such projects

Actores del SNIP



Disaster Risk Management – within the SNIP

Based on interviews with MEF and MINAGRI civil servants as well as on the recent study realized by UNISDR¹⁷ in 2015 it was possible to get an impression of the baseline for public investment in disaster risk management (DRM) and Climate Change Adaptation.

Created in 2000, the National Public Investment System (SNIP) is considered as a starting point. Since mid-2007, the SNIP has developed several instruments for mainstreaming disaster risk into the project cycle and, recently, in the context of climate change. During the mission also the National System for Disaster Risk Management (SINAGERD) has been considered. The SINAGERD was created in 2011 with a mandate to manage risk from three different perspectives (prospective, corrective and reactive) and at the three levels of government (national, regional and local).

Main findings:

Peru has a set of legal, methodological and budgetary instruments that fosters the mainstreaming of Disaster Risk Management and Climate Change adaptation in the cycle of PIPs (Public Investment Projects). In particular, these instruments are mutually reinforcing since mid- 2011 with the creation of SINAGERD and, in 2013, the inter-agency efforts between the MEF and MINAM on the adjustments to the context of climate change (UNISDR, p.39).

Disaster Risk Management in Public Investment projects has been introduced in January 2015 by the new Project Identification and formulation guide, developed with support of the GIZ.

The main DRR measures considered within this system are: a) Riverine flood defences (Defensa riverieña), b) retaining walls (Muros de contención), c) Early Warning Systems (Sistemas de Alerta Temprana) and 4) National Centre of Operations for National Emergencies (COEN). All government actors interviewed are aware that projects implementing DRR measures should at least to some degree be co-financed by the government.

The following table presents the projects that registered investment costs in DRR measures, categorized by sectors. These costs in DRR measures represent approximately 6% of the total public investment of Peru. In terms of investment in DRR measures, defence, public order and safety sector, transport and communications sector, education, culture and sport sector, and sanitation, housing and development sector are significant investors. The defence, public order and safety sector has the highest percentage of investment in risk reduction measures (27.9%). The figures shown in this table may be higher in practice. As it can be seen in the table a total of 479 millions USD has been invested in DRR measures within different sector between 2011 and 2014.

¹⁷ UNISDR Working Papers on Public Investment Planning and Financing Strategy for Disaster Risk Reduction: Review of Peru, Interim Report, 2015, UNISDR. Geneva.

Sectors	Investment (USD millions)	Investment in DRR measures (millions USD)	%
Defence, public order and safety	472	132	27.9
Education, culture and sport	1338	75	5.6
Social protection	53	3	6.1
Sanitation, housing and development	1336	64	4.8
Commerce, industry, fisheries and tourism	214	14	6.6
Justice, planning, contingency	322	13	4.2
Environment	200	7	3.7
Agricultural and farming	1047	31	2.9
Health	423	5	1.3
Transport and communications	2029	124	6.1
Energy	98	1	0.6
Total	7532	470	6.2

Table: Total investments and Investment in DRR measures per sector, April 2011 Nov 2014.
Source: SNIP Project Bank, presented in UNISDR publication 2015 as Table 4, page 30.