PRIORITIZATION OF INVESTMENTS FOR INCLUSION IN THE IMPLEMENTATION OF THE NATIONAL WATER RESOURCES PLAN IN PERU

DELIVERABLE 3: ROADMAP FOR THE IMPLEMENTATION OF THE 30 PRIORITIZED INVESTMENTS

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Acronyms

AAA	Autoridades Administrativas de Agua (Water Administrative Authorities)
IA	Alternativas de Inversión (Investment Alternatives)
ALA	Administraciones Locales de Agua (Local Water Administrations)
ANA	Autoridad Nacional del Agua (National Water Authority)
APP	Asociación Público-Privada (Private Public Partnership)
AyS	Abastecimiento de Agua y Saneamiento (Water Supply and Sanitation)
BBDD	Base de Datos (Database)
BID	Banco Interamericano de Desarrollo (IDB - Inter-American Development Bank)
BM	Banco Mundial (WB – World Bank)
BP	Banco de Proyectos (Project Bank)
COFIDE	Corporación Financiera de Desarrollo de Perú (Peru´s Financial Corporation for Development)
CRHC	Consejos de Recursos Hídricos de Cuenca (Basin-level Water Resources Council)
COSUDE	Agencia Suiza para la Cooperación y el Desarrollo (Swiss Agency for Development and Cooperation)
CTO	Concesión Trasvase Olmos
Drain	Drenaje (Drainage)
DFBOT	Diseño, Financiamiento, Construcción, Operación y Transferencia (Design, Finance, Construction, Operation, and Transfer)
DGPM	Dirección General de Programación Multianual del Ministerio de Economía y Finanzas (MEF) (Directorate General of Multiannual Scheduling of the Ministry of Economy and Finance)
DGPP	Dirección General de Presupuesto Público (Directorate General of Public Budget)
D+R	Proyectos de presas y embalses (Dam and reservoirs projects)
ED	Estudio Definitivo (Definitive/Final Study)
ET	Expediente Técnico (Technical Report)
ESG	Ambiental, Social y Gobernanza (Environmental, Social, and Governance)
EPS	Empresa Prestadora de Servicio de Saneamiento (Sanitation Services Provider)
FRM	Gestión de riesgo de inundaciones (Flood Risk Management)
GGGI	Global Green Growth Institute
GIRH	Gestión Integral de Recursos Hídricos (Integrated Water Resources Management)
GL	Gobierno Local (Local Government)
GR	Gobierno Regional (Regional Government)
IRR	Proyectos de irrigación (Irrigation Projects)

JASS	Junta Administradora de Servicios y Saneamiento (Administration Board of Services and Sanitation)
LRH	Ley de Recursos Hídricos (Water Resources Law)
MINAGRI	Ministerio de Agricultura y Riego (Ministry of Agriculture and Irrigation)
MEF	Ministerio de Economía y Finanzas (Ministry of Economy and Finance)
O&M	Operación y Mantenimiento (Operation and Maintenance)
OPI	Oficina de Programación e Inversión (Program and Investment Office)
OxI	Obras por Impuestos (Public Works Tax Deduction)
PESIA	Análisis de Impacto Político, Medioambiental y Social (Political, Environmental, and Social Impact Analysis)
PENRH	Política y Estrategia Nacional de Recursos Hídricos (National Water Resources Policy and Strategy)
PGRHC	Planes de Gestión de Recursos Hídricos en la Cuenca (Basin-level Water Resources Management Plans)
PIA	Presupuesto Institucional de Apertura (Opening Institutional Budget)
PIP	Proyecto de Inversión Pública (Public Investment Project)
PNRH	Plan Nacional de Recursos Hídricos (National Water Resources Plan)
PTAP	Planta de Tratamiento de Agua Potable (Potable Water Treatment Plant)
PTAR	Planta de tratamiento de aguas residuales (Wastewater Treatment Plant)
PROINVERSION	Agencia de Promoción de la Inversión Privada (Private Investment Promotion Agency)
S	Saneamiento (Sanitation)
SNGRH	Sistema Nacional de Gestión de los Recursos Hídricos (National Water Resource Management System)
SNIP	Sistema Nacional de Inversión Pública (National Public Investment System)
SUNASS	Superintendencia Nacional de Servicios de Saneamiento (National Superintendency of Sanitation Services)
UE	Unidad Ejecutora (Implementing Unit)
UF	Unidad Formuladora (Formulating Unit)
WS	Abastecimiento de agua (Water Supply)
WT	Transferencias de agua (Water Transfer)
WWTP	Plantas de Tratamiento de Aguas Residuales (Waste Water Treatment Plant)
2030WRG	2030 Water Resources Group

1 Background

The National Water Authority (ANA), which is affiliated with the Ministry of Agriculture and Irrigation (MINAGRI), as the governing entity of the National Water Resource Management System (SNGRH), has recently published important planning tools for the management of water resources. These tools, including the National Water Resources Plan (PNRH) and six water resources management plans, were validated by the Water Resources Councils of the Tumbes, Chira-Piura, Chancay-Lambayeque, Chancay Huaral, Chili and Caplina-Locumba-Sama river basins with the support of the World Bank and the Inter-American Development Bank (IDB). As part of the participative development of the tools, diagnostic analyses were conducted to identify the main problems in the management of water resources, their probable causes and their effects.

The diagnostic analyses enabled participants to reach a consensus on the common vision defining the creation of future scenarios. As a result, they establish a group of structural and non-structural measures under the responsibility of the key actors involved in the management of water resources, which must be strategically implemented in the short, medium and long term.

In addition, ANA has made significant efforts to establish water governance in the country through the implementation of Water Administrative Authorities (AAAs) and Local Water Administrations (ALAs), which act as decentralized entities at the basin-level, ensuring compliance of the Water Resources Law.

Water resources planning, as a management tool, aims to promote sustainable use, balance water supply and demand, and preserve and protect of natural resources quality, in agreement with national, regional and local development goals as well as with the protection and increase of water availability.

The PNRH is the country´s most important tool on the subject of water resources. It contains the scheduling, costs, financing sources, investment recovery criteria, responsible entities, and other relevant information to achieve the objectives and apply the measures of national interest established in the National Water Resources Policy and Strategy.

The Basin-level Water Resources Management Plans (PGRHC) aims to achieve sustainable water resources use at the basin-level and to increase water availability to meet demands in terms of quantity, quality and opportunity in the short, medium and long term. It seeks to do so in agreement with national, regional and local development and relevant economic, social and environmental policies.

The PNRH identified an investment need of $ 45.7 billion through 2035. It is evident that the Government cannot fund that amount by itself, so it is necessary to find innovative solutions and establish partnerships with the private sector to face this challenge.

Peru´s current economic, social, environmental, political and institutional challenges are heightened by the speed and magnitude of the changes caused by new technologies, information and knowledge. In this context, the government approaches water resources issues from a proactive position, by developing strategies within the frame of SNGRH to break the vicious circles keeping the country underdeveloped. The government seeks to formulate tools of change to overcome technological backwardness and develop alternative agendas for public policies, such as the Policy 33 from the National Agreement and National Water Resources Strategy. These alternative agendas aim to bring new institutional and governance structures closer to local realities, to suggest roadmaps for the implementation of competitive action plans in an increasing globalized and decentralized world, and to balance growth, equity and competitiveness with value-added and technical progress.

Under this premise, the PNRH and PGRHC become the fundamental basis for the development of alternative

scenarios, long-term visions, and participative, comprehensive, systemic and efficient processes of change. The outputs of these processes include multi-sectoral projects seeking to improve spatial and temporal distribution of available natural water resources in order to provide quality water services and meet people and productive demand at water basin-level.

Since 2000, the country has a National Public Investment System (SNIP), which aims to optimize the use of public resources for investment purposes by establishing principles, processes, methodologies and technical standards related to the different phases of project investment.

All projects conducted within the framework of the SNIP are regulated by the priorities established in the national, sectoral, regional and local strategic plans, by the economic, efficacy and efficiency principles evaluated throughout all project phases, and by the appropriate maintenance of physical infrastructure to ensure its utility over time.

Similarly, the government established the National Budget System as the group of entities, regulations and procedures, which guide the budget process of all public sector entities and agencies throughout the scheduling, formulation, approval, execution, and evaluation phases. The budget is oriented to public entities, which are composed of all entities at the National, Regional and Local Government levels, including their corresponding Decentralized Public Agencies and companies, the Funds, the companies where the Government has shareholding control, and the Constitutionally Autonomous Entities. In this context, state-funded public entities are those Public Entities with an approved budget allocation per the Public Sector Budget Law.

The goal is to align and articulate the scopes of work of the National Water Resources Management System, National Public Investment System, and the National Budget System to close existing infrastructure gaps in the Large-Scale Hydraulic Systems of the basins.

2 Introduction

Global Green Institute (GGGI) supports and promotes a model of economic development known as “green growth”. This model integrates economic objectives, such as poverty reduction, job creation, and social development, together with environmental goals, such as sustainability and energy security.

In Peru, the National Water Authority (ANA) has recently published important documents for water resources planning, such as the National Water Resources Plan and the Basin-level Water Resources Management Plan. These documents identify potential supply-demand gaps and other issues (e.g. water quality) and estimate investment needs. GGGI and ANA are working together in the evaluation and design of public policies to promote the concept of green growth in the water sector.

2030 World Resources Group (2030 WRG) is also collaborating with ANA and GGGI in Peru. In 2014, 2030 WRG prepared the study “Hydro-Economic Analysis and Prioritization of Water Resources Initiatives in Peru”, which examined projects along the Peruvian coast (Tumbes, Chira-Piura, Chancay-Lambayeque, Chancay-Huaral, Chili and Caplina-Locumba, Lima-metro basins, Chillón-Rímac-Lurín and other coastal basins) and prioritize those project with the most potential to receive private and public investment and with positive political, social, and environmental effects on the country. The study identified 230 investment opportunities in these basins, with a total investment value of 22 billion soles, including projects that reduce water gap in 4.900 hm^3/year.

In a second phase, GGGI completed the work started by 2030WRG by commissioning a study to analyze financial instruments available at the international and regional level in order to promote private, public and

civil society investment in the water resources sector.

In this final phase of the study, GGGI conducted an in-depth analysis of the list of 230 investments opportunities to identify the status of each investment in terms of their readiness for financing, as well as the steps and actions necessary to make them ready for financing. The main objective of this phase is to develop a roadmap for the first one hundred days of the newly-elected government to promote the implementation of the most important structural measures of the National Water Resources Plan and the Water Resources Management Plans in pilot basins.

The study has four main tasks:

1. Review the methodology used by 2030 WRG and propose a new methodology to prioritize the 230 investments, taking into account the viability and implementation readiness of the projects.
2. Regarding the list of top 50 investments, make a detailed analysis to define the investments, which are ready to be developed, financed and implemented.
3. Develop a roadmap to promote the development of the top 30 investments.
4. Submit the final report to ANA and GGGI.

2.1 Project Selection. Data Sources

The data for this study were collected by reviewing the proposed interventions and investments in coastal basins in the National Water Resources Plan (PNRH), the six Water Resources Management Plans (PGRHC) in pilot basins, as well as the initial planning documents for the Chillón, Rímac and Lurín basins and coastal projects obtained from the databases of the National Public Investment System (SNIP) and the Private Investment Promotion Agency (PROINVERSION). The study identified a total of **2.303 projects**.

Figure 1: River basins considered for the analysis.

Successive steps of analysis eliminated all duplicate projects, projects that did not exceed one million Soles in value, projects oriented to operation and maintenance (O&M) or training, non-structural projects, and projects under execution.

In the third phase, some projects were grouped according to their geographical location and purpose.

The following figure summaries input data, the selection process, and the groups of projects.

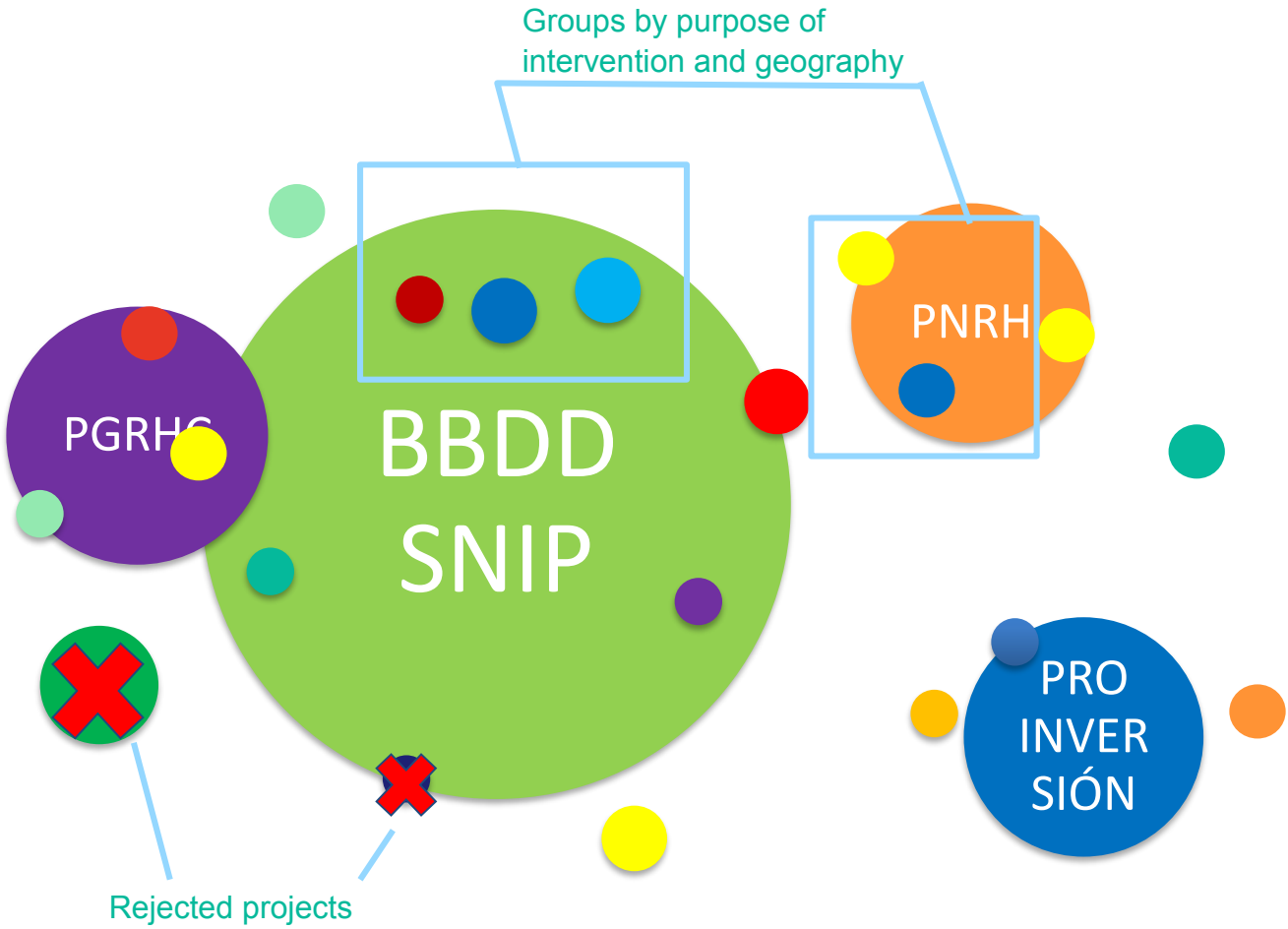


Figure 2: Data sources and future treatment.

In this last phase, **projects were regrouped** according to basins or data sources as follows:

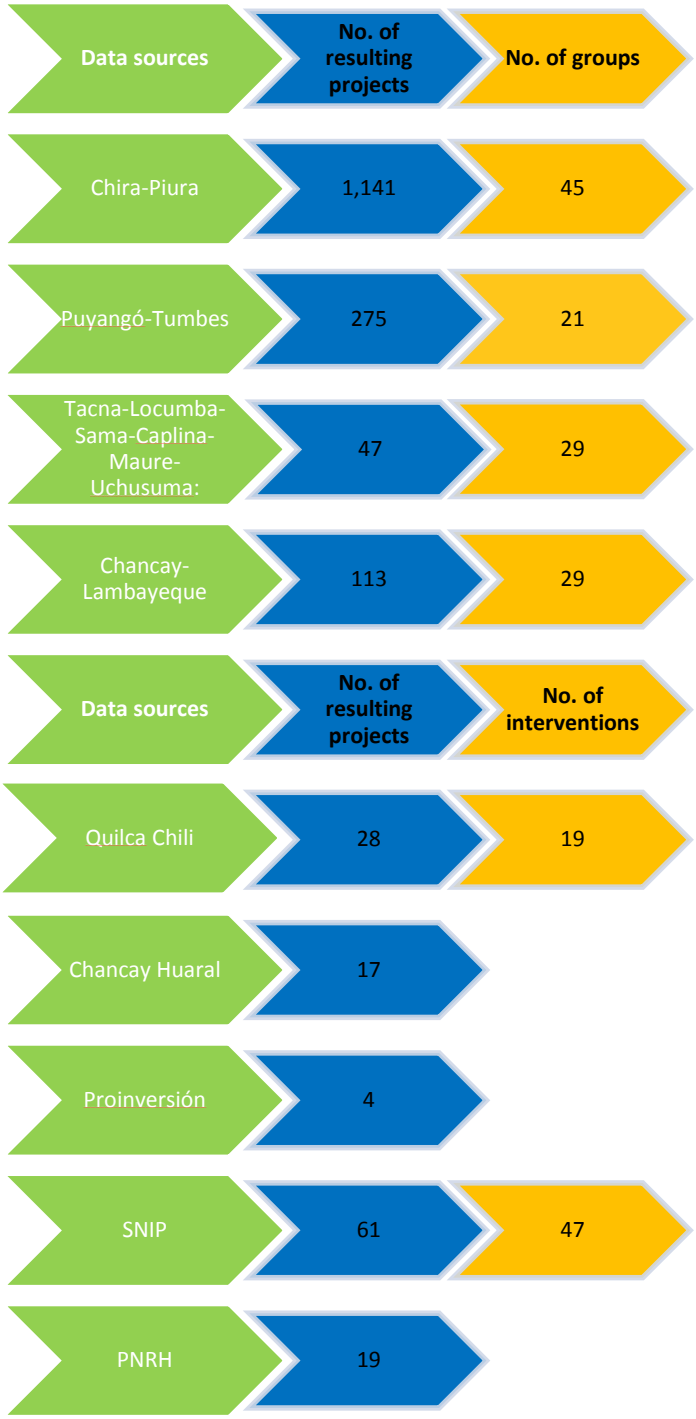


Figure 3: Groups of input projects

The total number of **projects and groups** (groups of projects) obtained from this data analysis is **230**. These are considered **investments opportunities**.

3 Brief summary of the methodology used in the study by 2030 WRG

The prioritization methodology deployed a hydro-economic tool and a PESIA analysis (Political,

Environmental, and Social Impact Assessment) to identify 230 investments.

The equation used for scoring investments is the following:

Pfase1 = Wec Fec + Wefectcosto Fefectcosto + Wamb Famb + Wsocial Fsocial

where:

Pfase1 = [1-5]

F = Factors vary from 1 to 5 according to the contribution of each investment to specific criteria (social, environmental, economic criteria)

W = Weight

As a result of a several meetings, the main actors agreed on the following weight distribution for the criteria:

W – Weight			
Financial Criteria	Economic Criteria	Environmental Criteria	Social Criteria
0.30	0.20	0.22	0.28

Table 1: Weight assigned to each criterion. Source: 2030WRG.

In order to review each criterion and assign the most appropriate weight to each investment, investments were classified by basins. The study analyzes different criteria within each basin, such as:

- Supply and demand charts
- Annual demand index and water availability ranges
- Existing water quantity and quality challenges
- General view of investment priorities
- Equivalent Annual Cost

The analysis of existing challenges in each basin provides a unique perspective on which investments to prioritize. In the context of the methodology, a detailed analysis of the investments prioritized in a given basin can determine how much each investment contributes to the fulfillment of needs of the basin and enable scoring in comparison to other projects.

Find below a summary of the analysis performed within each sub-criterion:

3.1 Financial Criteria

This assesses the equivalent Annual Cost (millions of PEN) and the technical efficacy of the measures (in hm3) for each investments and the calculates the quotient between them. The following factors were assigned:

PEN/hm3	From 0 to 0,24	From 0,25 to 0,35	From 0,36 to 0,53	From 0,54 to 0,56	From 0,57
Score	5	4	3	2	1

Table 2: Financial criteria scores

3.2 Economic Criteria

The following sub-criteria were considered:

Direct benefits	Productivity improvement
	Reduction of health risks
	Reduction of disaster risk
	Resilience to scarcity
	Costs avoided to meet water demand
Indirect benefits	Employment Generation
	Induced investment
	Impacts on GDP

Table 3: Sub-criteria considered within the economic criteria

Each sub-criterion was assigned a factor from 1 to 5 based on their contribution to the criteria in comparison with other projects. After determining that all sub-criteria were equally important, an average value was assigned to the Economic Criteria (sum of all sub-criteria/number of criteria):

$$\mathbf{Fec = (P_{prod} + P_{rs} + P_{rd} + P_{escasez} + P_{demanda} + P_{PIB}) /6}$$

3.3 Social Criteria

The following table shows the sub-criteria reviewed per intervention and the weight assigned:

	Social Conflicts	Access to Water	Human Health	Social Equity	Reduction of Exposure to Natural Disasters	Organization Chart
Weight	Social conflicts	Impacts of water access improvements on the communities (different to health)	Impact on human health	Impact on economic access (as a result of increase of water services rates)	Impact of natural disasters (floods, droughts, etc.) on people and properties	Impact on local organization structures and/or regional customs
	0.2	**0.15**	**0.15**	**0.2**	**0.1**	**0.2**

Table 4: Sub-criteria and weights considered in social criteria

The social criteria score for each investment is the sum score of each sub-criterion times the weight assigned to the sub-criterion. Sub-criteria scores were assigned based on their contribution to the criteria in comparison to other projects.

$$\mathbf{Fsocial = 0{,}2 \times P_{conf\_soc} + 0{,}15 \times P_{acc\_agua} + 0{,}15 \times P_{salud} + 0{,}20 \times P_{equidad} + 0{,}1 \times P_{desastres} + 0{,}2 \times P_{org}}$$

The weight of each sub-criterion ranges from 1 to 5 and is assigned in comparison with the other two criteria.

3.4 Environmental Criteria

The following table shows the sub-criteria assessed and the weight assigned to each sub-criterion:

	Positive Criteria				Negative Criteria			
Weight	Environmental costs avoided (Quantity)	Environmental costs avoided (Quality)	Hydro morphological improvements	Biodiversity improvements	Increase of water scarcity and risk of drought	Wastewater discharge	Adverse hydro morphological changes	Damages related to air pollution
	0.30	**0.20**	**0.20**	**0.30**	**0.35**	**0.25**	**0.25**	**0.15**

Table 5: Sub-criteria and weight considered within the environmental criteria

The environmental criteria score of each investment is the sum score of each sub-criterion times the weight assigned to the sub-criterion. The weight of each sub-criterion ranges from 1 to 5 and is assigned in comparison with the other two criteria.

$Famb = 0,3 \times P_{costoscant} + 0,2 \times P_{costocal} + 0,2 \times P_{mhidrom} + 0,3 \times P_{biodiv} + 0,35 \times P_{escasez} + 0,25 \times Par + 0,25 \times Pc_{amhidro} + 0,15 \times P_{daños}$

The **hydro-economic analysis and PESIA** identified 230 investments, which were competitive from the cost-benefit perspective and beneficial from the social and environmental impacts perspective. The first phase was useful to generate an **initial filter of projects** and a **valid prioritization in terms of economic, water, environmental and social criteria**. This final phase built on these results, taking into account the viability and implementation readiness in order to add value and generate a new prioritization.

4 Brief description of the prioritization process in the PNRH Implementation Project

The following perspectives were integrated into the existing methodology:

a) Viability of the investments
b) Implementation readiness of the investments

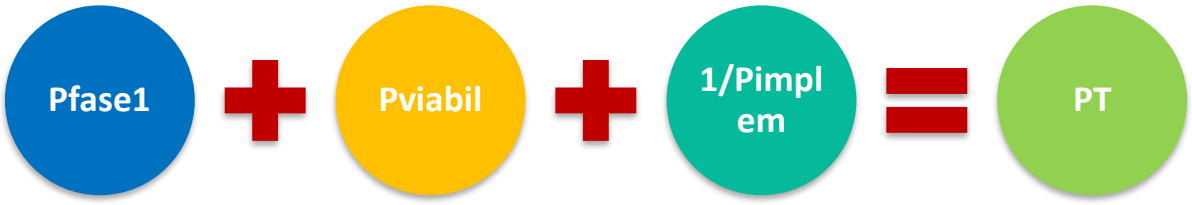
The first point assesses if the prioritized investments are part of a national water resources strategy (i.e. a plan) or, in other words, if they are administratively viable. It also considers political viability, referring to the political will for the projects to be executed.

The second point assesses the status of each investment in its potential trajectory of implementation, meaning, within the SNIP database.

The methodology considered these two perspectives because the implementation of a project largely depends on the viability granted by the SNIP, the prioritization given by promotion entities, and the politicians´ will to implement them.

Regarding the new prioritization process, the score obtained in the first phase (1 to 5 points) was added to the score obtained in the assessment of viability and implementation readiness.

The following formula shows the process to generate the new scores:



P_T = total score [1-10,2]

P_{phase1} = score obtained during the project WRG2030 [1-5], considering the hydro-economic, social, environmental and political parameters

$P_{viability}$ = score obtained considering the viability criteria [1-5]

$P_{implementation}$ = score obtained for the preparation of each project to be implemented [1-100]

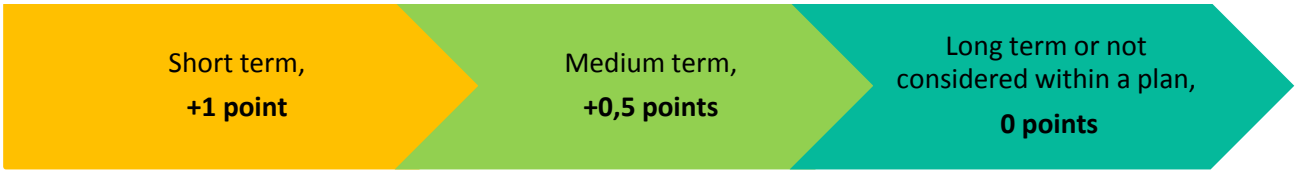
Political – Administrative Viability

Political viability assessed alignment to the objectives of the National Water Resources Plans (PNRH) and the relevant Basin-level Water Resources Management Plan (PGRHC) (i.e. political-administrative viability, according to the guidelines established by ANA), as well as the political programs of the main presidential candidates.

For each of the 230 projects/groups, the study identified the relevant PNRH´s policies, strategies, and programs. In addition, to incorporate the dimension that all plans are formed by prioritized projects which must be executed within a specific time frame, the new methodology evaluates the time horizon for all projects under study.

Political-administrative scores are defined as follows:

- If the investment is consistent with the PNRH, it will obtain +**1,5 points**. Otherwise it will obtain 0 points.
- If the investment is consistent with the relevant PGRHC, it will obtain:



Political Viability

The methodology analyzed the presidential programs of the 3 main candidates (Fuerza Popular, Peruanos Por el Kambio y Frente Amplio por Justicia, Vida y Libertad). The analysis identified information from all the programs and actions related to water and water resources.

At the time of the drafting of this document, the Peruvian presidential elections had not been held yet, so the methodology assigned scores to each investments according to the importance given by the presidential programs. It analyzed recurring subjects, regroup them by ideas, and assign a high or low score depending on the relative importance given by the presidential programs. For this purpose, the analysis considered the number of programs or actions related to the same subject proposed by each candidate and the recurring subjects among the candidates. The score ranged from 0 to 2 (0= not mentioned, 1= included in the program of a candidate, 2= included by several candidates and/or in a recurring manner).

Number	Subject	Importance	Points
1	Water and sanitation: increase of the infrastructure coverage for drinking water and wastewater treatment.	Important	2
2	Improvement of the agricultural hydraulic infrastructure, contribution to the agricultural development	Important	2
3	Reforestation programs and biodiversity management	Medium	1
4	Land use planning, protection and management of headwater basins. Sustainable development.	Medium	1
5	Aquafarming development	Medium	1
6	Risk and natural disasters management	Medium	1
7	Non-traditional supply systems for inhospitable areas	Medium	1
8	Solid waste management. Sustainable development	Medium	1

Table 6: Points for political viability.

Articulation

Regarding "articulation" viability, the study deemed important that prioritized investments belong to a pre-defined basin hydraulic scheme in order to ensure social acceptance at the basin level and avoid possible issues or conflicts related to the management or availability of water resources.

The methodology identified the projects that belong to a "pre-defined hydraulic scheme", based on the existence of special projects, hydraulic sectors or irrigation areas controlled by a user board.

If an investment belongs to a **pre-defined hydraulic scheme**, it will get **+0,5** points; otherwise it will get **0 points** for **articulation viability**.

Pviab = Ppol-adm + Ppol + Partic

Where:

Pviab: Total score obtained by an investment according to the viability criteria

Ppol-adm: Score obtained by an investment according to the political-administrative viability criteria

Partic: Score obtained by an investment according to the articulation criteria

Implementation readiness of the investments

The methodology assigned the following scores to the 230 investments according to their status within the SNIP:

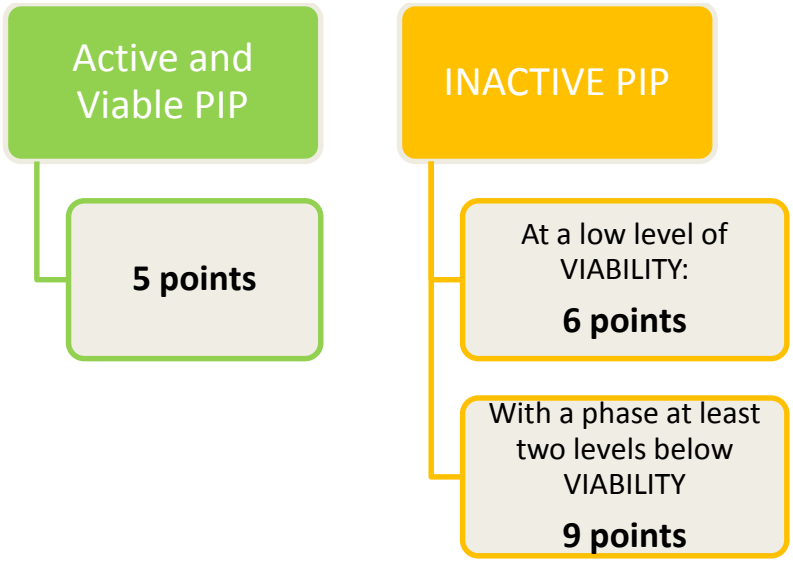


Figure 4: Score according to the implementation readiness.

The methodology assessed the investments from PROINVERSION in a similar fashion. The investments awarded "buena pro" obtained 5 points, the investments with a final version of the contract obtained 6 points and the investments with preliminary studies obtained 9 points. Otherwise the investments obtained 100 points.

5 Analysis of the implementation readiness of the top 50 investments

Once a year, the Annual Budget Law is adopted by Congress. The Ministry of Economy and Finance formulates the draft bill based on the contribution of different entities that program their institutional budget proposal.

Budgetary programming is the initial phase of the Budgetary Process where the entity estimates the expenses to be executed the following fiscal year according to the services provided and the achievement of goals. That phase encompasses the following actions:

- Review the priority scale of the entity.
- Determine the Overall Expenditure Demand considering the quantification of goals, programs, and projects to achieve the objectives of the entity.
- Estimate public funds that will be available to finance the annual budget in order to determine the amount of the Budget Allocation for the entity.
- Determine financing for the Overall Expenditure Demand based on the Total Budget Allocation.

The budgetary programming is subject to the macroeconomic forecasts and macro-fiscal regulations. Programming is executed at two levels:

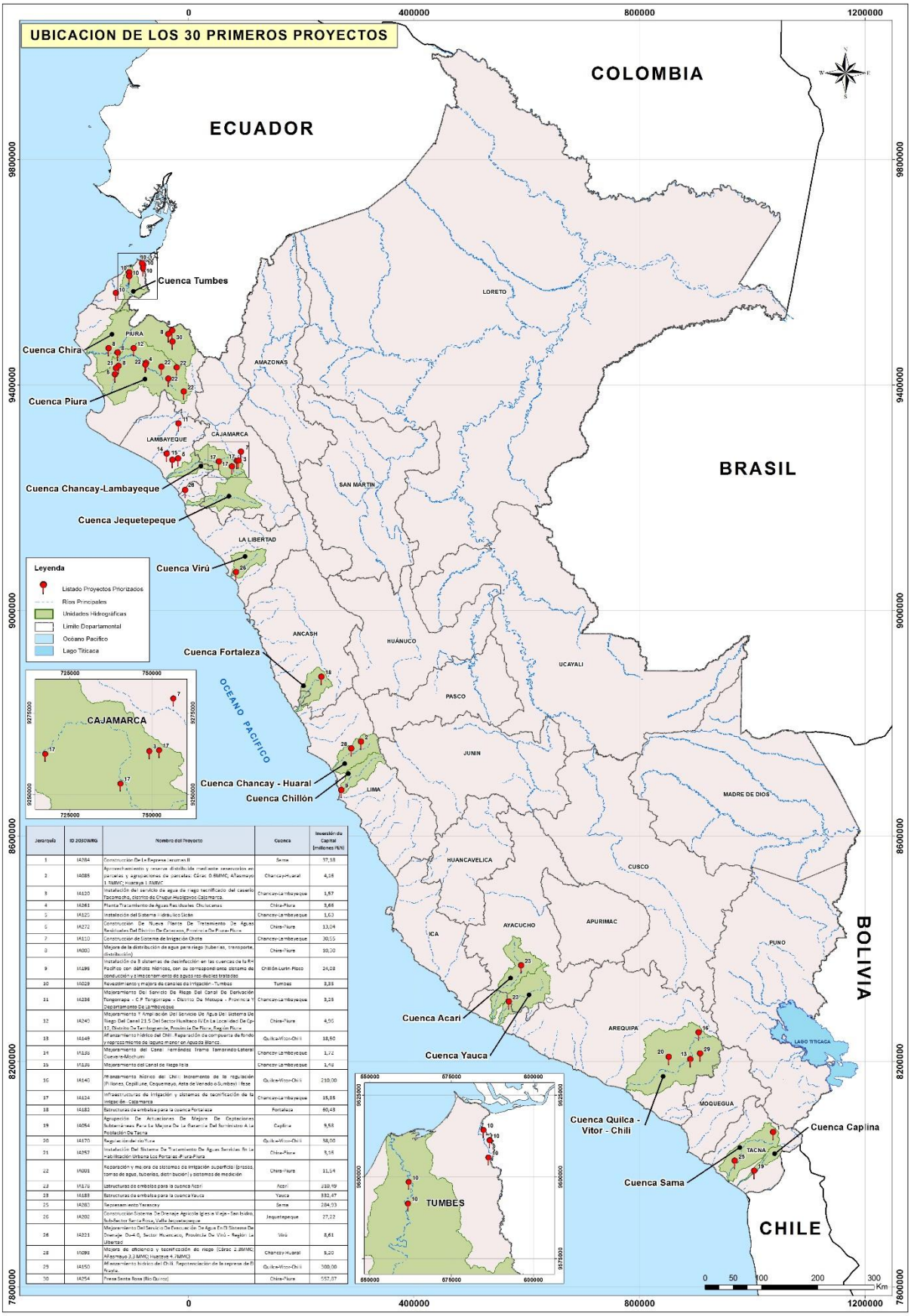
1. In charge of the Ministry of Economy and Finance (MEF), which proposes to the Council of Ministers the budget credit limits for public entities to finance their interventions with Public Treasury resources. Those limits consist of the estimation of the entities´ expected income as well as the public resources determined by the MEF.
2. In charge of state-funded public entities, which refer to the Public Treasury resources, the expected income, and future expenditure according to the priority scale and the prioritized expenditure policies.

Based on the proposals for institutional budgets submitted by the state-funded public entities, the Directorate General of Public Budget (DGPP) develops the Budget Draft Bill of the Public Sector, which is submitted to the Council of Ministers for approval and resubmission to Congress.

Once the Law is approved, the corresponding entities approve their Opening Institutional Budget (PIA) according to the allocation approved by the Annual Budget Law.

Each entity has its own method to prioritize investments. Considering the budget allocated by the Annual Budget Law, an entity will execute the investments, which have been deemed viable in the SNIP and correspond to its established prioritization method.

It is therefore important to analyze the methodology used by the SNIP as a first step to implement an investment.



Jerarquía	ID 2030WRG	Nombre del Proyecto	Cuenca	Inversión de Capital (millones PEN)
1	IA264	Construcción De La Represa Tarumas II	Seme	97,18
2	IA088	Aprovechamiento y reserva distribuida mediante reservorios en parcelas y agricultores de parcelas. Cáraz. 0.8MMC, ATacamayo 1.5MMC, Huaraya 1.8MMC	Chancay-Huaral	4,16
3	IA120	Instalación del servicio de agua de riego tecnificado del caserío Tacamacha, distrito de Chugur-Hualgayoc-Cajamarca.	Chancay-Lambayeque	1,57
4	IA263	Planta Tratamiento de Aguas Residuales Chulucanas	Chira-Piura	3,68
5	IA125	Instalación del Sistema Hidráulico Sicán	Chancay-Lambayeque	1,63
6	IA272	Construcción De Nueva Planta De Tratamiento De Aguas Residuales Del Distrito De Catacaos, Provincia De Piura-Piura	Chira-Piura	13,04
7	IA110	Construcción de Sistema de Irrigación Ocoto	Chancay-Lambayeque	30,55
8	IA060	Mejora de la distribución de agua para riego (tuberías, transporte, distribución)	Chira-Piura	10,20
9	IA196	Instalación de 3 sistemas de desinfección en las cuencas de la RH Pacífico con defícits hídricos, con su correspondiente sistema de conducción y almacenamiento de aguas residuales tratadas	Chillón-Lurín-Piaco	24,03
10	IA029	Revestimiento y mejora de canales de irrigación - Tumbes	Tumbes	3,35
11	IA236	Mejoramiento Del Servicio De Riego Del Canal De Derivación Tongorrapa - C.P Tongorrapa - Distrito De Motupe - Provincia Y Departamento De Lambayeque	Chancay-Lambayeque	3,25
12	IA240	Mejoramiento Y Ampliación Del Servicio De Agua Del Sistema De Riego Del Canal 21.5 Del Sector Hualtaco IV En La Localidad De Cpm 12, Distrito De Tambogrande, Provincia De Piura, Región Piura	Chira-Piura	4,95
13	IA149	Mejoramiento Hídrico del Chili - Reparación de compuerta de fondo y represamiento de laguna menor en Aguada Blanca	Quilca-Vitor-Chili	18,50
14	IA126	Mejoramiento del Canal Hernández Tramo Tamarindo Lateral Cuenca-Mochumi	Chancay-Lambayeque	1,72
15	IA126	Mejoramiento del Canal de Riego Iota	Chancay-Lambayeque	1,48
16	IA140	Mejoramiento hídrico del Chili: Incremento de la regulación (Pillones, Cepillune, Coquemayo, Asta de Venado o Sumbaya) - Fase	Quilca-Vitor-Chili	210,00
17	IA124	Infraestructuras de irrigación y sistemas de tecnificación de la irrigación - Calamarca	Chancay-Lambayeque	15,85
18	IA181	Estructuras de embalse para la cuenca Fortaleza	Fortaleza	80,43
19	IA064	Ampliación De Actuaciones De Mejora De Captaciones Subterráneas Para La Mejora De La Garantía Del Suministro A La Población De Tacna	Caplina	9,68
20	IA170	Regulación del río Vítor	Quilca-Vitor-Chili	38,00
21	IA257	Instalación Del Sistema De Tratamiento De Aguas Servidas En La Habilitación Urbana Los Portales -Piura-Piura	Chira-Piura	3,16
22	IA001	Reparación y mejora de sistemas de irrigación superficial (presas, tomas de agua, tuberías, distribución) y sistemas de medición	Chira-Piura	11,54
23	IA178	Estructuras de embalse para la cuenca Acari	Acari	210,19
24	IA183	Estructuras de embalse para la cuenca Yauca	Yauca	332,47
25	IA261	Represamiento Yaracoy	Seme	284,33
26	IA202	Construcción Sistema De Drenaje Agrícola Iglesia Vieja - San Isidro, Sub-Sector Santa Rosa, Valle Jequetepeque	Jequetepeque	27,22
27	IA221	Mejoramiento Del Servicio De Evacuación De Agua En El Sistema De Drenaje Dren-0, Sector Huaricanco, Provincia De Virú - Región La Libertad	Virú	8,61
28	IA098	Mejora de eficiencia y tecnificación de riego (Cáraz 2.8MMC, Atacamayo 2.2 MMC, Huaraya 4.7MMC)	Chancay-Huaral	5,20
29	IA150	Mejoramiento hídrico del Chili. Repotenciación de la represa de El Frayle.	Quilca-Vitor-Chili	300,00
30	IA254	Presa Santa Rosa (Río Quiroz)	Chira-Piura	557,07

Figure 5: Geographical location of the top 30 prioritized projects

5.1 Prioritization and analysis of implementation readiness

The methodology generated a list of priority investments, which are described in detail in the Annex I and II. This study conducted an in-depth analysis of the top 50 investments, identifying the actors involved, timeframes, and estimated costs for getting the investments ready for implementation. Annexes III and IV contain the details of the in-depth analysis.

Annex III shows an analysis of each investment across the different phases of the SNIP, identifying the status of each investment according its characteristics. For that purpose, the timeframes and costs have been analyzed as follows:

5.1.1 Timeframe of the studies

The following chart **summarizes the times considered in this study**:

Study	Time (months)
Simplified profile	12
Profile	12
Feasibility	12
Technical Report of:	
Small projects	3
Large projects	6
Major projects	12
Updates	The time term is equivalent to the study to be updated.

Table 7: Estimated timeframe for the different studies required in the SNIP

5.1.2 Costs of the studies in the Pre-Investment and Investment Phases

The costs of the studies depend on their nature, the sector they belong to, and their complexity.

The following chart summarizes the prices estimated for different studies according to the nature of the investment. It was elaborated based on the expertise of the team in the development of similar studies within the framework of the SNIP as well as the indicative prices provided by some ministries.

The methodology differentiates comprehensive studies, whose cost estimates are given in Soles. Comprehensive investments encompass the entire water cycle in their scope. Considering that these are related to agriculture investments, they include catchment, transport, distribution, and use of technified irrigation systems.

The price of specific projects, that is to say the investments that encompass only one phase of comprehensive studies, has been estimated as a percentage of the total cost of the investment. These percentages were calculated through the analysis of large number of project studies in different phases (profile, feasibility, technical reports), according to their sector (agriculture, sanitation) and their scope of work (transport, WWTP, PWTP, etc.) as a function of the total cost of the investment.

A calculation was used to generate the cost estimates to update the studies for those investments, which are inactive in the SNIP.

GUIDE FOR THE ESTIMATION OF IMPLEMENTATION COSTS

Nivel de Estudio	AGRICULTURA						SANEAMIENTO							MULTIPROPÓSITO			
	Riego Grandes y Medianos > 500ha			Riego Menor < 500ha			EPS > 15 000hab			2 000hab < Pequeñas Ciudades < 15 000hab			Ámbito Rural < 2 000hab	Derivación y Conducción	Regulación	Trasvase	Protección y Control de inundacio-nes
	En % del costo de inversión del		Integral (en miles de PEN)	En % del costo de inversión del		Integral (en miles de PEN)	En % del costo de inversión del		Integral (en miles de PEN)	En % del costo de inversión del		Integral (en miles de PEN)	Integral (en miles de PEN)	Integral (en miles de PEN)	Integral (en miles de PEN)	Integral (en miles de PEN)	Integral (en miles de PEN)
	Proy. de Conducción/ Distribución/ Aplicación/ Drenaje	Exp. Técnico		Proy. de Cond./ Distrib./ Aplicación/ Drenaje	Exp. Técnico		Proy. De PTAP/ PTAR/AP /Alcantarillado	Exp. Técnico		Proy. De PTAP/ PTAR/AP /Alcantarillado	Exp. Técnico						
Perfil Simplificado	10%	20%	-	10%	20%		10%	20%		10%	20%			-	-	-	-
Perfil (10 MPEN< Costo Inv. Proy >1,2	5%	10%	2000	5%	10%	500	5%	10%	500	5%	10%	100	50	3000	3000	3000	2000
Perfil (Costo Inv. Proy >10MPEN)	2%	-	2000	2%	-		2%	-		2%	-						
Factibilidad	5%	10%	5000	5%	10%	2000	5%	10%	1000	5%	10%	200	100	5000	5000	5000	3000
Expediente Técnico	-	-	8000	-	-	3000	-	-	2000	-	-	300	200	8000	8000	8000	5000
Estudios Adicionales	-	-	1000	-	-	200	-	-	200	-	-	50	30	1000	1000	1000	1000
Actualización de estudios (perfil)			500			200			400			50	30	1000	1000	1000	1000
Actualización de estudios (factibilidad)			1000			400			600			100	50	2000	2000	2000	2000
Actualización de estudios (expediente técnico)			2000			600			800			150	50	3000	3000	3000	3000

Table 8: Guide for the estimation of study costs in the Investment and Pre-Investment phases.

6 Considerations about projects in the SNIP

The National Budget System is a very useful tool for planning government investments. However, it is also a complex mechanism with processes and milestones, which are difficult to manage and analyze. Extensive experience is necessary to provide advice about the projects considered within the system.

Since its implementation in 2001, the SNIP´s functions and guidelines were modified to ensure that they address to key challenges faced by the country.

For instance, **sanitation projects**, regardless of the investment cost of associated capital, only **require fulfilling the Profile phase in the SNIP to achieve viability**. As a result, the time needed to reach the implementation phase has decreased considerably. Faster implementation enables the government to address issues, which are essential for equitable development throughout the country, more effectively.

Additionally, the timeframe for a project to achieve viability usually extends for years. For this reason, the OPI **can approve a project in the Profile phase "skipping" directly to the Feasibility phase** for projects that require the feasibility level in order to be considered viable. "Skipping" means that the project disregards the pre-feasibility study, thus saving time. This is a common option for the investments evaluated in this study.

The study reviewed in detail those investments, made out of groups of projects, which were included in the top 50 list. The analysis found evidence that **some projects within groups had already been executed**, so the total number of projects within these groups might have changed since the 2030WRG analysis[1].

The study also found that all the PIPs prioritized in this analysis, which indicated Feasibility as the phase to be considered viable, had their Profiles approved skipping directly to Feasibility phase. To estimate costs and time frames for prioritized projects at the Idea phase that seek to obtain viability through a feasibility study, the study assumes that their Profiles will be approved skipping directly to the Feasibility phase.

Other aspect to be considered is the **inactivity of PIPs**. Among many reason, PIP can be considered inactive if sufficient time has elapsed. This occurs when a project that has not begun the investment phase is frozen, meaning that at least three years go by since the last study conducted. The inactivity can be explained by unresolved observations or inability of a "viable" project to obtain required funds for implementation. As a result, a number of projects, deemed beneficial for society by the SNIP, are left unrealized.

For those prioritized projects that are in this situation, the study calculated the time and costs of updating the studies, obtaining the approval and viability, as well as the time and cost to conduct a definitive (final) study.

It should be noted that **Definitive (final) Studies are require to be approved by SNIP**, which means that the **total time to conduct them** is considerably **less** than the Profile or Feasibility studies.

Despite the controls that should be conducted by OPI and the Formulation Units when registering a project in the BP, there is observable **project fragmentation within the SNIP**. Due to parameters of the system, such as the specification that a smaller project requires fewer studies (Simplified Profile) and less time to be implemented, a single project can be divided into several minor projects in order to save time. The problem with this "hack" is that the size and benefits of the entire project get diluted, as well as the real time for implementation.

[1] Hydro-Economic Analysis and Prioritization of Initiatives for Water Resources in Peru

In the first phase of the study, this aspect was partly addressed through the global study of the benefits of the projects. For the purpose of this study, an **individual analysis of each project was initially conducted to define the time and costs and then a global review was conducted to define the overall time and costs**.

The purpose of this study is neither to understand nor define mitigating measures for these "hacks". However, it is important to understand the reason why project promoters take these shortcuts. One could contemplate that project promoters simply cannot afford the time and studies required for larger projects.

7 Analysis of results

7.1 Analysis of the Top 50 Investments

Once the files on each project were completed, the next step was to conduct an overall analysis of the status of the top 50 investments prioritized in the first phase of this study.

As a result, prioritized investments may be divided in the following categories:

- **Imminent implementation**: The majority of these projects have achieved viability and are waiting for final financing details in order to commission the Definitive (final) Studies and begin implementation. The majority of these projects require small investment amounts. The total number of investments in this category is 13. The approximate costs of the studies required for the implementation of these projects range from 20,000 –4,084.000 Soles. The estimated total cost of the studies required for all the projects in this category is 14.728.000 Soles. The estimated average time for the projects to be implemented is 0-12 months.
- **Short-term implementation**: These projects that are already within the BBDD SNIP. Most of these projects were deemed viable, but are currently inactive and will need reactivation. There are also Ideas that must reach the Profile level to be considered viability and therefore they do not need a long time to reach implementation. Proinversion projects are included into this category. The total number of investments in this category is 18. The approximate costs of the studies required for the implementation of these projects range from 6.000-14.259.100 Soles. The estimated total cost of the studies required for all the projects in this category is 43.250.500 Soles. The estimated average time for the projects to be implemented is 12-24 months.
- **Medium-term implementation projects:** These projects have a high investment cost at an Idea level. They are within the SNIP but are currently inactive before being considered viable. The total number of investments in this category is 19. The approximate costs of the studies required for the implementation of these projects are 2.148.000 –26.708.700 Soles. The estimated total cost of the studies required for all the projects in this category to be implemented is 255.811.690 Soles. The estimated average time for the projects to be implemented is 24-36 months.

The following chart summarizes the results:

Required aspects for implementation	Imminent implementation	Short-term implementation	Medium-term implementation
Time until implementation (months):	0<T<=12	12<T<=24	24<T<=36

Number of investments	13	18	19
Range of estimated costs (PEN):	20.000 – 4.084.000	6.000 – 14.259.100	2.148.000 – 26.708.700
Total costs of studies (PEN):	14.728.000	43.250.500	255.811.690

Table 9: Summary of aspects required for the top 50 investments to be ready for implementation. Own source.

The analysis of the top 30 investments underscores their varied development stages in regard to their proximity to implementation. Those which are farthest from implementation have obtained a high score in the PESIA analysis, so they are included in the top 30 despite the fact that they are at an Idea level.

The breakdown of the top 30 investments is as follows:

- 7/30 could be developed for imminent implementation (0-6 months);
- 14/30 could be developed for short implementation (6-18 months);
- 9/30 could be developed for medium-term implementation (18-36 months).

7.2 Analysis of the Top 30 Investments

The top 30 priority investments were studied in depth.

Annex V shows the roadmap with the actors that are responsible for each investment, as well as the steps needed for implementation.

The total costs of the studies required for these projects to be implemented and the investment costs during the construction phase were also analyzed.

As in the analysis conducted for the top 50 investments, the top 30 investments can be divided according to the time until implementation: imminent (less than 12 months), short-term (12-24 months), and medium-term implementation (2-3 years).

Table 10 shows this analysis including the total costs of the studies required for the implementation of each investment.

The analysis enabled the formulation of an annual schedule of investments, which considers the time horizons needed to conduct the studies as well as the funding necessary for the works once the studies have been conducted and the projects are ready to be implemented. All costs have been calculated for a time horizon between 2017 and 2021.

This tool is likely to be useful for decision makers as it estimates the financing needs to implement the prioritized investments of the PNRH in next 4 years. Considering the change of Government in Peru in July 2016, this table may allow the new administration to estimate financing needs, formulate the schedule of investments and forecast an Overall Expenditure Demand. The forecast informs the relevant entity´s budget proposal to be submitted to the Directorate General of Public Investment (DGPP). As explained in Chapter 5, the DGPP develops the Budget Draft Bill of the Public Sector considering all budget proposals of the entities. This draft bill is then submitted to the Council of Ministers for approval and resubmission to the Congress.

Once the Act is approved, the relevant entities approve their Opening Institutional Budget (PIA) according to the allocation approved by the Annual Budget Act. The implementation of works should face few problems because the entities (Ministries, public bodies, etc.) would have already prioritized these investments and considered them within their Overall Expenditure Demand, and the investments themselves are considered

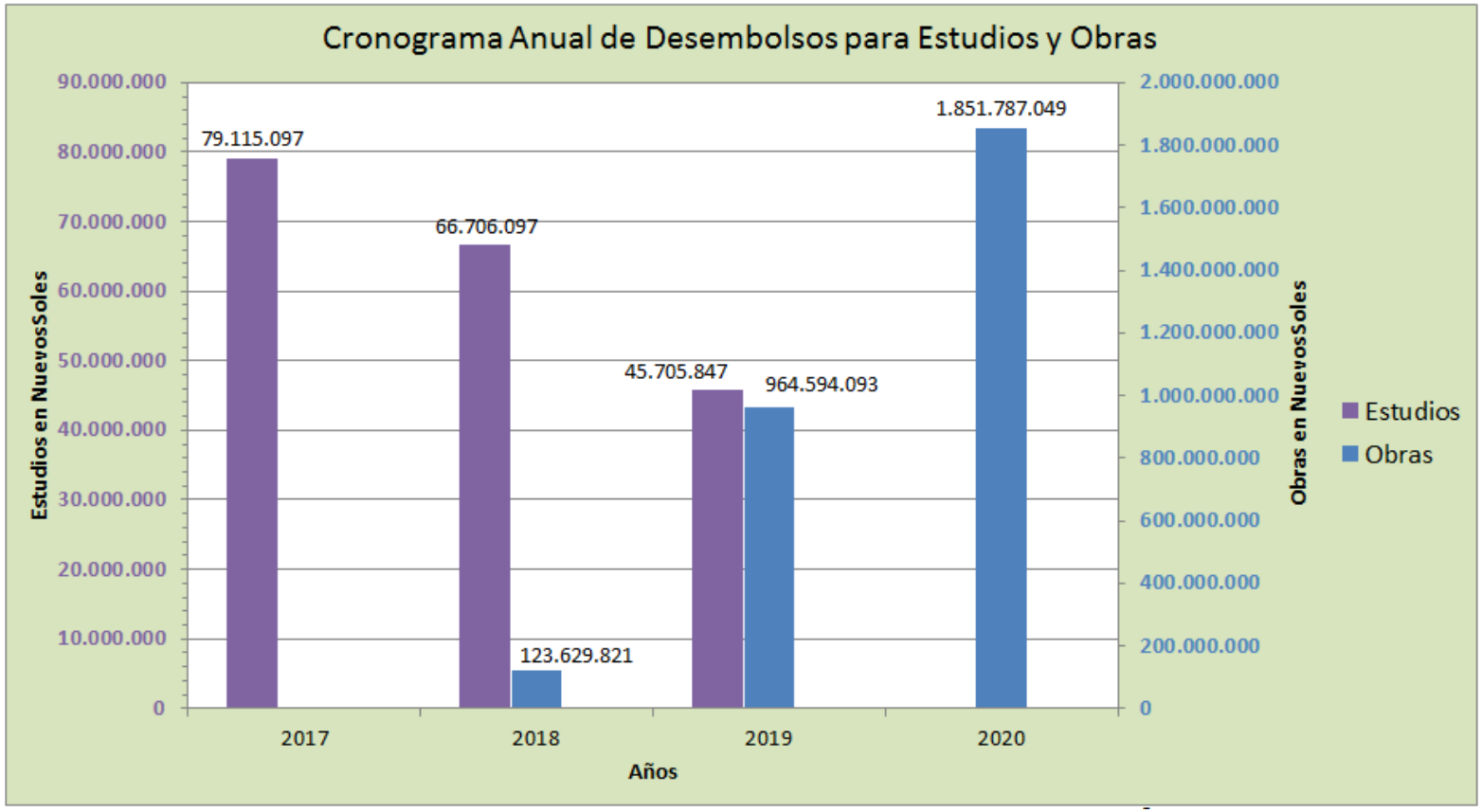
viable in the SNIP.

The crucial and most difficult part of this process is to ensure that the investments prioritized by this study obtain the support of the entities to include them into their prioritized projects and budget proposals for the next 4 years.

Figure 6 shows the annual schedule of investments with the costs of the studies and the financing needs for the implementation of works.

Policy	Intervention Strategy	Program for Measures	Investment/Intervention		Budget Requirement (PEN)		Term for Studies (x = months)		
			Hierarchy	Name	Studies (PEN)	Works (PEN)	x < 12	12< x <24	x >24
1.- Quantity Management	2.- Improvement of the Efficiency of Water Usage and Management of the Demand	5.- Improvement of Water Conveyance and Distribution Systems	7	Construction of Chota Irrigation System	5.468.000,00	36.443.661,00		24	
			8	Irrigation improvement (Group of projects)	860.000,00	3.752.323,00		15	
			10	Improvement of Tumbes irrigation channels	424.000,00	1.398.604,00		15	
			11	Improvement of Tongorrape cannel	325.000,00	3.248.120,00	3		
			12	Improvement of 21.5 channel irrigation	497.000,00	4.969.031,00	3		
			14	Improvement of Fernández cannel	351.000,00	2.330.900,00		15	
			15	Improvement of Fala cannel	222.000,00	1.470.778,00		15	
			22	Repair of Irrigation System	906.000,00	7.459.636,00		15	
			26	Improvement of Huancavo – Virú Drainage	826.000,00	8.613.944,00	6		
			27	Iglesia Vieja – Jequetepeque drainage	2.723.000,00	27.222.804,00	12		
		5.- Technified Irrigation	3	Tacamache technified irrigation – Cajamarca	236.000,00	1.570.000,00	6		
			17	3 Irrigation systems Cajamarca	2.049.000,00	14.239.650,00		15	
			28	Huaral technified irrigation	780.000,00	5.200.000,00		24	
	3. Increase of the Availability of Resources	8.- Increase of Regulation of Water Resources and Transfers among Basins	1	Construction of Jarumas II dam	3.718.000,00	37.175.100,00	6		
			2	Cárac, Añasmayo and Huataya reservoir	624.000,00	4.159.000,00		24	
			5	Installation of SICAN hydraulic system	13.595.800,00	429.782.399,00		24	
			13	Repair of Aguada Blanca	3.145.000,00	18.500.000,00			36
			16	Regulation Pillones, Capillune, Caquemayo	25.200.000,00	210.000.000,00			36
			18	Impoundment of Fortaleza basin	10.273.100,00	60.430.000,00			36
			20	Regulation of Yura river basin	6.460.000,00	38.000.000,00			36
			23	Impoundment of Yauca basin	21.610.550,00	332.470.000,00			36
			24	Impoundment of Acarí basin	20.181.850,00	310.490.000,00			36
			25	Yarascay dam	14.259.100,00	441.960.798,00		24	
			29	Reinforcement of El Frayle dam	20.500.000,00	300.000.000,00			36
			30	Santa Rosa Dam	25.661.940,00	557.867.049,00			36
2.- Quality Management	5.- Improvement and Expansion of the Sanitary Services Coverage	16.- Improvement and increase of coverage of potable water	19	Underground catchments in Tacna	1.439.000,00	9.581.140,00		24	
		18.- Improvement of wastewater treatment	4	Chulucanas WWTP	548.600,00	3.656.250,00		18	
			6	Catacaos New WWTP	4.084.000,00	40.830.822,00	6		
			9	Installation of three WWTP Sanitation Systems	4.085.100,00	24.030.000,00			36
			21	Los Portales WWTP - Piura	474.000,00	3.158.954,00		15	
TOTAL					S/. 191.527.040,00	S/. 2.940.010.963,00	S/. 12.409.000,00	S/. 42.000.500,00	S/. 137.117.540,00
						# Investments	7	14.	9
				ANNUAL SCHEDULE OF EXPENDITURE FOR OUTSTANDING STUDIES			79.115.096,67	66.706.096,67	45.705.846,67
				ANNUAL SCHEDULE OF EXPENDITURE FOR WORKS SINCE YEAR 2			123.629.821,00	964.594.093,00	1.851.787.049,00

Table 10: Annual schedule of expenditures for outstanding studies and works



	Inversiones (PEN)			
	2017	2018	2019	2020
Estudios	79,115,097	66,706,097	45,705,847	-
Obras	-	123,629,821	964,594,093	1,851,787,049
Total	79,115,097	190,335,918	1,010,299,940	1,851,787,049

Figure 6: Annual schedule of expenditures for studies and works

8 Conclusions

After reviewing all the information used for the development of this study, we conclude the following:

1. One of the fundamental principles established by the Water Resources Law is the integrated management of water basins.
2. In most cases, the natural demarcation of the basins does not correspond to the political demarcation of regions, provinces, and districts. This situation prompted the creation of CRHC as a platform for dialogue decisions.
3. The SNIP projects, which are related to water resources, were conceived to address sector demands. The SNIP does not consider Large-scale Hydraulic Infrastructure projects focused on multi-sector use of natural sources.
4. There are few projects focused on the improvement of the temporal and spatial distribution of the water resources in the basin.
5. There is progress related to the evaluation of water resources in 12 basins including a management model to support decision-making and generate consensus in the development of management plans.

9 General recommendations for the Implementation of the National Water Resources Plan

The roadmap contains recommendations for the implementation of the top 30 priority investments. As noted when defining the prioritization methodology, a project within a plan, such as the National Water Resources Plan and the Water Resources Management Plan, has higher impact. This impact is likely to be augmented if the implementation of the project coincides with other non-structural measures that encourage a favorable environment for the execution, operation, maintenance, and use of such works. These non-structural measures have not been included in the prioritization input data. They are analyzed in this section in order to be considered during the implementation of prioritized investments and increase their chances to deliver impactful results.

Considering the 5 policies, 11 intervention strategies, and 30 programs for the National Water Resources Plan, the following steps are recommended for their implementation:

1. POLICY 1: QUANTITY MANAGEMENT

1.1. INTERVENTION STRATEGY 1: IMPROVING KNOWLEDGE OF RESOURCES AND DEMANDS

1.1.1. Program for Measure 1: Implementation of a National Hydrometeorological Network.

- Continue with the implementation of the National Water Resources Information System under the responsibility of the National Water Authority.
- Begin the Pre-Investment phase for the Design and Implementation of the Meteorological Station Network in the catchment basins of the Water Administrative Authority.

1.1.2. Program for Measure 2: Increase of Knowledge related to Groundwater.

- Update the regulations, which establish the methodologies for the development of Hydrogeological studies for the main aquifers of the country.
- Establish piezometric control networks for the sustainable use of groundwater potential.
- Define standard protocols for the regular measurement of physical and chemical parameters of aquifers.

1.1.3. Program for Measure 3: Implementation of the National Information System on Water Quantity

- Continue the development of studies to evaluate the water resources availability in Peruvian water basins.
- Define standard protocols for the regular measurement of flows in the hydrometric stations of the main rivers.

1.2. INTERVENTION STRATEGY 2: IMPROVING THE EFFICIENCY OF WATER USAGE AND DEMAND MANAGEMENT

1.2.1. Program for Measure 4: Control and measurement of demand.

- Each productive sector must regularly supply its technically substantiated water demand to the operator of the hydraulic infrastructure of natural sources and to the National Water Authority.

1.2.2. Program for Measure 5: Improvement of water conveyance and distribution systems

- The Large-Scale Multi-Sector Infrastructure Operators that provide water to sectorial operators must update the inventories of hydraulic infrastructure used for regulation, transfer, diversion, conveyance, and measurement purposes. They should highlight the current state of preservation, working capacity, losses per sections, and conveyance efficiency to determine the baseline of current conditions for the provision of services to Small-Scale infrastructure or sectorial operators.
- The National Water Authority must issue regulations to determine the standard methodology for the development of efficiency programs established in the Water Resources Act.
- Based on the directions issued by the National Water Authority, each hydraulic infrastructure operator in pilot basins must develop efficiency programs for corresponding approval by the Water Administrative Authority.
- In this transition phase, the rehabilitation and improvement projects of hydraulic infrastructures have been obtained from the SNIP. However, in the future, these projects must belong to the efficiency programs of registered operators.

1.2.3. Program for Measure 6: Technified Irrigation

- The Sub-Sectoral Irrigation Program (PSI), as the governing entity in technified irrigation, must promote the technification of irrigation in agricultural areas with availability of regulated water with high degree of guarantees.

1.2.4. Program for Measure 7: Expansion of the Agricultural Frontier through Efficiency Increase

- The agricultural areas with regulated water may expand the agricultural boundaries, conditional on the improvement of irrigation efficiency.

1.3. INTERVENTION STRATEGY 3: INCREASING THE AVAILABILITY OF WATER RESOURCES

1.3.1. Program for Measure 8: Increase of Surface Regulation of Water Resources and Transfers among Basins

- Continue with the studies that evaluate water resources availability to analyze water balances at a basin level, define the regulations and improve temporary distribution of water resources.
- Identify the basins with surplus in future scenarios to evaluate potential transfers to basins with deficiencies.

1.3.2. Program for Measure 9: Reforestation of Headwaters

- Develop the regulations for ecosystem services payments that enable operators of large-scale infrastructure to establish agreements with farmer communities in the high Andes for the preservation of forests, reforestation, and preservation of soils contributing to the water quality supplied by multi-sectorial operators to sectorial operators.

1.3.3. Program for Measure 10: Management of Overexploited Aquifers

- Promote the use of aquifers by unique operators combining surface waters and groundwater use in a multi-sectorial sustainable management framework.

1.3.4. Program for Measure 11: Reuse of Treated Wastewater

- Promote the reuse of treated household wastewater for the irrigation of long stem crops.

2. POLICY 2: QUALITY MANAGEMENT

2.1. INTERVENTION STRATEGY 4: IMPROVING KNOWLEDGE OF WATER QUALITY.

2.1.1. Program for Measure 12 and 13: Improvement of Knowledge of Water Quality

- Begin the Pre-Investment phase within the framework of the SNIP for the design and implementation of surface water and groundwater monitoring network in the basins for the regular collection of physical-chemical data related to the quantity and quality of water.

2.1.2. Program for Measure 14: Supervision and Regulation of Discharges in Natural Sources

- Initiate the Pre-Investment phase within the framework of the SNIP for the design and implementation of the regulatory framework for natural sources with supervision, audit, and effective sanction protocols for those who engage in misconduct related to Water Quality Standards.

2.1.3. Program for Measure 15: Regulations for water quality and best practices related to the water use

2.2. INTERVENTION STRATEGY 5: IMPROVING AND EXPANDING THE COVERAGE OF SANITATION SERVICES

2.2.1. Program for Measure 16, 17 and 18: Improvement and Expansion of Potable Water, Sewage System, and Wastewater Treatment Coverage

- The Directorate General of Sanitation of the Ministry of Housing and Construction must contribute to expand the coverage and improve the quality and sustainability of potable water services, sewage system, wastewater treatment, and usage of outputs.
- The Ministry of Housing and Construction must continue to promote the participation of the

private sector in the area of Sanitation Services Providers (EPS) in Peru.

3. POLICY 3: OPPORTUNITY MANAGEMENT

3.1. IMPLEMENTATION STRATEGY 6: IMPLEMENTING INTEGRATED WATER RESOURCES MANAGEMENT

3.1.1. Program for Measure 19, 20 and 21: Institutional and Administrative Strengthening of Integrated Water Resources Management (GIRH) and Implementation of the GIRH in Transboundary Basins

- Formalization of Users Boards as sectorial operators, specifying their areas of competence, as well as the responsibilities assumed during the provision of water services to their partners with the corresponding sanctions in case of breach.
- Introduction of rates based on the water quality supplied to multisectoral users by multisectoral and sectorial operators.

3.2. INTERVENTION STRATEGY 7: DEVELOPING IRRIGATION AND SANITATION SERVICES IN POOR AREAS

3.2.1. Program for Measure 22: Development of Irrigation and Sanitation Services in Poor Areas

- Establish the criteria, parameters and limits for the selection of groups in extreme poverty for the implementation of social assistance measures through Mi Riego program or the National Rural Sanitation Program.

4. MANAGEMENT OF CULTURE OF WATER

4.1. INTERVENTION STRATEGY 8: INSTITUTIONAL COORDINATION AND WATER GOVERNANCE

4.1.1. Program for Measure 23 and 24: Consolidation of Integrated Water Resources Management, Participation and Query

- Continue to promote the Basin-level Water Resources Councils, as well as the cyclic and iterative participation processes in the development of water resources management plans at a basin level.

4.2. INTERVENTION STRATEGY 9: ENVIRONMENTAL EDUCATION AND CULTURE OF WATER

4.2.1. Program for Measure 25 and 26: Management of knowledge, culture of water, communication, and awareness of actors within the GIRH.

- Promote research related to knowledge management and culture of water, focused on the use of water resources.
- Develop curriculum proposals at different educational levels and modes for the development of a culture of water for each sociocultural reality.

5. ADAPTATION TO CLIMATE CHANGE AND EXTREME EVENTS

5.1. INTERVENTION STRATEGY 10: ADAPTING TO CLIMATE CHANGE.

5.1.1. Program for Measure 27 and 28: Improvement of knowledge and awareness of the effects of the climate change and adaptation measures.

- Promote research on extreme events of glacial and climate origins in glacier basins that are sensitive to climate change.
- Strengthen technical capabilities of the institutions that are part of national systems specialized in the prevention of risks, mitigation, climate change adaptation, and

management of disaster risks in water resources.

5.1.2. Program for Measure 29 and 30: Risk Management.

- Formulate and implement vulnerability reduction programs and early warning systems in glacier basins and hazardous lagoons in the High Andes in coordination with competent sectors.

9.1 RECOMMENDATIONS FOR PRIVATE PUBLIC PARTNERSHIPS

As noted at the beginning of this document, due to the dynamic nature of the SNIP, recent private public investment projects may not be included in this analysis. This document intends to promote Private Public Partnership under the BOT method for the following projects:

1. **Puyango Tumbes Binational Irrigation Project**

Building of a diversion dam in the Puyango river, in the border section of Linda Chara, to conduct water through a tunnel to Las Lajas ravine and the Zarumilla river where the Matapalo dam will be used for the irrigation of upstream lands, as well as the Palmales reservoir for the irrigation of 15,300ha in Peru and 22,000ha in Ecuador.

2. **Regulation of Chillon River (PROINVERSION IPA)**

Design, financing, construction, operation, and maintenance of dams and related work (aprox. 40 MMC) in the Chillon river basin.

3. **New San Bartolo WWTP for Reclaimed Waters (PROINVERSION IPA)**

Design, financing, repairs, expansion, operation, and maintenance to the Wastewater Treatment Plant, called San Bartolo WWTP. It also considers complementary works to ensure compliance of environmental regulations related to the treatment of wastewater and provide a safe source of water resources for urban maintenance works, and industrial and agricultural use.

4. **Water Reinforcement System in the Ica Valler (under evaluation - PROINVERSION)**

Construction of a dam in the Carhuancho River (38 MMC of impoundment), a Carhuancho – Choclococha conveyance channel, a dam in the Lea river (80 Hm3 of impoundment) and diversion of Pisco - Pampas Lanchas and Villacurí rivers.

5. **Integrated Water System of Chancay - Lambayeque Valley in the Region of Lambayeque (under evaluation PROINVERSION)**

Construction of the primary infrastructure for two dams (La Monteria and Sican) and execution of secondary conveyance works. The operation and maintenance of the infrastructure will also be developed.

6. **Reinforcement of Poechos Reservoir and mitigation of vulnerability of the system caused by extreme rainfall in the Piura River basin (under evaluation PROINVERSION)**

Increasing the Poechos dam´s storage capacity to 885 MMC entails the recovery of water storage capacity and the expansion of Large-Scale Hydraulic Infrastructure for the irrigation of the Chira and Piura valleys. This will be possible through the improvement of existing infrastructure and the construction of new infrastructure for regulation and water storage, removal of catchment inefficiencies, vulnerability reduction in agriculture and other economic activities due to El Niño Phenomenon in cities and towns of both valleys, as well as the generation of additional water volumes to enable the incorporation of 66 000 ha to the irrigation system (40 000 ha new) into the system.

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