EMBEDDING ECOSYSTEM SERVICES INTO POLICY (EESP)

LEARNING SERIES

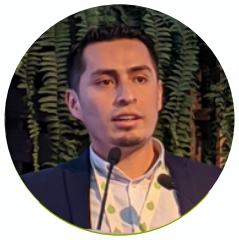
Session 3: Ecosystem Service Assessments for Payments for Ecosystem Services

Day 1

about this session

This session will provide participants the opportunity to explore the concept of a water fund and its 3 key characteristics - bringing together diverse stakeholders, sustainability and benefits for water quality and quantity. It will then provide insights into financing watershed conservation in Latin America and the Caribbean through FONAG. Finally, the session explores the return on investment in Water Funds, discussing the methodological approach to modeling future ecosystem service scenarios and economic benefits. Participants will explore insights from Peru's MERESE mechanisms and a case study on the Return on Investment in Nature-Based Solutions for Quito's Water Fund.

Keywords: Water funds, return on investment, nature-based solutions, Quito's Water Fund, FONAG



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Boris F. Ochoa-Tocachi, PhD in Hydrology, is the CEO of ATUK Consultoría Estratégica and founder of the Institute for Applied Sustainability Research (iiasur). He specializes in mountain hydrology, hydrological monitoring, and ecosystem service management. As a scientific advisor for Forest Trends, he works on the "Natural Infrastructure for Water Security" project in Peru. Boris has published 40+ scientific articles, delivered 100+ presentations, and received 10 prizes and awards. His current research focuses on nature-based solutions, natural infrastructure, and engineering options for water security.

learning objectives

- Understand water funds, various types of PES, and changing expectations and benefits.
- Explore international case studies challenging traditional cost bearers and promoting innovative financing.
- Discuss the economic valuation of ecosystem services and potential conflicts in monetization.
- Gain insights into payments for results and its impact on sustainable conservation practices.
- Develop critical thinking skills for integrating economics into environmental management.

BELA Biodiversity, Ecosystems, & Landscape Assessment

GPS Global Program on Sustainability

atuk

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Embedding Ecosystem Services into Policy (EESP) Learning Series

Payment for Ecosystem Services: Case Studies and Learnings

Boris F. Ochoa-Tocachi, PhD

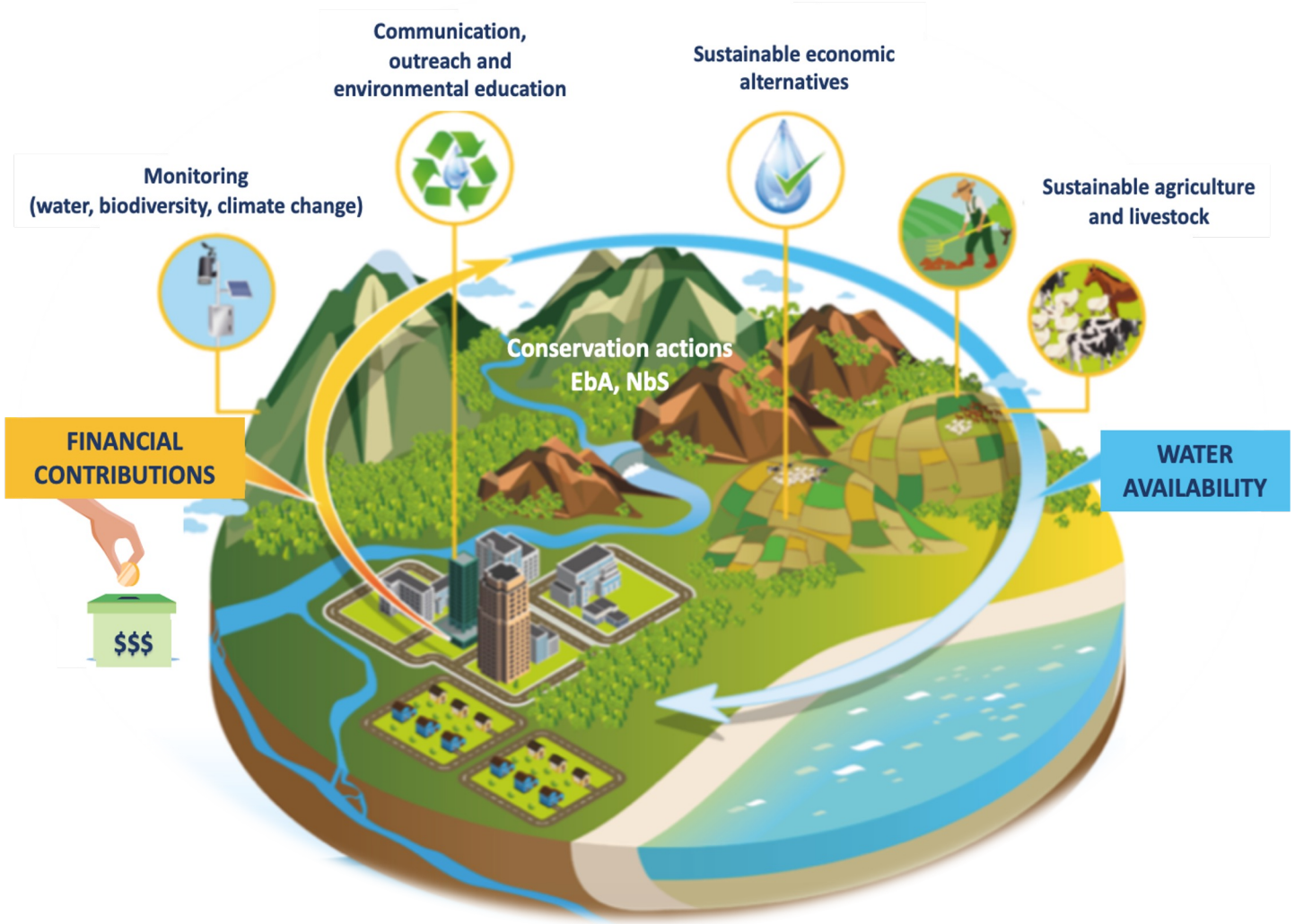
ATUK Consultoría Estratégica

OBJECTIVES

- Show examples from water funds, types of PES, shifting paradigms around benefits and expectations, payments for results.
- Highlight examples from other countries: water funds, break barrier about who has to pay (especially for those ES that are more direct or presumed to always be there and free).
- Initiate a discussion around the economic value of ES and the conflicts and interests that will rise when money involved and when there is a need to pay for something that was not used to be paid for before.

CONTENT

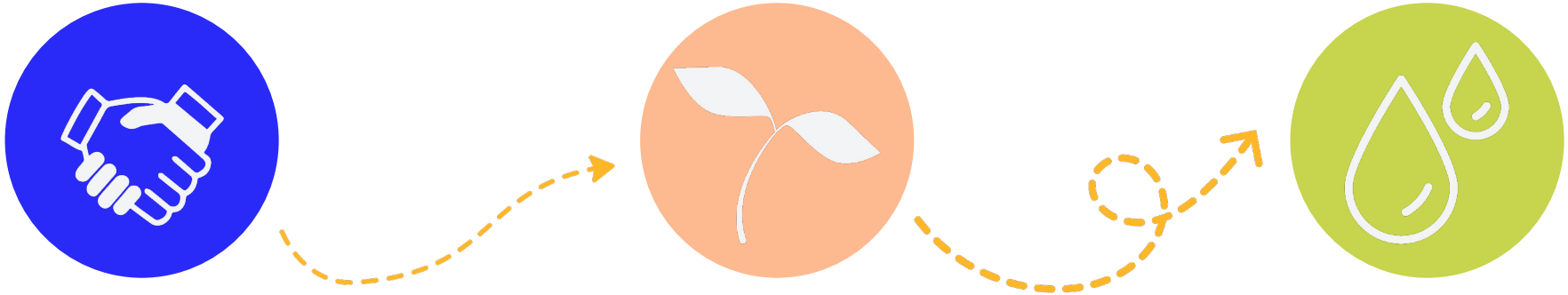
What is a water fund?



Water Funds are stable, transparent, and long-term financial mechanisms that gather various water stakeholders to find solutions to a common water problem.

They are based on the use of or nature-based solutions for water: natural infrastructure with an integrated water resource management approach.

Key characteristics of a water fund



Brings together a variety of stakeholders

- Public-private
- National-local
- Domestic, hydropower, agricultural industrial users

Sustainability

- Long term mechanism

Benefits: water quantity and quality

- Co-benefits: Carbon, biodiversity, social including secure water for the historically disadvantaged

Water Funds in Latin America

- More than 25 funds created
- More than US$200M invested
- More than 1,600,000 ha conserved
- 89 M. benefited population

- México
- Monterrey
- Chiapas
- Guatemala
- Sto. Domingo
- Yaque del Norte
- Bogotá
- Cali
- Medellín
- Manizales
- Cúcuta
- Valle del Cauca
- Quito
- Tungurahua
- Paute
- Guayaquil-Daule
- Loja
- Napo
- Lima
- Piura
- Santiago
- Brasil

Source: http://www.fondosdeagua.org/

ALIANZA LATINOAMERICANA DE FONDOS DE AGUA

The Nature Conservancy

FUNDACIÓN FEMSA

BID Banco Interamericano de Desarrollo

fmam

Fomentado por el:
Ministerio Federal de Medio Ambiente, Protección de la Naturaleza y Seguridad Nuclear
en virtud de una resolución del Parlamento de la República Federal de Alemania

Water Funds in Africa

Stages of Development

- Partnership in Place
- Feasibility
- Design
- Business Case
- Implementation
- Maturity

WaterFunds for Africa

The Nature Conservancy

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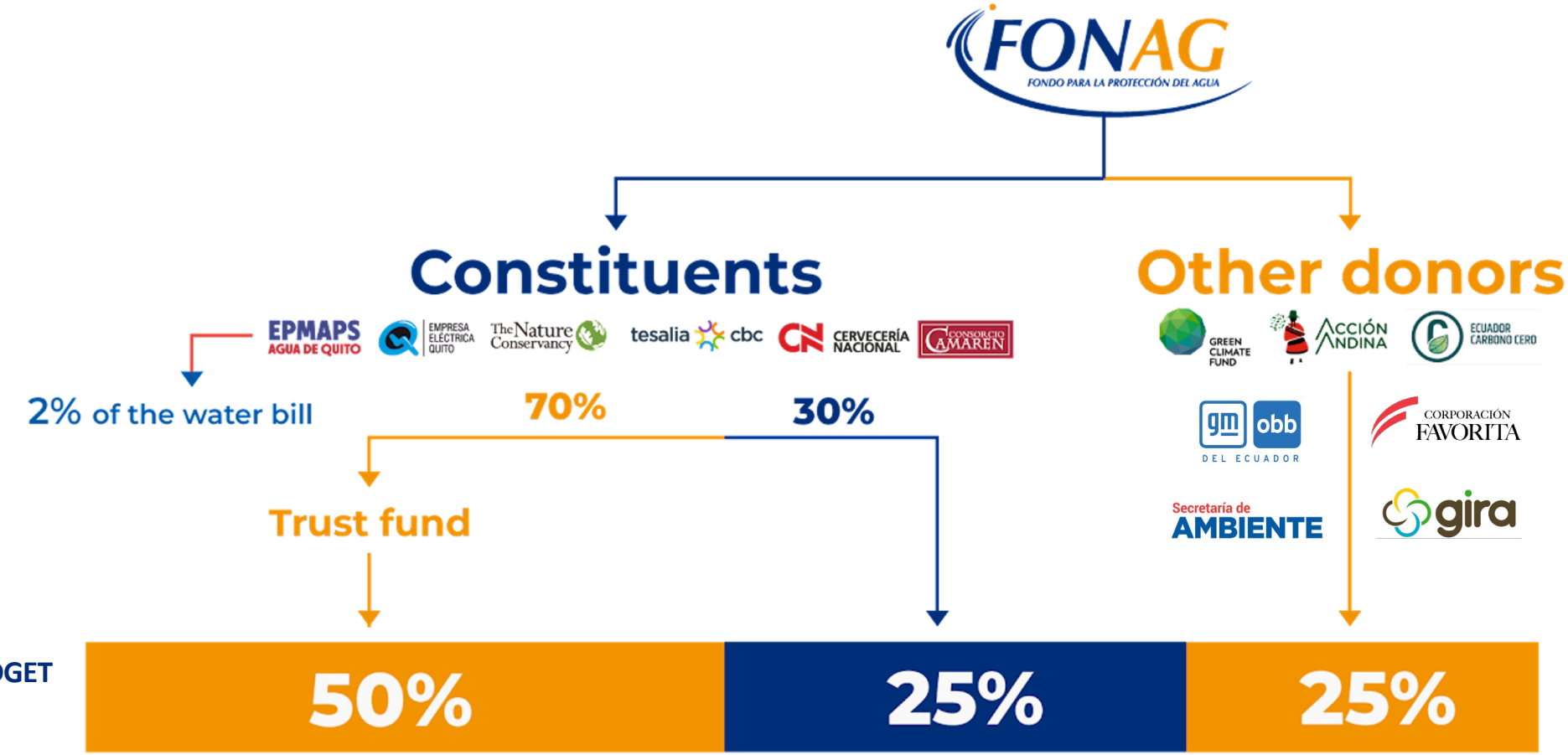
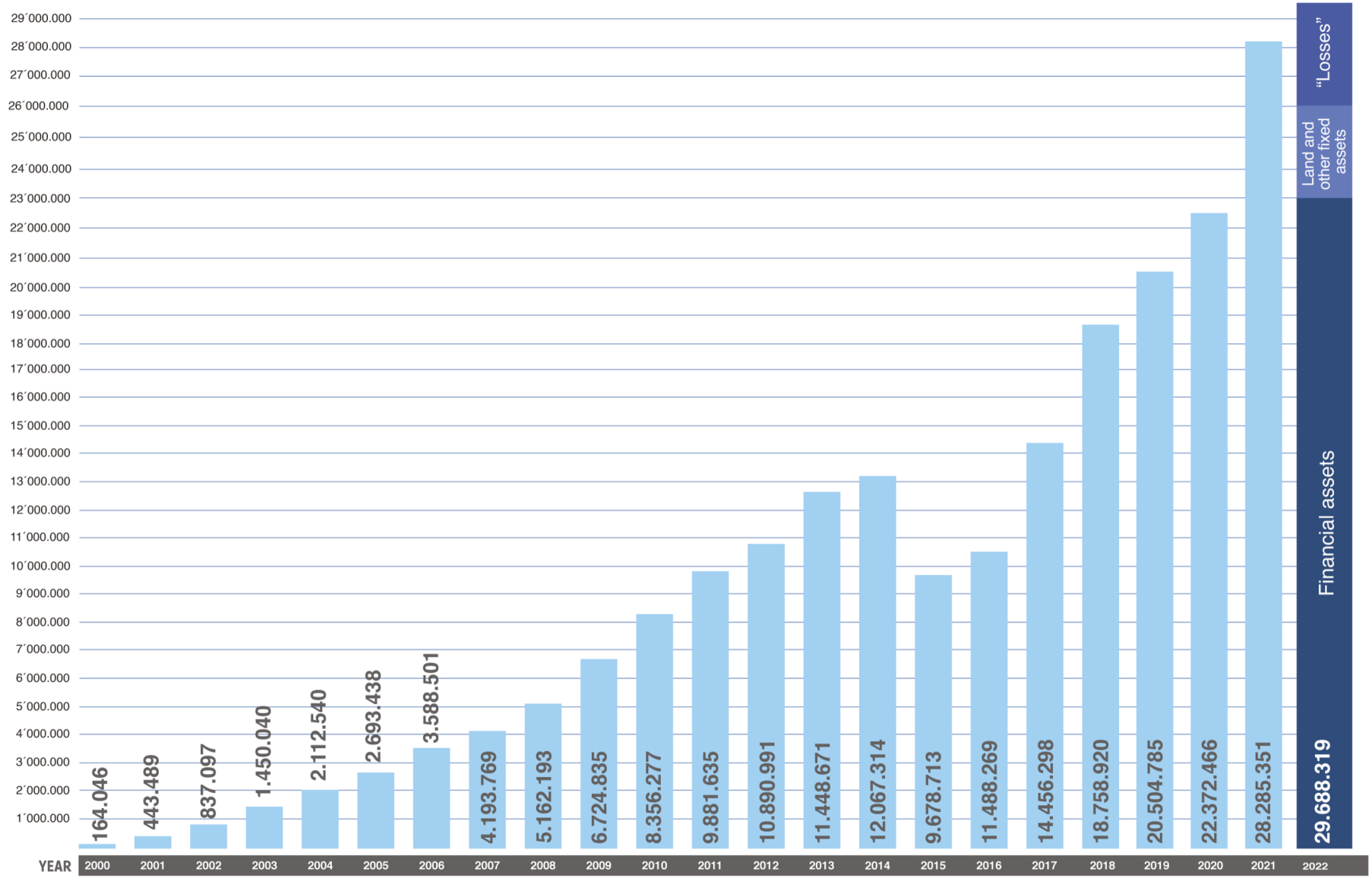
Financial mechanism



FONAG, 2023

Financial patrimony in millions of US Dollars



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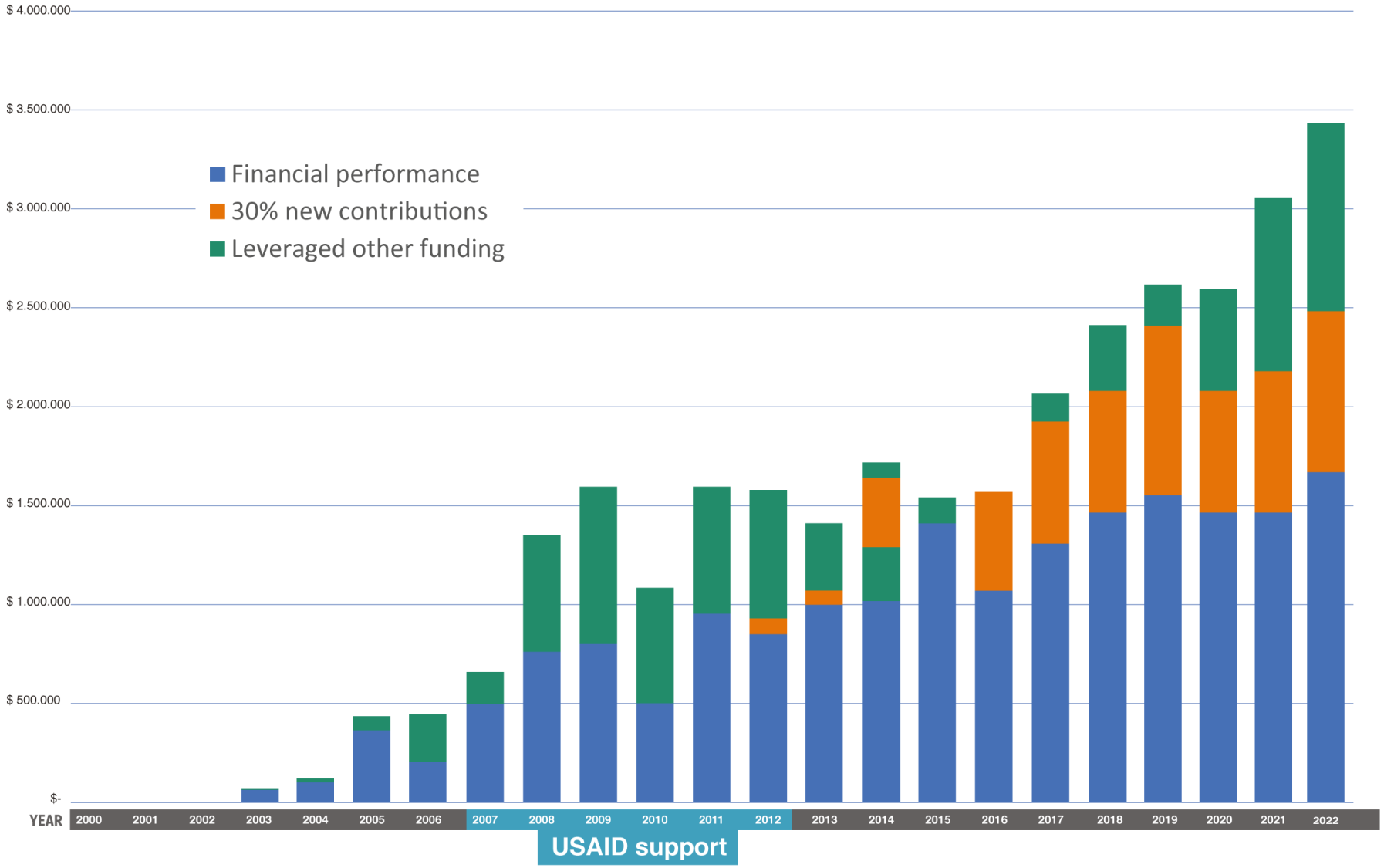
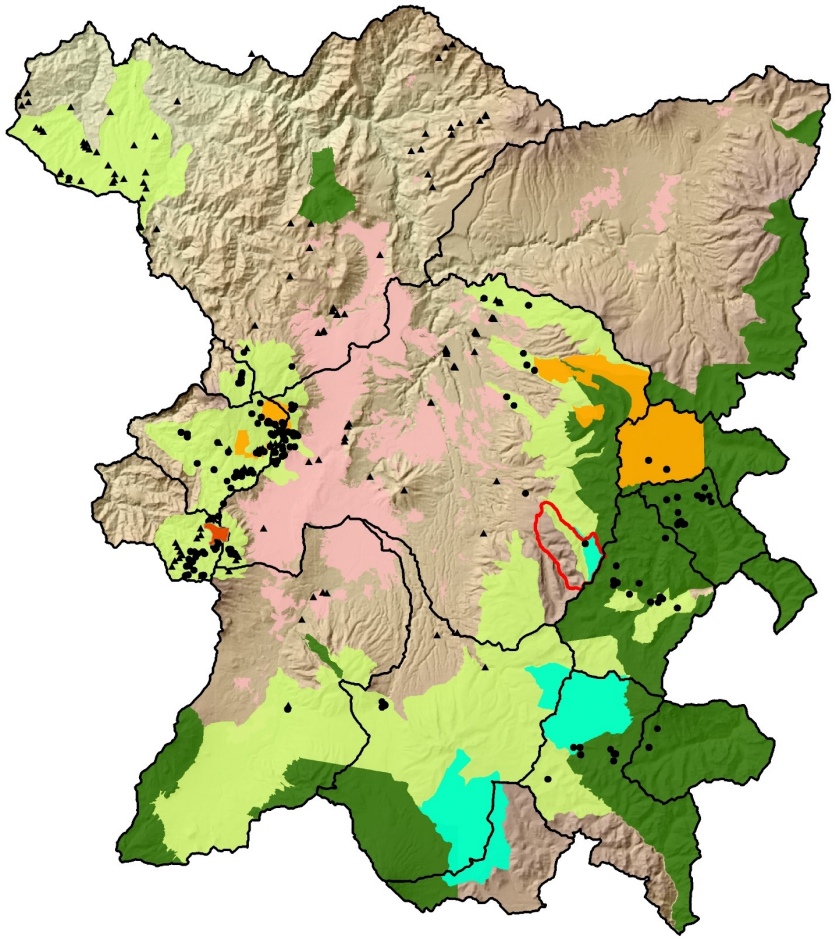
FONAG, 2023

Implementation budget (US Dollars)





FONAG-EPMAPS priority areas

Water Funds can take advantage, in a flexible way, of existing conservation and restoration mechanisms:

Populated areas – Quito and other settlements

FONAG total interest area – **688,416 ha**

National Protected Areas System (SNAP) – **81,500 ha**

FONAG's priority intervention area – **155,100 ha**

- ○ △ Water abstraction points

Water Conservation Areas (EPMAPS–FONAG property land) – **20,000 ha**

FONAG's Conservation Agreements – **13,400 ha**

National Water Conservation Areas (SENAGUA) – **4,200 ha**

Local Water Conservation Areas (Atacazo) – **400ha**

FONAG, 2020


With a corps of
guardapáramos
(paramo rangers)
we manage about
20,000 ha of
"own" land
FONAG-EPMAPS

CONSERVATION AGREEMENTS

2 to 5 years *with exceptions

765 families

No cash payments are made. Incentives are based on sustainable alternatives such as: community tourism, productive reconversion, among others.

Agreements are made with private and community landowners, irrigation associations, among others.

We establish conservation agreements based on trust, will, and commitment

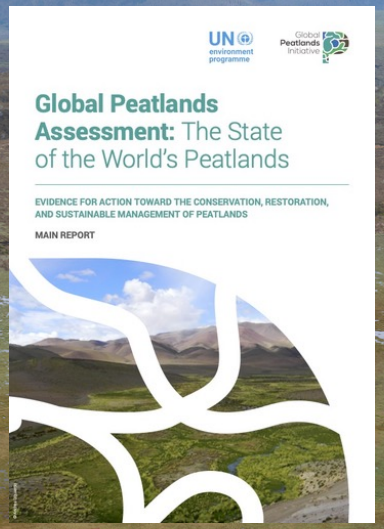
We restore degraded and historically overgrazed *páramos* (moorlands)

Restoration in *páramo* (moorland)

Restoration in forest

Native plant production in community nurseries

Restoration and recovery of wetlands.



Success story in Latin America and the Caribbean.

Adaptation

Restorations and recovery of wetlands

Avoiding degradation more (cost-)effective than restoration

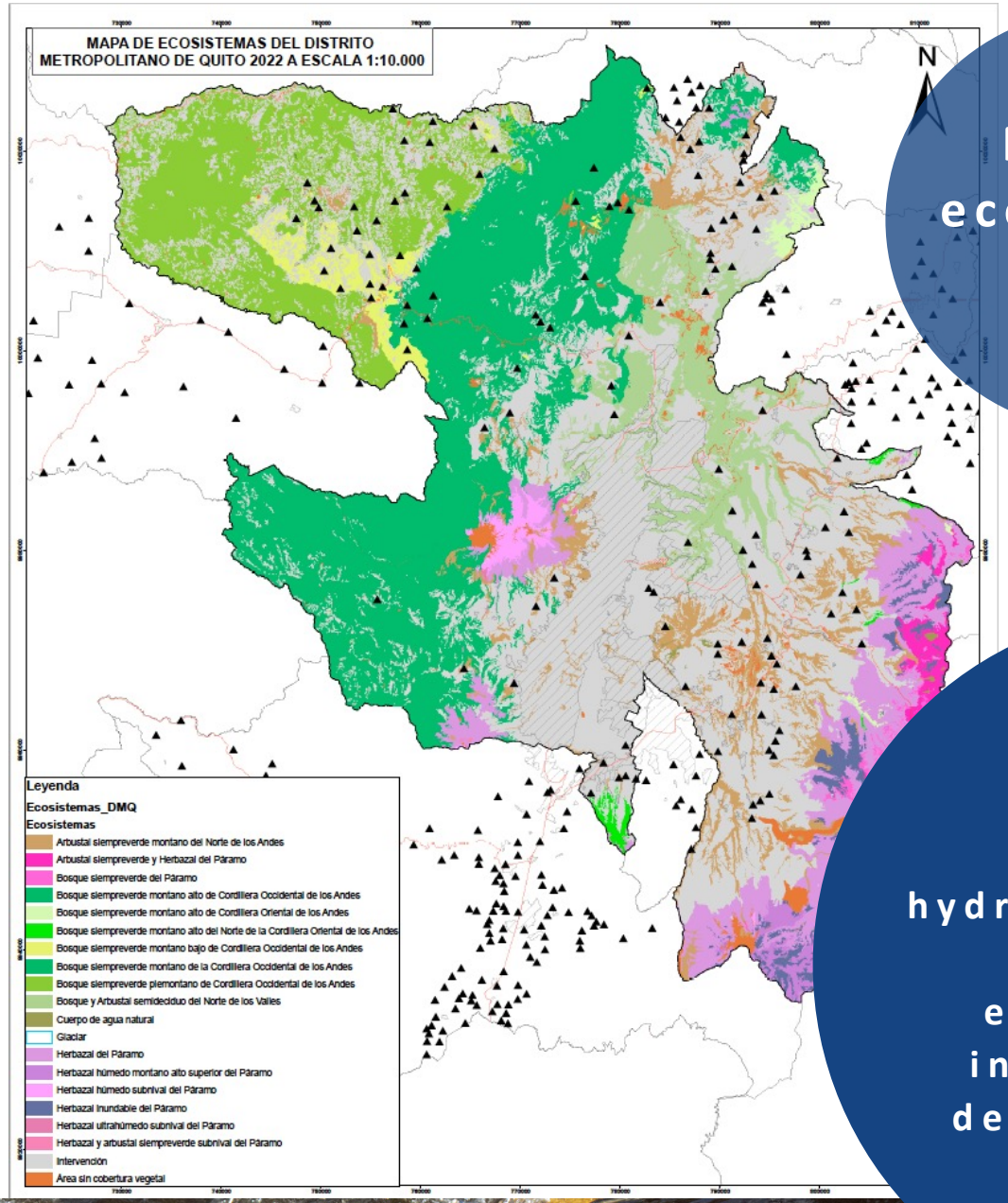
Mitigation

we contribute to the fight against climate change

1ha of preserved paramo (moorland) is capable of storing between 119 y 125ha tC/ha, in the first 20 cm of soil depth, while the restoration of 1ha of vegetation cover (herbaceous and shrub) of the *páramo* ecosystem is capable of capturing between 8 and 33 tC/ha.

ECUADOR CARBONO CERO

FONAG
FONDO PARA LA PROTECCIÓN DEL AGUA



Map of ecosystems DMQ

We generate relevant hydrometeorological , social and environmental information for decision-making.

Hydrometeorological monitoring

We educate and raise awareness about the importance of water source ecosystems.

We build learning about nature to transform our relationship with water sources.

ECAP:
Link with
universities

ECAP
ESTACIÓN CIENTÍFICA
AGUA Y PÁRAMO

Una iniciativa de:
EPMAPS
AGUA DE QUITO
FONAG
FONDO PARA LA PROTECCIÓN DEL AGUA

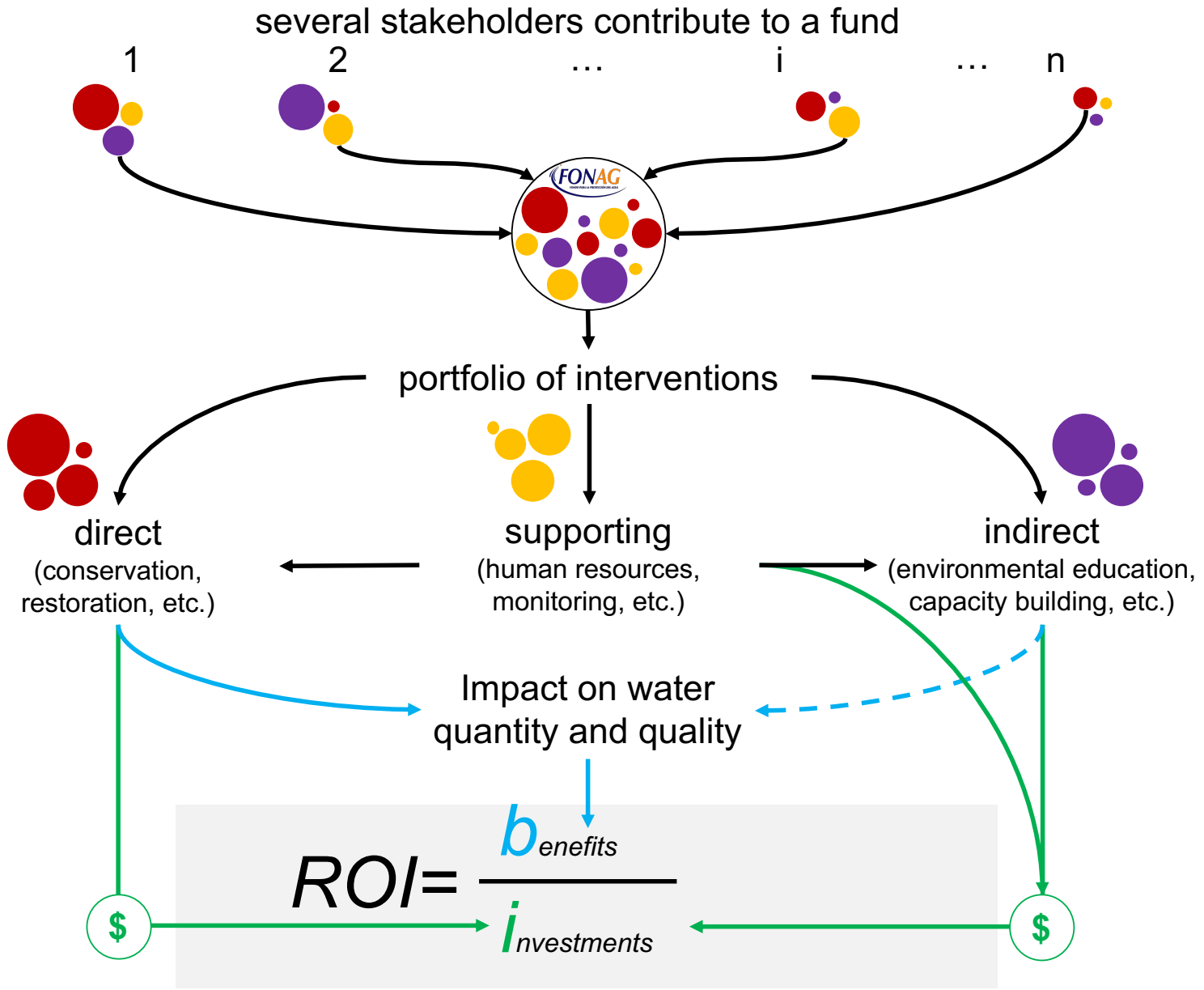
In ECAP we link researchers with decision-makers.

Impact monitoring

- Understand the key factors for the performance of water ecosystem services in QUANTITY and QUALITY of water.
- Demonstrate the impact of FONAG interventions on the quantity and quality of water.
- Optimize and improve interventions.

Return-on-investment

- Water funds are devised as long-term financial mechanisms to invest in a portfolio of watershed interventions with the aim of ensuring adequate water availability for a diverse set of stakeholders.



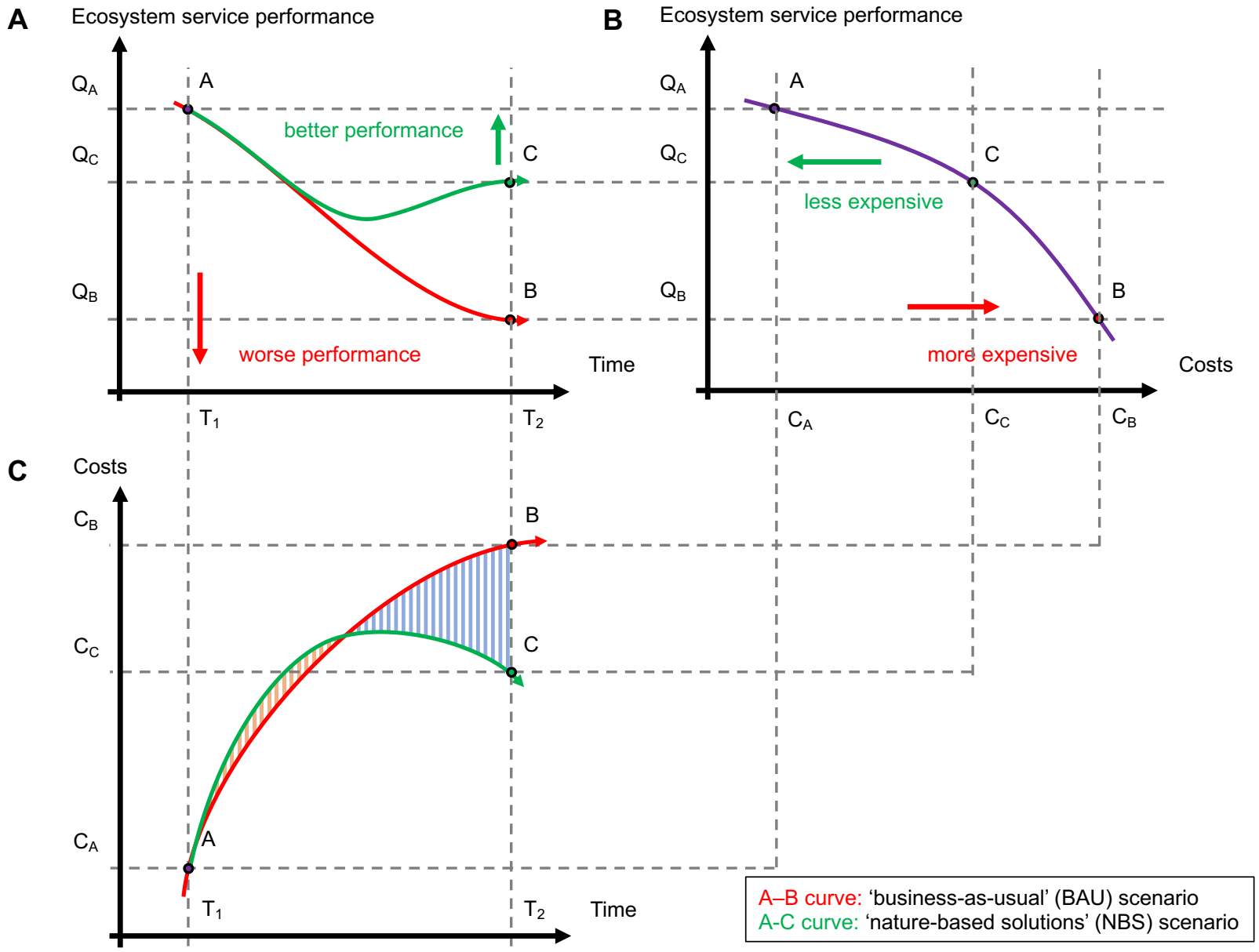
Ochoa-Tocachi et al., 2021; Return-on-investment in nature-based solutions for water

Methodological approach

A. Water quantity and water quality change with time under projected scenarios.

B. The combination of quality and quantity of water determines the costs of water use, for instance, production costs for human water supply or for hydroelectric generation.

C. The reduction in costs under the SEM scenario are only possible through the investment in watershed interventions.



Ochoa-Tocachi et al., 2021; Return-on-investment in nature-based solutions for water

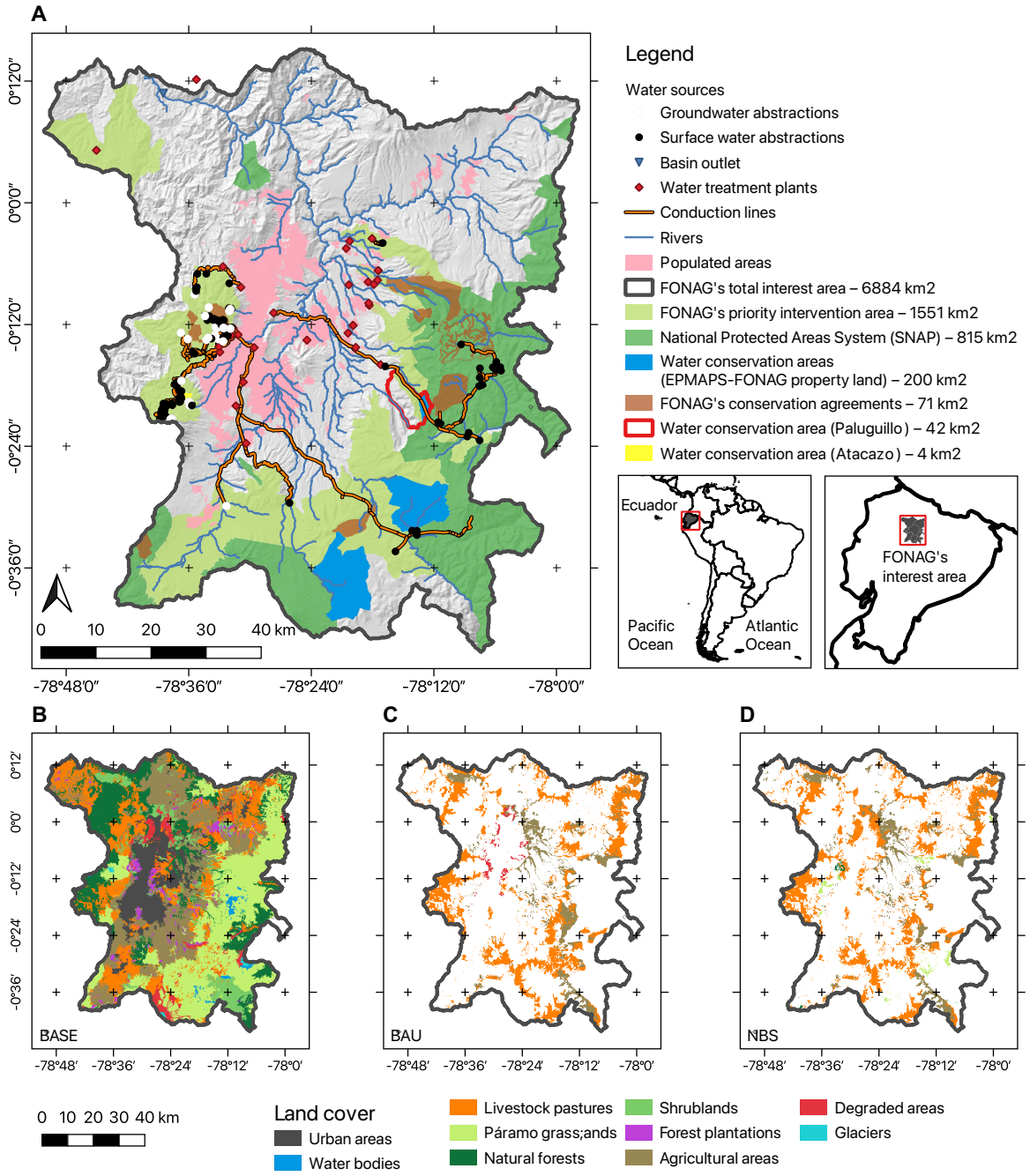
Scenario projection

A. FONAG's interest area in the Quito Metropolitan District (QMD) covers approximately 6,884 km2, from which 2,366 km2 supply water for human water consumption. FONAG implements nature-based solutions (NBS) in 1,551 km2, including 71 km2 that are under community conservation agreements and 200 km2 that are private conservation areas owned by the public water utility of Quito (EPMAPS) and FONAG. 70% of the NBS investments are directed to the latter areas.

B. The BASE scenario represents the current land-use mosaic in the study area and is used to calibrate a hydrological model to provide a comparative baseline.

C. The business-as-usual (BAU) scenario considers current trends in land-use degradation (from a multi-temporal analysis between 2007 and 2014) until 2080 and the absence of NBS interventions in source-water protected areas.

D. The NBS scenario considers the implementation of NBS during 2016–2020 in FONAG's priority conservation areas and their maintenance from 2021 to 2080 in addition to the degradation trends occurring simultaneously in the areas that are not intervened.



Ochoa-Tocachi et al., 2021; Return-on-investment in nature-based solutions for water

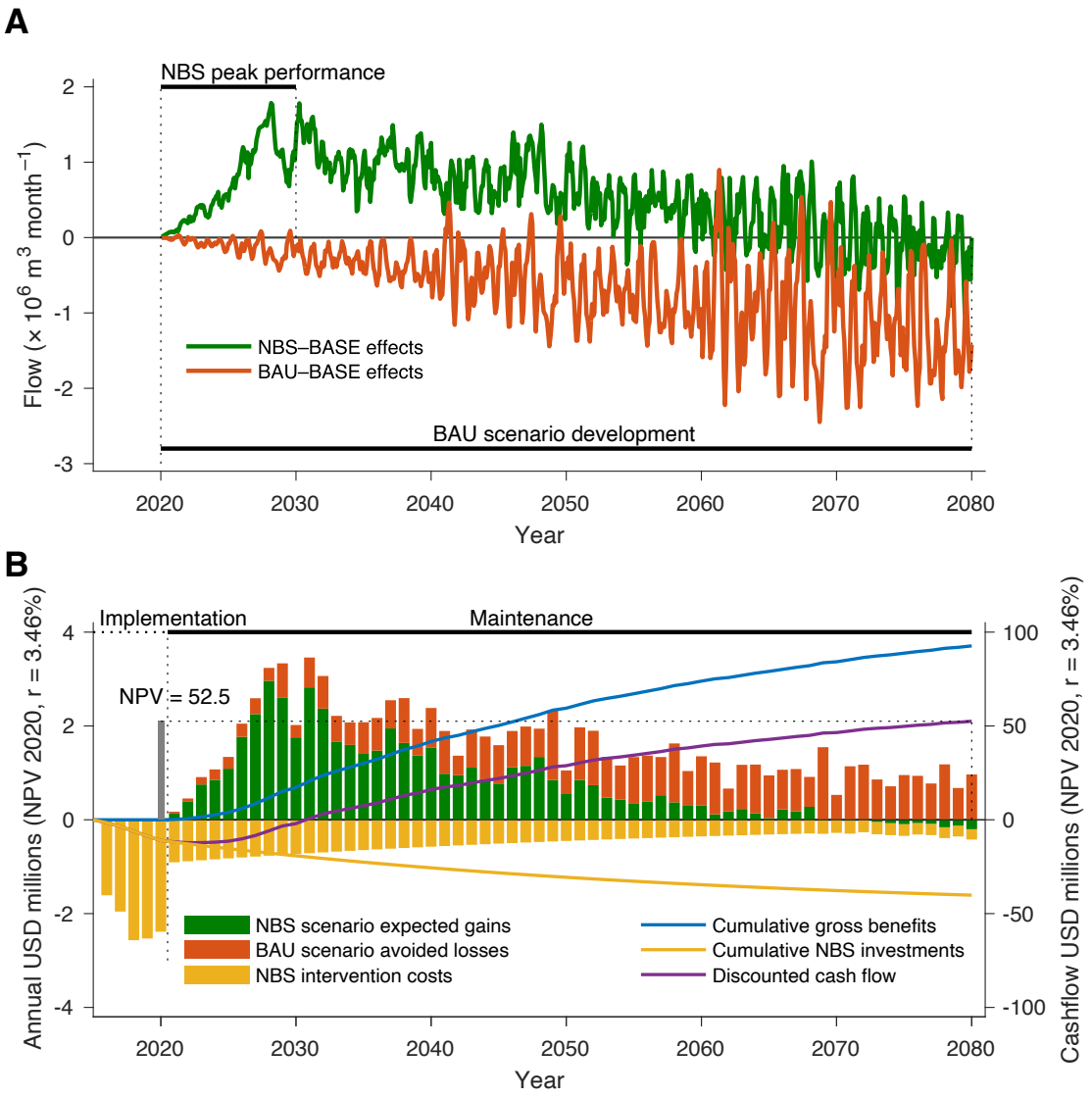
Financial performance of NBS for water

Hydrological modelling:

- Performance of NBS peaks in 2030. Then, the effect of business-as-usual trends can be considerable. The NBS scenario is still better than the BAU scenario on the long-term.

Financial performance:

- USD 11.8M are invested in NBS interventions between 2016 to 2020. Another USD 30M are invested in NBS maintenance until 2080. Net benefits sum USD 52.5M.



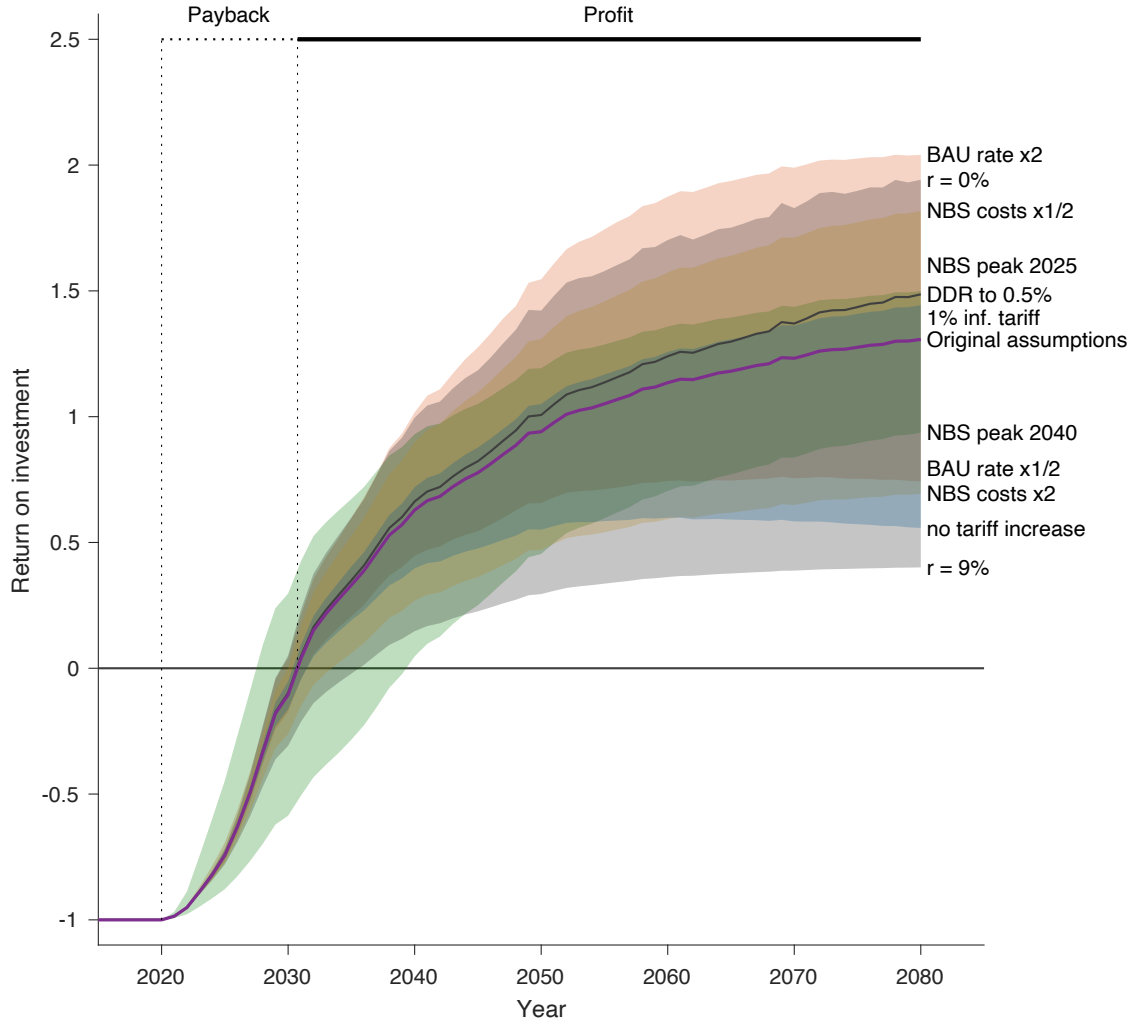
ROI in NBS for water and uncertainty

Return on investment:

- There are net benefits and thus a positive ROI by 2080. The payback year is ~2032.

Uncertainty:

- Considering diverse alternative scenarios, for example, quicker degradation trends or underperforming NBS, we obtain a range of ROI results and payback years that provide greater context and valuable decision-making information.



ATUK's hydroeconomic analysis tool for FONAG

HERRAMIENTA DE MONETIZACIÓN DE BENEFICIOS HÍDRICOS

INSTRUCCIONES

Bienvenido a las herramientas offline de ATUK Cloud® para el cálculo del retorno sobre la inversión (ROI) de soluciones basadas en la naturaleza. La herramienta de "Monetización de beneficios hídricos" permite procesar los datos obtenidos con el modelo FONAG 2.1 by ATUK para calcular los costos e ingresos de tratamiento de agua potable y obtener valores de balance anual para la EPMAPS.

Solamente las celdas amarillas pueden ser editadas para modificar los cálculos realizados con la herramienta. Por ejemplo:

HERRAMIENTA DE CÁLCULO DE FLUJO FINANCIERO Y ROI

INSTRUCCIONES

Bienvenido a las herramientas offline de ATUK Cloud® para el cálculo del retorno sobre la inversión (ROI) de soluciones basadas en la naturaleza. La herramienta de "Cálculo de flujo financiero" permite procesar los datos obtenidos con la herramienta "Monetización de beneficios hídricos" para calcular las inversiones, beneficios brutos y netos, y el retorno sobre la inversión de la EPMAPS en el FONAG.

Solamente las celdas amarillas pueden ser editadas para modificar los cálculos realizados con la herramienta. Por ejemplo:

ANÁLISIS DE SENSIBILIDAD DEL RETORNO SOBRE LA INVERSIÓN

INSTRUCCIONES

Bienvenido a las herramientas offline de ATUK Cloud® para el cálculo del retorno sobre la inversión (ROI) de soluciones basadas en la naturaleza. La herramienta de "Análisis de sensibilidad del retorno sobre la inversión" permite probar diferentes hipótesis alternativas para el cálculo del retorno sobre la inversión de la EPMAPS en el FONAG y compararlas simultáneamente.

Solamente las celdas amarillas pueden ser editadas para modificar los cálculos realizados con la herramienta. Por ejemplo:

1.465460

En la pestaña **1.1 Balance Mensual BAU** y **1.2 Balance Mensual SBN** ingrese los resultados de la monetización de beneficios hídricos para los escenarios BAU y SBN, respectivamente, a escala mensual. Se da la opción de ingresar dos resultados complementarios por cada escenario que luego son sumados para obtener el efecto total del escenario evaluado. Esto permite, por ejemplo, considerar el efecto de las diferencias entre los escenario SBN–BASE y el escenario SBN–BAU que se complementan para generar el efecto total SBN. Ingrese también aquí los factores de escalamiento mensuales utilizados para crear estos balances.

En la pestaña **2.1 Inversiones SBN** se muestran los presupuestos anuales de inversión en soluciones basadas en la naturaleza por parte del FONAG para los años 2016 a 2020. De esta lista de elementos, se han identificado aquellos que se consideran como costos de mantenimiento en color amarillo como guía. Se recomienda obtener valores promedio entre los 5 años analizados para los rubros del presupuesto marcados con el fin de determinar los costos de inversión promedio para los años siguientes. Sin embargo, el usuario tiene la opción de considerar otros valores de la lista del presupuesto u otras estadísticas (por ejemplo, máximos o mínimos) con el fin de determinar los costos de inversión que desea usar en el cálculo del flujo financiero.

En la pestaña **3.1 Suposiciones y Alternativas** ingrese: el año para el cual se desea calcular el valor actual neto (VAN) del dinero (recomendado, año 2020 o 2021); la tasa de descuento para convertir el dinero futuro en VAN (recomendado, 3.46%, el cual es usado por la EPMAPS en sus proyectos de inversión en infraestructura hidráulica); la tasa de inflación para considerar incrementos en costos de producción de agua y de mantenimiento de SBN (recomendado, 1% siguiendo un valor promedio nacional); y la tasa de incremento de la tarifa de agua potable cada 5 años, siguiendo los planes estratégicos de la EPMAPS (recomendado 5% cada 5 años).
Ingrese también aquí dos suposiciones alternativas para las cinco variables que serán evaluadas en el análisis de sensibilidad. Estas son: Escenario BAU (≈ 1a y 1b), Escenario SBN (Alternativas 2a y 2b), Costos de inversión en SBN (Alternativas 3a y 3b), Tarifa de agua potable (Alternativas 4a y 4b), Tasa de descuento (Alternativas 5a y 5b).

3.1 SUPOSICIONES ORIGINALES Y ALTERNATIVAS

Intervalo de análisis	Año inicial	2021	Valores recomendados
	Año final	2080	
Valor actual neto	Año	2020	2020
Tasa de descuento	Estándar	3.46%	3.46%
Tasa de inflación	Promedio	1.00%	1.00%
Tasa incremento tarifa	Incremento	5.00%	5.00%
	Cada # años	5	5

El valor actual neto se calcula para un año "presente" específico. Representa el valor del dinero en dicho año.	
La tasa de descuento se utiliza para representar el valor cambiante del dinero en el futuro. El dinero vale más ahora que luego de algunos años.	
La tasa de inflación, usualmente un promedio nacional, representa el incremento de los costos de vida, producción y gasto.	
La tarifa de agua potable puede incrementar para compensar los crecientes costos de producción. No aumenta automáticamente sino planificadamente	

Suposiciones originales	Suposiciones alternativas			
La degradación avanza a una tasa constante durante 60 años (hasta el 2080) en el escenario BAU.	1a. La tasa de degradación en el escenario BAU es mayor y alcanzaría su máximo en:	30 Años	1b. La tasa de degradación en el escenario BAU es menor y alcanzaría su máximo en:	120 Años
Las SBN alcanzan su máximo efecto a escala completa en 10 años (al 2030) en el escenario NBS.	2a. Los efectos de las SBN son menores y alcanzan su máximo desempeño en:	20 Años	2b. Los efectos de las SBN son mejores y alcanzan su máximo desempeño en:	5 Años
Los costos de mantenimiento de las SBN están estimados en USD 928263.757 y se incrementan con la inflación (1%).	3a. Los costos de mantenimiento de las SBN son mayores de lo estimado, equivalente a:	150.00 %	3b. Los costos de mantenimiento de las SBN son menores de lo estimado, equivalente a:	50.00 %
La tarifa de agua se incrementa 5% Incremento siguiendo los planes estratégicos de la empresa de agua potable.	4a. La tarifa de agua potable se incrementa un porcentaje anual, usualmente la inflación:	1.00 %	4b. La tarifa de agua potable no se incrementa o se incrementa menos, cada # años:	0.00% 0
Una tasa de descuento de 3.46% empleada por la empresa de agua potable para evaluar proyectos de infraestructura.	5a. Una tasa de descuento mucho mayor utilizada para inversiones de alto riesgo:	9.00 %	5b. Una tasa de descuento decreciente (2021–2080) desde 3.46% hasta:	0.50 %

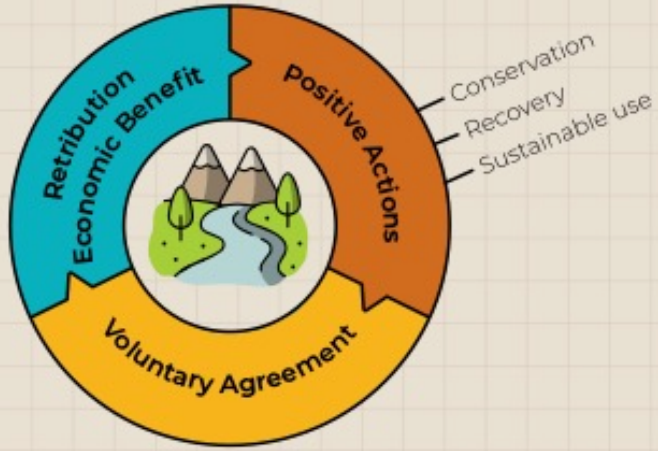
3.2 FLUJO FINANCIERO

Año	Factor de descuento	Factor de inflación	Factor de incremento de tarifa de agua	COSTOS DE INVERSIÓN EN SBN	COSTOS INV EN SBN (desc. & infl.)	Costos B
2016	1.0000	1.0000	1.0000	$1,609,709.55	$1,609,709.55	
2017	1.0000	1.0000	1.0000	$1,956,869.69	$1,956,869.69	
2018	1.0000	1.0000	1.0000	$2,566,958.09	$2,566,958.09	
2019	1.0000	1.0000	1.0000	$2,531,206.22	$2,531,206.22	
2020	1.0000	1.0000	1.0000	$2,386,176.22	$2,386,176.22	
2021	0.9666	1.0100	1.0000	$928,263.76	$906,192.15	-$23,041.95
2022	0.9342	1.0201	1.0000	$928,263.76	$884,645.34	-$36,318.33
2023	0.9030	1.0303	1.0000	$928,263.76	$863,610.86	-$97,460.61
2024	0.8728	1.0406	1.0000	$928,263.76	$843,076.52	-$155,575.5
2025	0.8436	1.0510	1.0000	$928,263.76	$823,030.43	-$178,572.5
2026	0.8154	1.0615	1.0500	$928,263.76	$803,460.98	-$190,313.1
2027	0.7881	1.0721	1.0500	$928,263.76	$784,356.85	-$254,528.0
2028	0.7618	1.0829	1.0500	$928,263.76	$765,706.96	-$215,493.3
2029	0.7363	1.0937	1.0500	$928,263.76	$747,500.51	-$546,492.2
2030	0.7117	1.1046	1.0500	$928,263.76	$729,726.96	-$244,345.7
2031	0.6879	1.1157	1.1025	$928,263.76	$712,376.02	-$487,411.9
2032	0.6649	1.1268	1.1025	$928,263.76	$695,437.64	-$557,079.4
2033	0.6426	1.1381	1.1025	$928,263.76	$678,902.00	-$475,129.4
2034	0.6211	1.1495	1.1025	$928,263.76	$662,759.54	-$437,714.7
2035	0.6004	1.1610	1.1025	$928,263.76	$647,000.91	-$623,967.5
2036	0.5803	1.1726	1.1576	$928,263.76	$631,616.97	-$627,157.4
2037	0.5609	1.1843	1.1576	$928,263.76	$616,598.82	-$581,670.0
2038	0.5421	1.1961	1.1576	$928,263.76	$601,937.76	-$903,715.1
2039	0.5240	1.2081	1.1576	$928,263.76	$587,625.30	-$588,709.0
2040	0.5065	1.2202	1.1576	$928,263.76	$573,653.16	-$890,001.5
2041	0.4895	1.2324	1.2155	$928,263.76	$560,013.23	-$913,165.3
2042	0.4732	1.2447	1.2155	$928,263.76	$546,697.63	-$419,421.5
2043	0.4573	1.2572	1.2155	$928,263.76	$533,698.63	-$819,233.6
2044	0.4420	1.2697	1.2155	$928,263.76	$521,008.71	-$1,047,142.4
2045	0.4273	1.2824	1.2155	$928,263.76	$508,620.53	-$955,098.0

PERU MEGA DIVERSE COUNTRY

- **Population:** 33.4 million (2022)
- **Area:** 1,285,215.60 km2
- **GDP:** 223.3 billion (2021)
- **Natural Resources:** Minerals, hydrocarbons, fisheries, coffee, cocoa, blueberries, others.
- **Biodiversity:**
  - Estimated expenditures (BIOFIN): $2.6 billion (2015-2020, 1% of GDP)
  - 18.8m Ha degraded ecosystems that need to be restored.
  - 17.1m Ha for conditioning territories in water seeding/harvesting systems.
  - 22.1m Ha with potential to support the sustainable use of biodiversity.
  - 10% of species of flora globally.
  - 1,847 species of birds (second world ranking);
  - 32 species of amphibians and 523 species of mammals (third world ranking).
  - $42m in total annual investment to maintain NPA

MERESE PAYMENT SERVICES



IMPACTS

- MERESE incorporated in Natural Infrastructure projects in risk management initiatives, 190k Ha.
- Generated employment and entrepreneurship, contributing to social and environmental well being.
- EBA Amazon: Sustainable production model to increase family income in indigenous communities from $45 to $170.

INVIERTE.PE

BIOFIN, 2023; FINANCE SOLUTION: Increasing Public Investment for Biodiversity 'Biodiversity Finance Solutions Exhibition - 5th BIOFIN Global Conference'
This poster is part of an series of all BIOFIN countries and showcases the innovative (existing or potential) finance solutions and work of the countries and partners. As part of the 5th Global Conference on Biodiversity Finance, held from May 9th to May 11th, 2023, these posters provided an additional platform for BIOFIN countries to discuss and network with participants outside of formal sessions. Each poster highlights the finance solutions that already exist or are being planned in the respective country.

BIOFIN, 2023; FINANCE SOLUTION: Increasing Public Investment for Biodiversity 'Biodiversity Finance Solutions Exhibition - 5th BIOFIN Global Conference'.

IMPACTS

- Accelerated execution of green PIP.
- Institutional arrangements for project financing through WfT and MERESE.
- Simplified procedures, increasing the efficiency of public entities.
- Public-private partnerships for resource mobilization in biodiversity, for at least $18m.
- Protection and recovery of ecosystems and their services.

Ecosystem Services
74 projects
$122M

Ecological Zonification
2 projects
$37M

Species
16 projects
$23M

Ecosystem Control and Surveillance in NPA
27 projects
$97M

Water Harvesting
62 projects
$210M

Forestation and Reforestation
83 projects
$ 31M

Ecosystems
112 projects
$512M

Sustainable Use
74 projects
$168M

TOTAL: 450 PROJECTS / $1200M

IMPLEMENTATION PHASES:

Portfolio of potential projects

1. Presentation of BIOFIN potential portfolio in biodiversity, registered from the Data Base of the Ministry of Finance.

Ad-hoc portfolio to public counterparts (sectors, subnationals, others)

1. Selection of projects by public sector partners.
2. Status of projects and political will of national entities for financing.

Project's expression of interest from private companies / Financial institutions

1. Mapping interest from private companies/financial institutions.
2. Presentation of counterpart interest to private companies /financial institutions.
3. Review and selection of projects. Formal willingness for financing.

Project implementation in next cycle

Mobilization actions:
1. Support institutional arrangements.
2. Collection of sources/means of verification (agreements, reports, MoU, budget commitment, others).
3. Biodiversity and Natural Infrastructure Comunication Strategy for scaling up and replication.

A diverse, integrated, portfolio of interventions is required (e.g. not only a mega reforestation program).

Improvement of effectiveness and generation of evidence through thorough impact monitoring

Main limitations for scaling up not necessarily financial: implementation capacity and effectiveness of investments

Thank you

Questions?

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BELA Biodiversity, Ecosystems, & Landscape Assessment

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