Part I: Project Information

GEF ID
10892

Project Type
MSP

Type of Trust Fund
GET

CBIT/NGI
CBIT **No**
NGI **No**

Project Title
Towards Sustainable Phosphorus Cycles in Lake Catchments (uP-Cycle)

Countries
Global, Chile

Agency(ies)
UNEP

Other Executing Partner(s)
The UK Centre for Ecology and Hydrology (CEH) in collaboration with the Chilean Ministry of Environment

Executing Partner Type
Others

GEF Focal Area
International Waters

Sector
Mixed & Others

Taxonomy

Chemicals and Waste, Focal Areas, Eco-Efficiency, Best Available Technology / Best Environmental Practices, Climate Change, Nationally Determined Contribution, United Nations Framework Convention on Climate Change, Climate resilience, Climate Change Adaptation, National Adaptation Plan, Community-based adaptation, Climate Change Mitigation, Agriculture, Forestry, and Other Land Use, Biodiversity, Mainstreaming, Fisheries, Agriculture and agrobiodiversity, Biomes, Lakes, Land Degradation, Food Security, Sustainable Land Management, Sustainable Agriculture, International Waters, Large Marine Ecosystems, Pollution, Nutrient pollution from Wastewater, Nutrient pollution from all sectors except wastewater, Sustainable Development Goals, Influencing models, Transform policy and regulatory environments, Strengthen institutional capacity and decision-making, Stakeholders, Local Communities, Information Dissemination, Type of Engagement, Consultation, Participation, Communications, Behavior change, Strategic Communications, Awareness Raising, Civil Society, Community Based Organization, Non-Governmental Organization, Academia, Private Sector, Large corporations, Individuals/Entrepreneurs, Gender Equality, Gender results areas, Capacity Development, Participation and leadership, Knowledge Generation and Exchange, Gender Mainstreaming, Women groups, Sex-disaggregated indicators, Beneficiaries, Gender-sensitive indicators, Capacity, Knowledge and Research, Knowledge Generation, Workshop, Seminar, Training, Learning, Adaptive management, Innovation, Knowledge Exchange, North-South, Conference, Field Visit

Rio Markers

Climate Change Mitigation

No Contribution 0

Climate Change Adaptation

No Contribution 0

Biodiversity

No Contribution 0

Land Degradation

No Contribution 0

Submission Date

1/31/2023

Expected Implementation Start

6/1/2023

Expected Completion Date

6/1/2025

Duration

24In Months

Agency Fee($)
190,000.00

A. FOCAL/NON-FOCAL AREA ELEMENTS

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount($)	Co-Fin Amount($)
IW-1-1	Strengthening Blue Economy opportunities - Sustaining healthy coastal and marine ecosystems	GET	1,000,000.00	23,194,244.00
IW-1-3	Strengthening Blue Economy opportunities - Addressing pollution reduction in marine environments	GET	200,000.00	4,638,849.00
IW-3-6	Enhance water security in freshwater ecosystems - Enhanced regional and national co-operation on shared freshwater surface and groundwater basins	GET	800,000.00	18,555,395.00
		Total Project Cost($)	**2,000,000.00**	**46,388,488.00**

B. Project description summary

Project Objective

To support lake ecosystems recovery through phosphorus emissions reductions from land to water to improve the protection and restoration of freshwater and coastal ecosystems, bringing together the global lake management and sustainable phosphorus management communities including developing and testing a sustainable phosphorus management framework in Chile to inform international application.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
Component 1 Increasing clarity on global phosphorus emissions, drivers and impacts leading to increased awareness of global scale sector-specific phosphorus emissions reductions opportunities.	Technical Assistance	**Outcome 1** Global stakeholders have the evidence needed to assess the capacity for phosphorus emissions reductions to contribute to their commitments to delivering large-scale ecosystem restoration ambitions (e.g., the UN Decade and SDGs). Improved international and cross-sector awareness of the need for coordinated action to deliver large-scale phosphorus emissions reduction.	????**Output 1.1** The Global Phosphorus Emissions Dashboard beta version developed and implemented as an open-source online mapping tool allowing visualization of emissions estimates and their contribution to eutrophication risk across the world?s large lakes, extending to coastal waters. **Output 1.2** Two global stakeholder workshops demonstrating the Dashboard and informing discussions on cross-sectoral drivers of global phosphorus emissions to freshwater and coastal ecosystems, as well as opportunities to address them. **Output 1.3** A White Paper outlining	GET	318,182.00	7,379,990.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			priority sector-specific actions towards delivering a more sustainable global anthropogenic phosphorus cycle to support improved food security while delivering on global ecosystem protection and restoration ambitions.?			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
Component 2 Building the Global Net Zero Phosphorus Community of Practice on sustainable phosphorus management in lake basins, producing the uP-Cycle Framework and Assessment Approach and accelerating its uptake to optimize emissions reductions programs.	Technical Assistance	**Outcome 2** Increased uptake of an international monitoring and assessment approach for the optimization of phosphorus emissions reduction programs leading to increased ambitions on the protection and restoration of lakes and their catchments and associated socio-economic benefits.	**Output 2.1** Convene the Global Community of Practice on Sustainable Phosphorus Management in Lake Basins; a global network of practitioners tasked with assessing the global baseline on large-scale phosphorus emission reduction programs. **Output 2.2** Guidance materials leading to international implementation of the uP-Cycle Net Zero Phosphorus Framework and Monitoring and Assessment Approach, co-developed with the Global Community of Practice. **Output 2.3** Global Baseline Assessment	GET	585,000.00	13,568,633.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			Report produced showcasing the first internationally coordinated assessment of present-day phosphorus emissions programs for lakes and increasing international motivation to implement new policies, programs, and/or investments leading to more sustainable phosphorus management.			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
Component 3 Demonstrating the uP-Cycle Monitoring and Assessment Approach in Chile from basin to transboundary scales, in the context of enhancing existing policies.	Technical Assistance	**Outcome 3** Improved understanding across Chilean government departments and its stakeholders on opportunities for enhancing phosphorus emission reduction programs and policies, targeting protection of lake basins and the Humboldt Current Large Marine Ecosystem. *Outcomes 3.1-3.3 will support delivery of GEF core indicator 4: Area of landscapes under improved practices = 195,000 hectares (excluding protected areas), contributing to sub-indicator 4.1 and 4.3.* *Outcomes 3.1-3.3 will support*	**Output 3.1** A virtual surveillance portal integrating data streams to produce baseline and forecast outputs on phosphorus emissions and their impacts for the Lake Villarrica Basin, to inform the development of a national scale system. **Output 3.2** Two virtual laboratory workshops and targeted awareness-raising materials to engage stakeholders in the co-development and uptake of new opportunities for sector-specific emissions reductions at the lake basin- to national scales in Chile, utilizing the surveillance portal.	GET	610,000.00	14,148,489.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
		delivery of GEF Core indicator 7. While considered as a global project hence asked not to formally reflect any ?beneficiary? water body, it is believed that this project will contribute somehow to improved ecosystems health in one water marine ecosystem and one freshwater ecosystem under improved cooperative management: the Humboldt Current Large Marine Ecosystem - contributing to sub-indicator 7.3 and 7.4, both at level 2. *Outcomes 3.1-3.3 will also support delivery of GEF core indicator 11, by delivering targeted support to 45,123 male and 46,367 females (91,490 people*	**Output 3.3** A transition plan for Chile is published and shared across relevant government departments identifying opportunities to strengthen the implementation of the existing Lake Villarrica Basin Decontamination Plan, as well as improving the integration of sustainable phosphorus management across national policies for the protection and restoration of lakes and coastal ecosystems.			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
		in total), through the improved management of Villarrica Lake, this is based on the three major population centers of the lake: Puc?n, Villarrica and Curarrehue communes. *Outcomes 3.1-3.3 will further develop the Lake Villarrica Basin Decontamination Plan through stakeholder engagement activities upscaling from basin to national scales. This stakeholder group will be led by the Chilean Environmental Ministry and will include representatives from the Ministries on Agriculture, Chilean Housing and urban planning Ministry (MINVU), CONADI*				

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
		(National Commission for the Indigenous Development), Local Chilean Municipalities, SISS (Superintendence of Sanitary Services), SMA (Superintendency of the environment), SSR (Rural Sanitary Services), DGA (General Water Directorate) and several Civil Society Organizations and Local groups (see Appendix 8A).				

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
Component 4 Accelerate integration of global sustainable phosphorus management opportunities across existing national, regional, and global policy frameworks.	Technical Assistance	**Outcome 4** Improved national, regional, and global awareness of the benefits of integrating sustainable phosphorus management across existing policies within a coordinated approach (e.g., across World Water Quality Alliance (WWQA) and the Global Programme of Action (GPA); IPBES; IPCC; FAO, etc.).	**Output 4.1** Documented project results disseminated through IW:LEARN activities (1% of the project budget) and established global initiatives. **Output 4.2** Global communications plan to raise awareness across public, private and policy audiences, disseminated to IW:LEARN and established global initiatives. **Output 4.3** The uP-Cycle Innovation Hub - a web-based information portal to accelerate the development and implementation of sustainable phosphorus initiatives. **Output 4.4** Global Policy Briefs to	GET	225,000.00	5,218,705.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			increase awareness across governments on the need for better integration of phosphorus sustainability across the existing policy arena.			
Component 5 Monitoring and Evaluation of project delivery	Technical Assistance	**Outcome 5**. Efficient and timely project execution, monitoring and evaluation process carried out in support of Components 1 and 2 activities, and corresponding improvement of project execution as appropriate.	?**Output 5.1** Documented monitoring and reporting process throughout the entire project execution life cycle ensuring project activities under Components 1-4 are on the right track. **Output 5.2** Independent evaluations documenting the process of collecting and analyzing information in order to understand the progress, success, and effectiveness of project activities under other Components.	GET	80,000.00	1,855,540.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
				Sub Total ($)	**1,818,182.00**	**42,171,357.00**
Project Management Cost (PMC)						
				GET	181,818.00	4,217,131.00
				Sub Total($)	**181,818.00**	**4,217,131.00**
				Total Project Cost($)	**2,000,000.00**	**46,388,488.00**

Please provide justification

C. Sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Other	Chinese Research Academy of Environmental Sciences (CRAES)	In-kind	Recurrent expenditures	310,000.00
Other	Institute for Water Education (IHE-Delft)	Grant	Investment mobilized	3,381,000.00
Other	Institute for Water Education (IHE-Delft)	In-kind	Recurrent expenditures	180,000.00
Other	Linkoping University	In-kind	Investment mobilized	2,709,399.00
Other	University of Edinburgh	Grant	Investment mobilized	21,945,563.00
Other	University of Edinburgh	In-kind	Recurrent expenditures	76,783.00
Civil Society Organization	World Resources Institute (WRI)	Grant	Investment mobilized	373,353.00
Other	UK Centre for Ecology & Hydrology (UKCEH)	In-kind	Investment mobilized	13,900,000.00
Other	UK Centre for Ecology & Hydrology (UKCEH)	In-kind	Recurrent expenditures	200,000.00
Private Sector	Phoslock Environmental Technologies (PET)	In-kind	Recurrent expenditures	40,000.00
Private Sector	EMG EasyMining Germany GmbH	In-kind	Recurrent expenditures	6,000.00
Recipient Country Government	Chile?s General Water Directorate (Direcci?n General de Agua ? DGA)	Public Investment	Investment mobilized	110,000.00
Recipient Country Government	Chile?s General Water Directorate (Direcci?n General de Agua ? DGA)	In-kind	Recurrent expenditures	30,000.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Civil Society Organization	Mar Adentro Foundation	In-kind	Recurrent expenditures	12,333.00
Civil Society Organization	Mar Adentro Foundation	Other	Investment mobilized	48,801.00
Other	Agricultural Research Institute - Chile (INIA)	In-kind	Recurrent expenditures	27,054.00
Recipient Country Government	Superintendence of Environment of Chile	In-kind	Recurrent expenditures	22,872.00
Recipient Country Government	Superintendence of Environment of Chile	Public Investment	Investment mobilized	50,501.00
Recipient Country Government	Ministry of the Environment of Chile	Public Investment	Investment mobilized	500,236.00
Recipient Country Government	Ministry of the Environment of Chile	In-kind	Recurrent expenditures	91,329.00
Other	Universidad de La Frontera	Other	Investment mobilized	2,306,409.00
Other	Universidad de La Frontera	In-kind	Recurrent expenditures	66,855.00
			Total Co-Financing($)	**46,388,488.00**

Describe how any "Investment Mobilized" was identified

Co-financing for the uP-Cycle project has been strategically selected to address specific knowledge needs identified during co-development of the components with co-financiers, implementing partners and executing agents. Contributions have been secured for, (1) global phosphorus emissions modelling and visualization to support the preparation of global maps of phosphorus emissions for this project, as well as the implementation of future scenarios; (2) global public and private sector stakeholder engagement and the development of the Global Sustainable Phosphorus Lakes Network drawing on operations of the ecosystem restoration community of practice, (3) country-level activities on the development of phosphorus emission reduction programs and stakeholder engagement, and (4) large scale analyses of

restoration effectiveness including engagement with key international initiatives, industry and public bodies. At the global scale, supporting Components 1 and 2, we align a range of Mobilized Investments across National Governments, for example, delivering evidence and guidance on the development of Sustainable Nutrient Strategies [e.g., University of Edinburgh Climate Change Institute, the EU GOVAQUA project and the UKCEH expertise from the Scottish Government HydroNations programme], in the development of sustainable food systems, nutrient recycling programs, and nature-based solutions [e.g., University of Link?ping; End of Waste Water, Urban Agriculture as Blue-Green Infrastructure; Spatial Recycling Scenarios], in data visualization on phosphorus emissions, environmental and socio-economic impacts, and spatial planning to maximize gains [e.g., WRI Aquaduct and global emissions modelling; UKCEH EC Horizon 7 MERLIN; CRAES Yangtze River Programme], in coordinating global networks of lake restoration practitioners including capacity development and stakeholder engagement [e.g., IHE-Delft coordination of the World Water Quality Alliance Ecosystems Programme with representation from ILEC], and, in identifying co-benefits of phosphorus management [e.g., UKCEH the GCRF Nitrogen Hub]. Finally, we build on partner activities for identifying interventions to increase uptake of circular economy approaches with respect to nutrient recycling, drawing on experiences of program delivery globally [e.g., UKCEH GCRF Nitrogen Hub; University of Link?ping RECAP programme] and in data capture, management and interpretation [e.g., UKCEH?s UKSCAPE Programme, AgZero+, and Net Zero International programs] and delivering on poverty alleviation [e.g., University of Edinburgh Nature?s Contribution to Poverty]. Such investments mobilized are considered as in-kind given that their body of work will contribute to the uP-Cycle project but will not be directly managed through it. Finally, we have secured commitment and expressions of interest from Industry Partners; with focus on developing the global Net Zero Phosphorus in Lakes Network [e.g., Phoslock Ltd] as well as experts in implementing large scale developments in phosphorus recycling from wastes and renewable fertilizer production [e.g., EMG EasyMining Germany GmbH]. At the national scale in Chile, supporting Component 3, we align a range of Mobilized Investments across National Government departments with in-kind contributions from relevant in-country co-financing partners. These contributions will provide integration across relevant government departments through public investments [e.g., Direccion General de Aquas-Chile, Superintendencia Del Medio Ambiente, Ministerio del Medio Ambiente] associated with water quality monitoring and management, legislation, and for the design and implementation of catchment management plans including the Lake Villarrica Decontamination Plan as well as input to the Humboldt Current LME SAP. To support these government investments, the Chilean government have mobilized investment across key NGOs and evidence providers, bringing together expertise in water body monitoring and assessment and data science [i.e., Universidad de La Frontera], in the development of sustainable agriculture practice and land use planning [i.e., The Instituto de Investigaciones Agropecuarias of Chile (INIA)], and in complex stakeholder engagement and the use of nature based solutions in Chile [i.e., Mar Adentro Foundation]. Supporting Component 4, we align Investment Mobilized from key international programs or initiatives. These include programs on regional plans for sustainable nutrient management [e.g., UKCEH the GCRF Nitrogen Hub], conducting knowledge exchange to raise awareness across United Nations Environment Assembly Member States, and in delivering capacity development materials and public awareness raising outputs [i.e., IHE-Delft World Water Quality Alliance Ecosystems Work Stream].

D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNEP	GET	Global	International Waters	International Waters	2,000,000	190,000	2,190,000.00
			Total Grant Resources($)		**2,000,000.00**	**190,000.00**	**2,190,000.00**

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. Project Preparation Grant (PPG)

PPG Required **true**

PPG Amount ($)

50,000

PPG Agency Fee ($)

4,750

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNEP	GET	Global	International Waters	International Waters	50,000	4,750	**54,750.00**
				Total Project Costs($)	**50,000.00**	**4,750.00**	**54,750.00**

Core Indicators

Indicator 4 Area of landscapes under improved practices (hectares; excluding protected areas)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
280500.00	195000.00	0.00	0.00

Indicator 4.1 Area of landscapes under improved management to benefit biodiversity (hectares, qualitative assessment, non-certified)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
280,500.00	155,000.00		

Indicator 4.2 Area of landscapes under third-party certification incorporating biodiversity considerations

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

Type/Name of Third Party Certification

Indicator 4.3 Area of landscapes under sustainable land management in production systems

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
	40,000.00		

Indicator 4.4 Area of High Conservation Value or other forest loss avoided

Disaggregation Type	Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

Indicator 4.5 Terrestrial OECMs supported

Name of the OECMs	WDPA-ID	Total Ha (Expected at PIF)	Total Ha (Expected at CEO Endorsement)	Total Ha (Achieved at MTR)	Total Ha (Achieved at TE)

Documents (Please upload document(s) that justifies the HCVF)

Title	Submitted

Indicator 7 Shared water ecosystems under new or improved cooperative management

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Shared water Ecosystem	Humbolt Current	Humbolt Current		
Count	**1**	**1**	**0**	**0**

Indicator 7.1 Level of Transboundary Diagonostic Analysis and Strategic Action Program (TDA/SAP) formulation and implementation (scale of 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)

Indicator 7.2 Level of Regional Legal Agreements and Regional management institution(s) (RMI) to support its implementation (scale of 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)

Indicator 7.3 Level of National/Local reforms and active participation of Inter-Ministeral Committees (IMC; scale 1 to 4; See Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Humbolt Current		1		

Indicator 7.4 Level of engagement in IWLEARN throgh participation and delivery of key products(scale 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Humbolt Current	1	1		

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	33,239	46,367		
Male	33,399	45,123		
Total	66638	91490	0	0

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

Part II. Project Justification

1a. Project Description

DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF

The overall project structure presented in this document is generally consistent with the one presented in the PIF, albeit limited language refinement and updates in the components and associated budgets, including some reshuffling due to the creation of a fifth component on M&E. Furthermore, the budget per Components has also been revised in-line with actual costings for activities. Key changes include:

? Component 5: Monitoring and Evaluation was added as a component in the results framework rather than a stand-alone activity.

? The total confirmed co-financing amount is above the amount indicated at the PIF stage (USD 46,388,488 at the CEO Endorsement stage while it was USD 15,413,844 at the PIF stage). At PPG stage, it was possible to contact different stakeholders (including public and private sector) related to the project and commit them to present co-financing letters, for which the amount of co-financing and support for the project was increased.

There have been changes in Core indicator 4 (see table below). During PPG, the Chilean government made a more realistic calculation of the **CI 4.1** area of landscapes under improved management to benefit biodiversity (the detailed calculation can be found in section F). At PIF stage the entire area of the lake basin was considered, during PPG protected areas where excluded using GIS data. On the other hand, **CI 4.3** area of landscapes under sustainable land management in production systems was estimated in addition at PPG stage, capturing productive areas that will improve the production more sustainable.

Core indicator 11 (number of direct beneficiaries) has increased from PIF stage, from 66,639 to 91,490, because up to data information was used for the calculations.

Core Indicator 4	**Area of landscapes under improved practices (hectares; excluding protected areas)**					***(Hectares)***
		Hectares (4.1+4.2+4.3+4.4)				
		Expected		Expected		
		PIF stage	Endorsement	MTR	TE	
		280,500	**195,000**			
Indicator 4.1	Area of landscapes under improved management to benefit biodiversity					
		Hectares				
		Expected		Achieved		
		PIF stage	Endorsement	MTR	TE	
		280,500	**155,000**			

Indicator 4.3	Area of landscapes under sustainable land management in production systems					
			Hectares			
			Expected		Achieved	
			PIF stage	Endorsement	MTR	TE
			0	**40,000**		

a) The global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description)

The pollution of fresh waters with phosphorus (and nitrogen), is one of the most conspicuous impacts of the Anthropocene.[1][1] During the 20th century, global phosphorus loading (and nitrogen loading) to freshwaters has doubled[2][2] mainly due to anthropogenic emissions from agriculture and wastewater (Figure 1). This is a consequence of national to global scale demands for food and non-food goods, some of which are destined for international trade.[3][3] These demands are often driven by national economic development plans and are not, necessarily, reflected in the global sustainability policy arena. If phosphorus emissions are not reduced in the coming years, then the environmental and socio-economic impacts are predicted to be irreversible. [4][4]

Healthy waters underscore many of the UN Sustainable Development Goals (SDGs). In its recent report on delivering SDG 6.3.2., UNEP (2021) states that ??quite likely for most countries, reducing nutrient release and transport will have the greatest positive impact on water quality.?[5][5] However, this assessment also indicates that monitoring and assessment of nutrient emissions to fresh waters is inadequate across many countries, at present.

Globally, biodiversity loss is occurring at a faster rate in freshwater ecosystems (83% decline between 1970 and 2014) than in any other environmental domain.[6][6] Phosphorus, together with other stressors, is a key driver of these losses.[7][7] Excess loading of nutrients to lakes causes harmful algal blooms (HABs) which serve as a stark indicator of ecosystem collapse. Such conditions threaten human health and drinking water supplies, drive biodiversity loss, including fish kills, and bleed these effects towards

the coastal ecosystems into which they drain.[8][8] These effects will be exacerbated in many cases by climate change. However, phosphorus enriched lakes are also an important source of greenhouse gas emissions, the net present value global social costs of which could increase from US$7.5 to $81 trillion (2015 ? 2050) following the current phosphorus emissions trajectory [9][9].

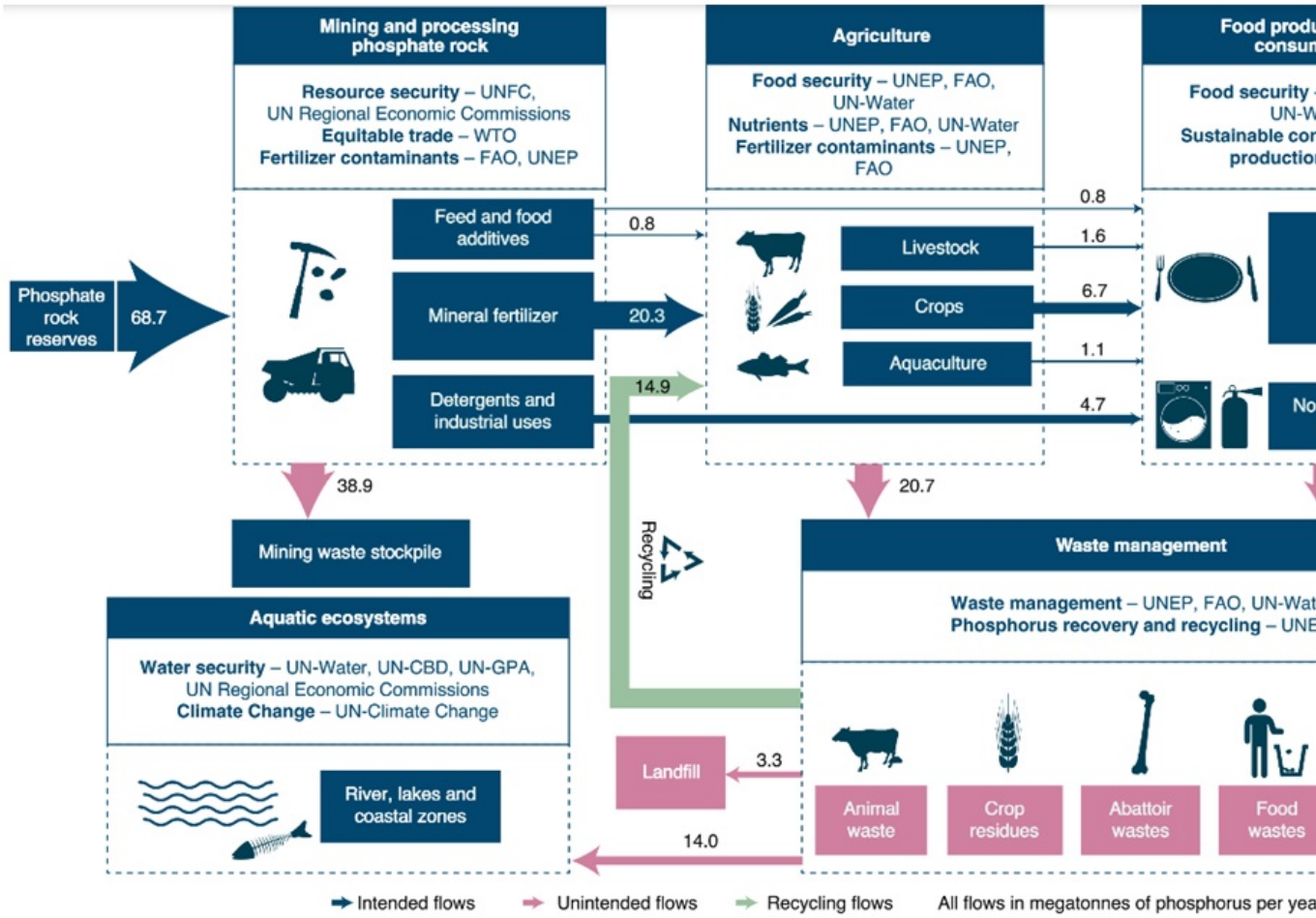

Figure 1. The global phosphorus system. Global phosphorus flows[10][10] and fragmentation of existing international frameworks are shown. There is currently no intergovernmental coordination mechanism on phosphorus, which is needed to link phosphorus science-policy support between existing intergovernmental frameworks and other initiatives. Key bodies with relevant interests include the UN Environment Programme (UNEP) and Food and Agriculture Organization (FAO), UN-Water, the UN Regional Economic Commissions, the UN Framework Classification for Resources (UNFC), the World Trade Organization (WTO), the UN Convention on Biological Diversity (CBD), the UN the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UN-GPA) and the UN Climate Change Convention (UN Climate Change). Arrow widths are proportional to the magnitude of phosphorus flows in 2013; units shown are in megatons of phosphorus per year.

Rivers and lakes combine to form complex drainage basins through which global nutrient exports have increased by 31% for phosphorus and 60% for nitrogen between 1970 and 2020 (currently, 49 Mt yr^{-1} of nitrogen and 5 Mt yr^{-1} of phosphorus;[11][11]). The delivery of phosphorus and nitrogen, in particular, from land to sea has been related to increasing coastal eutrophication. The Global Environment Facility Transboundary Waters Assessment Programme (GEF TWAP) reported that, if current nutrient loading trends continue, a further 13 large marine ecosystems will be at increased risk of eutrophication by 2050 relative to 2000.[12][12] It also highlighted challenges in predicting future trends of degradation in transboundary lakes and reservoirs as a result of limited data, environmental and ecological quality standards, mechanistic understanding of large ecosystem responses to environmental change, uncertainties in projected stressors, and a lack of transparency on governance issues.[13][13]. Action is required to address these issues, for example, through the development and implementation of SDG 6.3.2 indicators to support national to global nutrient emission reductions.[14][14] In doing so, there is an opportunity to target benefits for both freshwater and coastal ecosystems where emissions reductions programs are considered at scale.

The global outlook for phosphorus loading to fresh waters is bleak. Phosphorus demand in the agricultural sector is predicted to double, again, by 2050, further increasing emissions to freshwater and coastal ecosystems.[15][15] Phosphorus losses from food production for domestic consumption will impact directly on catchments that have been ?set-aside? for agriculture. Losses of phosphorus from wastewater to fresh water are expected to increase globally by up to 70% by 2050 (equivalent to 2.4 Mt phosphorus per year[16][16]). Phosphorus pollution from wastewater will impact those catchments connected to urban populations and rural settlements with poor sewerage connections (e.g., a concern in the Lake Villarrica basin, Chile). As marine fisheries fail, emissions from freshwater aquaculture (aquaculture has a global turnover of US$ 160.2 billion yr^{-1}) are projected to rise from 0.94 Mt phosphorus yr^{-1}, estimated in 2016.[17][17]

As nitrogen use is being transformed towards a more sustainable future,[18][18] phosphorus remains underrepresented across many national policies. No global policy exists for phosphorus. Business as usual for phosphorus ignores the impacts of degraded natural capital on the growth of the green economy.[19][19] It assumes that restoration will be affordable, whereas investments in nature-based solutions must increase fourfold by 2050 (from US$ 133 billion in 2020) to meet global ambitions.[20][20] It neglects the value of circularity in the anthropogenic phosphorus cycle, where currently less than 50% of phosphorus wastes are recycled back to the global food system.[21][21] Finally, it fails to recognize that unsustainable phosphorus use is driven, in part, by the international

trade of food and non-food goods, creating a novel transboundary context to nutrient impacts across freshwater and coastal ecosystems.

There is a pressing need to widen the scope and accelerate the development of phosphorus emissions reduction programs, within a new narrative set by the global restoration practitioner community. There is international recognition of the need for an Emergency Recovery Plan for freshwater ecosystems[22][22] and international coordination of action to deliver improved global phosphorus sustainability is key to this goal.[23][23] In addition, there is international recognition of the need to consider a coordinated approach to reduce the impact of land-based activities on coastal-marine ecosystems.[24][24] A globally coherent Framework is required to address these goals which reflects geographical contexts. In some countries phosphorus emissions reduction is already a component within water quality management programs (e.g., USA, Canada, Australia, Europe, UK, and China), and here emissions have decreased, or are expected to decrease. In most developing economies, however, phosphorus emissions reduction programs are in their infancy or do not yet exist. Here, emissions are increasing, for example in Latin America and Asia.

The development of the UN SDG Indicators, and in particular SDG 6.3.2, has highlighted a significant evidence gap in terms of nutrient emission and impacts reporting in low GDP countries.[25][25] Here, the SDG Global Accelerator Framework encompasses Data & Information, Financing, Capacity Development, Innovation, and Governance to address this issue and to help countries to work towards the development of mitigation responses to improve water quality. However, where baseline monitoring data are limited, global modelling outputs and remote sensing can be used to gap-fill offering analyses of trends in phosphorus and nitrogen emissions (i.e., global nutrient emissions models), and algal blooms (remote sensing) as well as the development of future scenarios to inform preliminary mitigation and policy development.[26][26]

A framework for sustainable phosphorus management (as outlined in Focus Box 1) would support globally coherent ambitions and actions targeted at areas of concern with respect to freshwater and coastal degradation. Such a framework should empower countries to reach beyond traditional emissions reduction programs to unlock multiple benefits, for example, aligned through the SDGs (e.g., on equality, food security, terrestrial biodiversity, etc.), and, translated into national and transboundary policies through use-based targets. Many examples of such innovations have been implemented at the lake basin scale through eutrophication management programs across the world, representing an International Community of Practice. Recent examples at the large lake basin scale (e.g., Lake Toba, Indonesia[27][27]) have demonstrated that phosphorus emissions reductions across sectors can be planned to increase the resilience of freshwater biodiversity, water, and food systems, whilst also releasing new sustainable development opportunities (e.g., through eco-tourism).

The immediate opportunity now lies in mobilizing the international community of practice through the co-development of an International Framework for Sustainable Phosphorus Management, to include a monitoring and assessment system designed to optimize existing and emerging emissions reduction programs. On-the-ground support should be prioritized towards countries where freshwater ecosystems are under severe or growing stress from phosphorus emissions, where large scale emissions reductions may benefit sensitive transboundary (lake or marine) ecosystems, and where government and public readiness for change are high. We focus here on Chile (see Baseline), where phosphorus emissions to the Chilean Lake District and other regions have been increasing, where land-based activities have a significant impact on nutrient delivery to the Humboldt Current Large Marine Ecosystem, and where the Chilean Ministry of the Environment are in Stage 1 (Focus Box 1) of implementing phosphorus emissions reduction programs. In this case, and others, there is an urgent need to demonstrate the benefits of emissions reductions across sectors and scales supported by a new narrative on global sustainable phosphorus use.

Focus Box 1. A Framework for Sustainable Phosphorus Management is key to supporting policy makers and practitioners in the development of emissions reduction programs targeting protection and restoration of fresh waters whilst enabling sustainable and inclusive economic growth along the continuum from land to sea. Here, within a Net Zero Phosphorus concept, we split this pathway into two interrelated steps, recognizing that emissions reductions must be phased through:

(1) halting increasing present-day emissions trajectories to avoid further ecosystem degradation and then reducing levels of future emissions to deliver ecosystem recovery (Step 1: Towards Net Zero P), and,

(2) accelerating the selection, placement and implementation of programs of measures that deliver multiple benefits along the full value chain, in the long term (Step 2: Beyond Net Zero P or Net Zero **P**lus).

The general architectures of these phases are outlined below. Whereas Step 1 should be the foundation of emissions reductions investments in all cases leading ultimately to ecosystem restoration, we envisage that the additional gains delivered through Step 2 will be basin and country-specific, and dependent on relevant policy frameworks (example co-benefits have been included). Finally, the approach recognizes that each ecosystem has a specific carrying capacity for phosphorus emissions and that emissions reductions must be planned within this context.

Step 1. Towards Net Zero P for ecosystem recovery. Addresses the urgent need to identify and control major anthropogenic emissions sources to halt further ecosystem degradation and then to implement measures to reduce emissions in the medium to long-term that will support sustained ecosystem recovery.

Transforming phosphorus emissions assessments

Source Identification, Monitoring and Assessment utilizing integrated sensor networks, earth observation, regulatory monitoring data (e.g., discharge consents), and catchment land-use export modelling to quantify sector-specific contributions to the anthropogenic emissions landscape.

Setting Ecological and Natural Capital Targets linking anthropogenic source-specific emissions reduction contributions to ecosystem responses using empirical data and ecosystem modelling tools and defining the carrying capacity of the systems.

Emissions reductions at scale to enhance the natural environment

Emissions Reduction at Source, identifying and accelerating sector-specific opportunities to reduce direct emissions to existing waste streams and/or to optimize practices to increase phosphorus use efficiency to reduce point and diffuse source emissions.

Phosphorus Capture and Re-Use, assessing capacity for Nature-Based Solutions, both in urban and rural settings, to divert, capture and recover phosphorus from points of accumulation in the natural environment, upstream of sensitive ecosystems.

Implement Lake Ecosystem Resilience Enhancing Measures, ensuring that ecological recovery following emissions reductions is effective, including the creation of refuge habitats for threatened species, the control of legacy phosphorus pollution in lakebed sediments, and the control of other important stressors (e.g., climate change, non-native invasive species, other nutrients and pollutants) which may constrain ecosystem recovery in the long term.

Step 2. Beyond Net Zero P (or Net Zero P Plus). Ensures that emissions reduction measures are selected that deliver wider gains, including supporting sustainable and inclusive economic growth, enhancing biodiversity in connected ecosystems across scales, and improving human interactions with the natural environment through education and knowledge exchange.

Enabling sustainable and inclusive economic growth

Embracing the Circular Economy to identify opportunities that address losses of phosphorus and other nutrients along the full value chain delivering on wider sustainability ambitions including the reduction of food waste and wastewater discharges.

Increasing Resilience in Food and Drinking Water Sectors by reducing reliance on mined (and imported) inorganic phosphorus fertilizers in agriculture and aquaculture (and other end-uses), within the carrying capacity of the system, whilst reducing drinking water treatment costs associated with the reduction of harmful algal blooms and their toxins.

Supporting Growth in Eco-tourism, Business and the Housing Sectors by enhancing the value of natural capital to contribute to the creation of vibrant and dynamic water economies working with stakeholders to develop opportunities for businesses or industries for whom clean, safe and biodiverse lakes are a critical resource. Linking P-Smart housing development schemes to maximize recycling, minimize emissions from domestic sources whilst informing placement of developments outside phosphorus critical zones.

Contributing to Net Zero Ambitions by reducing direct greenhouse gas emissions from standing waters related to a reduction in phosphorus driven algal biomass and through the selection of Nature-Based Solutions that deliver both reductions in phosphorus emissions from land to water as well as greenhouse gas emissions from land to atmosphere.

Empowering communities

Fostering Inclusive Sustainability Communities to ensure that all members of society play an active role in the development of future emissions reduction plans, including, Youth and Indigenous Peoples Assemblies.

Accelerating Inclusive Sustainable Innovation working across sectors to support the development of innovations, jobs and opportunities through the transition to new emissions reduction practices (e.g., small holding farmers) for vulnerable groups who are historically socially and/or economically reliant on the *status quo*.

Enhancing Capacity across the Institutional Framework by connecting knowledge providers (e.g., universities, citizens? science practitioners, businesses, and regulatory bodies) through shared education and skills development activities to underpin the long-term knowledge base.

To achieve this, we must first overcome the following **tractable barriers** to change:

Barrier 1 (B1): Lack of an internationally relevant phosphorus monitoring and assessment system

Baseline data for indicators of phosphorus sustainability, including emissions to waterbodies and ecological and socio-economic impacts, are essential for underpinning restoration or protection targets at catchment to national scales. However, there is, currently, no internationally accepted list of indicators or assessment system. Monitoring and assessment programs provide a critical link between information, evidence-based decision making and policy development and should be used to inform a common approach to adaptive management planning, including those relevant to transboundary ecosystems. This is especially important given ecosystem restoration is often based on long-term targets, that the impacts on waterbodies of multiple pressures, such as climate change, population growth and urbanization, are rarely considered in target setting[28][28], and where emissions reductions require coordinated action across countries. For phosphorus, the lack of such a system limits the ambition of restoration investments, which currently focus on biodiversity gains, but ignore other benefits as described within the UN SDGs. In addition, where targets exist, they commonly include only pressure-related targets and lack clarity on used-based targets. An internationally developed monitoring and assessment system considering phosphorus as a driver of socio-economic and ecological systems across scales is urgently needed, especially in countries where phosphorus emissions are increasing rapidly. General frameworks exist to support the development of Integrated Catchment Management Programs across scales. For example, UNEP?s Framework for Freshwater Ecosystem Management[29][29], the International Lake Environment Committee (ILEC) Integrated Lake Basin Management models, and the SDG 6 SDG Global Accelerator Framework which are adaptable for phosphorus and acknowledge the need for accurate evidence to inform decisions within coordinated governance, policy, and institutional frameworks. The potential to implement phosphorus emission reduction programs at scale to relieve stress at basin to transboundary scales should be reflected within a new Global Sustainable Phosphorus Framework.

Barrier 2 (B2): Poor knowledge exchange limits the effectiveness of phosphorus emissions reduction programs

There is a pressing need to enhance knowledge exchange on the challenges, solutions and multiple benefits of phosphorus emissions reductions to accelerate large scale initiatives. Many, currently disparate, case studies exist with which to exemplify the complexity of including phosphorus within integrated catchment management programs across large ecosystems, including transboundary rivers, lakes and LMEs. These case studies represent a global evidence base on the implementation of improved sustainable phosphorus management, within an Ecosystem Based Management Approach. The drive for restoration through phosphorus emissions reductions to address the decline of biodiversity in lakes across, for example, Europe, North America, and New Zealand has led to the development of an impressive evidence base on sustainable nutrient management. For example, nutrient source apportionment and ecosystem response monitoring approaches have been developed

through the EU Water Framework Directive and USA Clean Water Act. Ecosystem modelling tools are available to predict ecological resilience and recovery. Ecosystem service models have been developed and applied to map out, in time and space, the benefits of reduced phosphorus emissions on lakes and their catchments, supporting policy development. These models can be used collectively to deliver *future world* scenarios, for example, including the effects of climate change or urban development. Nature-based solutions have been developed to support increased efficiency in agriculture and wastewater discharges, including reducing losses through recapture and re-use of nutrients underpinning novel landscape planning strategies to support this. Actions to reduce losses from agriculture can be framed within the wide-reaching 5R approach[30][30] (i.e., Re-align phosphorus inputs, Reduce losses to water, Recycle, Recover from wastes, and Redefine food systems) offering basin to global scale application.[31][31] The use of so-called in-lake ?geoengineering? and/or ?biomanipulation? techniques offer immediate, but shorter-term, relief from the effects of HABs when phosphorus pollution reduction from land-based sources will be slow. Such innovations can remain out-of-reach for many developing countries. Innovative knowledge exchange platforms have been established in some countries and regions, for example, the European Sustainable Phosphorus Platform (see Baseline scenario for other examples), which offer access to evidence on emerging measures, but not necessarily the expertise to select, monitor and apply them. Knowledge across these multiple disciplines remains siloed, both geographically, and within sectors limiting their uptake in countries where emissions reductions programs are emerging.

Barrier 3 (B3): Low awareness of the public and private sectors on the rewards of improving phosphorus sustainability, and the risks of inaction.

At the global scale, food demand is currently the engine driving the phosphorus cycle. However, despite the importance of phosphorus for food, drinking water and environmental health, public awareness of the impacts of food choice on phosphorus sustainability remains low.[32][32] Whilst there is a pressing need for education on the impacts of consumer behavior (i.e., *purchasing power),* businesses and governments will ultimately drive change. The currency of that change will be natural capital. However, many companies remain blind to their exposure to Nature Related Financial Risks, including those associated with phosphorus pollution [33][33]. These risks may, for example, include losses to real estate value and income through eco-tourism, increases in litigation costs associated with pollution discharges and water treatment, and production capacity decreases linked to natural disasters (e.g., fish kills in lakes for aquaculture). The accounting methods to make such assessments are available but not yet widely applied. In the USA, estimates of such losses in response to eutrophication are *ca.* US$ 2.2 billion per year. In the UK, similar assessments indicate losses will increase from *ca.* US$ 245 million in 2018 to *ca.* US$ 595 million by 2080 as a result of climate warming, alone. These losses will increase with phosphorus pollution. There is a clear need to develop assessment and reporting systems for phosphorus that supports both private companies and public bodies in assessing their financial exposure over the short to long terms and their performance in relation to pollution monitoring and reduction, within an internationally relevant framework. The opportunity exists for

businesses to foster growing consumer demand for products with lower pollution footprints and to expand into new market areas that deliver nutrient pollution reductions and promise lower exposure to nature-related financial risks[34][34]. The potential for investments in nature-based solutions to offset emissions elsewhere is gathering attention but importantly, the net effects of emissions reductions must deliver benefits to natural capital, so unlocking the wider values of ecosystem restoration.

Barrier 4 (B4): Where they exist, basin to national scale phosphorus emissions reduction policies are fragmented and limited in ambition

Strategies to improve phosphorus management for fresh waters, or for phosphorus sustainability generally, are conspicuously absent in many regions and are disconnected globally.[35][35] Few policies relating specifically to sustainable phosphorus management exist at the national scale and none at the global scale.[36][36] The interactions between countries and regions that drive the export and import of phosphorus, and also phosphorus emission from catchment to national and transboundary scales, seem out of reach for most lake basin managers. Phosphorus was identified as an emerging issue in the UNEP Year Book 2011.[37][37] However, relevant international sustainability initiatives do not specifically mention phosphorus, including the SDGs,[38][38] and the Aichi Biodiversity Targets.[39][39] This is despite the considerable contribution that improving phosphorus sustainability can make to achieving the goals for freshwater biodiversity and wider benefits.[40][40] There is a need for more international consistency in the approach to phosphorus management in lake catchments, focusing on the release of multiple societal benefits, as well as better integration across water policy and other policy domains including agriculture, urban planning, flooding, and climate change and energy.[41][41] To address this, it is important to demonstrate the value of such a scalable approach in a country with an increasing phosphorus pollution problem and where ecosystems are of high socio-economic value.

Addressing the Barriers ? Project architecture

This project has been co-developed with key actors to address the barriers outlined above (specifically described in the Overview of Components in Section 3). We focus here on lakes as the primary loci for ecosystem degradation related to phosphorus emissions from the landscape. In doing so, we recognize that coordinated initiatives to reduce emissions for ecosystem protection can deliver benefits that resonate along the full value chain, and from emissions sources through connected freshwater and coastal ecosystems. We recognize the need for international coordination and direction in this area to support the reduction of impacts from land-based activities on transboundary ecosystems (e.g., Transboundary Lakes and Large Marine Ecosystems) as well as global ambitions, for example, in relation to SDG 6.3.2. To support these needs, sustainable phosphorus management must be better integrated across basin, national, and international policy arenas and our project components are

structured around these scales. We will adopt a multidisciplinary, international approach, bringing together and informing industry, policy makers, and the ecosystem restoration community of practice, alongside academic and non-governmental bodies with expertise in implementing large scale phosphorus emissions reduction programs, or who are tasked with developing them. We will focus this community on the development of an internationally coordinated monitoring and assessment approach designed to optimize the benefits of existing and emerging phosphorus emissions reduction programs and to produce comparable and scalable data resources to support decision making, framed within a novel Net Zero Phosphorus concept (Focus Box 1). This approach will be piloted in collaboration with the Ministry for the Environment, Chile and their evidence providers, where phosphorus pollution in the Chilean Lake District is increasing and where land-based pressures are a key concern of the Humboldt Current Large Marine Ecosystem Strategic Action Program. As such, the architecture of the project allows consideration of challenges and solutions across scales. It allows consideration of a basin to transboundary approach to sustainable phosphorus management and will address the critical need to accelerate the uptake of advanced surveillance systems in emerging economies, demonstrating this approach through on-the-ground activities in Chile to inform similar activities in other world regions. Finally, it will set a new narrative on sustainable phosphorus management through engagement with established global bodies and programs (as outlined in the Baseline section below).

b) The baseline scenario and any associated baseline projects

We outline below the current baseline conditions across catchment to global scales as well as relevant programs/projects that have delivered important evidence to support the uP-Cycle Project. We highlight also those activities and investments that stand to benefit directly from the project deliverables and outcomes.

The Global baseline

In 2013, the opportunity was highlighted for a 20% improvement in nutrient use efficiency by 2020 across the full chain of food and waste systems.[42][42] Since this time, several nutrient sustainability goals have been proposed. The United Nations Environment Programme (UNEP) Colombo Declaration calls for the halving of nitrogen (N) waste by 2030.[43][43] The working group of the Post-2020 Global Biodiversity Framework proposed to reduce pollution from excess nutrients by 50% by 2030.[44][44] The Farm to Fork strategy underpinning the European Green Deal, for example, calls for actions to reduce nutrient losses by at least 50% and to reduce fertilizer use by at least 20% by 2030.[45][45] Despite this, phosphorus management remains largely ignored in the food and environmental policy agendas of most countries, and international conventions.[46][46] Progress remains hindered by a lack of policy and public awareness, fragmentation of actions and policies, and the absence of intergovernmental

coordination.[47][47] The momentum for action on nitrogen pollution is building; the first United Nations Environment Assembly (UNEA) resolution for sustainable nitrogen was agreed in 2019.[48][48] A lack of comparable action for phosphorus has provoked scientists worldwide to sign ?the Helsinki Declaration? (Call for International Action on Phosphorus) - (www.opfglobal.com); a petition initiated by the UKCEH and the European Sustainable Phosphorus Platform that calls for government support in addressing the phosphorus emergency by coordinating action across sectors and nations. By the end of 2020, over 500 scientists had signed this Call. The uP-Cycle network will help deliver a new narrative on Global Sustainable Phosphorus Management through activities focused on the international policy arena in Components 1 and 4.

Global Baseline - relevant GEF supported projects

The towards an ?International Nitrogen Management System? project (GEF project ID: 5400; Implemented by UNEP and executed by UKCEH, 2017-2022)

The GEF/UNEP-UKCEH ?Towards the International Nitrogen Management System? project (INMS) is developing the evidence base to showcase the need for effective practices for global nitrogen management and to highlight options to maximize the multiple benefits of better nitrogen use. uP-Cycle will build on the successes of INMS, outlined below, supporting activities within the global nitrogen sustainability policy arena to build on the obvious synergies between phosphorus and nitrogen. In addition, we will have access to evidence and tools with which to enhance our proposed Innovations Hub, including a measures database for sustainable nitrogen management which may also deliver on phosphorus sustainability. INMS offers access to over 70 global project partners, supporting the work through co-finance which includes the establishment of five funded regional demonstrations in Africa, South Asia, East Asia, Latin America, and Eastern Europe with a self-funded demonstration in Western Europe and the US. Since the launch of the INMS, global progress on nitrogen has rapidly accelerated. Learning from the UNECE, a partnership was formed in 2017 between INMS and the South Asian Cooperative Environment Programme (SACEP) to draft a first-ever UN Resolution on Sustainable Nitrogen Management, adopted by the Fourth UN Environment Assembly in March 2019 (UNEP/EA.4/Res.14). Among its provisions, the nitrogen resolution calls for the UNEP executive director to ??consider the options for facilitating improved coordination of policies across the global nitrogen cycle at the national, regional and global levels, including consideration of the case for establishing an intergovernmental mechanism for coordination of nitrogen policies?. In response to this, the INMS has led the development of an inter-convention nitrogen coordination mechanism (INCOM). INMS is now following up with member states under a newly formed UNEP Nitrogen Working Group, preparing the basis for establishing INCOM. Under this approach, INMS provides nitrogen science support relevant across multiple multi-lateral environmental agreements. This process was accelerated with the launch of the UN Global Campaign on Sustainable Nitrogen Management in Colombo, Sri Lanka, in October 2019. The resulting Colombo Declaration agreed on the ambition to halve nitrogen waste by 2030 as part of National Nitrogen Action Plans while endorsing the UNEP Road Map for Sustainable Nitrogen

Management. The INMS project is implemented by the UN Environment Programme (UNEP) with 6M USD funding through the Global Environment Facility (GEF) (GEF project ID: 5400). INMS is executed through the UKCEH, on behalf of the International Nitrogen Initiative (INI).

The INMS project has greatly raised awareness of policymakers and stakeholders on the importance of nutrient management, with a focus on nitrogen. The uP-Cycle project will build upon this progress by providing a focus on phosphorus, providing balanced improvement in nutrient management across a well-established global community.

Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of Global Nutrient Cycle (GEF 4212; 2011-2015; implemented by UNEP and executed by The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)).

The project, which was global in scope, contributed to building the knowledge foundations on nitrogen and phosphorus nutrient cycling, the impacts on the environment and the development of a Global Nutrient Management Decision-Support Toolbox. The toolbox is a web-based information portal to support nutrient management, focused predominantly on nitrogen, including more than 200 nutrient management practices and policies in use around the world and case study accounts on implementation of best management practices and tools with which to assess nutrient loading scenarios at a river basin scale.

The uP-Cycle project will develop on the progress made in the project through its ?Innovation Hub?. The ?Innovation Hub? will not replicate work already done but provide a more detailed source of information on phosphorus management practices.

Towards a Lake Basin Management Initiative and a Contribution to the Third World Water Forum: Sharing Experiences and Early Lessons in GEF and non-GEF Lake Basin Management Projects (GEF project code: 1665; 2002 ? 2006; implemented by World Bank Group).

This project catalyzed communication in lake restoration practitioners and used this knowledge to produce training materials that can be used generally as an introduction to Integrated Lake Basin Management. These outputs informed the UNEP Framework for Freshwater Ecosystem Management. The uP-Cycle project will build on this network to inform the development of the Zero P Lakes Network and will learn from the capacity development materials produced to support the production of targeted guidance on sustainable phosphorus management leading to lake ecosystem recovery.

GEF Transboundary Waters Assessment Programme (TWAP; GEF Project code: 4489; 2012 ? 2017; implemented by UNEP).

The Transboundary Waters Assessment Programme (TWAP) aimed to provide a baseline assessment across the world?s transboundary water systems (groundwater, lakes/reservoirs, rivers, large marine ecosystems) capturing the impacts of human activities and natural processes, and the consequences of these on human populations. The methodologies for conducting a global assessment of these water systems were developed during the TWAP Medium-sized Project (2009-2010). The TWAP Full-sized

Project implemented the first global comparative assessment for transboundary waters to support GEF and other international organizations in setting priorities for supporting the conservation of transboundary water systems. The TWAP assessment is the first global assessment that uses quantified indicators of system states, pressures and impacts under three broad themes: biophysical, socioeconomic, and governance. TWAP has demonstrated the widespread incidence of the risk of unsustainability in transboundary aquifers, lakes, rivers, Large Marine Ecosystems and the open ocean, across the planet. To reduce and reverse the causes of risk to meet Sustainable Development Targets by or before 2030, TWAP stresses the need for countries to develop further their specific monitoring of key indicators to identify and mitigate anthropogenic and natural processes impacting their transboundary ecosystems. The uP-Cycle project will respond directly to this need through the on-the-ground activities focused on emissions reductions programs, potentially delivering benefits to LMEs, for example, the Humboldt Current LME which receives inputs from land-based activities in Chile (Component 3), and through engagement and knowledge exchange with representatives of nutrient management programs focused on Transboundary Lakes (e.g., Lake Victoria, Lake Erie and others, to be included in the Community of Practice; Component 2).

GEF Strategic Partnership on the Black Sea and Danube River Basin including (a) The Danube Regional Project (DRB to 2007): Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin; (b) The Black Sea Ecosystems Recovery Project (BSERP): Control of eutrophication, hazardous substances and related measures for rehabilitating the Black Sea ecosystem; and (c) World Bank Investment Fund for Nutrient Reduction in the Black Sea/Danube Basin, and GEF Funded Danube River Basin Environmental Management Project (GEF ID: 399).

The GEF Strategic Partnership on the Black Sea and Danube Basin supports 17 countries in addressing pollution in the Danube and its impact on the Black Sea LME. This GEF support, along with support from the UNDP and the World Bank, was one founding stone of the Danube Commission, and informed the development of the European Water Framework Directive, the main mechanisms under which the Danube basin is now managed. We will learn lessons from such investments, including industry collaborations that lead to efficient nutrient reductions from key industry hotspots via targeted policy reforms. While specific geographical drivers of change may have advanced progress (EU accession prospects etc.) these past lessons may give an indication both of the necessity, drivers and means by which to advance industry dialogue at the level of this MSP. We will access contemporary information on nutrient management experiences in the Danube through the EC MERLIN Project, listed within the UKCEH Co-Financing (Table C and associated text).

Global - relevant non-GEF Projects/Initiatives

The Our Phosphorus Future Project (2017-2022)

The ?Our Phosphorus Future? project (OPF) responded to the critical need to provide direction from the scientific community on sustainable phosphorus use, including water quality degradation and biodiversity loss. The OPF project brought together over 100 scientists and industry experts from around the world to develop the OPF report. The report identified the priority issues, possible solutions

and the capacity to address phosphorus sustainability at the global scale. At the same time, it primed the international scientific and policy communities to co-develop the next steps towards a durable international process on phosphorus science support to policy. The OPF network is a global network of academic, industry and government actors formed through their contributions to the OPF project. Their collective expertise represents a valuable knowledge resource to this project. The OPF project was delivered through a partnership between the UKCEH and the University of Edinburgh, UK, and was funded by the UK Natural Environment Research Council (NERC) (NERC; award number NE/P008798/1), with support from the European Sustainable Phosphorus Platform (ESPP), the United Nations Environment Programme (UNEP) and the GEF Towards an International Nitrogen Management System project (described above; GEF project ID: 5400).

The uP-Cycle project responds directly to the findings of the OPF project, which includes the need for integrated phosphorus management for the protection of freshwater and coastal ecosystems and to address international interactions that drive phosphorus cycles from national to global scales. The expertise of the OPF Network will form an important evidence base on the academic community to inform Component 1 and 4 activities, on delivering the global baseline emissions data and in interpreting these in consultation with key stakeholders to inform the international policy community.

The UNEP Global Partnership on Nutrient Management

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was created as a unique intergovernmental mechanism to counter the issue of land-based pollution. The GPA, adopted by 108 Governments, and the European Commission in 1995, is a voluntary, action-oriented, intergovernmental program led by UNEP. Between 2009 and 2013, GPA created three global multi-stakeholder partnerships. These are the Global Partnership on Nutrient Management (GPNM), (launched in 2009), The Global Partnership on Marine Litter (GPML), (launched in 2012) and The Global Wastewater Initiative (GWI) (launched in 2013). In 2021 the GPA was dismantled and whilst it no longer exists, the GPNM survives under the leadership of the International Waters team of UNEP. The GPNM supports efforts to address the challenge of nutrient excess or deficits and the potential negative impacts on the marine and terrestrial ecosystems, by sharing information globally and encouraging the adoption of improved nutrient management practices. The mandate to address particularly marine pollution and the creation of hypoxic zones associated with nutrient runoff was affirmed by countries at the 2012 Inter-Governmental Review of the GPA under the Manila Declaration. Based on this mandate, the GPNM under support from UNEP has mobilized resources from various donors, but most significantly from the GEF to execute the Global Nutrient Cycling Project (outlined above). In 2013, came the publication of *Our Nutrient World*, which linked a cross-cutting analysis of mitigation opportunities with scenarios of the potential economic benefits, which focused on nitrogen. To give special attention to the global phosphorus sustainability challenge, in November 2015, the GPNM established a specific Phosphorus Task Team (PTT). Its inaugural meeting was held later the same year in Edinburgh, UK. The GPNM is directed through its International Steering Committee, with membership from academia, government, and industry. The GPNM acts as a conduit for strategic advocacy and cooperation at the global and regional levels to provide information and enhance capacities to design and implement effective management policies to address the growing problems of nutrient over?enrichment. It sets out to achieve this overarching aim

by focusing activities in the following areas: (1) contributing to the development of knowledge (policy & technical) products to inform decision making amongst policymakers, professionals, farmers, private sector; (2) providing support for piloting and replication of appropriate pilot solutions and best management practices (BMPs) for sustainable nutrient management and pollution reduction with a focus on developing countries, sharing lessons from developed countries; (3) generating awareness resources and social marketing tools and facilitating easy dissemination (via the GPNM platform and other ICT tools) to influence farmers, extensionists, policymakers and other stakeholders to drive change in behaviors and practice; and (4) contributing to the continued strengthening of the GPNM to facilitate expanded global and regional partnerships.

The uP-Cycle project will support the strategic goals of the GPA, including the GPNM, by identifying opportunities to reduce nutrient pollution impacts on terrestrial and marine ecosystems. We will work with GPA to engage with public and private stakeholders operating at the global scale in Component 4. Our outputs will be used to support the GPNM, for example, as it works to raise awareness of the issues of nutrient sustainability through the global policy framework, and our outputs in Component 1 and 4 will be designed to increase the capacity of the GPA to influence international action on addressing environmental impacts associated with an unsustainable global anthropogenic phosphorus cycle.

UNEP coordinated World Water Quality Alliance

United Nations Environment Assembly (UNEA) Resolution 3/10 on ?Addressing water pollution to protect and restore water-related ecosystems? (UNEP/EA.3/Res.10) requested UNEP to develop a global water quality assessment in collaboration with UN-Water and relevant stakeholders by UNEA-5. During the Inception Meeting for the Assessment, around 50 organizations (UN, research, civil society, private sector), which had expressed interest to engage in the assessment, also expressed interest to work with UNEP in co-designing agendas and action around emerging issues. This group formed the World Water Quality Alliance (WWQA) as an open community of practice, representing a voluntary and flexible global Expert, Practitioners and Policy Network, which advocates the central role of freshwater quality in achieving prosperity and sustainability. It explores and communicates water quality risks in global, regional, national and local contexts and points towards solutions for maintaining and restoring ecosystem and human health and wellbeing. It aims to serve countries throughout the lifetime of the 2030 Agenda for Sustainable Development and beyond. UNEP, and more specifically the Global Environment Monitoring Unit in the Science Division, acts as a Coordination Unit for the Alliance. The WWQA activities include use-cases on Lake Victoria and the Volta River Basin Transboundary Systems. The WWQA Ecosystem Work Stream led by a core group of UKCEH, IHE-Delft, World Bank Group, Wageningen University, UNEP, and JRC works directly with lake restoration practitioners to support the development of novel restoration programs focusing on delivering socio-economic and environmental gains, especially in developing economies where data availability is sparse. The WWQA is engaged with UNEP Water focused on improving nutrient emissions reduction indicators within SDG 6.3.2.

As the urgency for the protection and restoration of lakes is increasingly recognized, the Indonesian Government proposed a United Nations Environment Assembly (UNEA) Resolution on Sustainable Lake Management (UNEP/EA.5/Res.4, Box 6) at UNEA 5.2. This Resolution sets the way for greater

international recognition of the importance of lakes for human development, and for the necessary action and mobilization of resources. The WWQA is supporting delivery of this UNEA resolution ?Sustainable Lake Management? (UNEP/EA.5/Res.4) that was adopted in March 2022.

The uP-Cycle project will support the strategic goals of the WWQA by developing the uP-Cycle Community of Practice Network, enhancing the WWQA membership with a focus on delivering effective ecosystem restoration (including Transboundary ecosystems), and utilizing WWQA data products (e.g., World Water Quality Assessment Reports) and expertise to inform activities in Components 2 and 3. The project will engage with the diverse group of WWQA Workstreams to address specific knowledge needs in Component 3 and we will establish the WWQA Ecosystems Workstream as a long-term coordination mechanism for the community of practice.

International Lake Environment Committee Foundation

The International Lake Environment Committee Foundation (ILEC) was established in 1986 by Shiga Prefecture, Japan, and was authorized as an incorporated foundation by the Government of Japan. ILEC seeks international knowledge exchange and research promotion to develop sustainable management of the world lakes and reservoirs. It has a continuing mission to enhance international cooperation for conserving lake environments and promoting environmentally sound management of world lakes through encouraging investigations and research. ILEC continue to provide a global coordination and knowledge exchange platform supporting the Integrated Lake Basin Management approach, working with UNEP and other relevant UN agencies in this pursuit, and providing a conduit for knowledge exchange between lake basin catchment managers through their World Lakes Conference and joint activities of their voluntary Scientific Committee.

The uP-Cycle project will learn from the experiences of the ILEC, drawing on the capacity development and educational materials previously produced for the implementation of the Integrated Lake Basin Management Approach to inform the development of the uP-Cycle Framework and Monitoring and Assessment Approach (Component 2 and 3). ILEC will also be engaged in establishing the Community of Practice Network drawing on their previous experiences in establishing global networks of practice and supporting future related engagement activities (including the World Lakes Conference).

The Committee on Fisheries ? and its Sub-Committee on Aquaculture

The Committee on Fisheries (COFI), a subsidiary body of the FAO Council, was established by the FAO Conference at its Thirteenth Session in 1965. The Committee presently constitutes the only global inter-governmental forum where major international fisheries and aquaculture problems and issues are examined and recommendations addressed to governments, regional fishery bodies, NGOs, fish workers, FAO and the international community, periodically on a worldwide basis. COFI has also been used as a forum in which global agreements and non-binding instruments were negotiated. COFI membership is open to any FAO Member and non-Member eligible to be an observer of the Organization. Representatives of the UN, UN bodies and specialized agencies, regional fishery bodies, international and international non-governmental organizations participate in the debate. The Committee has held 31 sessions. The First Session in 1966, and thereafter annually till 1975. Since

1977 the sessions have been held biennially. COFI has established sub-committees on certain specific issues, for example, the COFI Sub-Committee on Trade and of particular relevance to this project, the COFI Sub-Committee on Aquaculture. The Sub-Committee on Aquaculture provides a forum for consultation and discussion on aquaculture and advises COFI on technical and policy matters related to aquaculture and on the work to be performed by the Organization in the subject matter field of aquaculture. The Sub-Committee is tasked with identifying major issues and trends in global aquaculture development and making recommendations for international action to address aquaculture development needs. Further roles include advising on the preparation of technical reviews and of issues and trends of international significance and addressing any specific matters relating to aquaculture referred to it by its Members, the Committee on Fisheries or the Director-General of FAO.

The uP-Cycle project will engage with COFI through the Sub-Committee on Aquaculture to raise awareness of the need for improving phosphorus use efficiency within aquaculture activities globally (Component 1) supporting the co-development of guidance on reducing the impact of phosphorus emissions on lakes (e.g., Lake Villarrica) and connected ecosystems, and supporting sector-specific dissemination and engagement at the lake basin and country scales in Component 3.

National and regional phosphorus sustainability innovation platforms

A range of knowledge exchange partnerships exists across various countries and regions with little international coordination. They include the European Sustainable Phosphorus Platform (ESPP), The Sustainable Phosphorus Alliance ? North America (SPA), the Global Phosphorus Institute, The Dutch Nutrient Platform, The German Phosphorus Platform, The Swedish Sustainable Nutrient Platform, The Irish Nutrient Sustainability Platform, and the Phosphorus Industry Development Organization of Japan.

The uP-Cycle project recognizes the community of Innovation Networks that, collectively, represents an international resource providing direct access to innovation in the field of phosphorus sustainability to a global audience of industry, practitioners, regulators, and policymakers. We will work with the coordination teams of these networks to develop the uP-Cycle Innovations Hub (Component 4) designed to address the disconnect between restoration practitioners and leading innovators in the field. We will utilize the wide reach of the Innovations Networks to enhance the dissemination of our outputs.

The Chile Baseline

Background: Chile?s location and latitudinal span determine one of the most extremely variable climatic settings worldwide, from north-to-south precipitation increases and temperature decreases. As such, Chile?s rivers and lakes exist in highly diverse geographical settings, from the driest desert on earth to Patagonia, and are characterized by extraordinary biodiversity. Lake Villarrica (Lago Villarrica) in the Region de La Araucan?a (Araucan?a), is in the South of the country. Araucan?a, "the granary of Chile", has become one of the principal agricultural districts of Chile. Aquaculture, especially in lakes, is practiced in the territory. Tourism is also a growing industry in the region; the main tourism center surrounds Villarrica Lake and the city of Puc?n. Agriculture, aquaculture and tourism in Araucan?a, and Chile more generally, are heavily reliant on clean rivers, lakes and healthy

freshwater ecosystems. A significant challenge to water managers, who must balance increasing water demand against the need for water security, is how these ecosystems, and the services they provide, will respond to increasing phosphorus pollution, especially in light of global change processes (e.g., climate change and economic and population growth). Chile?s economy is reliant on agricultural, aquaculture, forestry and mining exports that are also highly reliant on water. Agriculture, driven especially by export crops, is growing rapidly. This follows the declaration of the goal for Chile to become a world agricultural and food production power in the twenty-first century, which will require an increase of the total area under irrigation by at least 36%.

Agriculture is a major source of phosphorus pollution to water bodies in Chile. Aquaculture in southern Chile uses large quantities of water in its production process, contributing dissolved phosphorus in its effluents. Tourism is also a growing industry in the region and will be severely impacted by the failing water quality of the country?s rivers and lakes. Indeed, water quality is at the center of water conflicts and the sustainability agenda in Chile. Access to sanitation in rural areas and safe and sufficient water is the obvious starting issue. However, the interdependencies of socio-environmental systems also prompt the need for public policy and decision making in issues related to water quality and food, ecosystem services, natural patrimony, and environmental justice. A decrease in the water quality (e.g., due to increasing phosphorus emissions) of lakes in Chile [49][49] Those lakes include Villarrica, Llanquihue, Caburgua, Calafqu?n and Ri?ihue. This may be explained by a combination of land-use change, expansion of urban [50][50] poor sanitation systems[51]51, lack of good agricultural practices and technological improvements in the aquaculture industry.

This increasing trend of eutrophication indicates an increasing trend in phosphorus (and nitrogen) loading from land-based activities to the Humboldt Current Large Marine Ecosystem (HC-LME). During the development of the Humboldt Current Large Marine Ecosystem Strategic Action Program (see below under GEF Activities) the mortality of marine species within the HC-LME has been identified as a priority concern. Immediate causes include ?eutrophicated areas due to the increase of nutrients with the presence of algal blooms and oxygen depletion, and harmful algal blooms?, related to the underlying cause of ?improper use of agrochemicals and fertilizers that increase the amount of nutrients in the receiving marine environment.? Whilst Chile has greatly enhanced its water quality monitoring program in recent years, for example, in response to the SDG 6 Data Drives, significant gaps in nutrient emissions and impacts at the national scale remain to be resolved, especially for lakes and reservoirs[52][52]. There is a pressing need to develop such a national system, drawing on international experiences and from emerging in-country emissions reduction programs which, to date, have been focused on lake basins assessed as being most at risk from cultural eutrophication (e.g., the Lake Villarrica Basin outlined below).

Governance of Chile?s Water Resources

Following decentralization and market reforms in the 1970s, the water sector in Chile underwent major changes. This led to the Water Code of 1981, which is the main regulation governing terrestrial water

use and water rights in Chile. Under the Water Code, water is considered national property for public use and neither appropriable by the state nor directly by individuals. The Water Code grants permanent and transferable ?water rights? to individuals, for consumptive or non-consumptive use, to be exercised continuously or discontinuously. Once water rights have been granted, they fall under the jurisdiction of private civil law, rather than administrative law. Importantly, water rights are transferrable. The aim is to achieve an efficient allocation of water through market transactions of water rights. The management of water rights is conducted under a dual water institutional system. Firstly, through a centralized administration exercised by the National Water Directorate; tasked with authorizing transfers of water rights to protect potential negative impacts on third parties. Secondly, through decentralized management, corresponding to users (e.g., private organizations), collectively organized in each river basin in ?*Water User Associations?*. Water User Associations manage and distribute water at the local level and are not part of the State administration. In 2013, the World Bank identified 43 institutional actors/stakeholders involved in the management of water resources in Chile[52][53][53].

The Water Code is mainly focused on water quantity and allocation, and not water quality and ecosystem protection. However, a reform in 2005 established the requirement for ?minimum ecological flows?. This was reinforced with the 2010 reform of Chile?s Environmental Law (i.e., Law 19,300) which regulates the protection of aquatic ecosystems through the implementation of ecological water flows. Chile?s water quality regulatory system is led by the Ministry of Environment, since its creation in 2010, and is mainly regulated by the Law N? 19.300 of 1994, the Law N?20.417 of 2010 and the Law N? 20.600 of 2012. The basic regulatory water quality instruments are: (a) environmental water quality standards, (b) decontamination plans and strategies, (c) emission standards, and (d) environmental impact assessments for new investments. Additionally, a new Water Code reform that includes non-extractive water right for environmental conservation and prioritize human consumption and water sanitation was approved during April 2022[54][54].

Despite considerable advances in water quality monitoring in Chile, advances in decision making and public policy are still hampered by insufficient data and poor integration of process understanding.[55][55][55] Chile?s General Water Directorate (Direcci?n General de Agua (DGA)) is the public entity responsible for promoting water resource management and providing and disseminating information on the water quality of Chile? freshwater resources. The DGA inventory includes 101 watersheds with 1,251 rivers, 12,784 lakes, and 24,114 glaciers (as reported in 2018[56][56][56]). The DGA monitoring network for water quality includes 829 stations, for streams, groundwater, and lakes and reservoirs (252 located in Southern Chile). For each site, 1?12 samples are taken annually, depending on operational definitions and constraints (typically 3 for streams and groundwater and 2 for lakes and reservoirs). In a report by the DGA, in 2014, about 39% of the 101 watersheds in the DGA inventory were not actively monitored, 19% had 1 water quality monitoring station, and only 19% had 10 or more water quality monitoring stations.[57][57][57] The Chilean monitoring network includes sampling and analyses of nutrients for lakes and reservoirs. Whilst this limited lake monitoring network focuses on

assessing the trophic state of lakes through the measurement of phosphorus, nitrogen and chlorophyll-a in the water column, it is not the only source that reports measurements of water quality parameters. Other sources of water quality information include:

Secondary water quality standards surveillance plans. Several watersheds, including Villarrica, have implemented secondary water quality standards (known as NSCA), which include a predefined set of parameters, locations, and monitoring regimes.
Environmental impact assessment platform. The Chilean law 19.300 *Bases for the Environment*, which enacts the Environmental Impact Assessment System (SEIA) requires that new investment projects or modifications conduct an environmental impact assessment. When activities entering the SEIA have the potential to impact water, they are required to consider a water quality baseline and a water quality surveillance program (data may be available on request).
Superintendence of Sanitary Services (SISS). According to the Chilean concession system, all water companies that provide drinking water and wastewater treatment are required to comply with drinking water and treated wastewater discharge standards, (data may be available on request).
Superintendence of Environment (SoE). According to Chilean law, all companies that discharge industrial wastewater into surface, underground or marine water bodies, are required to comply with Industrial Effluent standards. Also, projects approved by the SEIA that include a water quality surveillance program must periodically submit Environmental Monitoring Reports to the SMA (data available on the SMA website).

To support the implementation of SDG indicator 6.3.2, ?Proportion of bodies of water with good ambient water quality? the Chilean Direcci?n General de Aguas (DGA, the Chilean water agency) reported on monitoring data across 989 surface water monitoring stations (excluding lakes and reservoirs) and groundwater resources. This data resource represented over 1 million data records including basic parameters (pH, electrical conductivity, dissolved oxygen, temperature), ions (e.g. Ca, Mg, Na, K, SO4, Cl), total metals (e.g. As, Al, Cu, Fe, Mn, Pb), nutrients (nitrogen and phosphorus) and organic compounds (BOD51 and COD2) (CEDAS-DGA, 2020). Following the guidance of UN-Water in the methodology for indicator 6.3.2, the DGA has identified hydrological units in the form of basins and sub-basins as well as surface water body type (surface streams, lakes, reservoirs, groundwater aquifers), defining the boundaries of 101 basins at the national scale.

Chile does not, yet, have an integrative water quality ?clearinghouse? that takes advantage of these different monitoring programs and data resources or collates such data from miscellaneous data sources with respect to nutrient emissions to surface waters or loads through the basins to the coast. The current approach to water quality is mostly statistical, without systematically supporting conceptual and quantitative models helping to frame data interpretation. An improved approach for water quality monitoring and data management and interpretation, including the use of ecosystem-based process modelling, is required which should be coherent with an integrated watershed management approach.

Phosphorus Management in the Villarrica Catchment

Villarrica Lake Basin includes several tributaries to the lake. The ?Trancura River? contributes about 90% of the tributary runoff water that the lake receives. Villarrica Lake is a sub-basin of the Tolt?n River, it has a surface area of ??2,805 km2 and includes the communities of Villarrica, Puc?n, Curarrehue and Cunco. This basin includes two main lake bodies, Villarrica Lake and Caburgua Lake. The lake is a major tourist attraction of the City of Puc?n where eco-tourism is a key industry on the east shore and Villarrica to the west where salmon farming, agriculture and forestry are key industries.

Nutrient discharge from rivers in this zone can contribute to enhancing biological activity in coastal waters, which sustain local ecosystems during periods of minimum or delayed seasonal upwelling (winter and early springs). Studies in this area have shown that high concentrations of chlorophyll-a in rivers are accompanied by increased primary production in coastal waters58[58][58]. This is also expected for Tolten river discharge. Although there is no demonstrated connection between the Tolt?n river (small catchment) and the Humboldt current LME, it is evident that the nutrient load from this lake flows into this critical LME, which according to the TWAP[59][59] is impacted by large amounts of nitrogen loading entering coastal waters from human activities in watersheds. Additionally, according to the International Waters Program Study conducted in 200260[60][60], there is an ongoing need in South America to give opportunities to developing country-driven projects that address dominant problems in the smaller catchments draining regions to the west of the Andes.

The Decontamination Plan for Villarrica. In the case of Lake Villarrica, the main anthropogenic sources that provide nutrients to the lake are: population pressure (mainly increase in summer floating population); lack of local sanitation; fish farming; and agro-forestry activities.

The increase in nutrient loads from these sources can result in an increase in the growth of microalgae leading to a decrease in oxygen concentrations in the surface water layers, a reduction in water clarity, and an increase in toxins that can affect humans and animals. In addition, these impacts can result in changes to food web structures in lakes associated with biodiversity loss, as well as a decrease in the economic value of land and property, among other impacts.

In this context, in 2017, the Chilean Government declared Lake Villarrica as a ?saturated zone? due to poor water quality, which included exceeding chlorophyll-a, water transparency, and dissolved phosphorus limits established in the Villarrica Lake Secondary Water Quality Standards (Villarrica Lake NSCA). This resulted in the initiation of The Decontamination Plan for Villarrica. On May 25th, 2020, the official draft of the Villarrica Basin Decontamination Plan was published, starting with a public consultation process. An Indigenous Peoples Consultation Process is underway. All observations provided by citizens, indigenous people and public services will be answered by the Environmental Ministry Team and an official final version of the Villarrica Basin Decontamination Plan is expected to be published during the uP-Cycle project.

Phosphorus pollution to Lake Villarrica is above critical thresholds. Around 303 tons of phosphorus and 1438 tons of nitrogen per year enter Villarrica Lake. The phosphorus load is 1.54 times greater than the Villarrica lake critical load, which was defined as the maximum load that the lake can receive to maintain its trophic status, beyond which ecosystem damage is inevitable. Point sources and nonpoint sources identified in the official draft of the Villarrica Basin Decontamination Plan include aquaculture (38.2% of the total phosphorus load), the Puc?n wastewater treatment plant (1.2 %) and Non-Treatment of Currarrehue Town Public Sewage System (1.6 %). Nonpoint sources identified include septic tanks (2.7% of the total phosphorus), natural runoff (45.1%), and forestry/agricultural runoff (land-use changes;11.2%).

Plans to reduce phosphorus pollution to Lake Villarrica: The goal of the Decontamination Plan is to reduce emissions to meet the limits established in the Villarrica Lake NSCA through measures including the implementation of treatment systems in rural and urban areas of the basin and the reduction of emissions of nutrients and sediment/soil losses through forestation, reforestation and restoration of the riparian vegetation. In addition, the development of emission standards for total phosphorus loading from aquaculture and sewage treatment plants located in the basin have been proposed, alongside other management measures aimed at protecting and maintaining the ecosystem services provided by the lake. Collectively, and if effective, these measures have been estimated to result in a reduction of the phosphorus load by 109.2 tons per year, representing about 30% of the total load to the lake. The main measures will be implemented in the first three years following the publication of the official final version of the Villarrica Basin Decontamination Plan, which seeks to recover the limits established in the Villarrica Lake NSCA in a maximum period of 15 years. A General Analysis of the Economic and Social Impact of the cost and benefits of the plan was developed in the official draft of the Villarrica Basin Decontamination Plan, which estimated benefits of USD 1,892 million from an investment in emissions reduction measures of USD 104 million.

It should be noted that the phosphorus load estimates, impact of measures, costs and benefits showed in this document are part of the official draft of the Villarrica Basin Decontamination Plan and may be modified in the final version of the Villarrica Basin Decontamination Plan.

The following list represents key upcoming developments and opportunities for this project to enhance basin to national scale sustainable phosphorus management. This list was compiled following consultation between the Chilean Ministry of the Environment and its stakeholders during the PPG phase of this project.

? Adopting integrated water resources management is a priority for Chile; currently, few integrated approaches bring together public, private, and civil society and different sectors rarely interact even when part of the same water user associations.

? Chilean lakes and reservoirs are not sufficiently protected from phosphorus pollution, with little mention of phosphorus pollution impacts in policy or regulation. In this context, the Ministry of the Environment in Chile is currently working on the preparation of a regulation that establishes minimum standards for the protection of the North Patagonian lakes[61][61]

? There is a pressing need for enhanced data collection on sources of phosphorus loading to lakes (agricultural and private sewage system (i.e., septic tanks) diffuse pollution; and treated wastewater and fish farming effluents are prime suspects for nutrient discharges). In this sense, the Ministry of the Environment has made efforts to estimate nutrient emission inventories, but further work is required. Currently the Ministry of Environment has secured funds to perform ?Propuesta de dise?o de una red de monitoreo para la calidad de las aguas de la cuenca del lago Villarrica y desarrollo de campa?as de monitoreo? which will expand the monitoring to 40 stations located within the basin and will collect 6 samples per year for 3 years (flow, nutrients and on-site variables).

? There is a need to enhance institutional capacity to strengthen baseline phosphorus emissions data and identify impacts to support the identification of emissions reductions measures.

? There is a requirement to better understand and access tools that can predict ecosystem impacts in response to phosphorus pollution and its mitigation. This information is critical to argue for more stringent standards on phosphorus pollution and to ensure maximum benefits are equitably realized from planned investments. In addition, it will better inform on the nature and extent of ecological and ecosystem service response following costly emissions reductions investments across sectors.

? There is a need to improve understanding of nutrient loading from land-based activities to the coats, to support the objectives of the HC-LME SAP, and a national surveillance and/or nutrient emissions modelling approach is required to inform the need for national scale nutrient load reduction.

Chile ? relevant GEF supported projects

There are many important efforts past and current *(coordination with the ongoing SAP implementation project is highlighted in the coordination section below)* that have benefitted from GEF investment in this region. Many of these are focused on improving the ecosystem health of the Humboldt Current Large Marine Ecosystem (HC-LME).

Towards Ecosystem Management of the Humboldt Current Large Marine Ecosystem ? GEF Project ID ? 3749, implemented by UNDP and executed by IFOP, IMARPE. 2009 ? 2016.

This project aimed to advance ecosystem-based management (EBM) in the HC-LME through a coordinated framework for improved governance and the sustainable use of living marine resources and services. To promote an Ecosystem-Based Management (EBM) of the HCLME, the Governments of Peru and Chile agreed to co-finance, with GEF, the above project. The management and implementation of this project were carried out with the support of the United Nations Development Program and the United Nations Office for Project Services (UNOPS) through a binational Regional Coordination Unit (RCU). The focal points were the Institute of Fishing Promotion (IFOP) in Chile and the Institute of the Sea (IMARPE) in Peru. The project formed a Technical Working Group for each country who co-produced an Ecosystem Diagnostic Analysis for each country, a Transzonal Ecosystem Diagnostic Analysis and the HC-LME Strategic Action Programme. Of relevance to uP-Cycle is the outcome of the Ecosystem Diagnostic Analysis which confirmed nutrient loading as a result of land-based activities is a contributing factor to mortality in marine species through eutrophication of receiving coastal waters. The results of these outputs will be used to inform national and basin scale policy analyses within component 3 of uP-Cycle in the context of relieving the impacts of land-based pollution on the HC-LME.

Catalyzing Implementation of a Strategic Action Program for the Sustainable Management of Shared Living Marine Resources in the Humboldt Current System (HCS). GEF Project ID ? 9592; 2017 ? ongoing.

Implemented by UNDP and executed by IFOP, IMARPE, SUBPESCA, PRODUCE, MMA, MINAM, SERNAPESCA, SERNANP, this project aims to facilitate ecosystem-based fisheries management (EBFM) and ecosystem restoration in the HC-LME for the sustainable and resilient delivery of goods

and services from shared living marine resources, in accordance with the HC-LME SAP-endorsed by Chile and Peru. The proposed project contributes to the SAP objective on ?Improve the environmental quality of the coastal and marine ecosystems through integrated management, considering different pollution sources.? The uP-Cycle project will consider the lessons learned from this project and will contribute to the SAP objective *?Improve the environmental quality of the coastal and marine ecosystems through integrated management, considering different pollution sources.?* To do this, we will work with the Chilean Ministry for Environment (Component 3), who work in contact with the relevant bodies in Chile and Peru, to advance a national-scale nutrient emissions monitoring and assessment approach with which to assess the effects of future land-management scenarios on eutrophication impacts of the HC-LME.

Mainstreaming Conservation of Coastal Wetlands of Chile?s South Center Biodiversity Hotspot through Adaptive Management of Coastal Area Ecosystems ? GEF Project ID 9766.

Implemented by UNEP and executed by the Chilean Ministry for Environment 2019-2024, this project aims to improve the ecological condition of coastal ecosystems in south-central Chile through sustainable management. The aim is to implement good practices and environmental aspects in different productive sectors, supporting local development through sustainable management, raising awareness on the need to reduce the pressures on these habitats occupied by various native and migratory species with different problems of conservation, and reduce threats and pressures on the relevant hydrographic basins. The project takes into consideration the results of the restoration pilot experience implemented in Demonstrative Wetlands that includes good practices and environmental criteria for production sectors; reforestation/afforestation; erosion control measures, among others. Lessons learned from this project in establishing relationships with public services, protocols for integrated sustainable land management and key biodiversity conservation in wetlands, among other topics will be utilized in the uP-Cycle project, and through direct collaboration with the Chilean Ministry for the Environment.

Economic instruments and tools to support the conservation of biodiversity, the payment of ecosystem services and sustainable development ? GEF Project ID 10213- Implemented by UNDP and executed by Chilean Environmental Ministry, 2021-2025.

This project aims to improve national financing of biodiversity through the design, implementation and optimization of market-based economic instruments that reinforce public financing and facilitate the economic contribution of the private sector to maintaining Chile?s natural capital. The project will take into consideration the results and lessons learned from the Institutional framework proposed, including Technical IECB guidelines and proposals for regulations for their application, monitoring and evaluation in freshwater environments. Multi-sectorial coordination mechanisms with the participation of public and private stakeholders will be assessed. Project models founded on Nature-Based Solutions recognized as eligible green expenditures will be identified and the results and lessons learned from pilot experiences in coastal wetlands will be shared. The uP-Cycle project will learn from the development of the Nature-Based Solutions and Natural Capital approaches developed for Chile in the project and will work to integrate these and build on them with a focus on achieving phosphorus emissions reductions, as well as multiple added benefits.

c) The proposed alternative scenario with a brief description of expected outcomes and components of the project

Overview of Project Approach and Theory of Change

Project Rational

The global environmental problems and global baseline (see Sections 1 and 2) demonstrate that current phosphorus practices are not sustainable, and that following the current trajectory will result in widespread environmental and socio-economic issues, some of which will be irreversible. To reduce these impacts, it is important to have a holistic and precautionary approach to phosphorus pollution/waste throughout the value-chain (e.g. Net Zero P approach). Countries, cities, and companies need to identify and act upon hotspots, detect leakage of phosphorus in their industries, and activate the most effective interventions systematically. Such efforts will lead to more sustainable phosphorus management and contribute significantly to the implementation of the 2030 Agenda for Sustainable Development and multiple regional and global calls for improvement in nutrient use efficiency.

Project Goal and Objective

The uP-Cycle Project has been developed to address the barriers (**B1-4**) outlined above.

To address the issue of insufficient phosphorus emissions and impacts surveillance data (**B1**), the project will deliver, in Component 1, a global model output (i.e., The Global Phosphorus Emissions Dashboard) producing export estimates from land to freshwater to sea; demonstrating basin-scale resolution, and the capacity to predict the effects of future mitigation and environmental change scenarios.

To inform development and optimization of phosphorus emissions reductions programs, for example, to benefit transboundary lakes or LMEs, requires a scalable, ?drag-and-drop? Framework and this will be developed in Component 2 learning from a new Community of Practice focused on sustainable phosphorus management for the benefit of lakes and their communities (**B1 & B2**).

The optimization of existing phosphorus emissions reduction programs will be achieved through a dedicated Monitoring and Assessment Approach aligned with existing global frameworks (e.g., associated with SDG Indicator 6.3.2; B3 & B4). This approach will be piloted in Chile (Component 3), working within existing basin scale (Lake Villarrica) and national scale sustainable nutrient management initiatives. These on-the-ground activities will enhance evidence-based integration across monitoring, assessment and governance systems with experiences being shared across the uP-Cycle Community of Practice (Component 2). We will utilize these experiences in Chile, and those of the

wider uP-Cycle community of practice to raise awareness on the environmental and socio-economic benefits of sustainable phosphorus management for communities reliant on healthy lake ecosystems across public and private sectors (**B3**).

Finally, an overarching outcome of the project will be to increase awareness of the opportunities of improving the integration of sustainable phosphorus management across the global policy arena through engagement with key stakeholders (Components 1 and 4; **B4**).

The objective of this project is:

To support lake ecosystems recovery through phosphorus emissions reductions from land to water to improve the protection and restoration of freshwater and coastal ecosystems, bringing together the global lake management and sustainable phosphorus management communities including developing and testing a sustainable phosphorus management framework in Chile to inform international application.

The project will be delivered through five interlinked components with corresponding activities designed to deliver specific outputs that underpin expected outcomes. The components and their activities are summarized below and in Figure 2:

Component 1. Increasing clarity on global phosphorus emissions, drivers and impacts leading to increased awareness of national, regional, and global scale sector-specific phosphorus emissions reduction opportunities.

Component 2. Building the Global Net Zero Phosphorus Community of Practice on sustainable phosphorus management in lake basins, producing the uP-Cycle Framework and Assessment Approach and accelerating its uptake to optimize emissions reductions programs.

Component 3. Demonstrating the uP-Cycle Monitoring and Assessment Approach in Chile from basin to transboundary scales, in the context of enhancing existing policies.

Component 4. Accelerating integration of global sustainable phosphorus management opportunities across existing national, regional and global policy frameworks.

Component 5. Monitoring and Evaluation of project delivery.

The component structure has been designed to enhance knowledge flow within the project and across a broad set of audiences. However, resilience in project design allows that no one component is reliant on another for its delivery. Instead, outputs and outcomes complement one another ensuring reach across scales from basin to transboundary and global scale audiences. These planned interactions are summarized in Figure 3. For instance, Activities under Component 1 will bring together data providers to develop a dashboard to help visualize phosphorus emissions datasets to support the assessment of phosphorus pollution and impacts. It will also bring together cross-sector expertise to identify opportunities to mitigate such pollution. The lessons learnt from this Component will feed directly into Component 3, for example, including guidance on placement of phosphorus recycling systems or in improving nutrient use efficiency of aquaculture operations. Indeed, Component 3 will build from

Component 1 to develop a virtual surveillance portal for Lake Villarrica - to assess and monitor phosphorus emissions and impacts to the lake. The knowledge exchange activities of the cross sector working group established in Component 1 and the Global Community of Practice established in Component 2 will benefit the national scale assessment in Chile. Similarly, the experiences of the project team in Chile will inform sustainable phosphorus management programs across the Community of Practice (Component 2) and will provide context on sector specific transition pathways to the Cross-Sector Working-Group in Component 1.

Appendix 3 provides a detailed workplan and timeline showing when each Activity is to be delivered over the two-year project duration.

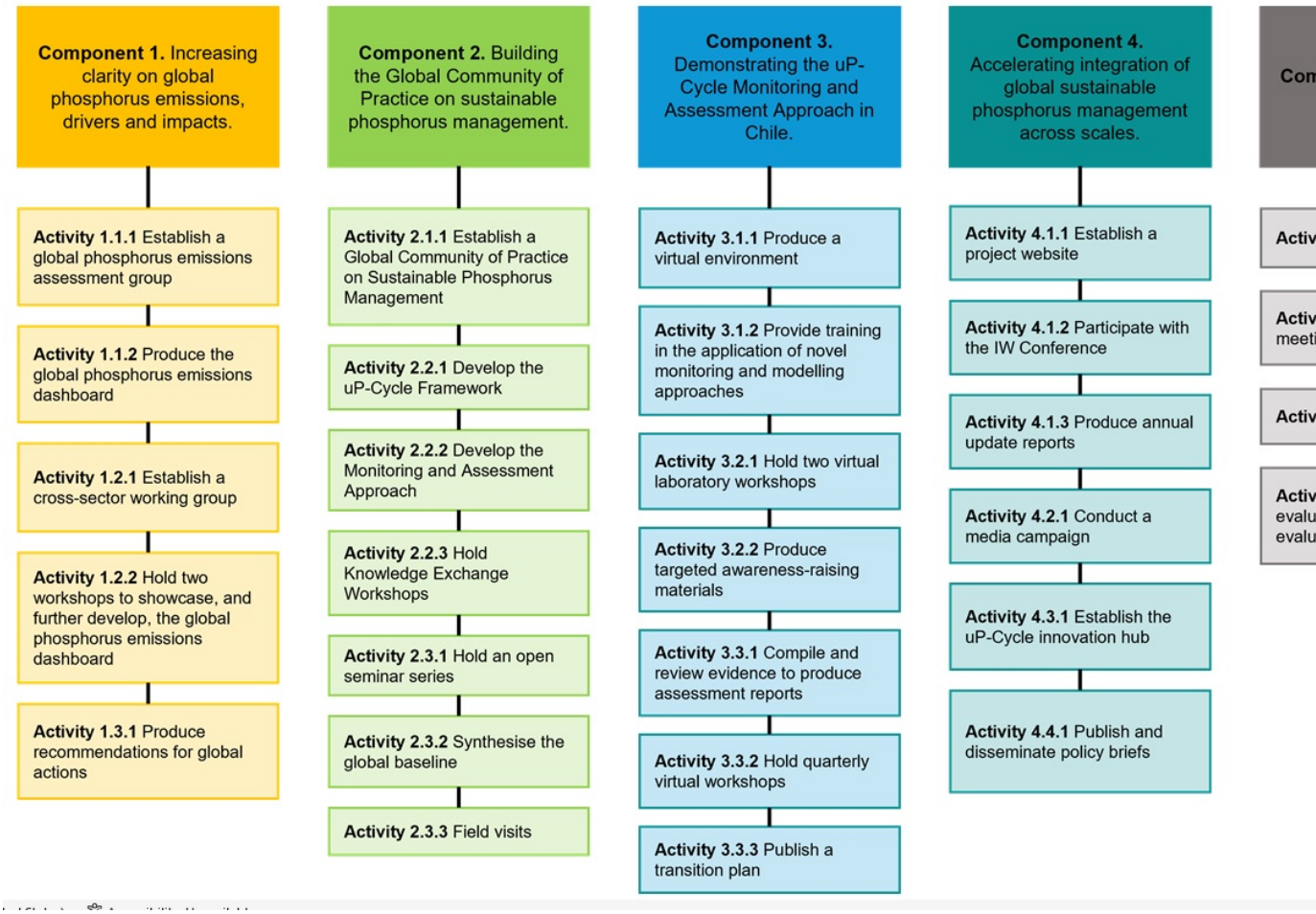

Figure 2. Component structure showing activities under each component.

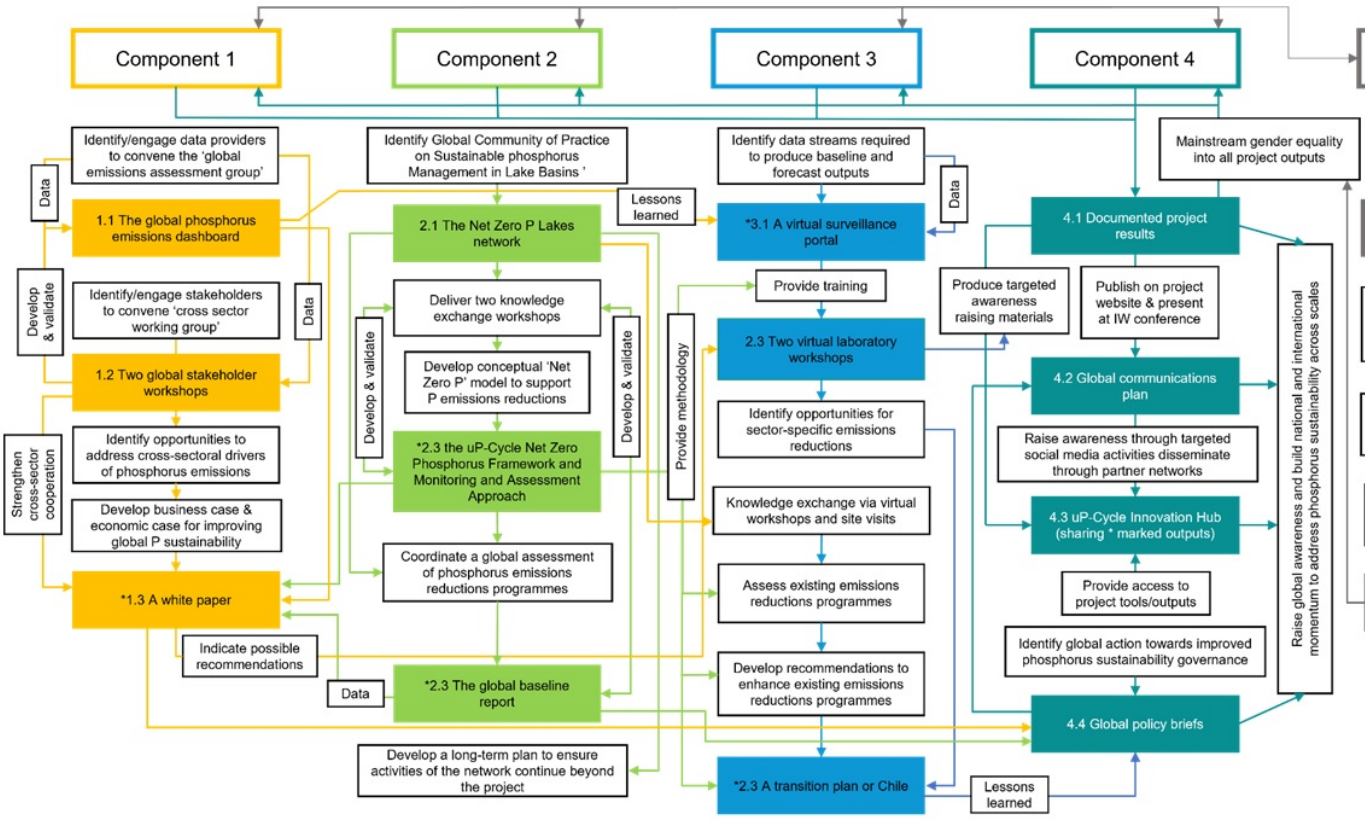

Figure 3. A flowchart of project outputs and components and their connections.

Description of expected Components, Outcomes, Outputs and Activities.

***Component 1*. Increasing clarity on global phosphorus emissions, drivers and impacts leading to increased awareness of global scale sector-specific phosphorus emissions reductions opportunities.**

In **Component 1**, we will produce a ?Global Phosphorus Emissions Dashboard? through which modelled emissions at basin to national and regional scales and their drivers may be interrogated (Output 1.1). The Global Phosphorus Emissions Dashboard will inform policy development priorities through multi-sectoral workshops, working to identify sector-specific emissions and their international drivers at the global scale (Output 1.2). The workshops may utilize the Global Phosphorus Emissions Dashboard to provide context around real-life case studies with which to examine the capacity to reduce emissions to specific transboundary ecosystems, aligning with other GEF investments. We will engage and inform International Industry Associations (see Section 2) who hold key roles in influencing institutional policy changes to accelerate sustainable phosphorus use across scales, towards a coherent global approach on sustainable phosphorus management (Output 1.3).

Outcome 1. Global stakeholders have the evidence needed to assess the capacity for phosphorus emissions reductions to contribute to their commitments to delivering large-scale ecosystem restoration ambitions (e.g., the UN Decade and SDGs). Improved international and cross-sector awareness of the need for coordinated action to deliver large-scale phosphorus emissions reduction.

Description of Proposed Outputs:

Output 1.1 The Global Phosphorus Emissions Dashboard beta version developed and implemented as an open-source online mapping tool allowing visualization of emissions estimates and their contribution to eutrophication risk across the world?s large lakes, extending to coastal waters.

The dashboard will combine modelling data products to produce maps of phosphorus emissions from land-based sources allowing interrogation of emissions estimates and their geographical and cross-sector sources to be identified across scales, from lake basin to national and global scales.

Output 1.1 will be delivered through two interconnected activities:

Activity 1.1.1 ? This activity will establish a global phosphorus emissions assessment group, bringing together data providers with which the global extent of emissions and their impacts on freshwater and coastal ecosystems can be mapped. As a result, a geospatial database with capacity for cross-sector emissions estimates at the basin, LME, national, regional and global scale resolution will be compiled. To ensure a gender-sensitive approach, representatives of women data providers will be identified.

Activity 1.1.2 ? This activity will develop the global phosphorus emissions dashboard - building on existing web-based infrastructure to (e.g., WRI Aqueduct Water Risk Atlas) to host and integrate relevant global data streams, from the geospatial database as compiled under Activity 1.1.1. The Dashboard will be developed with input and feedback from the stakeholder workshops as delivered

under the activities of Output 1.2. The dashboard will be hosted through an Innovations Hub (Activity 4.3). Awareness raising activities under Component 4 will disseminate the Dashboard to relevant stakeholders and stakeholder networks. The project will ensure that women?s organizations and gender specialists are part of the group that validates the beta version of the dashboard.

Output 1.2 Two global stakeholder workshops demonstrating the Dashboard and informing discussions on cross-sectoral drivers of global phosphorus emissions to freshwater and coastal ecosystems, as well as opportunities to address them.

Component 2 will deliver two workshops to showcase and further develop the Dashboard through engagement with key global stakeholders. Workshops will bring together those communities who are responsible for reducing emissions to protect ecosystems and those who are responsible for industries who can influence institutional behavioral change to accelerate emissions reduction policies within their respective sectors. These will include, but not be limited to, representatives from global environmental authorities (e.g., UNEP, World Bank, FAO) and International Industry Associations representing a ?community of influence? across key emissions sectors including agriculture, food waste, aquaculture, wastewater, and nutrient recycling sectors.

Output 1.2 will be delivered through two interconnected activities:

Activity 1.2.1 ? This activity will bring together stakeholders throughout partner networks, to establish a cross-sector working group with participation across relevant global policy sectors and International Industry Associations, representing a ?community of influence? across key emissions sectors (including agriculture, food waste, aquaculture, wastewater, and nutrient recycling sectors). The project will ensure that targeted women representatives are engaged to participate in the cross-sector working group. This is an important element of Component 1 and will allow the voice of industry to be represented in project outputs, as well as to increase awareness of the private sector to the myriad opportunities of improving sustainable phosphorus management.

Activity 1.2.2 ? This activity will deliver two workshops to showcase, and further develop, the global phosphorus emissions dashboard and explore cross-country-sector influences on the anthropogenic phosphorus cycle impacting on exemplar national or basin-scale phosphorus emissions programs. The project will ensure equal participation of women and men at the workshops. This process will also inform development of the Surveillance Portal (Activity 3.1.1) and may also help inform and develop the training as required under Activity 3.1.2.

Output 1.3 Publish a White Paper outlining priority sector-specific actions towards delivering a more sustainable global anthropogenic phosphorus cycle to support improved food security while delivering on global ecosystem protection and restoration ambitions.

The White Paper will be designed to support International Industry Associations and global environmental authorities in their role as ?influencers? of behavioral change at national and international scales. In the report, we envisage that the global ?business case? for improving phosphorus sustainability will be made, providing economic context on the benefits of phosphorus

recycling as well as potential savings associated with investments in emissions reduction measures leading to ecosystem recovery.

The ?White Paper? will be reviewed by gender specialist to ensure that gender considerations have been included.

Output 1.3 will be delivered through the following Activity:

Activity 1.3.1 ? This activity will be developed with inputs from the cross sector working group (Activity 1.2.1) as well the Global Community of Practice on Sustainable Phosphorus Management (established in Activity 2.1.1) to identify priority actions identified for phosphorus emitting sectors, recommendations for global actions, and a draft global business case. This will inform the development of a White Paper that will outline the benefits of ?Future World? policy development options and their capacity to deliver change against ?Present Day? conditions within the context of existing relevant national and international public and private policy frameworks. The White Paper will be disseminated via the communications plan (Output 4.1 ? Activity 4.2.1), the project website and innovation hub (Activities under Outputs 4.1 and 4.3).

The outcomes, outputs and activities of Component 1 are shown in **Figure 4**.

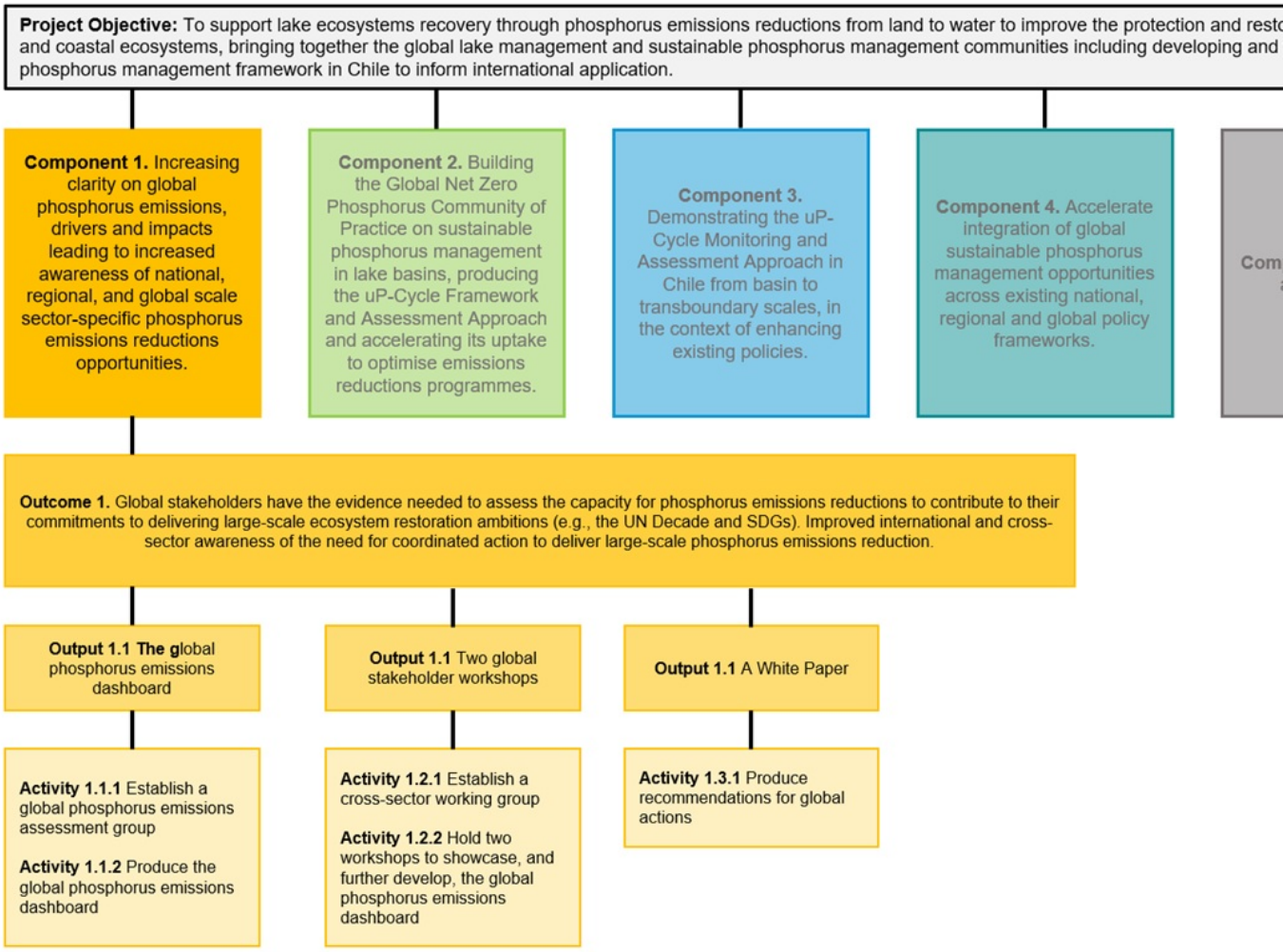

Figure 4. Component 1 showing the outcome, outputs and related activities.

Component 2. **Building the Global Net Zero Phosphorus Community of Practice on sustainable phosphorus management in lake basins, producing the uP-Cycle Framework and Assessment Approach and accelerating its uptake to optimize emissions reductions programmes.**

In **Component 2**, working with the WWQA and its members and with other global bodies of relevance, we will establish a global network of practitioners tasked with implementing phosphorus emissions reductions programs across the world?s lakes, including transboundary lakes (Output 2.1). This network will be an important conduit through which to raise awareness on the ground. We will mobilize the community to co-develop the uP-Cycle Framework providing stakeholders and practitioners with a conceptual model, centered on the Net Zero Phosphorus concept (Focus Box 1). This Framework will be adapted from existing frameworks (e.g., the SDG Global Accelerator Framework encompassing Data & Information, Financing, Capacity Development, Innovation, and Governance; and the ILEC Integrated Lake Basin Management Framework) and will learn from experiences in developing and implementing Net Zero Carbon initiatives.

A Monitoring and Assessment approach will be designed to allow identification of actions required to optimize existing and emerging emissions reductions programs (e.g., combining the IUCN Restoration Opportunities Assessment Methodology, the EC MERLIN project indicators, and relevant SDG indicators). The global landscape of investments and expected benefits in this context will be estimated by applying the Monitoring and Assessment approach across the Community of Practice. This component will review experiences and increase ambitions across existing and emerging phosphorus reduction programs, widening the scope of existing programs to consider wider benefits.

Outcome 2. Increased uptake of an international monitoring and assessment approach for the optimization of phosphorus emissions reduction programs leading to increased ambitions on the protection and restoration of lakes and their catchments and associated socio-economic benefits.

Description of Proposed Outputs:

Output 2.1 Convene the Global Community of Practice on Sustainable Phosphorus Management in Lake Basins; a global network of practitioners tasked with assessing the global baseline on large-scale phosphorus emission reduction programs.

The Network will draw on existing members of the WWQA and will consult with ILEC and UN-Water to identify representatives from lake basin management programs where phosphorus is a priority concern and will reflect the GEF IW Transboundary Waters focus with the inclusion of relevant Transboundary Lakes (e.g., Lake Victoria and Lake Erie already accessible). This community will be coordinated through the WWQA. We will enhance knowledge exchange across the network through practitioner surveys, field visits (depending on Covid travel restrictions) and annual workshops.

Output 2.1 will be delivered through the following activity:

Activity 2.1.1 - This activity will establish a Global Community of Practice on Sustainable Phosphorus Management, ensuring equal participation of men and women, to co-develop the uP-Cycle Framework providing stakeholders and practitioners with a conceptual model, centered on the Net Zero Phosphorus concept. The experiences of the Community of Practice will be reviewed through virtual meetings (including those detailed under Activity 2.2.3 and 2.3.1) to synthesize the global baseline on key challenges and solutions for achieving cross-sectoral phosphorus emissions reductions. Surveys will be used to conduct the first coordinated global assessment across this community of practice enabling the practitioner community to embed the Framework and Monitoring and Assessment Approach within their existing programs and working closely with UNEP to ensure relevance for SDG Indicator development and integration.

Output 2.2 Guidance materials leading to international implementation of the uP-Cycle Net Zero Phosphorus Framework and Monitoring and Assessment Approach, co-developed with the Global Community of Practice.

The Community of Practice will provide the evidence base to inform the development of the uP-Cycle Framework and Monitoring and Assessment Approach whilst also acting as a springboard to accelerate their international uptake and application. Guidance materials and common assessment methodology

will be produced and disseminated to the Community of Practice through knowledge exchange workshops and through the Innovations Hub (Component 4). The Framework will set out the multiple benefits of implementing sustainable phosphorus management plans to protect and restore lake basins whilst releasing multiple socio-economic benefits. The project will ensure that gender differentiated benefits are developed by contracting a gender specialist that will assist the development of the products. We envisage that these benefits will be aligned with the SDGs as well as targets embedded within existing and emerging national and regional sustainability policies. The Monitoring and Assessment Approach will allow lake basin managers to conduct internationally coordinated assessments of the operational effectiveness of existing programs whilst identifying opportunities to improve them. For example, the Assessment approach will allow quantification of benefits, for example, in line with the GEF Core Indicators, providing a global baseline.

Output 2.2 will be delivered through two interconnected activities:

Activity 2.2.1 ? This activity will develop the uP-Cycle framework - setting out the multiple benefits of implementing sustainable phosphorus management plans to protect and restore lake basins whilst releasing multiple socio-economic benefits. Evidence compiled under Activity 2.1.1 will be used to inform the development of the uP-Cycle Framework. Outputs from Cross Sector Working Group as detailed under Activity 2.2.1 and 2.2.2 will also inform development of this outputs.

Activity 2.2.2 - This activity will develop the monitoring and assessment approach - to allow lake basin managers to conduct internationally coordinated assessments of the operational effectiveness of existing programs whilst identifying opportunities to improve them. Evidence compiled under Activity 2.1.1 will be used to inform the development of the Monitoring and Assessment Approach. Outputs from Cross Sector Working Group as detailed under Activity 2.2.1 and 2.2.2 will also inform development of this outputs.

Activity 2.2.3 - This activity will hold knowledge exchange workshops to enhance knowledge exchange and to disseminate guidance materials and common assessment methodology to the Community of Practice in connection with Activity 2.1.1. The project will ensure equal participation of women and men at the workshops.

Output 2.3 Global Baseline Assessment Report produced showcasing the first internationally coordinated assessment of present-day phosphorus emissions programs for lakes and increasing international motivation to implement new policies, programs, and/or investments leading to more sustainable phosphorus management.

We will work with this community to conduct the first globally coordinated assessment of emissions reductions programs. The data and information produced will be synthesized to produce a report documenting the current levels of disparity in approaches and barriers to their effective implementation, drawing on specific case studies as exemplars and utilizing lessons learned from Component 3. A global baseline assessment of costs and benefits will be included drawing on reporting against common indicators (e.g., in line with SDGs and GEF Core Indicators). Opportunities to enhance existing programs to optimize benefits will be proposed. The report will be used to increase

international motivation to implement new policies, programs, and/or investments leading to more sustainable phosphorus management.

Output 2.3 will be delivered through the following activities, that will ensure equal participation of women and men:

Activity 2.3.1 ? This activity will hold a virtual open seminar series. The open seminar series will provide the opportunity for practitioners to introduce their emissions reductions programs in detail in the context of the uP-Cycle Framework, highlighting specific challenges and solutions, with opportunities to learn from the experiences of others.

Activity 2.3.2 ? This activity will synthesize the global baseline - a globally coordinated assessment of emissions reductions programs to produce a report documenting the current levels of disparity in approaches and barriers to their effective implementation. This activity will set the conditions for inclusion of cases and will reflect the GEF IW Transboundary Waters focus with the inclusion of relevant Transboundary Lakes (e.g., Lake Victoria and Lake Erie already accessible), where relevant.

Activity 2.3.3 ? Should COVID-19 restrictions allow, this activity will hold field visits to showcase exemplars of effective sustainable phosphorus management in established programs.

The field visits will build on an established international community of practice convened by the World Water Quality Alliance during PPG. This community of practice currently consists of representation from 63 countries covering over 180 lake restoration case studies. We have, through a Global Survey of Lake Practitioners, confirmed that the primary issue facing these practitioners is sustainable phosphorus management, specifically requiring reduction in phosphorus pollution to meet established lake management targets. In addition to this community the project will engage with countries reporting to SDG 6.3.2 through our contact in the leadership team of this indicator. Selection of exemplar cases will be conducted in partnership with the WWQA and SDG 6.3.2. Currently, we have offers to host a field trip from established exemplar teams, including Loch Leven (UK), Lahti Lake (Finland), and Lake Villarrica (Chile). Attendees will be invited and selected from across the international community of practice, but will also include representatives from international bodies (e.g. ILEC, WWQA, UNEA 5/4 Resolution Implementation Unit). Knowledge exchange material will be recorded on each visit and made publicly available along with reports on key topics discussed and key messages for policy makers, the international practitioner community and the public. In this way, we will utilise our global reach to ensure that lessons learned are scaled-up across all sectors.

Activity 2.3.4 ? This activity will develop and publish a long-term plan to ensure engagement with the Community of Practice beyond the lifetime of the project, this is likely to be facilitated by the WWQA. The projects will guarantee gender-inclusive approaches and language in the plan development.

It is anticipated that project actions will be sustainable through partnership with established long-term actors. These include the World Water Quality Alliance (at least to 2030) and the UN SDG 6 teams. These teams are currently working together through association with the UNEA 5/4 Resolution on Sustainable Lake Management which calls for enhanced international collaboration and knowledge

exchange on this topic. As an early output following discussions during PPG the project team in collaboration with WWQA and SDG6 have produced a White Paper on Sustainable Lake Management which sets out a long-term plan for support of the Global Community of Practice, recognising the need for a new Global Coalition on Lakes, including the establishment of a Green Finance Initiative. This is designed to directly address the concern raised in the reviewer?s comment, which is highly relevant, and should support future GEF projects in this arena.

The outcomes, outputs and activities of Component 2 are shown in **Figure 5**.

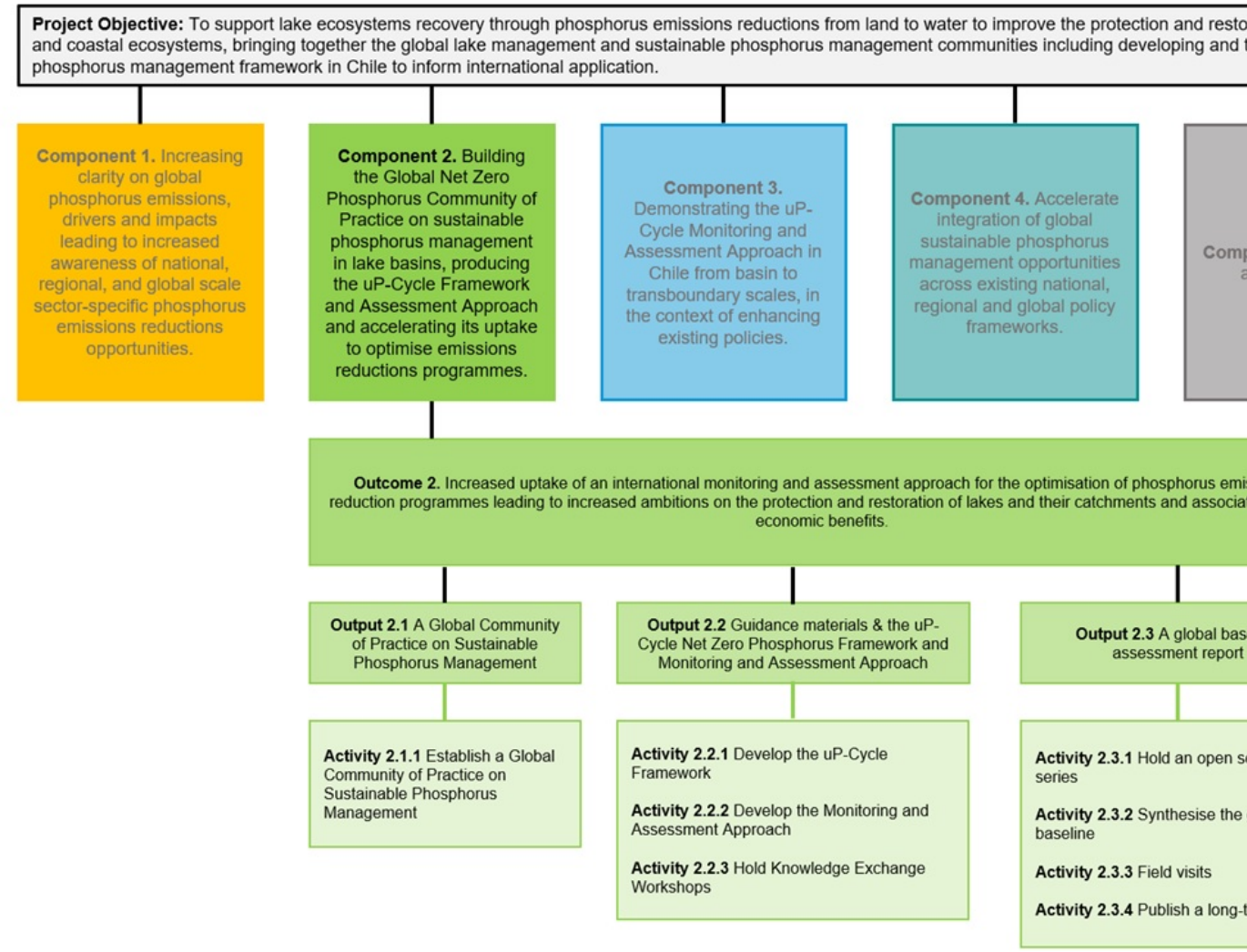

Figure 5. Component 2 showing the outcome, outputs and related activities.

Component 3: **Demonstrating the uP-Cycle Monitoring and Assessment Approach in Chile from basin to transboundary scales, in the context of enhancing existing policies.**

In **Component 3**, working with the Chilean Ministry of the Environment, its sister departments, and their evidence providers and key stakeholders, we will pilot the Monitoring and Assessment Approach to identify areas of improvement required at the basin (i.e., Lake Villarrica) and national scales (i.e.,

enhancing Chile?s reporting on SDG Indicator 6.3.2, optimizing the Lake Villarrica Decontamination Plan, and supporting priority actions on decreasing land-based impacts on the HC-LME). We will work on the ground in Chile to enhance surveillance data streams (e.g., physical and remote monitoring systems) and to supplement existing data and information streams within an integrated surveillance and forecasting system. This will require training in data interrogation, visualization, and ecosystem modelling to fully utilize all emerging information. Together, these information flows will be combined following the *Digital Twin* approach towards providing present-day and future emissions and effects scenarios to enhance decision making. This will equip the Chilean government departments with the knowledge and evidence to support medium- to long-term policy development targeting ecosystem protection and restoration.

Outcome 3 Improved understanding across Chilean government departments and its stakeholders on opportunities for enhancing phosphorus emission reduction programs and policies, targeting protection of lake basins and the Humboldt Current Large Marine Ecosystem.

Description of Proposed Outputs:

Output 3.1 Develop a surveillance system integrating data streams to produce baseline and forecast outputs on phosphorus emissions and their impacts for the Lake Villarrica Basin, to inform the development of a national scale system. The project will guarantee gender-inclusive approaches and language in the virtual surveillance portal, by hiring a gender specialist that will participate in the development group.

Improved catchment-scale surveillance was identified during the PIF stage as a priority need to support evidence based development of the existing Lake Villarrica Decontamination plan. The integration of evidence and data streams was also identified as a priority to inform the development of similar plans in other lake basins in Chile impacted by phosphorus pollution. To address these needs, we will work through the Chilean Ministry of the Environment to identify data and information flows across government departments and non-governmental evidence providers (e.g., Universities, Industry and NGOs) to improve the integration and interpretation of data and information flows, enhancing these, where necessary. Enhancements may include the citizens? science and remote monitoring techniques. Recent advances in physical monitoring systems, for example, allowing integration of lake ecosystem and catchment process-based predictive models will also be considered (e.g., emissions estimates from the Global Phosphorus Dashboard in combination with lake ecosystem models[62][62]). We envisage socio-economic data streams will be included (e.g., social deprivation and other indicators) alongside biodiversity and water quality data allowing potential benefits to be mapped. Utilizing advances in data generation, interrogation, and visualization techniques we will work to produce a virtual environment capable of assessing phosphorus emission reduction scenarios, impacts and benefits to inform stakeholder engagement and policy development. We will draw on experiences of producing similar systems within the UK[63][63].

Output 3.1 will be delivered through two activities, that will ensure equal participation of women and men:

Activity 3.1.1 ? This activity will build capacity in Chile in producing evidence to support stakeholder engagement activities targeting continual improvement and development of decontamination plans for lake basins. A virtual environment capable of assessing phosphorus emission reduction scenarios, impacts and benefits to inform stakeholder engagement and policy development will be produced. This Activity will build upon lessons learnt in Activities 1.1.1 and 1.1.2.

Activity 3.1.2 ? This activity will provide training in the application of novel monitoring and modelling approaches and in data interrogation and visualization techniques delivered through staff exchanges and directed training activities, drawing on the expertise of the UKCEH and relevant national and international partners.

Output 3.2 Hold two Virtual Laboratory Workshops and produce targeted awareness-raising materials to engage stakeholders in the co-development and uptake of new opportunities for sector-specific emissions reductions at the lake basin- to national scales in Chile, utilizing the surveillance portal.

Workshops will be developed by the Chilean Ministry of the Environment to meet the needs of its stakeholders and to showcase the surveillance portal. The outcomes of these workshops will be used to develop public awareness raising materials. Content may include (1) delivering school and higher education materials to inform more sustainable choices, (2) providing guidance on the placement and benefits of nature-based solutions, (3) increasing phosphorus use efficiencies across sectors (e.g., agricultural and aquaculture), (4) increasing recycling from existing waste streams (e.g., wastewater discharges), (5) developing guidance for emissions disclosure and reward schemes, (6) supporting finance and local policy mechanisms to reduce emissions from unconnected domestic properties, and (7) exploring green investment opportunities related to increased returns through eco-tourism.

Output 3.2 will be delivered through two activities:

Activity 3.2.1 ? This activity will hold two virtual laboratory workshops to develop and showcase the surveillance portal and identify synergies and opportunities to release multiple benefits through more sustainable phosphorus management across the value chain. The workshops will be led by the Chilean Ministry of the Environment and will bring together a wide range of stakeholders as listed in Section (2) and will ensure equal participation of women and men.

Activity 3.2.2 - This Activity will produce targeted awareness-raising materials to engage stakeholders in the co-development and uptake of new opportunities for sector-specific emissions reductions at the lake basin- to national scales in Chile. Awareness raising material will be targeted to those stakeholders that carry the most influence to drive forward improvements in sustainable phosphorus management within the catchment and region. Influential stakeholders will be identified within this activity and informed through Activity 3.1.1 and Activity 3.1.3. Basin and national scale stakeholder engagement will be supported by our international stakeholder community (e.g., the International Industry Associations) to provide sector-specific guidance of direct relevance to local practices, and to increase readiness levels for change. We will draw on the existing expertise of public engagement (e.g., social

media and engagement with minority groups) across the wider project and national stakeholder group to develop and deliver clear messages on the benefits of sustainable phosphorus management considering equality and inclusion. Awareness-raising materials will be review by a gender specialist that will include mainstream gender considerations.

Output 3.3 A Transition Plan for Chile is published and shared across relevant government departments identifying opportunities to strengthen the implementation of the existing Lake Villarrica Basin Decontamination Plan, as well as improving the integration of sustainable phosphorus management across national policies for the protection and restoration of lakes and coastal ecosystems.

We will assess the Lake Villarrica Decontamination Plan using the Monitoring and Assessment Approach. This will require surveys across all relevant government departments, for example considering Data & Information, Financing, Capacity Development, Innovation, and Governance structures. Recommendations will be produced for better integration across Government Departments (see Section 8) to identify synergies and opportunities for delivery of multiple sustainability and socio-economic targets, to accelerate scaling up emissions reductions? programs, to inform nutrient emission reduction targets relevant to HC-LME SAP, where appropriate, and to raise public awareness on opportunities and benefits associated with more sustainable phosphorus use.

The project will guarantee gender-inclusive approaches and language in the different publications and will ensure equal participation of women and men at the different workshops.

Output 3.3 will be delivered through three activities:

Activity 3.3.1 - Compile and review evidence to produce assessment reports of existing emissions reductions programs (e.g. Lake Villarica Decontamination Plan) following the Monitoring and Assessment Approach.

Activity 3.3.2 ? This activity will hold quarterly virtual workshops (and *ad hoc* site visits) to co-develop recommendations for enhancing existing emissions reductions programs within the uP-Cycle Framework. The application of the Monitoring and Assessment Approach (as developed in Activity 2.2.2) will be delivered by collaborative teams, embedding international expertise across the existing catchment management groups, led by the Chilean Ministry of the Environment. These workshops will help produce evidence for the assessment reports of existing emissions reductions programs (Activity 3.3.1), and to inform the development and content of the transition plan for Chile (Activity 3.3.3). Recommendations for enhancing these programs within the uP-Cycle Framework will be co-developed during these quarterly virtual workshops and *ad hoc* site visits.

Activity 3.3.3 ? This activity will produce a Transition Plan Report for Chile and disseminate it across relevant government bodies. This report will include a synthesis of the evidence produced by Component 3. This will include knowledge on the implementation of innovative emissions reduction measures, including nature-based solutions, and will draw on expertise of practitioners responsible for their implementation in Chile (Component 3) and in other countries (e.g., engagement activities in Component 2) including industry sectors (Component 1).

The outcomes, outputs and activities of Component 3 are shown in **Figure 6**.

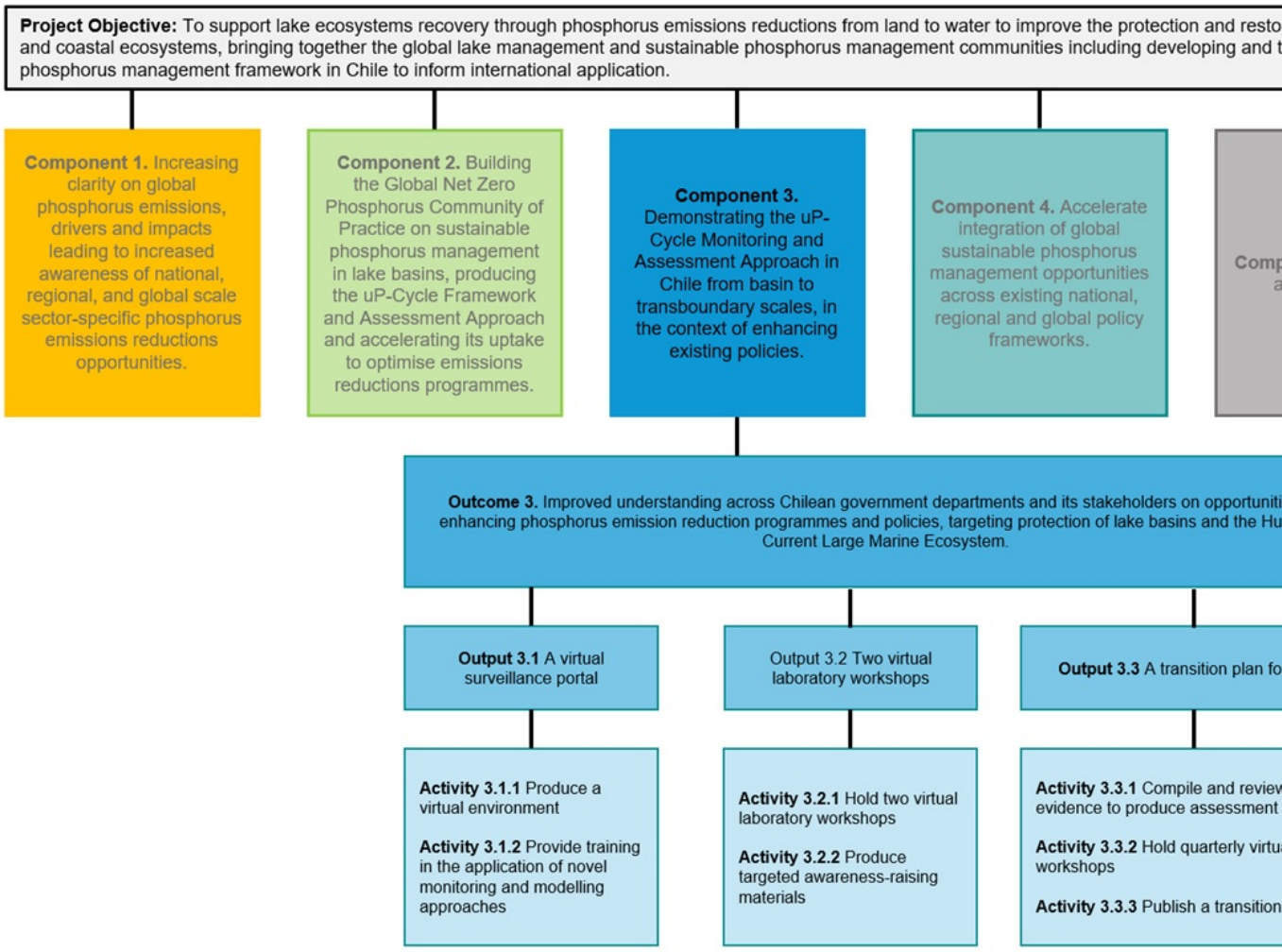

Figure 6. Component 3 showing the component outcome, outputs and related activities.

***Component 4*: Increasing integration of global sustainable phosphorus management opportunities across existing national, regional and global policy frameworks.**

In **Component 4**, working with GEF and UNEP, the project will re-define global ambitions on the sustainable management of phosphorus for reversing freshwater biodiversity loss and creating a new path for post-pandemic sustainable recovery. We will raise awareness of these ambitions working with established global stakeholders to address the need for intergovernmental action leading to better integration of sustainable phosphorus management across the current global policy arena.

Outcome 4. Improved national, regional, and global awareness of the benefits of integrating sustainable phosphorus management across existing policies within a coordinated approach (e.g., across World Water Quality Alliance (WWQA) and the Global Programme of Action (GPA); IPBES; IPCC; FAO, etc.).

Description of Proposed Outputs:

Output 4.1 Documented project results disseminated through IW:LEARN activities (1% of the project budget) and established global initiatives.

The project will esure that the work related to gender equality and women?s empowerment conducted by the project is showcased in the materials to share on the website, regional and international meetings, etc.

Output 4.1 will be delivered through the following activities:

Activity 4.1.1 ? This Activity will establish a dedicated website to raise awareness of the project, project workshops and knowledge exchange activities, host project outputs as they are developed throughout the project and will link to the Innovation Hub.

Activity 4.1.2 ? This activity will support participation in the IW Conference, and to develop project results, experience notes, documented cooperation and a knowledge exchange log which will be shared with (i) IW:LEARN as well as (ii) the STAP.

Activity 4.1.3 ? This Activity will produce annual update reports to support monitoring and evaluation requirements, both internally with the PCU and also externally (see Component 5). Report will be circulated to, for example, the WWQA and GPA; and through targeted special sessions of internationally important meetings (e.g., SIWI World Water Week, the World Lake Congress, and the UN Environment Assembly).

Output 4.2 Global gender responsive communications plan to raise awareness across public, private and policy audiences, disseminated to IW:LEARN and established global initiatives.

Output 4.2 will be delivered through the following activity:

Activity 4.2.1 ? This activity will conduct a media campaign (e.g., websites, web pages on government sites, and a project portal) to increase public awareness through targeted social media activities, for example, including through the project website and GEF and UNEP social media outlets (where appropriate). Content may include short videos, webinars, surveys, and other interactive communication tools, it will also include at least 3 gender-responsive comms materials. Part of the activity will be developed in Activity 4.1.1, which outlines the development of a dedicated project website to raise awareness of the project, but also to host project outputs as they are developed throughout the project.

Output 4.3 The uP-Cycle Innovation Hub - a web-based information portal to accelerate the development and implementation of sustainable phosphorus initiatives.

Output 4.3 will be delivered through the following activity:

Activity 4.3.1 This activity will establish the uP-Cycle Innovation Hub - providing access to project outputs designed to accelerate the development and implementation of sustainable phosphorus

initiatives. The uP-Cycle Innovation Hub will enable online access to the more complex and interactive project tools (e.g. the Dashboard - Activity 1.1.3) and may also host interactive versions of reports (e.g. the Global Baseline - Activity 2.3.2) which will be developed throughout the project and are designed to accelerate the development and implementation of sustainable phosphorus initiatives. The Innovations Hub will also link through to other knowledge exchange initiatives at the global scale.

Output 4.4 Global Policy Briefs to increase awareness across governments on the need for better integration of phosphorus sustainability across the existing policy arena.

Output 4.4 will be delivered through the following activity:

Activity 4.4.1 - This activity will publish and disseminate several policy briefs shaping the narrative on a ?Global Sustainable Phosphorus Strategy? (Output 2.3). These briefs will highlight the ecosystem health, economic, and real-life cases for global action towards more sustainable phosphorus management. Policy briefs will be developed in collaboration with the GEF, WWQA members, and to target UNEA.

The outcomes, outputs and activities of Component 4 are shown in **Figure 7**.

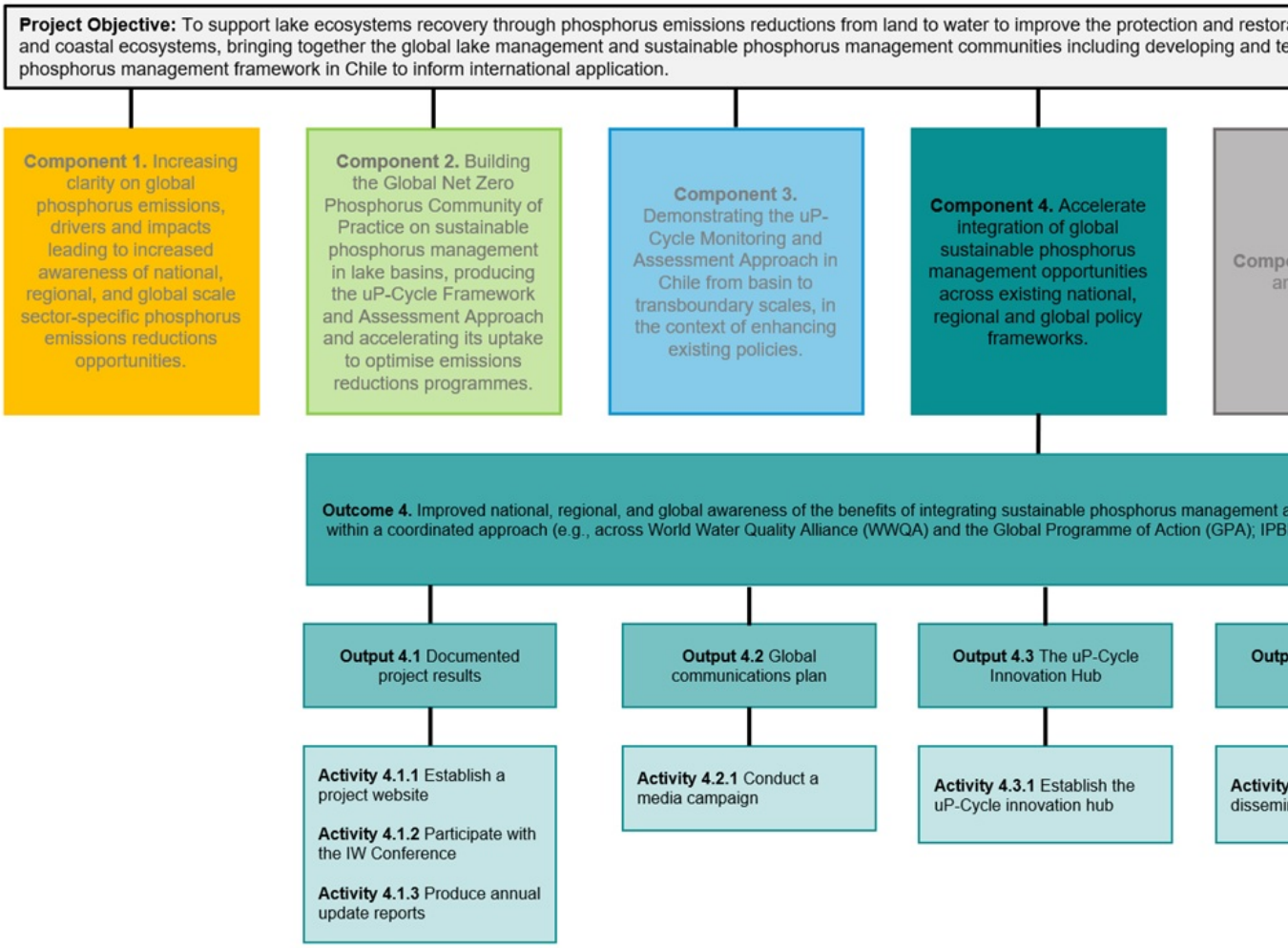

Figure 7. Component 4 showing the component outcome, outputs and related activities.

***Component 5*: Monitoring and Evaluation of Project Delivery.**

Component 5 will deliver the regular and structured monitoring and evaluation of project delivery following UNEP and GEF requirements. This component will assess progress utilizing a range of project tools, including a risk register as well as defined indicators for each output and activity, as outlined in Appendix 4. The project will be evaluated at several points throughout its duration to ensure timely production and an acceptable quality of delivery. Engagement with project stakeholders will also be tracked and optimized continually.

Outcome 5. Timely delivery of high-quality project outputs developed with informed and engaged project partners.

Description of Proposed Outputs:

Output 5.1 Documented monitoring and reporting process throughout the entire project execution life cycle ensuring project activities under Components 1-4 are on the right track.

Output 5.1 will be delivered through the following activities:

Activity 5.1.1 ? This activity will produce quarterly financial and progress plans and annual project execution and operational plans. Annual Co-financing and Project Execution and Operational Plans will also be produced. These will be shared with the UNEP project coordination team and disseminated by the project coordination unit.

Activity 5.1.2 ? This activity will deliver the uP-Cycle Project Inception meeting.

Activity 5.1.3 ? This activity will deliver the uP-Cycle Project Final meeting.

Output 5.2 - Independent evaluations documenting the process of collecting and analyzing information in order to understand the progress, success, and effectiveness of project activities under other components.

Output 5.2 will be delivered through the following activity:

Activity 5.2.1 ? This activity will deliver midterm and terminal evaluation reports facilitated by UNEP and conducted by external consultants.

The outcomes, outputs and activities of Component 5 are shown in **Figure 8**.

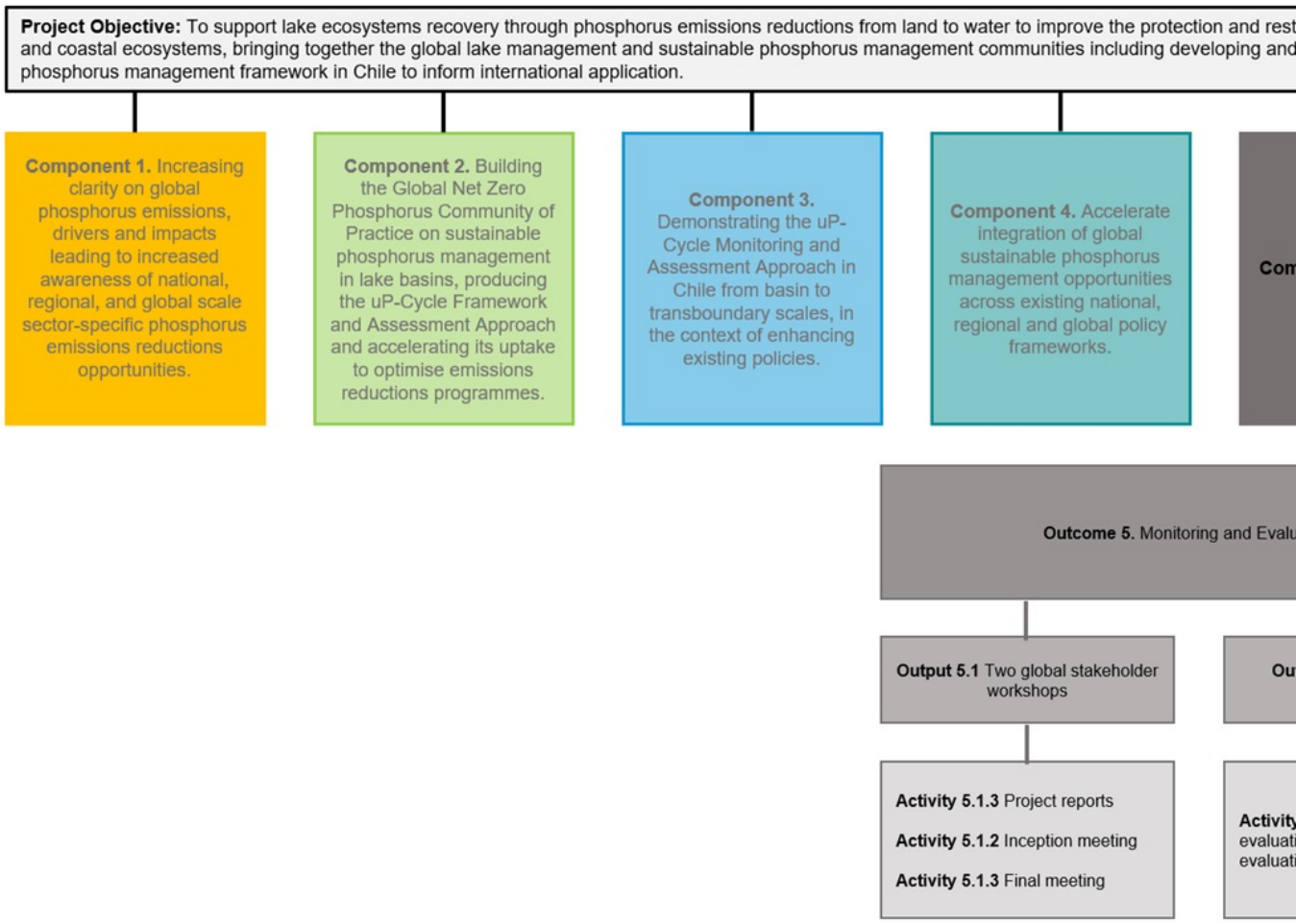

Figure 8. Component 5 showing the component outcome, outputs and related activities.

Theory of Change

The five Components presented above, each with specific outcomes and outputs, are elaborated in the Results Framework (Annex A). **Figure 9** illustrates the project?s Theory of Change (detailed in Appendix 1). The uP-Cycle Theory of Change is designed to demonstrate how the project outcomes will overcome the barriers outlined above (B1-B4), visualizing interconnections between components (as shown in Figure 3) and the specific outputs and outcomes. The main project goals and impacts are shown in the context of time-bound stages of change. The five Components will operate across basin, national, transboundary, and global scales. The project design recognizes that success in reducing emissions at the basin to national scales (Component 2 and 3) may require interventions to address drivers of emissions at the transboundary to global scales (Component 1 and 4). To achieve this requires improved international awareness of the need for coordinated action on phosphorus emissions reduction (Outcome 1.) leading to enhanced ambitions across existing and emerging emissions reduction programs (Outcome 2.). It is important to demonstrate that such transitions can be achieved through engagement with countries where phosphorus emissions are increasing but where existing

policies do not yet reflect the need for such a transition (e.g., Chile, Outcome 3.). Finally, raising awareness of the benefits of more sustainable phosphorus management will be key to accelerating international action (Outcome 4.). These outcomes will deliver improved assessments of phosphorus emissions and their impacts and will support countries as they develop mitigation plans to protect and restore impacted ecosystems, i.e., in response to the UN Decade on Restoration and the UN Sustainable Development Goals. In the longer term, they will underpin transition plans towards more sustainable phosphorus economies enabling greater food security whilst releasing new economic development opportunities. The project outputs will be monitored and independently evaluated throughout (Component 5).

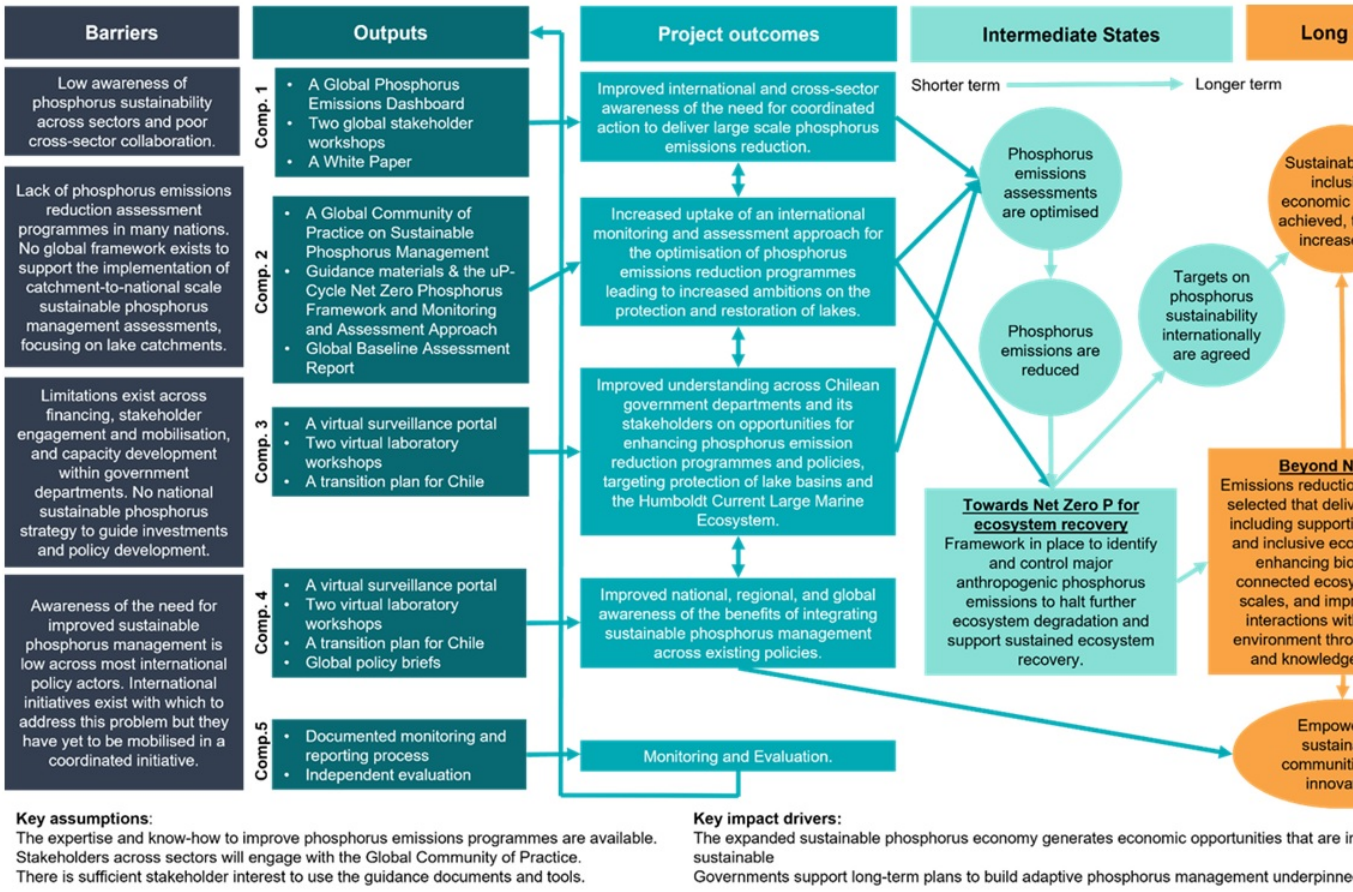

Figure 9. Theory of Change showing the outputs, outcomes and the intermediate stage leading to long-term outcomes of the uP-Cycle project.

d) Alignment with GEF focal area and/or Impact Program strategies

This project directly supports GEF-7 International Waters Focal Area Objective 1, "Strengthening Blue Economy Opportunities" and Objective 3, ?Enhance water security in freshwater ecosystems?. In

overview, this will be achieved through the development of a robust process to create catchment management plans that safeguard not only freshwater resources (as identified in Objective 2 and 3), but also reduce the risk of downstream pollution impacts to coastal and marine ecosystems (as identified in Objective 1 and 3). This process will, in part, foster unique public-private partnerships, helping countries identify sustainable investments within the Blue Economy space and transform the private sector contributions to improved health of coastal assets (see Objective 1 in the GEF-7 Programming Directions and Policy Agenda; paragraph 183; preceding reference hereafter excluded). Importantly, the project will de-risk innovation in measures to address water security both in terms of quality and quantity/availability (see Objective 3; Paragraph 204). Innovations may include technologies, e.g., for scalable water reuse, water efficiency, and water pollution abatement technologies and regulations (see paragraph 205).

We highlight that private sector engagement, through relevant industry sectoral roundtables and industry groups is a key focus across Components 1-3 (as detailed in investments that are supported; paragraphs 186, and 202). Opportunities to deliver on the criteria identified in Objectives 1 and 3, at the national scale will be identified through the international partnerships created between Chile and with the community of Practice and through engagement with SDG 6.3.2 and the WWQA through UNEP and our other partners (see paragraph 186). By facilitating knowledge exchange between these actors, the project will enhance capacity at the country level and dialogue among countries to draw conclusions from increasingly complex and innovative information sources to support decision making and to identify joint opportunities for action (as outlined in paragraph 199). Opportunities identified will be further defined through the work of the Global Emissions Assessment Groups (Components 1) and through the stakeholders of the Chilean Ministry of the Environment (see Component 3). Such outputs will enhance the quality, coverage and free availability of sound information on surface water quality and natural resources and related grey and green infrastructure assets and adaptation deficits, thereby contributing to advanced information exchange and early warnings systems (as detailed in investments that are supported; paragraph 199). Alongside the development of the Global Phosphorus Emissions Dashboard (see Component 1), the project will provide the training, knowledge, and tools (e.g., the uP-Cycle Innovation Hub ? see Component 4) to support on the ground actions to strengthen Blue Economy Opportunities, underpinned by a Sustainable Phosphorus Economy (aligned with Paragraph 183). The roadmap will also strengthen nature-based efforts for disaster risk management, however, in this context, we extend disasters beyond drought and floods as identified in Objective 3 (paragraph 197 and 199), to include the sudden onset of toxic algal blooms, nutrient pollution and their impacts (e.g. destruction of fisheries and potable water supplies).

As highlighted in Objective 3, cooperation on water resources in most international basins to support the need for water, food, energy, and ecosystems security and increase resilience for each nation is essential. The need for transboundary cooperation, therefore, has been anchored in the SDGs as an essential element for effective integrated water resources management (SDG 6.5). However, in this context, the project has the potential to address transboundary polluting effects that are shared through both lakes (Component 2) and marine ecosystems (Component 1 and 4). Through Component 2 and 3 of the project, the capacity to manage terrestrial phosphorus sources contributing to this risk will be strengthened.

e) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, and co-financing

Developing sustainable solutions to mitigate phosphorus pollution of lakes is a key step in effectively managing fresh waters and connected coastal waters in all regions. As established in Section 1, increasing levels of phosphorus pollution, associated with food and waste production, threaten the security of essential freshwater ecosystem services; a situation exacerbated by population growth, climate change and economic development. This is acknowledged by stakeholders in Chile, who have identified actions necessary through GEF support to develop sustainable phosphorus management programs for the protection of freshwater and coastal ecosystems (see Baseline). This is a common story. In most nations, for phosphorus management strategies to be successful, the development of new and innovative finance mechanisms as realized through sustainable phosphorus economies (with the engagement of the private sector), is paramount. The GEF incremental funding will allow the development of a framework for sustainable phosphorus management to support economic development whilst releasing the full benefits of healthy lake ecosystems (Component 1 and 2). Without GEF investment, many low-income countries that currently lack phosphorus emissions reduction programs, associated surveillance systems, and supporting policies will be locked into a heavily unsustainable and polluting phosphorus management pathway, resulting in further degradation of freshwater and coastal ecosystems. Lessons from high-income countries provide clear evidence on the socio-economic and environmental impacts of this pathway.

We recognize here that action at the basin to national scales requires consideration of a complex landscape of multi-sectoral interactions at the international scale. Chile provides an excellent demonstration case in this context. National and regional strategies must consider international issues that exert pressure on phosphorus sustainability at smaller scales. For example, in Chile, aquaculture and agriculture products drive major exports from the country (see Baseline) but they also drive pollution in the Villarrica Lake Basin (and other lakes) and the HC-LME. To increase the productivity of these industries, Chile relies on imported fertilizers. The globalization of trade has created a highly connected system within which a specific country?s influence on another?s phosphorus sustainability can be obscured and is little understood. Such ?interactions? are not only influenced by societal behaviors, but also by national and regional policies, trade deals, taxes, tariffs, and legislation, which can all influence phosphorus management decisions domestically, as well as internationally. These issues are best considered in the global context, yet their impacts are felt most keenly at the ecosystem scales. These issues are poorly understood and may involve multiple countries, each with unique sustainability issues, forming a range of potential interactions. Understanding, and predicting, how these interactions may impact a country?s national phosphorus cycle is critical to developing adaptive national phosphorus strategies that are resilient to future pressures. Whilst it is acknowledged that to de-risk investments in national phosphorus strategies, there is a need for systematic identification of the relevant interactions and factors driving their change, this is beyond the remit of national and sub-national scale projects. The incremental GEF funding will allow the creation of a global network (Component 1 and 2) to assess critical interactions between nations that influence unsustainable

phosphorus use responsible for ecosystem impacts (Component 2), supporting the development of a Framework and Monitoring and Assessment approach (Component 2) which recognizes these complexities of scale within an ecosystem-based management approach and demonstrating this approach within a country where the socio-economic impacts of phosphorus pollution are increasing (Component 3). Without the GEF increment, the global discourse on phosphorus management will remain locked within the fallacy that ?*to sustain food provision today, requires the destruction of the environment into the future*?. This scenario is laid out in the projections of increases in phosphorus emissions to freshwaters outlined in Section 1a and will result in multiple impacts across human and environmental health, socio-economic losses and damages, and potential geo-political instability related to the international trade of phosphorus goods.

f) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

The proposed project will support the GEF work under the International Waters Focal Area by addressing the causes of phosphorus pollution of fresh waters, to lessen threats to freshwater ecosystems, goods and services. It will contribute to achieving the following GEF core indicators (see Section E. Project?s Target Contributions to GEF 7 Core Indicators for further details on calculation methods).

GEF Core Indicator 4. Area of landscapes under improved practices: = 195,000 hectares (excluding protected areas), contributing to sub-indicator 4.1 and 4.3.

GEF Core Indicator 7. While considered as a global project hence asked not to formally reflect any ?beneficiary? water body, it is believed that this project will contribute somehow to improved ecosystems health in one water marine ecosystem and one freshwater ecosystem under improved cooperative management: the Humboldt Current Large Marine Ecosystem - contributing to sub-indicator 7.3 and 7.4, both at level 2.

GEF Core Indicator 11. by delivering targeted support to 45,123 male and 46,367 females (91,490 people in total), through the improved management of Villarrica Lake, this is based on the three major population centers of the lake: Puc?n, Villarrica and Curarrehue communes.

The following paragraphs outline the impact on people, the economy, and the environment, with a focus on the Villarrica Catchment in Chile.

The proposed project will work with a network of international experts to develop a process by which local governance/catchment managers are equipped and can identify the most effective and ?resources suitable? options to improve phosphorus sustainability, through the development of sustainable phosphorus catchment management plans. Whilst plans will be highly specific to the local context, generalisations can be made. For example, plans will involve placing areas of the landscape under improved practices (GEF Core Indicator 4), both to protect biodiversity (sub-indicator 4.1) and to improve land management used in agricultural production systems (sub-indicator 4.3), with the overarching aim to restore wetlands (GEF indicator 3) and maintain healthy freshwater ecosystems.

The project outputs will support better cooperative management of shared water ecosystems (GEF Core indicator 7), including the active participation of Inter-Ministerial Committees (sub-indicator 7.3). The project will achieve this through the global-scale activities in Components 1 and 2, by providing evidence to support the implementation of the HC-LME SAP in Component 3, and through engagement with IW:LEARN (sub-indicator 7.4) (e.g., data, media and tools available from the Innovation Hub).

Component 3 may include encouraging the development of Inclusive Sustainability Innovations to maximize economic revenue supporting businesses within local communities (e.g., community phosphorus recovery/recycling opportunities). These opportunities can, for example, be designed to close gender gaps in decision-making dialogue, ensuring that socio-economic benefits are shared equitably. These aims will be embedded in the decisions making processes developed by the project (GEF Core Indicator 11).

The legacy of this project is expected to deliver improved socio-economic benefits for a range of stakeholders in the future, including:

- For lakeshore communities directly impacted by eutrophication (e.g., risks to human health, supply of food, drinking water, recreation, property values, aesthetic, spiritual and cultural benefits).

- For the wider community, within lake catchment and beyond, that are reliant on lake ecosystem services (e.g., drinking water, irrigation water, transportation, recreation, hydropower).

- For coastal communities impacted by nutrient pollution delivered from upstream freshwater catchments.

- For aqua culturists, by supporting improved (long?term) and sustainable fisheries and through relief from future risk of hypoxic waters as a result of eutrophication.

- For waste managers through access to knowledge, training and technical guidance on the management of phosphorus-rich wastes to optimize phosphorus recycling.

- For farmers through better phosphorus management policies and practices, such as access to recycled phosphorus fertilizer, and contributing to food security.

- For communities economically dependent on biodiversity and high-quality freshwater ecosystems, through improved revenue from eco-tourism.

Global Environmental Benefits from activities in Chile

Lake Villarrica has become one of the most important tourist destinations in Chile due to the existence of protected areas. Around 28% of Chileans choose to vacation in the communes of Puc?n and Villarrica. Around 324,000 tourists (82% Chilean, 18% foreign), came to this zone in 2017 (3 times the population of the area). Tourism is one of the main economic activities in the region of La Araucan?a, where 17,730 people worked in activities related to tourism (hospitality and food services) in 2017 and

according to the latest available estimate (2007), the main communes of the basin registered an income related to tourism of USD 37 million per year.

A decrease in Lake Villarrica water quality due to increasing nutrient loads has triggered an impact on the quality and quantity of the ecosystem services provided in the basin. The high levels of nutrients produce algae blooms, which can decrease oxygen concentration in the lake, reduce water transparency, and, in some cases, increase toxins that could affect aquatic biota and/or human health due to accidental water intake, or direct contact with the skin. An increase in the frequency and intensity of harmful algal blooms has impacted foreign and national visitor numbers due to a decline in the scenic beauty of the landscape and heightened human health risks. This is negatively affecting the region?s economy due to the decrease in income related to tourism and a decrease in shoreline property values due to algal blooms.

The local economy is also reliant and impacted by inland freshwater aquaculture practices in the Villarrica Lake Basin. In Chile, there is limited regulation or monitoring of impacts in the freshwater phase stage, and there is some evidence of local eutrophication impacts and biodiversity impacts downstream of existing farms64[64]64. In fact, according to the draft version of the Villarrica Lake Decontamination plan, aquaculture discharges account for 38.2% of the total phosphorus load to the lake.

To gain wider access to export markets, through the main channels of modern retail and supermarkets, international markets are demanding increasingly detailed requirements on ethical and environmental criteria. The Chilean aquaculture industry recognizes that further sustainable expansion relies on improving the environmental reputation of farmed salmon. Chile is a member of the Global Salmon Initiative (GSI). The GSI members are committed to improved sustainability through cooperation and transparency. The aim is to achieve standards for all Chilean suppliers, so they can achieve certification from the Aquaculture Stewardship Council (ASC), which has progressed since 2014 when Cermaq (one of the main producers in Chile) achieved ASC status.65[65]65

Despite the above, none of the aquaculture operators located in the Villarrica Lake Basin has the ASC standard[66][66], and according to the Ministry for Environment estimation, most of these farms do not comply with the maximum permissible annual total phosphorus discharge limits per metric ton (t) of fish produced (4 kg/t of fish produced over 12 months)[67][67]. Through this project, a transition towards more sustainable phosphorus use in freshwater aquaculture could both reduce impacts on lakes whilst opening new international markets that demand higher environmental standards. This project provides the platform through which such innovations may be facilitated. For exa2mple, working with International Industry Associations in Component 1 may lead to the advancement of a novel ecosystem approach with clear incentives for responsible aquaculture farmers to support zoning and ecosystem monitoring to ensure sustainability and protect their investments. Also, planning at the ecosystem level may simplify permitting and ensure that farms occupy less environmentally sensitive areas.

g) Innovation, sustainability and potential for scaling up

Innovation: The proposed project represents a first in establishing a framework through which to deliver sustainable phosphorus economies based on new market and policy approaches to support the ?win-wins? of enhancing the circularity of food and wastewater systems whilst unlocking the socio-economic and biodiversity benefits of improved freshwater natural capital. This will include cost/benefit estimates of multiple externalities related to phosphorus, which will, for the first time, demonstrate the multi?focal benefits of a joined-up approach. This is critical because fundamental gaps in comparable data to describe key aspects of phosphorus sustainability make setting guidance on sustainability measures and setting targets (that are appropriate for the wide variation in phosphorus issues and resources found between nations) exceptionally challenging. Furthermore, measuring progress in achieving goals is difficult when baselines are potentially inaccurate and critical data are missing. We highlight the following broad areas in which this project innovates by addressing the issues above.

- This project will set out clear guidance on data requirements and collection methods that will support nations to collect data in ways that will allow international comparability and conformity.

The phosphorus flows for the global phosphorus cycle and a limited number of national phosphorus cycles have been estimated[68][68]. However, measuring, monitoring, and consolidating data on phosphorus flows is hampered by the non-comparability of datasets and missing and/or incomplete data, as recognized for example, by the recent review of progress on SDG Indicator 6.3.2. This can impact accuracy when assessing the level of risk posed by phosphorus emissions (i.e., phosphorus losses to fresh waters, vulnerability to food security risks) or identifying opportunities to improve phosphorus sustainability (i.e., potential to recycle phosphorus from wastes).

- This project will report on the socio-economic benefits of reducing eutrophication impacts.

Missing assessments detailing the extent of eutrophication, and quantification of the cost of impacts and mitigation costs, limits the development of emissions reductions programs in many lower-income countries. However, baseline data on phosphorus emissions and eutrophication impacts necessary to underpin phosphorus management programs are lacking in many of these countries. Without these data it is difficult to communicate the scale of the issue and, importantly when calling for policy development, to provide a cost of the damage and the benefits to the economy of implementing action. Assessments of the costs of eutrophication have been carried out in only a few countries (e.g., the USA and UK)[69][69].

Sustainability. The project will actively assist global partners and lake basin authorities to develop sustainable cross-sectoral partnerships (e.g., see stakeholders engaged with Lake Villarrica Basin in Section 8). The project will increase awareness of phosphorus associated risks through the Global

Phosphorus Emissions Dashboard, but also importantly provide a repository of options to lessen identified risk through the Innovation Hub (a data portal on measures to improve phosphorus efficiency across sectors). The legacy of the project will be long-lasting, existing through the Innovation Hub, the Community of Practice (long-term coordination through the WWQA) and associated component outputs. Combined, the project leaves a framework with supporting tools that can be accessed by all, to support the development of catchment plans that will deliver sustainable phosphorus cycles and economies with potential for international application. These outputs and the continued support of their uptake will be coordinated by the Chilean Ministry of the Environment in Chile, and by the WWQA Ecosystems team through coordination of the International Community of Practice, the latter for at least the duration of the UN Decade on Restoration. The Global Phosphorus Dashboard will provide a legacy resource, and we will work to ensure its development and application into the future, supporting countries to access it through guidance documents and demonstration materials (Component 4 ? Innovation Hub). The outputs of Component 3 will be embedded within existing institutional frameworks through the Chilean Ministry of the Environment. Finally, the long-term adoption of priority actions towards sustainability will be reflected in the White Paper in Component 1. Our Monitoring and Assessment approach will be designed to address the need for international coordination in the reporting on nutrient impacts delivering directly to SDG Indicator 6.3.2. In doing so, the approach will be embedded across countries reporting to this indicator; 96 countries have reported to SDG 6.3.2 since 2017.

Potential for Scaling up. In most cases it is anticipated that the scaling-up will require incremental adaptation, sustaining the approaches promoted by the project more widely. The GEF and other donors have supported considerable research and supported measures to mitigate the impacts of nutrients over the last 20 ? 30 years. However, this project represents the first GEF supported collaborative activity to deliver a global direction on the sustainable management of phosphorus with a focus on addressing the degradation of lake ecosystems extending to coastal zones. The project outcomes are designed such that they extend beyond the life of the project into long-term income-generating initiatives, which are designed not to need incremental adaptation funding. The project?s engagement and dissemination activities (i.e., Component 1, 2, and 4) will raise public and policymaker awareness internationally of the benefits of effectively reducing phosphorus emissions to lakes, accelerating uptake at a global scale.

Acronyms and Abbreviations

ANAMURI	National Association of Rural and Indigenous Women - Chile
BMPs	Best management practices
BSERP	Black Sea Ecosystems Recovery Project
CBD	Convention on Biological Diversity
CIWEM	Chartered Institution of Water and Environmental Management
COFI	FAO?s Committee on Fisheries
CORFO	Economic Development Agency - Chile

CRAES	Chinese Research Academy of Environmental Sciences
CSO	Civil Society Organization
DGA	*Direcci?n General de Agua* (Chile?s General Water Directorate)
DRB	Danube Regional Project
EA	Executing Agency
EBM	Ecosystem-Based Management
ECLAC	Economic Commission for Latin America and the Caribbean
EMG	EasyMining Germany GmbH
ESPP	European Sustainable Phosphorus Platform
EU	European Union
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GEF TWAP	GEF Transboundary Waters Assessment Programme
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GPNM	Global Partnership on Nutrient Management
GWI	Global Wastewater Initiative
FAO	Food and Agriculture Organization
HABs	Harmful Algal Blooms
HC-LME	Humboldt Current Large Marine Ecosystem
IFOP	Institute of Fishing Promotion - Chile
IHE-Delft	Institute for Water Education
IDH	Human Development Index
IFA	International Fertilizer Association
ILEC	International Lake Environment Committee
IMARPE	Institute of the Sea- Per?
IMC	Inter-ministerial committees
INCOM	Inter-convention nitrogen coordination mechanism
INI	International Nitrogen Initiative
INIA	Agricultural Research Institute - Chile
INMS	International Nitrogen Management System

IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPG	Gender Parity Initiative
IW	(GEF) International Waters
IW:LEARN	GEF International Waters: Learning Exchange and Resource Network (IW Project)
LMEs	Large Marine Ecosystems
MSP	Medium-sized Project
NERC	Natural Environment Research Council
N	Nitrogen
OPF	Our Phosphorus Future? project
P	Phosphorous
PCU	Project Coordination Unit
PET	Phoslock Environmental Technologies
PIR	Project Implementation Review
PMC	Project Management Cost
PPF	Project Preparation Facility
PPG	Project Preparation Grant
PPP	Private Public Partnership
PSC	Project Steering Committee
PTT	Phosphorus Task Team
RCU	Regional Coordination Unit
SACEP	South Asian Cooperative Environment Program
SAP	Strategic Action Program
SDG	Sustainable Development Goal
SEIA	Environmental Impact Assessment System
SER	Society for Ecological Restoration
SISS	Superintendence of Sanitary Services
SIWI	World Water Week
SoE	Superintendence of Environment

SPA	Sustainable Phosphorus Alliance ? North America
ToC	Theory of Change
UK	United Kingdom
UKCEH	UK Centre for Ecology and Hydrology
UNEA	United Nations Environment Assembly
UNECE	United Nations Commission for Europe
UNEP	United Nations Environment Programme
UNOPS	United Nations Office for Project Services
uP-Cycle	Towards Sustainable Phosphorus Cycles in Lake Catchments project
USA	United States of America
USD	United States Dollar
WRI	World Resources Institute
WWQA	World Water Quality Alliance

To save space references are listed fully only once. If the reference appears again later in the document the surname of the first author and document title will appear only.

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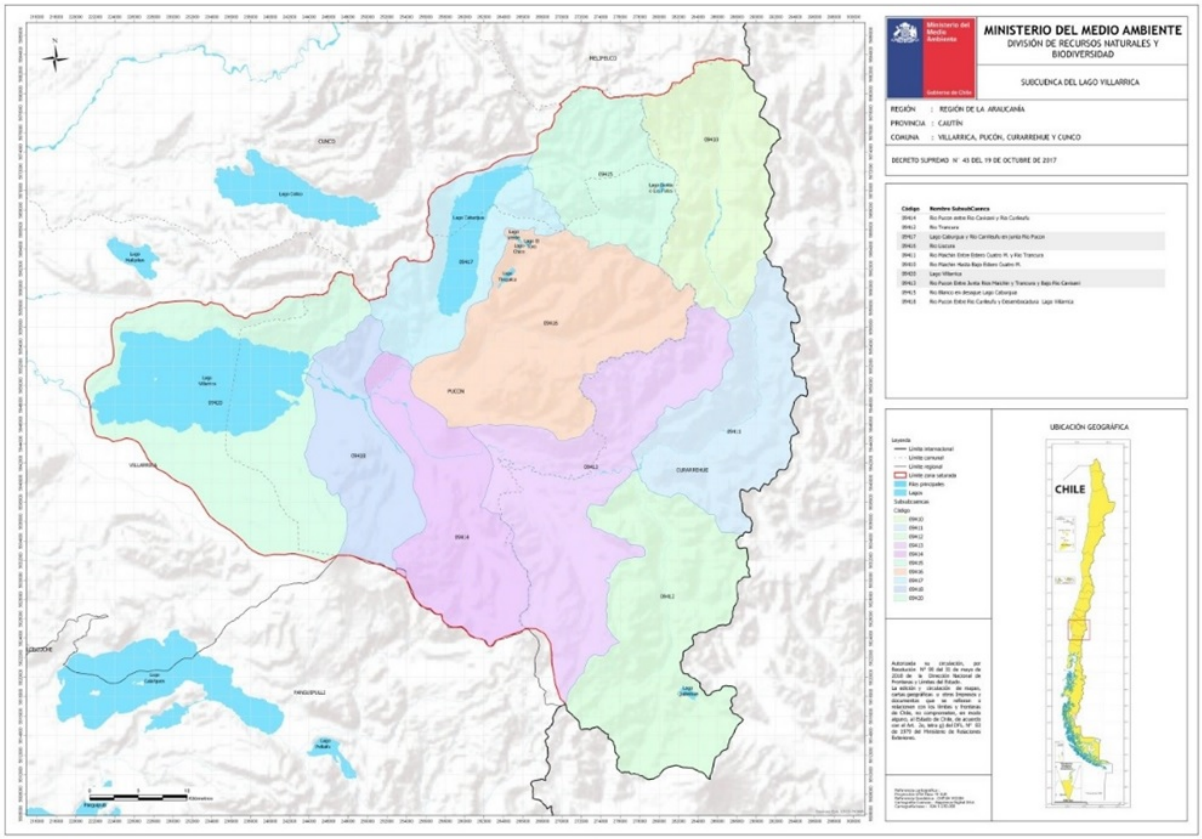
1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

Map 1. Villarrica Lake Basin - 39.2585? S, 72.1179? W



1c. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Civil Society Organizations Yes

Indigenous Peoples and Local Communities Yes

Private Sector Entities Yes

If none of the above, please explain why:

Please provide the Stakeholder Engagement Plan or equivalent assessment.

The effective implementation of the GEF project ?Towards Sustainable Phosphorus Cycles in Lake Catchments? (uP-Cycle project) will depend on the technical and institutional capacities as well as the participation of key stakeholders. The level of interest across stakeholders and their potential to

influence outputs was assessed during PPG phase in consultation with the Chilean Ministry of the Environment and UNEP, and through direct dialogue with many of these stakeholders.

Appendix 8B details a stakeholder analysis and engagement plan for the GEF uP-Cycle Project which provides an overview of different global and regional stakeholders and the stakeholders involved in the Chile demo. Appendix 8A and 8B present the plan for the stakeholder engagement process. The plan was developed based on the interaction with the over 50 actors and participants during consultation meetings. Moreover, the analysis provides a framework for conducting and evaluating stakeholder engagement efforts for an enhanced and effective engagement process. Towards this end, a stakeholder matrix (see Appendix 8A) was developed to identify the main public, private, academic, and non-governmental actors, their level and focus of interest in their project and their capacity to influence an enabling environment to implement the project. It should be highlighted that stakeholder analysis and engagement is an ongoing process, which may evolve as new stakeholders are introduced to the project. The Stakeholder Engagement Plan and Matrix (Appendix 8A and 8B) are intended to be living documents and to serve as a framework to continuously analyze and pursue partner opportunities.

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

The following tables (Table 1 and 2) provide a list of relevant stakeholders to the uP-Cycle project, their role in the project, how they will contribute and which Component and Output they will contribute to and/or influence. The strategy to engage with each stakeholder is also provided. We highlight discussions that have been initiated with most partners listed in the table below, but not all. The list of stakeholders and their roles with respect to the project will be further developed during the life of the project.

Table 1 Global-Regional Stakeholders

Stakeholder Name (partners related with circular economy, marine plastic litter and plastic pollution prevention)	**What is the role** of the stakeholder?	How could the stakeholder **contribute** to the project / involvement in the project?	Which **component** of the project could the stakeholder be engaged with, to support its implementation ?	Which project **output** could the stakeholder influence/support to ensure its implementation ?	**Strategy for engaging** the stakeholder
IHE-Delft	IHE Delft Institute for Water Education is the largest international graduate water education facility in the world. Based in Delft, the Netherlands. The Institute conducts research and supports capacity development to address the world's water challenges.	Consultation with IHE-Delft on EU sustainable policy development and via knowledge exchanged through the cross sector working group and stakeholder workshops (delivered under Output 1.2), will help in the development of policy relevant guidance documents developed under Component 2 (Output 2.2.).	Component 1	Output 1.2	EU JRC will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

International Nitrogen Management System (INMS)	A four-year project funded by GEF (2017-2021) and implemented by UNEP. The GEF/UNEP-UKCEH ?Towards the International Nitrogen Management System? project (INMS), is tasked with developing the evidence base to showcase the need for effective practices for global nitrogen management and to highlight options to maximize the multiple benefits of better nitrogen use.	Provided an advisory capacity for both PIF and PPG development. Providing access to evidence and tools with which to enhance our proposed Innovations Hub, including a measures database for sustainable nitrogen management which may also deliver on phosphorus sustainability	Component 1 & 4	Output 1.2, 4.3	Continuous information sharing, feedback meetings, and collaboration.
The Our Phosphorus Future Network	A global network of academic, industry and government actors formed through their contributions to the OPF project. Their collective expertise represents a valuable knowledge resource to this project.	Provided an advisory capacity for both PIF and PPG development. Contributions through the provision of expertise on phosphorus sustainability. Raising awareness of the project to its network, and to opportunities for members of the network to join the Cross Sector Working groups and Global Stakeholder Workshops (Output 1.2)	Component 1 & 4	Output 1.2, 4.3	Continuous information sharing, feedback meetings, and collaboration.

UK Centre for Ecology and Hydrology (UKCEH)	UKCEH are an independent, not-for-profit research institute. Our 500 scientists provide the data and insights that researchers, governments and businesses need to create a productive, resilient and healthy environment. UKCEH have a long history of investigating, monitoring and modelling environmental change, generating evidence-driven solutions to complex environmental challenges.	The UKCEH are the executing agents and will form the project coordination unit	Component 1, 2 and 4	Output 1.1., 1.2, 1.3, 2.2, 2.3, 4.1, 4.2, 4.3, and 4.4	Continuous information sharing, feedback meetings, and collaboration.

University Linkoping	Link?ping University is a public research university based in Link?ping, Sweden. Link?ping University emphasizes dialogue with the surrounding business sphere and the community at large, both in terms of research and education. It is a member of the European Consortium of Innovative Universities, as well as a founding member of the Conceive Design Implement Operate Initiative.	Contribute in identifying and enabling key stakeholders to articulate their priorities, perspectives, drivers, and how these directly or indirectly link to phosphorus in the Catchment. Share perspectives to foster social learning and build trust/momentum between diverse stakeholder groups; and co-develop and co-implement socially-desirable, technically-feasible and ecologically-sound adaptation strategies that will restore ecosystem health and benefit the community	Component 2	Output 2.2	Continuous information sharing, feedback meetings, and collaboration.

University of Edinburgh (School of Geosciences)	The University of Edinburgh is a public research university based in Edinburgh, Scotland and ranked among the top universities in the United Kingdom and the world. The School of Geosciences is one of the largest and most successful interdisciplinary groupings of geographers and geoscientists in the UK, with a community of staff, students and researchers passionately committed to understanding the impact of climate on the Earth's systems, the environment and ecosystems, as well as the social, economic, cultural and political implications for society.	Expertise and advice on implemented strategies to deliver net zero goal through government ministries and departments, learning through experience of net zero carbon goals. Providing expertise on social sciences and human geography in relation to socio-economics in the context of phosphorus sustainability and climate change. The School of Geosciences has a Chile Office - which is helps facilitate stakeholder engagement and dissemination of project outputs in Chile.	Component 1, 2 and 4	Output 1.2, 2.2, 4.2	Continuous information sharing, feedback meetings, and collaboration. We will also engage with the Chile office as part of a holistic communication strategy to raise awareness to diverse stakeholders.

University of Sterling (Earth and Planetary Observation Research Group)	The University of Sterling, Earth and Planetary Observation Research Group harness satellite, airborne and in-situ sensor technologies to provide new understandings of aquatic and terrestrial ecosystem responses to environmental change and deliver data-driven solutions to pressing global challenges.	The University of Sterling, Earth and Planetary Observation Research Group will contribute to the Global Phosphorus Emissions Assessment group (Activity 1.1.1) with the provision of earth observation data to be used in the Phosphorus Emissions Dashboard	Component 1	Output 1.1	University of Sterling will be engaged through PBL and the PCU in the course of discussions on collaborative links between the two bodies.

University of Technology, Sydney	The UTS team of social and interdisciplinary researchers have extensive expertise in engaging diverse stakeholders (from indigenous communities to policymakers and industry) across phosphorus value chains, natural resource management and food systems (both land-based and fisheries/aquaculture). We have worked across Asia-Pacific, Africa, The Americas and Europe	Contribute in identifying and enabling key stakeholders to articulate their priorities, perspectives, drivers, and how these directly or indirectly link to phosphorus in the Catchment. Share perspectives to foster social learning and build trust/momentum between diverse stakeholder groups; and co-develop and co-implement socially desirable, technically feasible and ecologically-sound adaptation strategies that will restore ecosystem health and benefit the community	Component 2	Output 2.2	Continuous information sharing, feedback meetings, and collaboration. We will also engage with the Chile office as part of a holistic communicatio n strategy to raise awareness to diverse stakeholders.

Wageningen University	Wageningen University & Research (also known as Wageningen UR; abbreviation: WUR) is a public university in Wageningen, Netherlands, specializing in life sciences with a focus on agriculture, technical and engineering subjects. It is a globally important center for life sciences and agricultural research. WUR consists of Wageningen University and the former agricultural research institutes of the Dutch Ministry of Agriculture.	Contributions through the provision of expertise on phosphorus sustainability in agriculture and food production; and to engage in the open seminar series to provide knowledge exchange in the context of the uP-Cycle Framework.	Component 2	Output 2.3	Wageningen will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

Chartered Institution of Water and Environmental Management (CIWEM)	CIWEM represents and supports a community of thousands of members and organizations in over 89 countries who are dedicated to improving water and environmental management for the benefit of the public. Their aim is to build a global community of water and environmental professionals dedicated to working for the public benefit. As an independent charity they champion professional standards, impartiality and the use of scientific evidence in the management of the environment. They are represented by highly qualified water and environmental managers, engineers and scientists who are recognized globally for their professional expertise and conduct.	Contribute expertise in water management through engagement with the Global Community of Practice on Sustainable Phosphorus Management in Lake Basins.	Component 2	Output 2.1	CIWEM will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

The European Sustainable Phosphorus Platform (ESPP)	A regional multi-stakeholder group, providing knowledge sharing, experience transfer and networking opportunities in the field of phosphorus management, facilitates discussion between the market, stakeholders and regulators, addresses regulatory obstacles, contributes to policy proposals, and contributes to defining a long-term vision for phosphorus sustainability in Europe. The Members of ESPP cover a wide range of actors across the whole value chain of phosphorus stewardship: phosphorus mining and processing, water and waste treatment, food, feed and agriculture, phosphorus reuse and recycling, innovation and technology providers, knowledge institutions, NGOs and governmental organizations.	Will be consulted on the development of the Innovation Hub, Component 4 and play a key role in raising awareness to its membership of the project and opportunities to engage in the Cross Sector Working Group and Global Stakeholder Workshops (Output 1.2).	Component 1 & 4	Output 1.2, 4.3	Continuous information sharing, feedback meetings, and collaboration.

The Society for Ecological Restoration (SER)	A global network of over 4,000 members, fostering the exchange of knowledge and expertise among ecological restoration practitioners and scientists from diverse disciplines and backgrounds. In addition to communicating leading-edge tools, technologies and scientific findings, SER actively promotes best practices and effective restoration policy around the world.	SER will be an invited member of the Zero P Lakes Network, with contributions to the development of phosphorus emissions programs. Raising awareness of the project to its membership.	Component 2	Outputs 2.1.	SER will be engaged through the WWQA in the course of discussions on collaborative links between the two bodies.
Phoslock Environmental Technologies (PET)	PET is a global leader in the treatment and remediation of freshwaters, particularly those impacted by excessive levels of phosphorus. Their flagship product, Phoslock?, was originally developed by the Australian national science agency. This proprietary technology binds excess phosphate present within a system which forms the naturally occurring, stable, insoluble mineral, Rhabdophane. Phoslock has been extensively assessed by independent experts as having distinct advantages over competitive in-lake treatments.	Providing expertise and evidence on measures for lake restoration in the context of mitigation of impacts resulting from elevated phosphorus concentrations in lake waters.	Component 1 and 2	Output 1.2 & 2.1	PET will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

EMG EasyMining Germany GmbH	EMG EasyMining Germany GmbH is a privately held corporate group, operating companies in four countries. Since 1966, we've been involved in waste management, environmental services and recycling. We collect, treat and recycle waste and residual products from businesses, organizations and households.	Providing expertise and evidence on phosphorus recycling.	Component 1 and 2	Output 1.2 & 2.1	EMG EasyMining Germany GmbH will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.
Susphos	Susphos is a pioneering company focused on upcycling of phosphate rich waste streams to generate high-quality alternatives to replace current fossil-sourced product	Providing expertise and evidence on phosphorus recycling.	Component 1 and 2	Output 1.2 & 2.1	Susphos will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.
The World Resources Institute (WRI)	A global non-profit organization that works with leaders in government, business and civil society to research, design, and carry out practical solutions to improve people?s lives and ensure nature can thrive, with expertise in policy, research, data analysis, economics, and political dynamics.	Consulted at PIF and PPG stage will contribute to Component 1 to help construct the phosphorus emissions dashboard. They also have expertise in communication strategies, data presentation and awareness-raising which will be utilized in development of the communication strategy	Component 1 and 4	Output 1.1 & 4.2	WRI will be engaged through continuous information sharing, feedback meetings, and collaboration

EU Joint Research Commission (EU JRC)	The Joint Research Centre is the Commission's science and knowledge service. The JRC employs scientists to carry out research in order to provide independent scientific advice and support to EU policy.	Consultation with EU-JRC on EU sustainable policy development and via knowledge exchanged through the cross sector working group and stakeholder workshops (delivered under Output 1.2), will help in the development of policy relevant guidance documents developed under Component 2 (Output 2.2.).	Component 1	Output 1.2	EU JRC will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

FAO?s Committee on Fisheries (COFI), and its sub-committee on Aquaculture	A subsidiary body of the FAO Council. COFI presently constitutes the only global inter-governmental forum where major international fisheries and aquaculture problems and issues are examined and recommendations addressed to governments, regional fishery bodies, NGOs, fish workers, FAO and the international community, periodically on a worldwide basis. Its Sub-Committee on Aquaculture provides a forum for consultation and discussion on aquaculture and also advises on the preparation of technical reviews and issues and trends of international significance.	COFI will be an invited contributor to the industry discussions in Component 1. Will provide technical expertise on measures to improve phosphorus management in aquaculture systems and informed narrative on opportunities at basin to global scales, and connected ecosystems, and supporting sector-specific dissemination and engagement at the lake basin and country scales in Component 3.	Component 1 and 3	Output 1.2 & 3.2	COFI will be engaged through the WWQA in the course of discussions on collaborative links between the two bodies.
Gemeente Rotterdam	Anne Mollema is a project manager for the Gemeente Rotterdam. The Gemeente Rotterdam is composed of The Municipal Executive Committee and the City Council, which jointly govern the city and make up the City Government. The City Council is the legislative body (sets out general policy and passes bills).	City of Rotterdam will provide insight in to legislative and policy procedures and opportunities to embed phosphorus stewardship into city planning and development policy.	Component 1 and 2	Output 1.2 & 2.1	Gemeente Rotterdam will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

International Lake Environment Committee (ILEC)	A global coordination and knowledge exchange platform supporting the Integrated Lake Basin Management approach, working with UNEP and other relevant UN agencies and providing a conduit for knowledge exchange between lake basin catchment managers through their World Lakes Conference and joint activities of their voluntary Scientific Committee.	We expect ILEC to play a role in identifying the Community of Practice in Component 2 and in developing the uP-Cycle Framework and Assessment Approach learning from experiences in the development of their Integrated Lake Basin Management Framework.	Component 2	Outputs 2.1.	ILEC will be engaged through the WWQA in the course of discussions on collaborative links between the two bodies.
PBL	PBL Netherlands Environmental Assessment Agency is the national institute for strategic policy analysis in the fields of the environment, nature and spatial planning. PBL contributes to improving the quality of political and administrative decision-making by conducting outlook studies, analyses and evaluations in which an integrated approach is considered paramount. Policy relevance is a prime concern in PBL studies.	PBL convene the global phosphorus emissions assessment group, bringing together data providers with which the global extent of emissions and their impacts on freshwater and coastal ecosystems can be mapped (Comp 1. Activities 1.1.1 & 1.1.2).	Component 1	Output 1.1 & 1.2	PBL will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

The Chinese Academy of Environmental Sciences (CRAES)	The Chinese Research Academy of Environmental Sciences (CRAES) was established in 1978, in affiliation with the Ministry of Ecology and Environment (MEE) of China. It functions as the national scientific think tank and academic governing body, providing advisory and appraisal services on issues on the environment. It also conducts a series of scientific and international cooperation activities which support the country?s overall environmental protection aims.	Contributions through the sharing of phosphorus emissions data and relevant data to assess impacts of phosphorus emissions to freshwaters in China, and to engage in knowledge exchange activities to contribute to the global knowledge base in addressing phosphorus sustainability across disparate regions.	Component 1	Output 1.1 & 1.2	CRAES will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.
The Global Community of Practice on Sustainable Lake Management	WWQA Ecosystems Workstream - composed of over 60 international country representatives, which includes expertise on over 200 lake restoration case studies.	Will provide the core membership of the Global Community of Practice on Sustainable Phosphorus Management (Comp. 2. - Activity 2.1.1).	Component 2	Output 2.1	Continuous information sharing, feedback meetings, and collaboration.

The Global Partnership on Nutrient Management (GPNM)	An intergovernmental mechanism to counter the issue of land-based pollution. UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) has now been dismantled. However, during its lifetime the GPA created three global multi-stakeholder partnerships. These are the Global Partnership on Nutrient Management (GPNM), The Global Partnership on Marine Litter (GPML and The Global Wastewater Initiative (GWI) (launched in 2013). The GPNM is now under the remit of the UNEP Freshwater Tea,, and supports the UNEP in addressing the challenge of nutrient excess or deficits and the potential negative impacts on the marine and terrestrial ecosystems, by sharing information globally and encouraging the adoption of improved nutrient management practices	Consulted at the PIF and PPG stage, the GPNM will act as a conduit for strategic advocacy and cooperation at the global and regional levels to provide information and enhance capacities to design and implement effective management policies to address the growing problems of nutrient over?enrichmen t. Contribute to the Global Stakeholders Workshops to inform discussions on cross-sectoral drivers of global phosphorus emissions to freshwater and coastal ecosystems, as well as opportunities to address them.	Component 1	Output 1.2	GPNM will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

The World Bank	An international financial institution that provides loans and grants to the governments of low- and middle-income countries to pursue capital projects. It comprises two institutions: the International Bank for Reconstruction and Development, and the International Development Association. The World Bank is a component of the World Bank Group. The work of the world bank is underpinned by three priorities which guide their work with countries i) end poverty and boost prosperity for the poorest people ii) help create sustainable economic growth, and iii) invest in people and build resilience to shocks and threats that can roll back decades of progress	The World Bank contributed to the development of the PIF, in particular in terms of government relations, and coordination of regional catchment management projects. The World Bank will help Inform the project on appropriate governance mechanism to support large scale ecosystem development project and engagement, with specific expertise in China.	Component 1 and 2	Output 1.2, 2.3	EU JRC will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

UNEP coordinators of SDG 6; Indicator 6.3.2	The United Nations Environment Programme (UNEP) is coordinating team of SDG Indicator 6.3.2. SDG target 6.3 is: ?By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally?. To track progress towards the target, SDG indicator 6.3.1 monitors the proportion of bodies of water with good ambient water quality, as per national and/or subnational water quality standards and based on measurements of five water quality parameters that inform on the most common pressures on water quality at the global level.	The UNESCO coordinating team of SDG indicator 6.3.2 will provide guidance on member state engagement on water quality and freshwater resources and will be engaged with the Chilean government on the establishment of a national monitoring system on lakes.	Component 1, 2 and 4	Output 1.3, 2.1 and 4.1	UNEP coordinators of SDG 6; Indicator 6.3.2, will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

UNEP?s World Water Quality Alliance (WWQA)	An open community of practice, representing a voluntary and flexible global Expert, Practitioners and Policy Network, which advocates the central role of freshwater quality in achieving prosperity and sustainability. It explores and communicates water quality risks in global, regional, national and local contexts and points towards solutions for maintaining and restoring ecosystem and human health and wellbeing. It aims to serve countries throughout the lifetime of the 2030 Agenda for Sustainable Development and beyond. UNEP, and more specifically the Global Environment Monitoring Unit in the Science Division, acts as a Coordination Unit for the Alliance. The WWQA Ecosystem Work Stream led by a core group of UKCEH, IHE-Delft, World Bank Group, Wageningen University, UNEP, and JRC works directly with lake restoration practitioners to support the development of novel restoration programs focusing on delivering socio-economic and environmental gains, especially in	Coordination of the Global Community of Practice on Sustainable Phosphorus Management (Comp. 2. - Activity 2.1.1). The project will also draw on the WWQA membership to contribute to Zero P Lakes Network (output 2.1) and the Cross Sector Working Group (Output 1.2). The WWQA will act as a conduit for strategic advocacy and cooperation at the global and regional levels to provide information and enhance capacities to design and implement effective management policies to address the growing problems of nutrient over?enrichmen t.	Component 1, 2 & 4	Outputs 1.2, 2.1, 2.2, 2.3, 4.2	Continuous information sharing, feedback meetings, and collaboration. We will also engage with the WWQA Youth Engagement Workstream as part of a holistic communicatio n strategy to raise awareness to diverse stakeholders.

	developing economies where data availability is sparse.				
UNESCO coordinators of SDG 6; Indicator 6.3.1	The United Nations Educational, Scientific and Cultural Organization (UNESCO) is the coordinator of SDG Indicator 6.3.1. SDG target 6.3 is: ?By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally?. To track progress towards the target, SDG indicator 6.3.1 monitors the proportion of total, industrial and domestic wastewater flows safely treated in compliance with national or local standards.	The UNESCO coordinating team of SDG indicator 6.3.1 will provide guidance on member state engagement on water quality and freshwater resources and will be engaged with the Chilean government on the establishment of a national monitoring system on lakes.	Component 1, 2 and 4	Output 1.3, 2.1 and 4.1	UNESCO coordinators of SDG 6; Indicator 6.3.1, will be engaged through the WWQA and the PCU in the course of discussions on collaborative links between the two bodies.

Table 2 National (Chile) Stakeholders

Stakeholder Name (partners related with circular economy, marine plastic litter and plastic pollution prevention)	**What is the role** of the stakeholder?	How could the stakeholder **contribute** to the project / involvement in the project?	Which **component** of the project could the stakeholder be engaged with, to support its implementation?	Which project **output** could the stakeholder influence/support to ensure its implementation?	**Strategy for engaging** the stakeholder

Universidad de La Frontera (and other relevant Chilean Academic Institutions est. 3)	Academic institutions play a key role in the knowledge of Villarrica Lake and its basin (including tributary rivers), especially the local institutions. A lot of Chilean Universities have been worked in Chilean Environmental Ministry projects and develop their studies located in Villarrica lake basins related to emission quantification (point and non-point sources), tributary river modelling, diffuse pollution models, water quality samples, among others. It is important to note that a Scientific Committee was created to support the elaboration of the Villarrica decontaminatio n plan, which includes academics from local universities and non-local universities with projects in the area,	Share resources and expertise. Academics can help to provide knowledge to better understand the behavior of the lake and its basin, regarding the biological, physical and chemical processes. Contribute to the ICMG and the Zero P Lake Network.	Component 3	Output 3.1, 3.2, 3.3	The Universidad de La Frontera will be engaged through the Chilean Environmenta l Ministry and the PCU in the course of discussions on collaborative links between the academic institutions.

	including groundwater experts, limnologists, ecologists, among others.				

Fundaci?n Mar Adentro	Fundaci?n Mar Adentro develops initiatives in art, education, and nature that encourage a change with respect to the value that is placed upon our natural and cultural heritage. Our strengths are in collaborative work and content generation. We believe in collaborative work between public and private organizations and develop our projects with multidisciplinary teams, enriching our work with different viewpoints, to contribute in areas that are not being primarily addressed by public entities. Our aim is to generate a positive impact on the quality of life of people and preserve the integrity of our ecosystems for future generations.	They will provide support in engaging with social enterprises and local stakeholders to provide a holistic understanding of community?s requirements on ecosystem services provided by Lake Villarrica - this will help develop a more integrated and social representative transition plan for the Villarrica Basin	Component 3	Output 3.1, 3.3	The Fundaci?n Mar Adentro will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.

Salmon Industries (based in Chile)	According to the official draft of the Villarrica Decontaminati on Plan, the aquaculture sector provides around 38% of the total phosphorus load of the lake, being the most important anthropic pressure. A key stakeholder related to this sector is Salmonchile (and its technological institute, Intesal), which is a group of salmon companies including a lot of fish farms in the Villarrica Basin.	Salmon industries play a key role in the phosphorus emissions to the lake, they will be a key stakeholder to advance in the accomplishment of the Net Zero P framework.	Component 1 & 3	Output 1.2, 3.3	Salmon Industries will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.
Trade and Tourism Aggrupation's	There are two local Trade and Tourism Aggrupation?s (Camara de Comercio, Servicios y Turismo), Villarrica and Caburgua, that are non-profit Aggrupations formed by companies and unions related to the trade, services and tourism in the area.	They could play a key role in promoting the sustainable development of tourism in the area. They may be invited to provide consultation on the Chile Transition plan.	Component 1 & 3	Output 1.2, 3.3	Trade and Tourism Aggrupation's will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

Chilean Construction Association (?C?mara Chilean de la Construcci?n?)	A trade union formed by construction companies with a core aim to promote the development of construction activity as part of the development of the country. They have headquarters in different Chilean regions including the Araucan?a region, where the local headquarter is located in Temuco	Construction activity plays a key role in the phosphorus management of the lake. The construction of proper wastewater plants in villages, and the protection of the riparian vegetation in housing projects, could help in the reduction of phosphorus emissions to the lake. They may be invited to provide consultation on the Chile Transition plan.	Component 1 & 3	Output 1.2, 3.3	The Chilean Construction Association will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.
Aguas Araucan?a	Aguas Araucan?a is the sanitary company that is in charge of the Puc?n and Villarrica towns sanitary system that includes potable and wastewater services. They are the owner of the Pucon wastewater treatment plant (WWTP) (which discharge in a tributary of the river) and the Villarrica WWTP (which discharge downstream of the Villarrica lake).	A key stakeholder to advance in the accomplishment of the Net Zero P framework. They may be invited to provide consultation on the Chile Transition plan.	Component 1 & 3	Output 1.2, 3.3	Aguas Araucan?a will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

SOFO	The SOFO is an aggrupation of agricultural and livestock producers located in the Araucan?a Region, they are one of the main agricultural unions in Chile, which supports the development and strengthening of agriculture in the country.	They could be a key stakeholder to advance in the accomplishment of the Net Zero P framework, related to the sustainable use of fertilizers, the protection of the riparian vegetation and the development of organic agriculture. They may be invited to provide consultation on the Chile Transition plan.	Component 1 & 3	Output 1.2, 3.3	SOFO will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

Chilean Environmental Ministry	The Chilean Environmental Ministry has the mission of leading the sustainable development of the country, through the creation of public policies and regulations, promoting good practices and improving citizen environmental education. Within its mandate, the ministry must analyze and systematize water quality measures; lead water quality and emission standards, and prevention and/or decontaminatio n plans; consolidate environmental monitoring programs of aquatic ecosystems inside and outside protected areas. They collaborate with competent services in the elaboration of environmental policies for the sustainable use and management of water resources, among others.	The PRODOC development team worked with the Chilean Environmental Ministry in developing the PRODOC and they will be a key regional partner in Chile, in particular in terms of government relations, and coordination of regional catchment management projects.	Component 3	Output 3.1, 3.2, 3.3	Continuous information sharing, feedback meetings, and collaboration.

Chilean Agricultural Ministry	The Chilean Agricultural Ministry oversees promoting, guiding and coordinating the forestry, livestock and agricultural activity of the country, with a mandate to advance competitive, sustainable, innovative and modern forestry and an agricultural sector, socially committed to regional and rural development.	The agricultural minister can help to assure the participation of the institutions under its mandate such as National Institute of Agricultural Research (INIA), National Forest Corporation (CONAF) and Agricultural Development Institute (INDAP). Through its institutions, this ministry could provide key information about forestation/reforestation plans, forest management, programs for recovery of degraded soils, use of fertilizers, and implementation of more sustainable policies for the forestry, agricultural and livestock sectors. Those institutions could contribute to the IMC and the Zero P Lake Network.	Component 3	Output 3.1, 3.2, 3.3	The Chilean Agricultural Ministry will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.

Ministry of Economy, Development and Tourism	Government ministry in charge of promoting the modernization and competitiveness of the country?s productive structure, private initiative and efficient action of the markets, the development of innovation in order to achieve sustainable and equitable growth	The economy minister can help to assure the participation of the institutions under its mandate such as Fisheries undersecretary (SUBPESCA), National fisheries service (SERNAPESCA), National tourism service (SERNATUR) and Corporation of Economic development agency (CORFO). Those institutions could provide key information related to aquaculture production, technologies implemented, promoting sustainable tourism and economic growth within the basin. They may also contribute to the IMC and the Zero P Lake Network.	Component 3	Output 3.1, 3.2, 3.3	Ministry of Economy, Development and Tourism will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.
Chilean Housing and urban planning Ministry (MINVU)	Government ministry in charge of developing policies for housing and urban issues. They also are in charge of developing municipal and inter-municipal territory using master plans. They also develop policies regarding the protection and management of riparian vegetation.	They can play a key role in developing urbanization plans that consider lake protection, including, for example, riparian vegetation protection.	Component 3	Output 3.1, 3.3	MINVU will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.

CONADI (National Commission for the Indigenous Development)	CONADI is responsible for promoting, coordinating, and implementing the activities for the economic, social and cultural development of the indigenous people and communities; and to promote their participation in Chilean Society	The project includes within its stakeholder?s indigenous people, therefore CONDAI will be a key partner in terms of relations with these groups.	Component 3	Output 3.1, 3.3	CONADI will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.
Local Chilean Municipalities	Municipalities are the local governments in the Villarrica lake basin. They are responsible for promoting the sustainable development of their territories and protecting ecosystem services. They are also a key stakeholder in the education of awareness-raising of citizens to issues that impact the community.	Play a key role in providing local knowledge of the area, coordinating activities with the community and working with local actors to promote the sustainable management of soils, forests and wetlands.	Component 3	Output 3.1, 3.3	Local Chilean Municipalities will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

SISS (Superintendence of Sanitary Services)	The government ministry responsible for enforcing laws related to sanitary companies, including potable water and wastewater uses. Among their attributions, they supervise the accomplishment of the emission standards from wastewaters treatment plants.	Play a key role in providing information related to the wastewater treatment plants, such as wastewater quality measures in the region. Provide information on the population connected and not connected to sanitation services within the catchment.	Component 3	Output 3.1, 3.2, 3.3	SISS will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.
SMA (Superintendency of the environment)	The government ministry is responsible for enforcing environmental law, including emission standards, environmental approval resolutions for projects, such as aquaculture projects, among others.	Play a key role in providing information on the accomplishment of environmental regulations of the industries in the basin, such as industrial wastes quality measures.	Component 3	Output 3.1, 3.2, 3.3	SMA engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.
SSR (Rural Sanitary Services)	The government ministry responsible for ensuring an adequate supply of potable water and wastewater treatment in rural zones (created on November 20th, 2020).	Play a key role in the development of wastewater treatment systems that could reduce the phosphorus loads to the lake in the rural areas (noting the Villarrica Lake Basin has a high percentage rural population (around 40%))	Component 3	Output 3.1, 3.2, 3.3	The Chilean Agricultural Ministry will be engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the two bodies.

DGA (General Water Directorate)	This institution is in charge of the regulation of the water rights and of the development of water quality monitoring such as the Villarrica Lake Water Quality program to comply with the water quality standard. Currently, the DGA has an online buoy measuring water quality parameters online in the Villarrica lake, such as chlorophyll ?a?, temperature, among others. They also have information related to precipitation, river flows and quality, among others.	Provide professionals related to water quality and its monitoring, and data on water quality, water quantity, precipitation, among others. Contribute to the ICMG and the Zero P Lake Network.	Component 3	Output 3.1, 3.2, 3.3	The DGA engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

DIRECTEMAR (General Directorate of the Maritime Territory and Merchant Marine)	This institution is in charge of providing authorization for performing constructions in the Chilean navigable lakes edge or to discharge wastewater into such lakes (e.g., Villarrica Lake). They also are in charge of taking samples of sediments and water quality for the observation monitoring network from the Villarrica Lake Secondary Water Quality Standard.	Play a key role in lake conservation since they authorize any construction in the lake edge, and also could provide sediment and water quality information. Contribute to the ICMG and the Zero P Lake Network.	Component 3	Output 3.1, 3.2, 3.3	The DIRECTEMAR engaged through the Chilean Environmental Ministry in the course of discussions on collaborative links between the academic institutions.

Civil Society Organizations and Local groups	There are many Civil Society Organizations and local groups within the basin. Some are part of a committee created in the framework of the Villarrica Lake Decontaminati on Plan, and others have participated in it thought public and indigenous consultancy process. These organizations in the area have knowledge about the phosphorus issues in the basin and could be aligned with the project objectives. Some are: Mar Adentro, ONG Aguas Libres, Fundaci?n sustenta Puc?n, ONG Propuesta Ciudadana, Comit? Ambiental y de desarrollo comunal de Villarrica, Movimiento Ambiental Intercutlural Cuenca del Trancura, Fundaci?n Red Nuevas Ideas, amongst others.	Civil Society Organizations and Local Groups are active stakeholders in the basin. They have knowledge about the phosphorus issues in the basin and could support the project in terms of collaboration during the implementation, communication and diffusion of the project, including local demands in the project, among other topics. Contribute to the ICMG and the Zero P Lake Network.	Component 3	Output 3.1, 3.3	Civil Society Organizations and Local groups will be engaged through the Chilean Environmenta l Ministry in the course of discussions on collaborative links between the two bodies.

Select what role civil society will play in the project:

Consulted only;

Member of Advisory Body; Contractor; Yes

Co-financier;

Member of project steering committee or equivalent decision-making body; Yes

Executor or co-executor;

Other (Please explain)

3. Gender Equality and Women's Empowerment

Provide the gender analysis or equivalent socio-economic assesment.

The project *Towards Sustainable Phosphorus Cycles in Lake Catchments (uP-Cycle)* will promote gender equality and empowerment of women throughout its execution. The project will adhere to the GEF?s Gender Policy and UNEP?s Operational Policy on Gender Equity in Development and gender mainstreaming policy.

Main international and national commitments related to gender equality

The essential role in the provision, management and protection of water played by women, formally appeared in the third principle outlined during the International Conference on Water and Environment (Dublin, 1992) endorsed by over 100 countries. The acceptance and implementation of this principle requires policies to address women's specific needs, to equip and empower women to participate at all levels in water resources programs; including decision-making and implementation, in ways defined by them[1].

Since the Dublin Declaration, the role of women in water management for health, nutrition and ecosystem balance has been recognized in several international documents. These documents postulate *inter alia*, that women have a vital role in environmental management and development, and their full participation is, therefore, essential to achieve sustainable development[2]; the involvement of women and men in decision-making roles at all levels can promote the sustainability of the management of scarce water resources and integrated and sustainable water management can significantly contribute to gender equity[3].

The fifth Sustainable Development Goal relates to Gender Equality and seeks to ?ensure the full and effective participation of women and equal opportunities for leadership at all levels of decision-making in political, economic and public life?; and to ?undertake reforms to give women equal rights to

economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources following national laws?[4].

Even though the role of women has been recognized as fundamental for the sustainable management of the environment and water resources, gender inequities and gaps persist, mainly manifested as unequal access to and control of natural resources; unbalanced participation and decision-making in environmental planning and governance at all levels; and uneven access to socio-economic benefits and services.

To address these gaps the GEF Policy on gender equity specifies gender-responsive actions, from design to implementation; and monitoring and evaluation to ensure that GEF programs and projects are not only designed with a good understanding of relevant gender differences, roles and needs but also that they actively pursue activities that contribute to equal access to, and control over, resources and decision making while empowering women and girls[5].

Chile

Mandates and frameworks on gender

Chile has ratified all the substantial international treaties on Human Rights[6]. In 1991 the National Women's Service was created to promote public policies for gender equality. Since 2015 the Ministry of Women and Gender Equality (Law 20820 of 03/08/15) was established to design, coordinate, and evaluate policies, plans and programs aimed at promoting gender equality, and equal rights and seeking the elimination of all forms of arbitrary discrimination against women[7].

Several laws seek to promote gender equality in Chile (Annex 1), for example, the law against sexual harassment (law 20.005), law against domestic violence (law 21.013), law against workplace harassment (law 20.067), the law 21.369 which has as objective to promote comprehensive policies aimed at preventing, investigating, punishing, and eradicating sexual harassment, violence, and gender discrimination[8], and the law 21.370 which modifies the General Law on Fisheries and Aquaculture, to promote gender equity in the fisheries and aquaculture sector[9].

The Report on the State of the Environment (2020) shows Chile's progress in achieving gender equity, and stresses the main challenges which are related to information gaps and inconsistency in the inclusion of gender[10]:

- **Need for gender-disaggregated information.** The absence of gender-disaggregated information makes the analysis of the environment biased and partial, which makes it necessary to establish baselines, monitor progress, and evaluate the results in an exhaustive and effective manner.
- **Inequality and gaps in gender inclusion.** This causes low coherence and less efficiency in the application of policies and programs.

In recent years, a variety of initiatives have been developed in the country that are designed to promote gender equality and strengthen women?s autonomy[11]. These include:

- The **gender strategy** of the Economic Development Agency (CORFO)[12], that technically guides, monitors, and evaluates the strategies to include the gender perspective in its activities, in coordination with the National Service for Women and Gender Equity, and the Gender Unit of the Ministry of Economy.

- Development of **gender statistics** by the National Statistics Institute (INE)[13], to visualize and understand the gaps, barriers and inequities between men and women. In addition, **methodologies** to promote the gender approach in statistical production, analysis documents, infographics, and the **gender atlas**, a collection of maps that, through indicators at the regional level, show gender inequities, gaps or visible barriers between genders.

- The **Gender Parity Initiative** (IPG), a public-private alliance promoted by the Inter-American Development Bank and the World Economic Forum, whose purpose is to reduce gender gaps and increase economic participation and progress for women[14].

- The **Win-Win: Gender Equality Means Good Business**, funded by the European Union (EU) Partnership Instrument and implemented by UN Women in partnership with the International Labor Organization (ILO) to promote gender equality through the private sector.

National context in relation to gender equality and women?s empowerment

The Human Development Index (IDH) for Chile in 2021 was 0.855, positioning the country in the ?very high? human development category, the highest of the Latin America and the Caribbean region, however, work still needs to be done in Chile to achieve gender equality. The Gender Inequality Index situates Chile in the 47th place out of 170[15], and the Global Gender Gap Index of the World Economic Forum assigns Chile an index of 0.736 for the year 2022[16]. In regional terms, it is much lower in the ranking (19th out of 26 countries in Latin America and the Caribbean)11. Although there has been progress in terms of gender equality in recent years, the goals to close the gap between men and women in economic participation and opportunity (0.616) and political empowerment (0.363) have not yet been achieved.

As of February 2021, only 22.6% of seats in parliament were held by women. In 2018, 5.8% of women aged 15-49 years reported that they had been subject to physical and/or sexual violence by a current or former intimate partner in the previous 12 months. Also, women and girls aged 10 or more spend 22.1% of their time on unpaid care and domestic work, compared to 9.9% spent by men[17].

As of December 2020, only 50.8% of indicators needed to monitor the SDGs from a gender perspective were available, with gaps in key areas, in particular: key labor market indicators, such as the gender pay gap. In addition, many areas ? such as gender and poverty, physical and sexual harassment, women?s access to assets (including land), and gender and the environment ? lack comparable methodologies for regular monitoring17.

According to estimates of the Economic Commission for Latin America and the Caribbean (ECLAC), women?s participation in work due to the effect of COVID-19 in Chile has been affected more than men. Currently, the average participation of women in work is 46%, below the Latin American average (59%), which may be related to the unequal distribution of time devoted by women to care tasks compared with men, a situation intensified during the COVID 1911.

The conditions of economic autonomy show disparities. In Chile, 9% of the feminine population are in a situation of poverty compared with 8.2% of men. In addition, according to the World Bank, only 29.6% of the companies have participation of women in ownership11. In the case of women, the distribution of low-income workers is approximately 1.6 times greater than that of men. The earnings gap between male and female employees is larger in Chile than in other countries. The average salary of full-time male employees is 12% higher than that of their female counterparts [18].

In rural environments, these gaps are even more pronounced. In rural areas, women have different occupations, such as farmers, salaried workers, collectors, seasonal workers, artisanal fisherwomen, and non-agricultural productive activities, such as caregivers, and artisans, among others. Rural women have usually triple work shifts, due to the sexual division of labor attributed to them by caring for boys, girls, teenagers, and of the elderly or chronically ill, in addition to agricultural production work[19].

Artisanal fishing has been defined and regulated as an extractive subsector where women have been excluded. To advance gender equity in the sector, in 2021 Law No. 21.370 was approved, which establishes equity criteria in the integration of fishing and aquaculture organizations and recognizes traditional or ancestral trades that women perform in the coves[20].

According to CASEN (2015) 9% of the national population identifies themselves as indigenous. Of that percentage, 83.8% identify themselves as Mapuches. In the case of the communes located within the Villarrica Lake Basin, the commune of Curarrehue has a 66.4% indigenous population, Villarrica has 27.1% and Puc?n 27.9% (INE, 2018)[21]. This is relevant for the development of the uP-Cycle Project because the gender relations in Mapuche society and Chilean society are not the same and the discrimination towards Mapuche women is different from the discrimination experienced by non-Mapuche women[22]. At the same time, the indigenous population have higher rates of multidimensional poverty than the non-indigenous population (CASEN, 2015)[23].

Relevant organizations working with gender issues

Table 3 presents relevant institutions and organizations *inter alia* that work with gender issues in Chile.

Table 3 Relevant organizations working with gender issues in Chile

Name	Description
ANAMURI	The National Association of Rural and Indigenous Women (ANAMURI) is a Chilean non-profit and autonomous civil organisation integrated by women, whose mission is to organise and promote the development of rural and indigenous women in Chile.
Centro de Estudios para el Desarrollo de la Mujer (CEDEM)	The organisation contributes to strengthening democracy, overcoming social exclusion and transforming gender relations, generating knowledge, participating in critical debate and promoting active citizenship.
Centro de Estudios de la Mujer (CEM)	CEM promotes the transfer of gender knowledge to different social and professional groups to ensure greater competence in their work.

Name	Description
Comunidad Mujer	A civil society organisation that has been promoting, for 20 years, social, cultural, normative, and organisational transformation for gender equality in Chile.
Corporaci?n de Mujeres de la Pesca Artesanal	The Corporation of Women of Artisanal Fishing in Chile seeks to make visible and strengthen women in the fishing sector -whether they are shuckers, netters, fisherwomen, seaweed, or shellfish collectors- for gender equality.
Fundaci?n Chile Mujeres	A non-profit organization was born in 2015 to promote legal and cultural changes necessary to promote equal rights and job opportunities for women in Chile.
Fundaci?n Instituto de la mujer	Produces, systematises, and disseminates knowledge through studies, workshops, and seminars, seeking consensus points with other civil society stakeholders to influence policies.
Observatorio de G?nero y Equidad	It supports women's organisations to facilitate public debate and citizen control over equality policies.
Fundaci?n PRODEMU	Is the first State Institution that takes charge of the needs, requirements and demands of women in Chile, to facilitate women participation, organisation and comprehensive development, promoting their empowerment and encouraging them to achieve a better quality of life.

Gender consideration in the sustainable phosphorus cycles in lake catchments

The role women and men play in the value chains that drive the phosphorus cycle are different. Food value chains include agriculture and aquaculture sectors which can play an important role in driving phosphorus cycles. Whilst there is limited high-quality sex-disaggregated data regarding value chains, it is acknowledged that gender equality in many of the key sectors involved in the food value chain has not been achieved.

Ensuring gender equality in the value chains driving global, regional, and national phosphorus cycles is an important step in achieving Inclusive Sustainable Phosphorus Economies. Gender equality must therefore be a central consideration when developing an internationally accepted framework and assessment approach to inform the development and implementation of sustainable phosphorus management programs in lake catchments. The proposed project will use gender-sensitive indicators in the framework to assess gender bias.

As a step towards achieving a successful implementation model for gender equality, methodologies to assess gender equality within a sustainable phosphorus cycle will be included within the Framework and Monitoring and Assessment approach, produced in Component 2 and we will engage with the groups identified in table 3 to support positive change in Chile in this respect. .

In addition, the project will investigate the availability of data on the role of women in the key activities identified, in particular in the pilot Chile lake basins, but also more generally at regional and global scales.

Gender mainstreaming action plan

The Gender mainstreaming action plan (detailed in Appendix 9) aims to ensure the integration of gender considerations throughout the project?s activities. The primary objectives of the plan are to:

1. Provide equal opportunities for women, girls, local communities, and marginalized groups to participate in and benefit from project activities.
2. Enhance women?s participation and role in decision-making processes.
3. Provide equitable access to capacity building and knowledge sharing across all stakeholder groups.
4. Integrate gender considerations across the results framework to drive gender mainstreaming and allow for evaluation of how the project?s activities impacted gender equality towards the end of the project.

Gender integration across the project

The project objective is *to support lake ecosystems recovery through phosphorus emissions reductions from land to water to improve the protection and restoration of freshwater and coastal ecosystems, bringing together the global lake management and sustainable phosphorus management communities including developing and testing a sustainable phosphorus management framework in Chile to inform international application.* Activities in the project will be guided by a gender-responsive approach. The following principles will be observed throughout the project:

a. Structure inclusive and gender-sensitive project teams with technical skills and experience to support gender-sensitive actions. A gender specialist consultant will be appointed to guide the gender plan.

b. Ensure the equal voice and influence of women and men in all aspects of the project, using culturally sensitive and appropriate approaches.

c. Ensure that women and women's organizations are represented in any stakeholder consultations or working groups (e.g., Component 1: cross-sectoral working group; Component 2: Global Community of Practice).

d. Ensure that the roles, needs, abilities and vulnerabilities of women and men are equally recognized.

e. Promote equal rights to access and benefit from the sustainable phosphorus management framework in Chile (Component 3).

f. Support the full, equal, and effective participation of women and men in decision-making and all actions related to the development, implementation, monitoring and evaluation of the project.

g. Ensure that all knowledge management activities (component 4), both face-to-face and virtual, are accessible to women, taking into account location, time, transportation constraints, household responsibilities, computer access, telephones and Internet, etc., which may affect your ability. attend/participate in project activities.

Table 4 shows the gender action plan across the project?s Results Framework.

Table 4 Gender Action Plan

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
Component 1: Increasing clarity on global phosphorus emissions, drivers and impacts leading to increased awareness of national, regional, and global scale sector-specific phosphorus emissions reduction opportunities				
Outcome 1: Global stakeholders have the evidence needed to assess the capacity for phosphorus emissions reductions to contribute to their commitments to delivering large-scale ecosystem restoration ambitions (e.g., the UN Decade and SDGs). Improved international and cross-sector awareness of the need for coordinated action to deliver large-scale phosphorus emissions reduction.				
Output 1.1 The global phosphorus emissions dashboard beta version was developed and implemented as an open-source online mapping tool allowing visualization of emissions estimates and their contribution to eutrophication risk across the world?s large lakes, extending to coastal waters.	1.1.1 Establish a global phosphorus emissions assessment group, bringing together data providers with which the global extent of emissions and their impacts on freshwater and coastal ecosystems can be mapped.	Identify women representatives as data providers.	Indicator: Percentage of women per peer reference group Target: At least 30%	Yr1-Q2
	1.1.2 Produce the global phosphorus emissions dashboard - building on existing web-based infrastructure to host and integrate relevant global data streams.	Women?s organizations and gender specialists are part of the group that validates the beta version of the dashboard.	Indicator: Percentage of women per peer reference group Target: At least 30%	Yr2Q4
Output 1.2 Two global stakeholder workshops demonstrate the Dashboard and inform discussions on cross-sectoral drivers of global phosphorus emissions to freshwater and coastal ecosystems, as well as opportunities to address them.	1.2.1 Establish a cross-sector working group with participation across relevant global policy sectors and International Industry Associations, representing a ?community of influence? across key emissions sectors (including agriculture, food waste, aquaculture, wastewater, and nutrient recycling sectors).	Engage targeted women representatives to participate in the cross-sector working group.	Indicator: Percentage of women per peer reference group Target: At least 30%	Yr1-Q3
	1.2.2 Hold two workshops to showcase, and further develop, the global phosphorus emissions dashboard and explore cross-country-sector influences on the anthropogenic phosphorus cycle impacting on exemplar national or basin-scale phosphorus emissions programs	Ensure equal participation of women and men at the workshops.	Indicator: Percentage of women/men Target: 50% of stakeholders actively participating in workshops are women	~Yr1-Q3 & ~Y2-Q1

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
Output 1.3 A White Paper outlining priority sector-specific actions towards delivering a more sustainable global anthropogenic phosphorus cycle to support improved food security while delivering on global ecosystem protection and restoration ambitions.	1.3.1 Produce recommendations for global actions outlining the benefits of ?Future World? policy development options and their capacity to deliver change against ?Present Day? conditions within the context of existing relevant national and international public and private policy frameworks	Revision of the ?White Paper? by gender specialist to ensure that gender considerations have been included.	Indicator: A gender-responsive ?White Paper? Target: 1 gender-responsive ?White Paper?	Yr2-Q4
Component 2: Building the Global Net Zero Phosphorus Community of Practice on sustainable phosphorus management in lake basins, producing the uP-Cycle Framework and Assessment Approach and accelerating its uptake to optimise emissions reduction programs.				
Outcome 2: Increased uptake of an international monitoring and assessment approach for the optimization of phosphorus emissions reduction programs leading to increased ambitions on the protection and restoration of lakes and their catchments and associated socio-economic benefits.				
Output 2.1 Convene the Global Community of Practice on Sustainable Phosphorus Management in Lake Basins; a global network of practitioners tasked with assessing the global baseline on large-scale phosphorus emission reduction programs.	2.1.1 Establish a Global Community of Practice on Sustainable Phosphorus Management - to co-develop the uP-Cycle Framework providing stakeholders and practitioners with a conceptual model, centered on the Net Zero Phosphorus concept.	Engage targeted women representatives to participate in the Net Zero P Lake Network.	Indicator: Percentage of women per peer reference group Target: At least 30%	Yr1-Q3

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
Output 2.2 Guidance materials leading to the international implementation of the uP-Cycle net zero phosphorus framework and monitoring and assessment Approach, co-developed with the Global Community of Practice.	2.2.1 Develop the uP-Cycle framework - setting out the multiple benefits of implementing sustainable phosphorus management plans to protect and restore lake basins whilst releasing multiple socio-economic benefits 2.2.2 Develop the monitoring and assessment approach - to allow lake basin managers to conduct internationally coordinated assessments of the operational effectiveness of existing programs whilst identifying opportunities to improve them	Socioeconomic indicators identified in the uP-Cycle framework are gender-sensitive. A gender specialist participates in the development group.	Indicator: Gender-sensitive indicators are identified and tested Target: At least 1 indicator is gender-sensitive	Yr1-Q3
	2.2.3 Hold knowledge exchange workshops to disseminate guidance materials and common assessment methodology to the Community of Practice	Ensure equal participation of women and men at the workshops.	Indicator: Percentage of women/men Target: 50% of stakeholders actively participating in workshops are women	Yr1-Q3

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
Output 2.3 Global baseline assessment report produced and shared with countries showcasing the first internationally coordinated assessment of present-day phosphorus emissions programs for lakes and increasing international motivation to implement new policies, programs, and/or investments leading to more sustainable phosphorus management.	2.3.1 Hold an open seminar series providing the opportunity for practitioners to introduce their emissions reduction programs in detail in the context of the uP-Cycle Framework, highlighting specific challenges and solutions, with opportunities to learn from the experiences of others. 2.3.2 Synthesize the global baseline - A globally coordinated assessment of emissions reduction programs to produce a report documenting the current levels of disparity in approaches and barriers to their effective implementation. 2.3.3 Field visits to showcase exemplars of effective sustainable phosphorus management in established programs	Ensure equal participation of women and men in the open seminar series.	Indicator: Percentage of women per peer reference group Target: At least 30%	Yr1-Q4
	2.3.4 Publish a long-term plan to ensure engagement with the Community of Practice beyond the lifetime of the project	Guarantee gender-inclusive approaches and language in the plan.	Indicator: A gender-responsive Plan Target: 1 gender-responsive Plan	Yr2-Q4
Component 3: Demonstrating the uP-Cycle Monitoring and Assessment Approach in Chile from basin to transboundary scales, in the context of enhancing existing policies.				
Outcome 3: Improved understanding across Chilean government departments and its stakeholders on opportunities for enhancing phosphorus emission reduction programs and policies, targeting the protection of lake basins and the Humboldt Current Large Marine Ecosystem.				
Output 3.1 Produce a virtual surveillance portal integrating data streams to produce baseline and forecast outputs on phosphorus emissions and their impacts on the Lake Villarrica Basin, to inform the	3.1.1 Produce a virtual environment capable of assessing phosphorus emission reduction scenarios, impacts and benefits to inform stakeholder engagement and policy development - e.g. a virtual surveillance portal.	Guarantee gender-inclusive approaches and language in the virtual surveillance portal. A gender specialist participates in the development group.	Indicator: A gender-responsive virtual surveillance portal Target: 1 gender-responsive virtual surveillance portal	Yr2-Q2

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
development of a national scale system.	3.1.2 Provide training in the application of novel monitoring and modelling approaches and in data interrogation and visualization techniques delivered through staff exchanges and directed training activities, drawing on the expertise of the UKCEH and relevant national and international partners.	Ensure equal participation of women and men at the training workshops.	Indicator: Percentage of women/men Target: At least 50% of staff exchanges are women	Yr2-Q4
Output 3.2 Two virtual laboratory workshops and targeted awareness-raising materials to engage stakeholders in the co-development and uptake of new opportunities for sector-specific emissions reductions at the lake basin- to national scales in Chile, utilizing the surveillance portal.	3.2.1 Hold two virtual laboratory workshops - to develop and showcase the surveillance portal and identify synergies and opportunities to release multiple benefits through more sustainable phosphorus management across the value chain.	Ensure equal participation of women and men at the training workshops.	Indicator: Percentage of women/men Target: At least 50% of workshop participants attending the virtual workshop are women.	Yr2-Q3
	3.2.2 Produce targeted awareness-raising materials to engage stakeholders in the co-development and uptake of new opportunities for sector-specific emissions reductions at the lake basin- to national scales in Chile, utilizing the surveillance portal	Review and mainstream gender considerations in awareness-raising materials.	Indicator: # gender-responsive awareness materials Target: At least 3 gender-responsive awareness materials	Yr2-Q3
Output 3.3 A transition plan for Chile is published and shared across relevant government departments identifying opportunities to strengthen the implementation of the existing Lake Villarrica Basin Decontamination Plan, as well as improving the integration of sustainable phosphorus management across national policies for the protection and	3.3.1 Compile and review evidence to produce assessment reports of existing emissions reductions programs (e.g. The Lake Villicarica Decontamination Plan) following the Monitoring and Assessment Approach	Guarantee gender-inclusive approaches and language in the virtual surveillance portal. A gender specialist participates in the development group.	Indicator: # gender responsive assessment repots Target: 1 gender responsive assessment repots	
	3.3.2 Hold quarterly virtual workshops (and ad hoc site visits) to co-develop recommendations for enhancing existing emissions reductions programs within the uP-Cycle Framework.	Ensure equal participation of women and men at the workshops.	Indicator: Percentage of women/men Target: At least 50% of workshop participants are women	Yr2-Q2

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
restoration of lakes and coastal ecosystems.	3.3.3 Publish a transition plan for Chile and disseminate across relevant government bodies	Review and mainstream gender considerations in the transition plan. -	Indicator: # gender-responsive transition plan Target: 1 gender-responsive transition plan	Yr2-Q3
Component 4: Accelerate integration of global sustainable phosphorus management opportunities across existing national, regional and global policy frameworks.				
Outcome 4: Improved national, regional, and global awareness of the benefits of integrating sustainable phosphorus management across existing policies within a coordinated approach (e.g., across World Water Quality Alliance (WWQA) and the Global Programme of Action (GPA); IPBES; IPCC; FAO, etc.).				
Output 4.1 Documented project results disseminated through IW:LEARN activities (1% of the project budget) and established global initiatives.	4.1.1 Establish a project website 4.1.2 Participate with the IW Conference 4.1.3 Produce annual update reports	Ensure that the work related to gender equality and women?s empowerment conducted by the project is showcased in the materials to share on the website, regional and international meetings, etc.	Indicator: Gender content is included in the website, presentations, and reports. Target: At least one presentation, five videos and 1 briefing note including reference to the work related to gender equality and women?s empowerment	Yr2-Q4
Output 4.2 Global communications plan to raise awareness across public, private and policy audiences, disseminated to IW:LEARN and established global initiatives.	4.2.1 Conduct a media campaign (e.g., websites, web pages on government sites, and a project portal) to increase public awareness through targeted social media activities, for example, including through the GEF and UNEP social media outlets, including short videos, webinars, surveys, and other interactive communication tools.	Ensure that the media campaign is gender responsive	Indicator: # gender-responsive awareness materials Target: At least 3 gender-responsive comms materials	Yr2-Q4
Output 4.3 The uP-Cycle Innovation Hub - a web-based information portal to accelerate the development and implementation of sustainable phosphorus initiatives.	4.3.1 Establish the uP-Cycle innovation hub - providing access to project outputs designed to accelerate the development and implementation of sustainable phosphorus initiatives	Ensure equal participation of women and men in the uP-Cycle innovation hub	Indicator: Proportion of women and men who participated in Hub Target: At least 30% women and at least 30% men.	Yr1-Q4

Output	Project Activities	Gender-specific action	Indicators and Targets	Timeline
Output 4.4 Publish and disseminate Global Policy Briefs to increase awareness across governments on the need for better integration of phosphorus sustainability across the existing policy arena.	4.4.1 Publish and disseminate policy briefs based on the more substantive Global Sustainable Phosphorus Strategy to highlight the ecosystem health and economic case for global action towards improved phosphorus sustainability governance.	Ensure both men and women receive and have access to the policy briefs	Indicator: Global Policy Briefs are widely disseminated to both men and women.	Yr2-Q4

Monitoring and evaluation of gender-responsive activities

As in other components of the Project, the gender mainstreaming strategies will be monitored regularly to evaluate if the desired outcomes are being achieved, and to determine whether adaptive mechanisms need to be developed if outcomes are not being reached. The Gender Action Plan presents a clear vision of desired gender impacts and realistic targets, which is fully aligned with the project results framework.

Gender-sensitive monitoring and evaluation reports, including project progress reports, midterm evaluations, and terminal evaluations will be developed. In addition, the consultant/team of mid and end-of-term evaluations will include gender expertise as a criterion for selection.

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[1] http://www.un-documents.net/h2o-dub.htm

[2] https://www.un.org/spanish/esa/sustdev/agenda21/riodeclaration.htm

[3] http://www.bibalex.org/Search4Dev/files/423458/449089.pdf

[4] https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs/sdg-5-gender-equality

[5] https://www.thegef.org/council-meeting-documents/guidance-advance-gender-equality-gef-projects-and-programs

[6] https://obtienearchivo.bcn.cl

[7] https://minmujeryeg.gob.cl/?page_id=34975

[8] https://oig.cepal.org/es/laws/1/country/chile-8

[9] https://www.bcn.cl/leychile/navegar?idNorma=1164124

[10] https://sinia.mma.gob.cl/wp-content/uploads/2021/04/3-genero-y-medio-ambiente.pdf

[11]https://lac.unwomen.org/sites/default/files/Field%20Office%20Americas/Documentos/Publicaciones/2021/08/EN_Informe%20Inversion%20con%20Lente%20de%20Genero%20Chile%20WEB.pdf

[12] https://www.corfo.cl/sites/cpp/estrategiadegenero

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[14] https://iniciativaparidadgenerochile.minmujeryeg.gob.cl/?page_id=4174

[15] https://www.undp.org/

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[17] https://data.unwomen.org/country/chile

[18] https://www.subrei.gob.cl/docs/default-source/estudios-y-documentos/otros-documentos/informe-igualdad-de-genero.pdf?sfvrsn=cf9fb02a_1

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[21] https://regiones.ine.cl/araucania/estadisticas-regionales/sociales/censos-de-poblacion-y-vivienda/censo-de-poblacion-y-vivienda

[22] Expanding Women's Citizenship?: Mapuche Women and Chile's National Women's Service, Patricia Richards, 2003.

[23] https://mesamujeresruralesaraucania.cl/wp-content/uploads/2022/02/Historia-Mesa-Regional-Mujeres-Rurales-Baja-1.pdf

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?

Yes
Closing gender gaps in access to and control over natural resources; Yes

Improving women's participation and decision making Yes

Generating socio-economic benefits or services or women Yes

Does the project?s results framework or logical framework include gender-sensitive indicators?

Yes
4. Private sector engagement

Elaborate on the private sector's engagement in the project, if any.

The private sector is important to the Project to understand the role of industry in the transition to a sustainable phosphorus economy. Indeed, highlighting opportunities for the private sector (e.g. business growth in the green economy), but also identifying barriers that slow progress will be essential. The project will seek contributions to industry networks where appropriate, to ensure a ?community of influence? across key emissions sectors (including agriculture, food waste, aquaculture, wastewater, and nutrient recycling sectors) is represented in the development of outputs (e.g. recommendations for global actions). The cross-sector working group (Output 1.2) will call for contributions from several networks (e.g. WWQA, The Our Phosphorus Future Network, ILEC, SER, GPNM) that have a cross-sector membership of both private and public stakeholders. For example, the GPNM has among its members the International Fertilizer Association (IFA), which itself has a broad membership from the fertilizer industry.

This project will convene a multi-stakeholder dialogue through activities at the global (Component 1 and 2) and national (Component 3) scales. Through stakeholder engagement workshops, we will develop new opportunities to address sector-specific emissions reductions at the lake basin to global scales, drawing on the influence and expertise of our global stakeholder community (i.e., the industry-representation of the GPNM and WWQA). The White Paper (Delivered under Activity 1.3.1) will include a focus on private sector priorities for increasing the global sustainable phosphorus cycle which will guide national and basin-scale change across relevant sectors. The influence of this approach will be tested within Chile, for example, targeting improvements in aquaculture, agriculture, and nutrient recycling from wastewater, as outlined below.

Key private stakeholders related to phosphorus emissions to lakes in Chile will be invited to engage in this project to join knowledge exchange activities to better understand barriers to sustainable phosphorus practices and invited to provide consultation on the Chile Transition plan. Private Sector stakeholders that will be engaged with in Chile may include Salmonchile (Aquaculture sector), Trade and Tourism Aggrupation?s (Tourism Sector), Chilean Construction Association (Construction Sector), Aguas Araucan?a (domestic Wastewater treatment sector) and SOFO (Agricultural sector). A more detailed description of these stakeholders is found in Appendix 8A and 8B.

The project will also engage with the key private sector industry associations through established partnerships, for example, the FAO?s Committee on Fisheries (COFI), and its sub-committee on Aquaculture, the GPNM and WWQA (e.g., connecting International Fertilizer Association and companies), as well as directly with innovation leaders operating globally to support nutrient recycling (e.g., Susphos and EMG EasyMining Germany GmbH) and ecosystem restoration (e.g., Phoslock Environmental Technologies). We will work to embed industry staff within activities throughout the components. These groups will be invited to participate in workshops and knowledge exchange activities to ensure the knowledge and viewpoints of the private sector are well represented in project outputs. These groups play a key role in influencing institutional policy changes to accelerate sustainable phosphorus use. The dialogue will focus on exploring the tremendous economic and financial values of sustainable phosphorus management, and how these values can be safeguarded or increased, through business practice changes and policies.

5. Risks to Achieving Project Objectives

Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):

Main Risks and Mitigation Strategy

The COVID-19 pandemic has resulted in rapid changes in work routines, commercial activities, health care and other industries and social services. Direct risks from the COVID-19 pandemic to the project include travel restrictions. In addition, it has been estimated that waste generation has increased sharply, including plastic waste streams.

Additionally, we acknowledge that significant uncertainty exists on projections of the global extent of future climate change. Climate change is expected to impact on freshwater and coastal ecosystems, and the reduction of nutrient pollution may be an important adaptation measure to limit these effects.

COVID-19 risks and Climate change risks are examined in Annex H and I, respectively.

COVID-19 Risks Mitigation Plan

The uP-Cycle project recognizes that the Covid Pandemic and related restrictions make it difficult to plan for a more sustainable future using communication approaches and monitoring systems that were relied upon up until only a few years ago. We identify opportunities provided to the project for increasing impact resulting from this challenge (Table 5). The challenges of the Covid Pandemic relate also to our interaction with the environment, where international travel may be restricted, patterns of movement around the natural environment may change. Despite this, society remains dependent on a healthy natural environment. The uP-Cycle activities will provide security to such risks by producing virtual communication tools and outputs with which future recovery plans can be developed. We will work to develop incentives to improve agriculture, fishery, and forestry practices, through engagement with relevant government bodies in Chile (Component 3), and through discussions with International Bodies in Component 1 and the Global Community of Practice (Component 2) to identify opportunities to Build Back Better in a global context. These opportunities will be embedded within our project reports and briefing notes recognizing the critical role of phosphorus in food provision and water security, essential in our fight against the Covid virus. The impacts of the Covid Pandemic for phosphorus is already apparent. The World Bank report that we are amid a significant price spike for phosphate fertilizers, meaning that the price of food is likely to follow in the course of this project. This represents significant challenges for countries reliant on phosphorus fertilizers and represents a unique opportunity to drive reductions in emissions, reduce food waste, and increase recycling. To achieve this, we will focus discussions with stakeholders to identify opportunities to reduce environmental pressures associated with unsustainable phosphorus use to support more sustainable patterns of production and consumption. Through public awareness-raising in the Villarrica Basin, we will pilot a green cities approach designed to increase resilience in the context of sustainable phosphorus use.

The following risks were identified:

- Direct effect of COVID-19 restrictions on project activities. Disruption to travel remains the main direct risk to the project. National and international travel has been significantly affected by COVID restrictions since 2020, although to a large extent these restrictions are lighter now than a year ago. Given the future of international travel remains uncertain, this represents the single greatest risk to project delivery.

Mitigation measures include:

- The program of work has been designed in such a way that it may be delivered remotely, with strong on-the-ground leadership teams in Chile, and global partners who are well equipped to utilize virtual communications platforms should this be necessary.

- We expect a high level of hybrid communication as the norm in the project including during inception and final meetings. This is with the exception of stakeholder meetings in Chile, were face-to-face meetings will be encouraged to aid engagement.

- Field trips will be planned to coincide with major project meetings and to avoid locations experiencing outbreaks or sever travel restrictions or lockdowns. In addition, we plan international meetings during northern and southern hemisphere ?summers? to avoid autumn/winter high infection rates expected to occur.

- The conference facilities identified by the Chilean Ministry for the Environment, for national scale stakeholder meetings in Chile, have excellent hybrid communication infrastructure to aid international cooperation.

- We will ensure that all vulnerable staff with underlying health issues are not excluded form project meetings, using hybrid facilities where necessary.

- Advances in the roll out of COVID 19 vaccinations have been achieved in all countries associated with the project. Full vaccination rates continue to increase, for example in the UK (73%), the Netherlands (70%), the USA (67%), China (87%), and Chile (92%). We will create a supporting environment to raise awareness of the positive benefits of vaccination within this project.

- Risk of infection during day-to-day operations. Data generation will be conducted in Chile, around the Villarrica Basin and this could be disrupted should Chile impose social controls through lockdowns during COVID 19 outbreaks. The last notable such event occurred more than one year ago, indicating low risk of occurrence.

Mitigation measures include:

- Risk Assessments will be prepared for the project drawing on experiences of research teams from the project partners to manage the risk of infection between field teams for the purposes of the project.

- All subcontractors will be required to agree to conform to the project level risk assessment, and to provide evidence of their own measures being taken during day-to-day operations.

- The generation of additional single use plastic (e.g., PPE) waste streams has emerged as a result of COVID 19 mitigation measures. The use of PPE is recommended in many countries, including in Chile in medical centres and public transport.

Mitigation measures include:

- Where possible, we will encourage project staff to wear appropriate mitigation PPE while considering reduction of single use PPE wastes.

- We will also request that project staff use personal drinking containers, to reduce the use of single use plastic materials during meetings, although this issue is not specific to COVID 19, there is a perception that the use of single use plastics in catering has increased during face-to-face meetings.

Climate Change Risk Mitigation Plan

This Climate Change Risk Assessment follows the guidelines set out by the GEF STAP Guidance on Climate Risk Screening, June 4, 2019, GEF/STAP/C.56/Inf.03.

With respect to the risk on the outcomes of the project it is important that we embed in our methodology a climate smart planning and projection approach. Where appropriate, our nutrient emission models will include the effects of RCP scenarios coupled with future nutrient loading scenarios to 2050, as requested by GEF STAP. This approach has been developed and applied previously for this approach within the World Water Quality Alliance on a global scale. We expect that in accounting for the effects of climate change as outlined below, within future ecosystem restoration and sustainable phosphorus management plans we will ensure that the objectives of the project are met.

We draw on authoritative reports on the effects of Climate Change on freshwater ecosystems as presented by the Intergovernmental Panel on Climate Change (IPCC, 2022; Figure 10).

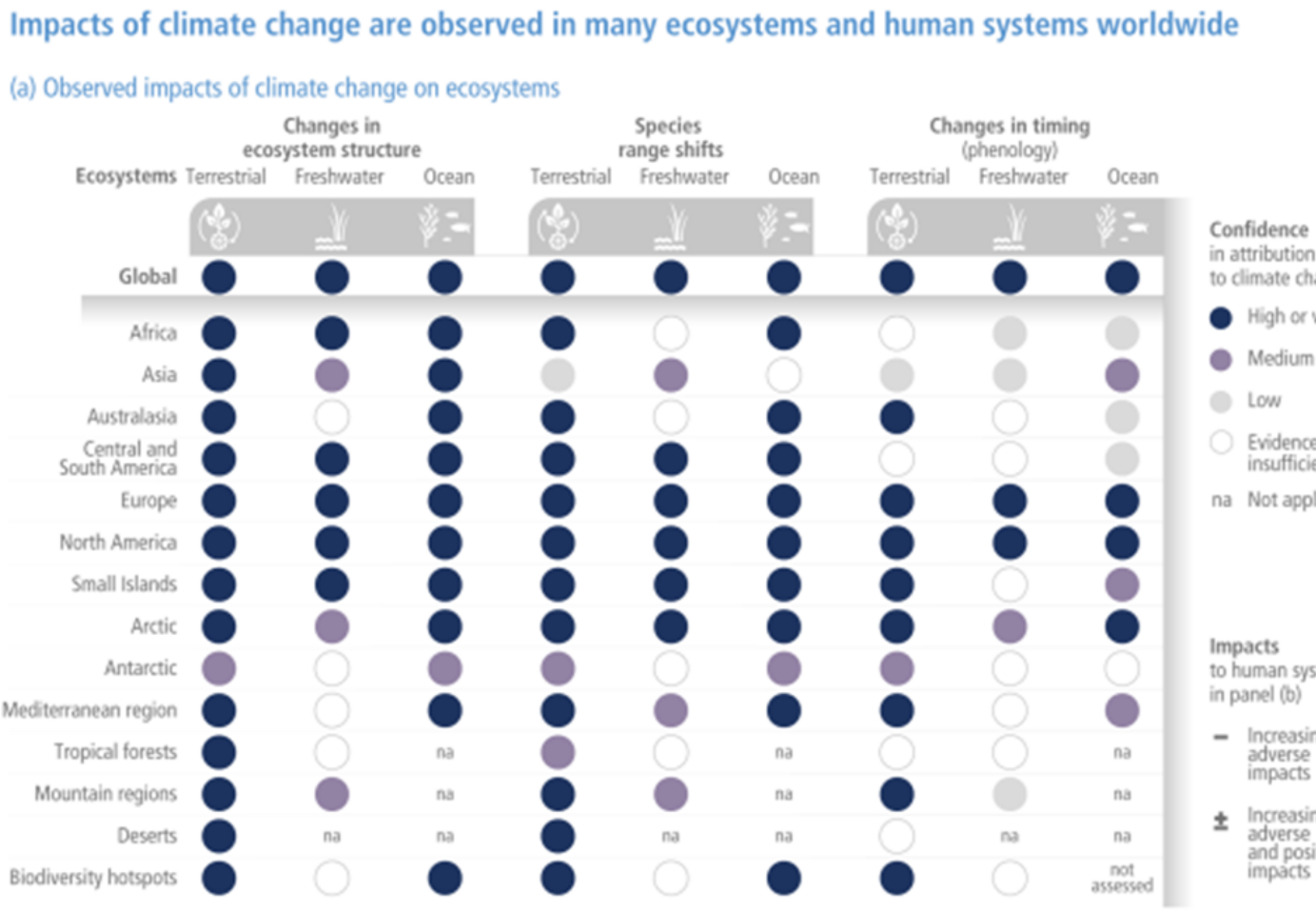


Figure 10. IPCC (2022) assessment of the impacts of climate change on global terrestrial, freshwater, and coastal ecosystems:

The Our Phosphorus Futures report (www.opfglobal.com; Chapter 5) presents a review of the literature on the global impacts of climate change on phosphorus loading and lake ecosystem responses as summarized in the following excerpts:

- The temperature of lakes, oceans and the atmosphere is rising, atmospheric concentrations of greenhouse gases have increased, snow and ice have diminished, and sea levels have risen. The spatial and seasonal distribution of fresh water will change under the pressures of a changing climate. Understanding how these changes will affect the quality and ecology of freshwater and coastal ecosystems at a global and regional scale is complex due to the variation in the geographical, hydrological, and climatic systems involved.

- Interactions between climate change?s effects on nutrient delivery and increased nutrient input to agricultural systems associated with intensification are unclear but are likely to exacerbate P pollution. We outline some of these complex interactions and their impacts on P delivery but stress that a comprehensive

global-scale analysis of the effects of climate change on P delivery to freshwater and coastal ecosystems is beyond the scope of this chapter.

- An increase in atmospheric temperature may cause an increase in precipitation intensity and alter rainfall patterns regionally. An increase between 1.5 and 4.5 ?C in global temperature is predicted to increase global mean precipitation by 3 to 15%. Precipitation is expected to increase in higher latitude regions and some areas of the tropics and decrease in sub-tropical regions in the coming century, resulting in expected significant changes in rates of P transfer from land to water.

- Increased rainfall may have dual effects: in the short-term, it can reduce nutrient concentrations and algal blooms in lakes due to greater flushing of the system (shorter hydraulic residence time) but in the long-term, it can stimulate blooms due to increased nutrients associated with runoff. In arid and semiarid landscapes, a decrease in precipitation and an increase in the occurrence of droughts are expected. The drying of soils may increase P transport via erosion following heavy rain. Increased air temperatures in some regions will increase evapotranspiration and may cause a reduction in surface runoff.

- A decrease in surface water flow may reduce dilution of point source pollution in waters, so increasing nutrient concentrations, but may also reduce the mobility of soil-bound P, and thus reduce diffuse pollution to proximal waters. Increased rainfall will result in greater nutrient delivery to coastal zones, potentially enhancing eutrophication and hypoxia (i.e. low or depleted oxygen in a waterbody).

- An expected rise in sea level caused by anthropogenic warming may increase P inputs to coastal areas due to the exposure of more land for erosion, the loss of natural buffers such as wetlands and mangroves, and P mobilization through greater soil water saturation. The interactions between these drivers are complex and make predicting the overall impact of climate change on nutrient transport difficult.

- The World Bank Group (2021) reviewed the country profile for potential climate change effects in Chile including key adaptation options for consideration. These are largely relevant here as evidence to support the processes outlined by the OPF report listed above. The following excerpts from the World Bank Country Profile for Chile are of relevance**[1]**:

- Climate change is expected to change water availability and seasonality as well as temperatures, which could also impact snowmelt and accumulation in the Andes. Changing temperatures are expected to have the highest impacts on the water systems in the Andean regions, especially in latitudes 30?40? and decrease in intensity from north to south.

- The majority of the population is concentrated in the center north while the southernmost areas of the country are sparsely populated, in large part due to historically challenging climatic conditions. Ensemble projection models estimate that annual severe drought likelihood for the country will increase by 34% by mid-century and by 63% by the end of the century.

- Some regions of the country are expected to experience desertification as the Atacama grows in surface area while other regions may experience scarcity. The areas between Coquimbo and O?Higgins are projected to see a 20%?25% decrease in precipitation by mid-century. Concurrently, the southern regions

of the country may experience consistent or increased water availability on an annual basis with light decreases in spring and summer.

- The Chilean government estimates that precipitation in the Altiplano and regions of Arica and Parinacota could experience a 15%?25% increase in precipitation by the 2050s.

- Drought and water scarcity are projected to be concentrated in the central and northern regions compared to southern regions. Standardized Precipitation Evapotranspiration Index (SPEI) projections estimate that precipitation in Chile will be ?1.42 standard deviations from the historical mean by the 2050s. However, while projections estimate a decrease of ?1.41 standard deviations in Antofagasta in the North, the southernmost areas of the country, such as Punto Arenas are expected to see no change in mean annual drought. Chile is projected to experience significantly heightened dry conditions and significant drought severity, which will likely increase pressure on water resources for the country and region.

Summary of risks to the uP-Cycle Project posed by COVID-19 and Climate Change

A summary of risks to the project from Climate Change and COVID-19, their rating (e.g. low, medium or high) and potential mitigation strategy are provided in Table 5.

Table 5 Risk Assessment for the uP-Cycle project

Risk	Rating	Mitigation Strategy
Failure to agree on common global approaches for indicators and models (C1)	Low	Development and utilization of inclusive networks of scientists and policymakers to ensure that demand for relevant information is met by the supply of appropriate data and indicators
Limited buy-in from global partners (C1-C4)	Low	Working with global key partners (which will contribute to the Zero P Lakes Network) include the International Lake Environment Committee (ILEC), UNEP?s World Water Quality Alliance (WWQA), The Society for Ecological Restoration (SER), The World Resources Institute (WRI) and UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) and FAO?s Committee on Fisheries (COFI), to facilitate the global dialogue on phosphorus.
A limited willingness by countries/stakeholders to develop strategies for problems of too much or too little phosphorus (C2-C4)	Medium	Close co-operation with countries and stakeholders across the phosphorus cycle will assist in identifying opportunities to mitigate phosphorus pollution. This will be facilitated by the Integrated Catchment Management Groups for the Pilot Lake Case and supported by the expertise of Zero P Lakes Network.

The impact of climate change and variability on conclusions	Medium	Specific attention to include effects of regional climate variation and global climate change will be examined and communicated in the context of uncertainty around the impacts of emissions reductions.
Inadequate communication between science assessment and policy development processes	Medium	Improved awareness and dialogue between researchers and policymakers through the development of the Zero P Lakes Network and Integrated Catchment Management Groups, which will specifically target the development of a process of science-policy support.
Lack of interest of private sector in activities related to reducing their phosphorus emissions due to the cost of the measures	Medium	evelopment of a private sector engagement strategy focused on the benefits of being part of the project to improve the image of the industry as a sustainable industry, for example, in the case of aquaculture in Villarrica Lake. Work with International Industry Bodies to communicate best practice guidance on more sustainable practices on the ground. We will work with established science-policy-industry communication platforms (e.g. Sustainable Phosphorus Alliance and European Sustainable Phosphorus Platform) to develop an engagement strategy for the private sector. This is likely to include regular communications through established networks as listed in the baseline section. We have established connections with relevant international bodies including the fertilizer (i.e. Fertiliser Europe, IFA), waste water (i.e. Veolia, International Water Association), and aquaculture sectors (i.e. FAO). Under Component 1, the project will work to bring these parties together to establish and implement a communication strategy as a key output.
Lack of interest of the public organization to participate in the project	Medium	Develop an early engagement strategy informing the different public services.
Establish relationships with indigenous communities	High	Develop an early engagement strategy with CONADI, to achieve a correct approach to the indigenous communities and to assure their participation in the project.
Interactions with other stressors	Medium	The development of ?Future World? scenarios to set ambitions and identify priority actions will include assessing linkages with other global stressors interacting with phosphorus. Opportunities will be identified to optimize and future-proof existing plans for each Pilot Lake Case to enhance multiple benefits and ensure an adaptive management approach that considers multiple stressors (e.g., including climate change).

New valuation and decision tools, and sustainable finance mechanisms do not clearly show benefits to major partners (inter-governmental organizations, regional organizations, governments and private sector) to secure their participation in the interventions.	Low	Communications products and supporting analyses will be designed to make a compelling case for why these mechanisms are in the interests of these different constituencies to promote/adopt/design.
Natural disasters (e.g., hurricanes) affect the capacity of local communities to participate in intervention activities.	Low	Consultations with stakeholders and technical advisors to develop intervention activities that have greater potential for quick recovery after a natural disaster.
Effect of COVID-19 restrictions on project activities.	Medium	National and international travel was significantly affected by COVID restrictions. Given the future of international travel remains uncertain, the program of work has been designed in such a way that it may be delivered remotely, with strong on-the-ground leadership teams in Chile, and global partners who are well equipped to utilize virtual communications platforms should this be necessary. We expect a level of hybrid communication as the norm in the project.

[1] Source: Climate Risk Profile: Chile (2021): The World Bank Group.

https://climateknowledgeportal.worldbank.org/sites/default/files/2021-07/15916-WB_Chile%20Country%20Profile-WEB%20%281%29.pdf

6. Institutional Arrangement and Coordination

Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

Execution arrangement

The UK Centre for Ecology and Hydrology (UKCEH) will work as **the executing agent**, to oversee the management and monitoring of project activities and consultants under the GEF Towards Sustainable Phosphorus Cycles in Lake Catchments (uP-Cycle) project. The Global Environment Facility (GEF) unit

within the **Ecosystems Division of the United Nations Environment Programme (UNEP)** will act as the project?s **implementing agency**. At the Implementing Agency level, oversight and backstopping will be ensured through an appointed Task Manager within UNEP. The evaluation process will follow the monitoring and evaluation policy of both the GEF and the Implementing Agency and is outlined in Appendix 4 ? Costed Monitoring and Evaluation.

A **Project Coordination Unit** (PCU) will be established to coordinate day-to-day activities across all five Components. The PCU will be based at the UKCEH.

A Project Steering Committee (PSC) will be established by the PCU and the outset of the project. The PSC will be tasked with steering the project execution and providing partners with advice. The PCU will report to the PSC and be advised through annual PSC meetings to ensure the delivery and quality of activities and outputs and to request feedback on Monitoring and Evaluation, where necessary. Membership of the PSC will be drawn from existing relationships as outlined Appendix 6. In establishing the PSC the implementing and executing agents were mindful of gender equality and diversity.

At the National level, a **Pilot Intervention Management Unit (PIMU)** will be established to coordinate the day-to-day activities for the Chile Demo/Component 3 and liaise with the PCU. The PIMU will be based at the Chilean Ministry for Environment.

A **Pilot Intervention Steering Committee (PISC)** will also be established and serve as an Inter-Ministerial Committee to ensure multi-stakeholder engagement in the execution of the pilot intervention. The Chair of the PISC shall also belong to the membership of the PSC.

The organizational structure of the uP-Cycle project is shown in Figure 11.

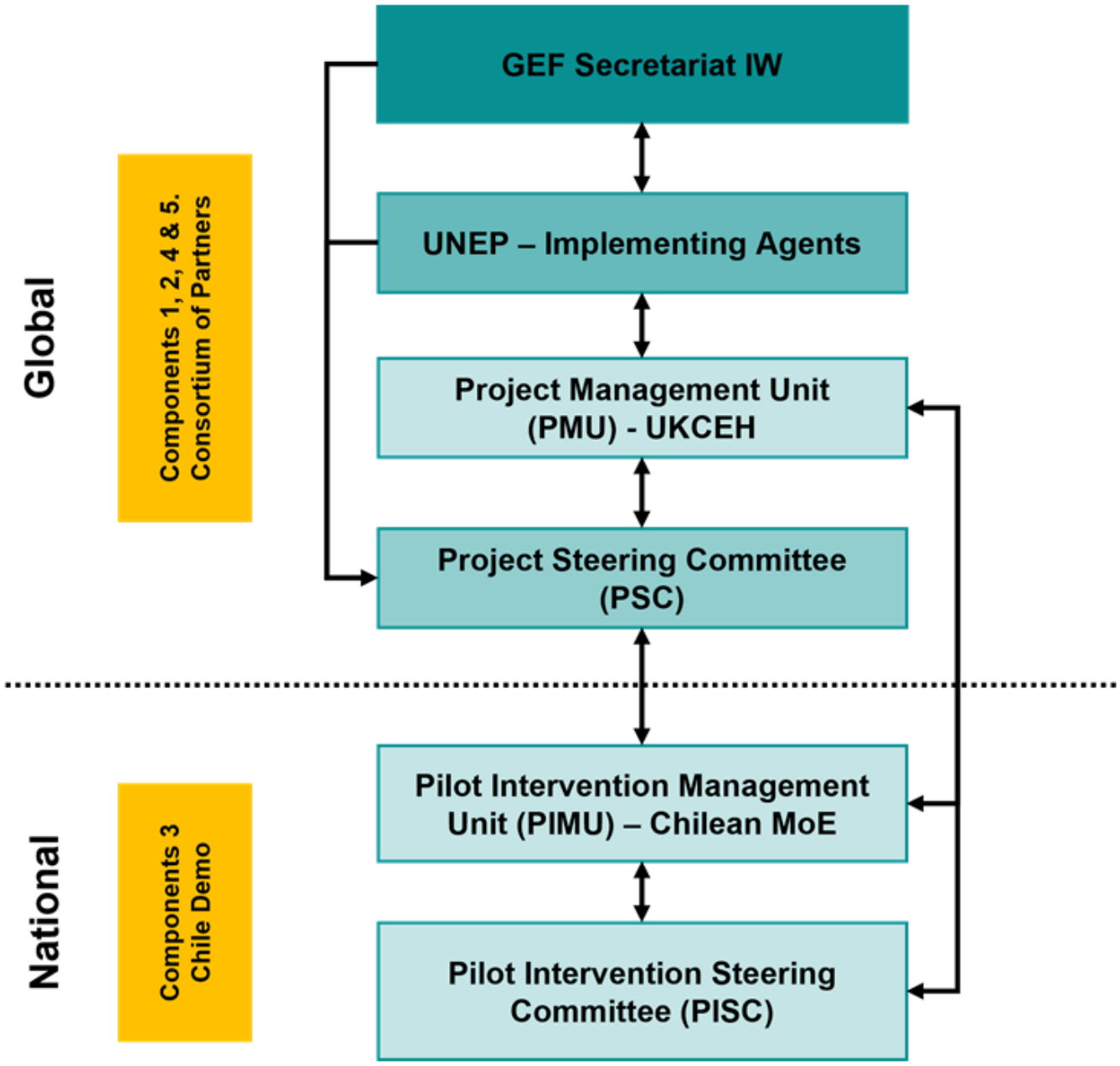


Figure 11. Organizational structure of the uP-Cycle project.

Organizational Structure by Component

Component 1 (Coordination Lead - UKCEH). UKCEH will develop with its partners (e.g., The World Resources Institute and the PBL Netherlands Environmental Assessment Agency) the Global Phosphorus Emissions Dashboard. Component 1 will engage with the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) Global Partnership on Nutrient

Management (GPNM) and other key global actors (e.g., FAO?s Committee on Fisheries, COFI) to facilitate engagement with international Industry Bodies and Innovation Platforms in Component 1, as well as the UN-Water SDG 6.3.2 Indicator Development Team. The project will engage with other private sector stakeholders operating globally (e.g., Phoslock and Susphos), national and transboundary (i.e., through the WWQA members).

Component 2 (Coordination Lead - UKCEH). Key partners for the development of the global Community of Practice activities include the World Water Quality Alliance (WWQA, including ILEC), through which representatives of basin-scale emissions reductions programs will be identified and engaged. This community will be coordinated by the WWQA Ecosystems WorkStream. The University of Edinburgh will coordinate the development of the uP-Cycle Framework and Monitoring and Assessment Approach and preparation of the Global Baseline Report, with likely support from the Link?ping University, University of Technology Sydney, and other key stakeholders.

Component 3 (Coordination Lead - Chilean Ministry of the Environment). The coordination team led by the Chilean Ministry of the Environment has engaged with relevant government departments and non-governmental evidence providers in Chile during the PPG phase (as listed in Appendix 8 - Stakeholder Engagement Plan). The Chilean Ministry of the Environment will coordinate the data providers and the development of the surveillance and forecasting portal. Edinburgh University will support through its Overseas Office in Santiago, Chile, the stakeholder engagement workshops and will support the Chilean Ministry of the Environment in the preparation of the Transition Plan Report and awareness raising activities. The Chilean Ministry of the Environment will coordinate engagement through National Priorities (see Section 13) and with GEF- (see table below) and non-GEF national and bilateral initiatives relevant to the outputs of this component including the Lake Villarrica Decontamination Plan, relevant national policies relating to biodiversity and water quality management, reporting to the UN SDG Indicators, and input to the Humboldt Current Large Marine Ecosystem Strategic Action Program.

Component 4 (Coordination Lead - UKCEH). UKCEH will coordinate activities drawing on input across Components 1 to 3 to underpin output development. UNEP will help target engagement activities through UNEA. The uP-Cycle Innovation Hub will be coordinated and delivered by UKCEH, aligning with the outputs of the GEF INMS project to enhance synergies.

Component 5 (Coordination Lead - UKCEH). UKCEH will coordinate activities, including inception and terminal meetings, whilst the PSC will produce quarterly progress plans and reports, and will also seek external consultants to produce independent evaluations under guidance from UNEP project managers.

Coordination with other GEF projects and non-GEF Projects

The uP-Cycle Project will build upon and be closely coordinated with and complementary to other GEF-supported projects as summarized in table 6.

Table 6 Title coordination of uP-Cycle project with other relevant GEF funded projects and non-GEF Projects

Name of Project	Potential opportunity for collaboration
The GEF/UNEP-UKCEH ?Towards the International Nitrogen Management System? project (INMS) as mentioned in the baseline section is a four-year project (2017- ongoing) to develop the evidence base to showcase the need for effective practices for global nitrogen management and to highlight options to maximize the multiple benefits of better nitrogen use.	The project team consulted the INMS team during PPG phase. We will build on the INMS outputs within the current project, supporting activities within the global nitrogen sustainability policy arena to build on the obvious synergies between phosphorus and nitrogen. We will build on evidence and tools with which to enhance our proposed Innovations Hub, including a measures database for sustainable nitrogen management which may also deliver on phosphorus sustainability.
Economic instruments and tools to support the conservation of biodiversity, the payment of ecosystem services and sustainable development (GEF ID 10213) GEF 7 - Project approved (2020)	Project Objective: Improve national financing of biodiversity through the design, implementation and optimization of market-based economic instruments (IECB) that reinforce public financing and facilitate the economic contribution of the private sector to maintaining Chile?s natural capital.
Restoration of biodiversity and ecosystem services at the landscape scale on productive agroforestry areas and their natural environment (GEF project ID 10718) GEF 7 - Concept approved (2020)	Project Objective: Restore productive and conserved landscapes in the Central zone of Chile. The proposed concept will coordinate with this project?s activities in component 2 promoting nature-based solutions and practices for sustainable agriculture.
Catalyzing Implementation of a Strategic Action Program for the Sustainable Management of Shared Living Marine Resources in the Humboldt Current System (HCS). GEF Project ID ? 9592	Implemented by UNDP and executed by IFOP, IMARPE, SUBPESCA, PRODUCE, MMA, MINAM, SERNAPESCA, SERNANP. 2017 ? ongoing. This project aims to facilitate ecosystem-based fisheries management (EBFM) and ecosystem restoration in the Humboldt current system for the sustainable and resilient delivery of goods and services from shared living marine resources, in accordance with the Strategic Action Program (SAP) endorsed by Chile and Peru. The proposed project contributes to the SAP objective on ?*Improve the environmental quality of the coastal and marine ecosystems through integrated management, considering different pollution sources.?*
Lake Villarrica: my basin, my space and my actions	Implemented by the *Centro UC Desarrollo Local*, the project seeks to provide elementary school students with *in situ* knowledge of the socio-ecological dynamics of the lake articulating the physical and ecological components of the basin with the anthropic practices and challenges of the basin.
Chile: clean lakes	The project aims to work with all stakeholders to ensure that the lakes of Chilean Northern Patagonia balance economic development, community and natural resources conservation through a science-based and collaborative approach.

7. Consistency with National Priorities

Describe the consistency of the project with national strategies and plans or reports and assesments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions from below:

- National Action Plan for Adaptation (NAPA) under LDCF/UNFCCC
- National Action Program (NAP) under UNCCD
- ASGM NAP (Artisanal and Small-scale Gold Mining) under Mercury
- Minamata Initial Assessment (MIA) under Minamata Convention
- National Biodiversity Strategies and Action Plan (NBSAP) under UNCBD
- National Communications (NC) under UNFCCC
- Technology Needs Assessment (TNA) under UNFCCC
- National Capacity Self-Assessment (NCSA) under UNCBD, UNFCCC, UNCCD
- National Implementation Plan (NIP) under POPs
- Poverty Reduction Strategy Paper (PRSP)
- National Portfolio Formulation Exercise (NPFE) under GEFSEC
- Biennial Update Report (BUR) under UNFCCC
- Others

Consistency with National Priorities. Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes /no). If yes, which ones and how:

The project will contribute to:

The UN-Sustainable Development Goals

The project addresses multiple UN-Sustainable Development Goals (SDGs) as discussed below.

SDG 1 - No poverty & SDG 2 - Zero Hunger: through the development of sustainable phosphorus economies, the project provides opportunities for business growth providing sources of income. The project also contributes to risk reduction of sectors (and employees) reliant on healthy lake ecosystems. Through the protection and provision of livelihoods, and to the reduction of malnutrition borne through poverty.

SDG 3 ? Good Health and Well-Being (Specifically Goal 3.9): By reducing the risk of harmful algal blooms, we will contribute to a reduction in illnesses from hazardous water pollution (e.g., cyanotoxins produced during harmful algal blooms).

SDG 5 ? Gender Equality: The project will implement and promote gender-balanced practices (see the section on gender equality above).

SDG 6 ? Clean Water and Sanitation: The project will reduce the risk to drinking water supplies through the improvement of water resources impacted by phosphorus pollution and the protection and restoration of water-related ecosystems. The focus of the project is on supporting and strengthening the participation of local communities in improving water and sanitation management.

SDG 12 ? Responsible consumption and production: A central tenet of the project is to achieve more sustainable management and efficient use of natural phosphorus resources and to achieve the environmentally sound management of chemicals (e.g., fertilizers) and all wastes throughout their life cycle.

SDG 13 ? Climate Action: Through the action of alleviating phosphorus pollution, this project reduces the risk of algal blooms and their subsequent contributions to climate change through methane emissions from standing waters. We will also deliver climate resilience planning within the Monitoring and Assessment approach to ensure that community exposure to environmental hazards caused by exacerbation of phosphorus pollution by climate change are reduced.

SDG 14 ? Life Below Water: The project will contribute to the sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts, including strengthening their resilience to environmental change.

SDG 17 - Partnerships: The project will promote the development, transfer, dissemination and diffusion of environmentally sound technologies, through its outputs and the work of the Zero P Lakes Network. The project will also respect each country?s policy space and leadership to support the development of policies for sustainable development.

National Priorities in Chile

The project is consistent with the following national plan and policies in Chile.

The Water Code 1981 (reformed in 2005) includes the requirement for ?minimum ecological flows?. This was reinforced with the 2010 reform of Chile?s Environmental Law, Law 19,300, which regulates the protection of aquatic ecosystems through the implementation of ecological water flows.

Chile?s Law N? 19.300 of 1994, the Law N?20.417 of 2010 and the Law N? 20.600 of 2012 with reference to the water quality regulatory system. The basic regulatory water quality instruments are: (a) environmental water quality standards, (b) decontamination plans and strategies, (c) emission standards, and (d) environmental impact assessments for new investments.

Environmental regulation program 2020-2021. This program defines the sustainability criteria and the programmatic priorities regarding policies, plans and programs for the establishment of environmental and emission-quality standards, and other environmental management instruments. Within the prioritized plans and standards for the water component, the Ministry of the Environment includes the development and revision of several secondary water quality standards for rivers and lake basins in the south of Chile, that is expected to include phosphorus as a pollutant to be controlled, and the Villarrica Lake Decontamination Plan which is related to phosphorus as outlined above in the Chile Baseline. The revision of the groundwater; and the marine and continental waters emission standards will also be prioritized, and the influence of phosphorus for such standards as stated below.

Revision of the marine and continental waters emission standards (DS 90). The Ministry of the Environment is conducting a review of the emission standards for marine and continental waters. Within its changes published in the official draft. The Ministry of the Environment is proposing to change the maximum concentration allowed for total phosphorus in discharges into tributary rivers to a lake from 15 or 10 mg/L (depending on river flows) to 2 mg/L.

Revision of the groundwater emission standards (DS 46). The Ministry of the Environment is conducting a review of the emission standards for marine and continental waters. Currently, The Ministry of the Environment is developing the official draft of this revision, and among its changes, is proposing to include a maximum concentration allowed for total phosphorus in discharges into groundwaters.

Villarrica Lake Secondary Water Quality Standards. The project is consistent with the Villarrica Lake Secondary Water Quality Standards which defines water quality levels for Villarrica Lake and includes parameters such as total and dissolved phosphorus and other trophic parameters such as transparency, oxygen saturation, dissolved nitrogen, total nitrogen, and chlorophyll-a.

Decontamination Plan for Villarrica (as outlined above in the Chile baseline).

Chile?s proposed long-term climate strategy. The project is consistent with the official draft of Chile?s long-term climate strategy. Within the Chilean long-term vision and its transition to sustainable and inclusive development to 2050, nature-based solutions play a key role as in this project. Reforestation and restoration are proposed in this long-term vision, along with other measures such as nutrient management and reduction of fertilizers used in agriculture, including tree planting in crops, restoration and protection of wetlands, use of specific nature-based solutions such as constructed wetlands, among others.

8. Knowledge Management

Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.

The basin to international partnerships created in Components 1 - 3 will facilitate knowledge exchange across sectors and countries. As outlined in Component 4, the project will produce annual update reports circulated to, for example, the WWQA and GPA; and through targeted activities around UNEA. The project will increase public awareness through targeted social media activities including through the GEF and UNEP social media outlets, where appropriate. Produced in collaboration with the GEF, UNEP, and UKCEH, we will deliver and disseminate a Policy Brief (Output 4.1.4) based on the more substantive

White Paper (Output 1.1.3) highlighting the ecosystem restoration and socio-economic cases for global action towards improved phosphorus sustainability governance. Importantly, the project's coordination activities will enhance capacity on the country level and dialogue among countries to support decision making and to identify bilateral/multilateral opportunities for action.

Knowledge products, data platforms, maps and communication materials generated by the project will be widely shared through the project website, which will be compliant with the IW: LEARN toolkit. Alongside the development of the Global Phosphorus Emissions Dashboard (see Component 1), the project will provide open access to resources on training, knowledge, and tools (e.g., the uP-Cycle Innovation Hub ? see Component 4) required by countries to develop and/or optimize their existing phosphorus emissions reductions programs within a common monitoring and assessment approach.

The objectives of the knowledge management approach, which are complementary and parallel, include (see Appendix 10 for more detail):

Objective 1. At the early stage of the project implementation phase, the project communication strategy will be developed, and the key target audience will be further identified based on the stakeholder analysis. Communication materials?(such as press releases, videos, and web stories) and relevant dissemination plans (media, conference, high-level events) will be developed to promote the visibility of the project and its key progress.

Key deliverables, the timeline and key responsible actors are shown below for the main activities:

Activities	Responsible actors	Timeline	Deliverables	Indicative Budget
Outlining and agreeing on a **Communications and Knowledge Management Strategy**, including clearly identified objectives, processes, and benefits of the project to be conveyed to key target audiences at the local and national level and a rapid assessment of communication capabilities to ensure that the communication strategy is realistic, actionable, and measurable.	Communication Specialist	Yr 1	Communication and Knowledge Management Strategy formulated and agreed upon. Assessment of communication capacity conducted. Key targeted audiences were identified, and mailing lists developed	85,000

Defining project **visual identity** and disseminating overall project information and communication products	Website developer, designer, and communication specialist	Yr 1- 2	Project visual identity in Spanish and English developed in Yr 1 Project website in Spanish and English developed in Yr 1 and updated regularly. Media information kits, including policy briefs on the GEF uP-Cycle project and planned interventions with contact information, and project briefs in Spanish and English developed by Yr 1	80,000
Developing communication products	Communication Specialist	Yr 1-2	Project newsletter disseminated in Yr1-2 Project briefings, web stories, press releases, and presentations developed. Short videos to introduce the project and its key progress developed. News or web stories about the communication campaigns (with the actual or estimated number of a gender-disaggregated audience) developed.	Part of strategy above
Developing dissemination plan	Communication Specialist	Yr 1-2	Workshops, conferences, and high-level events organised.	60,000

Objective 2. Raising awareness and cross-cutting communication activities among all related stakeholders will be conducted. These activities will raise stakeholder awareness of the project objectives, approach, and activities as well as the benefits associated with the implementation of the project at the local, national, and global scales.

Key deliverables, the timeline and key responsible actors are shown below for the main activities:

Activities	Responsible actors	Timeline	Deliverables	Indicative budget

Planning and delivering **educational and awareness-raising** activities on different thematic areas and critical issues related to phosphorus pollution and sustainable phosphorus management.	Project Manager, Communication Specialist	Yr 1-2	Key results/outputs from the awareness-raising activities integrated into the uP-Cycle Up-Cycle Innovation Hub and project website, IW:Learn platform, and other platforms if relevant Awareness-raising materials developed for the project were updated regularly Feature articles and interviews with key stakeholders published in the local and national networks, social media, partner's websites, etc). Educational presentations to different groups, (e.g. private sector associations, local community groups, public ministries, etc.) developed.	20,000

Objective 3. Behaviour Change Campaigns?will be developed to encourage behaviours and attitudinal changes that support sustainable phosphorus management and to encourage public engagement in building momentum to develop sustainable phosphorus policies and industry practices.

Key deliverables, the timeline and key responsible actors are shown below for the main activities:

Activities	Responsible actors	Timeline	Deliverables	Indicative budget
Promoting behaviour change campaigns	Communication Specialist, public and private sector, NGOs and other relevant organizations.	Yr 2	Targeted behaviour-changing campaigns directed to local communities designed and implemented, with a participatory strategy designed and material developed. Large-scale multi-channel campaigns aimed at motivating citizens to engage with a transition to sustainable phosphorus management.	Part of the Comms strategy delivery ? see above budget allocation under objective 1.

Objective 4. Lessons learnt, and best practices will be documented and communicated to key audiences to encourage the replication of successful approaches. Key knowledge products will be developed based on the learnings from project components 1, 2 and 3 (see Appendix 3).

Key deliverables, the timeline and key responsible actors are shown below for the main activities:

Activities	Responsible actors	Timeline	Deliverables	Indicative budget
Promoting access to project information, resources and knowledge products, through the Up-Cycle Innovation Hub, project website, the IW:Learn Platform and other relevant knowledge exchange platforms.	Project Manager, Communication Specialist	Yr 1-2	Guidance materials & the uP-Cycle Net Zero Phosphorus Framework and Monitoring and Assessment Approach, Transition Plan for Chile, Global Emissions Assessment and Policy Briefs, among other project outputs, are available to stakeholders and the public on the project website, Up-Cycle Innovation Hub, project website, the IW:Learn Platform, and other relevant knowledge exchange platforms. Phosphorus emissions data visualised through the Phosphorus Emissions Dashboard, available publicly.	Part of resources allocated under objective 2 above.
Promoting access to and replication of project interventions on the circular phosphorus economy.	Communication Specialist, public and private sector, NGOs and research institutions	Yr 1-2	Presentation of project experience and knowledge products knowledge exchange workshops, seminar series, and training events shared on the project website. Reports of the training events and knowledge exchange workshops available on the project website	Part of resources allocated under objective 2 above.
Disseminating experiences and lessons learnt from the project stakeholders and recommendations for global actions shared with stakeholders through the Up-Cycle Innovation Hub, project website, IW:Learn Platform and relevant platforms.	Communication Specialist, municipalities, private sector, NGOs and research institutions	Yr 1-2	Targeted awareness-raising materials produced and disseminated. A White Paper outlining priority sector-specific actions towards delivering a more sustainable global anthropogenic phosphorus cycle to support improved food security while delivering on global ecosystem protection and restoration ambitions.	10,000

Towards policymakers, learning experience and case studies will be compiled from Components 1, 2 and 3, related to the best practice for developing a circular phosphorus economy, and the need for supportive policies and enabling conditions (such as financing, knowledge, and enforcement).

Towards the private sector, learning experience and case studies will be compiled from Component 1, related to the best practice on developing circular innovation and solutions along the value chain, including circular product design, business models, waste and residue?collection?and phosphorus recovery and recycling.

Guidance documents and tools will be made available from the uP-Cycle Up-Cycle Innovation Hub and project website. Knowledge management will also be focused through the?IW:Learn?platform, as a one-stop shop to document and store project information, activities, progress, publication and events. Information will be regularly updated to maintain engagement with key stakeholders and partners. The knowledge products of the project will also be shared with stakeholder networks providing access to a wide audience of cross-disciplinary multi-stakeholders (e.g. GPNM, ESPP, OPF, SER, ILEC WWQA etc).

The main areas of intervention are further developed in the following section with associated activities, responsible actors, timeline, and deliverables. These will be further consulted with the main project stakeholders and fine-tuned during the implementation phase of the project.

9. Monitoring and Evaluation

Describe the budgeted M and E plan

The project Monitoring and Evaluation (M&E) plan is consistent with the GEF Monitoring and Evaluation policy. The Project Results Framework presented in Annex A includes Specific, Measurable, Achievable, Relevant and Time-bound (SMART) indicators and targets for each outcome and output. These indicators will be the main tools for assessing project implementation progress and whether project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in Appendix 4. M&E-related costs are presented below and are fully integrated into the overall project budget.

During the inception phase, the Project Coordination Unit (PCU) will prepare a detailed M&E plan in consultation with the Pilot Intervention Management Unit (PIMU). This plan will be presented to the Project Steering Committee (PSC). This process will continue to inform necessary amendments to the M&E plan during project implementation. The PCU and the PSC will review the M&E plan during scheduled meetings throughout the project, with a focus on improving indicators and their verification.

Day-to-day project monitoring will be conducted by the PCU and the PIMU, who will also coordinate input from other project partners where necessary. The Project Coordinator will regularly inform UNEP and the PSC on progress, with specific risk-based approach being reported to include any delays or difficulties faced during implementation, so that mitigation measures can be identified and implemented.

The Project Coordinator will be responsible for initial screening of the financial and administrative reporting from core partners prior to their submission. Key Progress Review Reporting systems (i.e.,

project trackers, risk register etc) will be updated continuously throughout the project and reviewed quarterly by the PCU in progress reports. These reports will be used to inform the annual Project Implementation Review (PIR), to be prepared by the Project Coordinator under the direction of the UNEP Task Manager. Progress Review Reports will include information on (responsible parties underlined):

- financial parameters to ensure cost-effective use of resources (PCU, PICU, and Partners),

- delivery of agreed project outputs, with peer review, where necessary, being coordinated by the UNEP Task Management Team (PCU, PICU, Partners and UNEP Task Manager), and,

- a risk management report per component following a consistent approach across all project partners and identifying mitigation strategies where necessary (PCU, PICU, PSC, UNEP Task Manager)

- details of conformance and/or non-conformance with UNEP and GEF policies and corrective measures where necessary, compiled by the UNEP Task Manager (UNEP Task Manager, GEF, PCU).

In-line with the GEF Evaluation requirements, the project will be subject to an independent Terminal Evaluation (TE), led by UNEP Task Manager. Additionally, a performance assessment will be conducted at the project?s midpoint, where necessary.

The mid-point assessment will identify corrective measures and/or changes to the intended work plan of the project, focusing on, (i) the level of progress in attaining the project objectives stated in the Results Framework, (ii) the level of acceptance of procedures developed under the project and (iii) the degree of effectiveness of the internal monitoring and supervision system of UNEP.

The Terminal Evaluation (TE) will provide an independent assessment of project performance (in terms of relevance, effectiveness, and efficiency), and determine the likelihood of impact and sustainability. The project performance will be assessed against standard evaluation criteria using a six-point rating scheme. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP staff and implementing partners. The direct costs of the evaluation will be charged against the project evaluation budget. The TE will typically be initiated after the project?s operational completion. If a follow-on phase of the project is envisaged, the timing of the evaluation will be discussed with the Evaluation Office to feed into the submission of the follow-on proposal.

The draft TE report will be sent by the Evaluation Office to project stakeholders for comment. Formal comments on the report will be shared by the Evaluation Office openly and transparently. The final determination of project ratings will be made by the Evaluation Office when the report is finalized.

The following Table provides an overview of the budget for the M&E plan.

Table 12 Summary of budget requested for monitoring and Evaluation plan

Cost item	Unit	Qt	Unit cost	Total cost	Year 1	Year 2
Firm to carry out independent mid-term evaluation	Lump sum	1	$ 15,000	$ 15,000	$ 15,000	

Cost item	Unit	Qt	Unit cost	Total cost	Year 1	Year 2
Firm to carry out independent terminal evaluation	Lump sum	1	$ 25,000	$ 25,000		$ 25,000
Project inception meeting	Lump sum	1	$ 20,000	$ 20,000	$ 20,000	
Project final meeting	Lump sum	1	$ 20,000	$ 20,000		$ 20,000
Total M&E				**$ 80,000**	**$ 35,000**	**$ 45,000**

10. Benefits

Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

The global environmental problems and global baseline (see Sections 1 and 2) demonstrate that current phosphorus practices are not sustainable and that following the current trajectory will result in widespread environmental and socio-economic issues. Barriers slowing progress towards sustainable phosphorus management across scales include:

- A lack of an internationally relevant phosphorus monitoring and assessment system,

- Poor knowledge exchange limits the effectiveness of phosphorus emissions reduction programs,

- Low awareness of the public and private sectors on the rewards of improving phosphorus sustainability, and the risks of inaction.

- Where they exist, basin-to-national-scale phosphorus emissions reduction policies are fragmented and limited in ambition.

It is important to have a holistic and precautionary approach to phosphorus pollution/waste throughout the value chain (e.g. Net Zero P approach). Countries, cities, and companies need to identify and act upon hotspots, detect leakage of phosphorus in their industries and value chains, and activate the most effective interventions systematically. Such efforts will lead to more sustainable phosphorus management and contribute significantly to the implementation of the 2030 Agenda for Sustainable Development and multiple regional and global calls for improvement in nutrient use efficiency.

By focusing on lakes as the primary loci of environmental impact, the GEF uP-Cycle project will demonstrate how ecosystem recovery can be achieved through phosphorus emissions reductions from land to water. Sustainable phosphorus management will be essential to improve the protection and restoration of freshwater and coastal ecosystems. To deliver on this aim, the project will bring together the global lake management and sustainable phosphorus management communities, developing and testing a sustainable phosphorus management framework in Chile to inform international application.

The project will be delivered through five interlinked components with corresponding activities to deliver the component outputs to reach expected outcomes (see ?Section 3. The Proposed Alternative Scenario? for further details).

By achieving these outcomes, the uP-Cycle project will deliver environmental and socio-economic benefits.

Expected environmental institutional benefits

The actions proposed by the project will bring benefits to environmental institutions, including:

- Enhanced institutional capacity to strengthen baseline phosphorus emissions data and identify impacts to support the identification of emissions reduction measures.

- A better understanding and access to tools that can predict ecosystem impacts in response to phosphorus pollution and its mitigation. This information is critical to argue for more stringent standards on phosphorus pollution and to ensure maximum benefits are equitably realized from planned investments. In addition, it will better inform on the nature and extent of ecological and ecosystem service response following costly emissions reduction investments across sectors.

- Improved understanding of nutrient loading from land-based activities to the coasts, to support the objectives of the HC-LME SAP, and a national surveillance and/or nutrient emissions modelling approach is required to inform the need for national-scale nutrient load reduction.

- Reduction of phosphorus emissions at source by identifying and accelerating sector-specific opportunities to reduce direct emissions to existing waste streams and/or to optimize practices to increase phosphorus use efficiency to reduce point and diffuse source emissions.

- Contributions to Net Zero Ambitions by reducing direct greenhouse gas emissions from standing waters related to a reduction in phosphorus-driven algal biomass and through the selection of Nature-Based Solutions that deliver both reductions in phosphorus emissions from land to water as well as greenhouse gas emissions from land to atmosphere.

- Increased regional to global capacity to implement phosphorus recovery and recycling by assessing capacity for Nature-Based Solutions, both in urban and rural settings, to divert, capture and recover phosphorus from points of accumulation in the natural environment, upstream of sensitive ecosystems.

- Increased access to knowledge and tools required to implement effective Lake Ecosystem Resilience Enhancing Measures, ensuring that ecological recovery following emissions reductions is effective, including the creation of refuge habitats for threatened species, the control of legacy phosphorus pollution in lakebed sediments, and the control of other important stressors (e.g., climate change, non-native invasive species, other nutrients and pollutants) which may constrain ecosystem recovery in the long term.

Expected Socio-economic Benefits

The actions proposed by the project will bring socio-economic benefits, including:

- Embracing the Circular Economy ? the project will identify opportunities that address losses of phosphorus and other nutrients along the full value chain delivering on wider sustainability ambitions including the reduction of food waste and wastewater discharges.

- Increasing Resilience in Food and Drinking Water Sectors ? the project will provide options to reduce reliance on mined (and imported) inorganic phosphorus fertilizers in agriculture and aquaculture (and other end-uses) (e.g. through improved phosphorus use efficiency, loss reduction and increase in phosphorus recycling), within the carrying capacity of the system, whilst reducing drinking water treatment costs associated with the reduction of harmful algal blooms and their toxins.

- Supporting Growth in Eco-Tourism, Business and the Housing Sectors ? The project will protect local economic growth by enhancing the value of natural capital to contribute to the creation of vibrant and dynamic water economies working with stakeholders to develop opportunities for businesses or industries for whom clean, safe and biodiverse lakes are a critical resource.

- Empowering communities by fostering Inclusive Sustainability Communities to ensure that all members of society play an active role in the development of future emissions reduction plans, including, Youth and Indigenous Peoples Assemblies.

- Accelerating Inclusive Sustainable Innovation working across sectors to support the development of innovations, jobs and opportunities through the transition to new emissions reduction practices (e.g., small-holding farmers) for vulnerable groups who are historically socially and/or economically reliant on the status quo.

- Enhancing Capacity across the Institutional Framework by connecting knowledge providers (e.g., universities, citizens? science practitioners, businesses, and regulatory bodies) through shared education and skills development activities to underpin the long-term knowledge base.

The following communities/sectors will directly benefit from the uP-Cycle project in the following ways:

- *For lakeshore communities* directly impacted by eutrophication (e.g., risks to human health, supply of food, drinking water, recreation, property values, aesthetic, spiritual and cultural benefits).

- *The wider community*, within the lake catchment and beyond, that are reliant on lake ecosystem services (e.g., drinking water, irrigation water, transportation, recreation, and hydropower).

- *For coastal communities* impacted by nutrient pollution delivered from upstream freshwater catchments.

- *For aqua culturists*, by supporting improved (long?term) and sustainable fisheries and through relief from future risk of hypoxic waters as a result of eutrophication.

- *For waste managers* through access to knowledge, training and technical guidance on the management of phosphorus-rich wastes to optimize phosphorus recycling.

- *For farmers* through better phosphorus management policies and practices, such as access to recycled phosphorus fertilizer, and contributing to food security.

- *For communities economically dependent on biodiversity* and high-quality freshwater ecosystems, through improved revenue from eco-tourism.

11. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

Overall Project/Program Risk Classification*

PIF	CEO Endorsement/Approval	MTR	TE
Low	Low		

Measures to address identified risks and impacts

Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

Main Risks and Mitigation Strategy

The COVID-19 pandemic has resulted in rapid changes in work routines, commercial activities, health care and other industries and social services. Direct risks from the COVID-19 pandemic to the project include travel restrictions. In addition, it has been estimated that waste generation has increased sharply, including plastic waste streams.

Additionally, we acknowledge that significant uncertainty exists on projections of the global extent of future climate change. Climate change is expected to impact on freshwater and coastal ecosystems, and the reduction of nutrient pollution may be an important adaptation measure to limit these effects.

COVID-19 risks and Climate change risks are examined in Annex F and G, respectively.

COVID-19 Risks Mitigation Plan

The uP-Cycle project recognizes that the Covid Pandemic and related restrictions make it difficult to plan for a more sustainable future using communication approaches and monitoring systems that were relied upon up until only a few years ago. We identify opportunities provided to the project for

increasing impact resulting from this challenge (Table 5). The challenges of the Covid Pandemic relate also to our interaction with the environment, where international travel may be restricted, patterns of movement around the natural environment may change. Despite this, society remains dependent on a healthy natural environment. The uP-Cycle activities will provide security to such risks by producing virtual communication tools and outputs with which future recovery plans can be developed. We will work to develop incentives to improve agriculture, fishery, and forestry practices, through engagement with relevant government bodies in Chile (Component 3), and through discussions with International Bodies in Component 1 and the Global Community of Practice (Component 2) to identify opportunities to Build Back Better in a global context. These opportunities will be embedded within our project reports and briefing notes recognizing the critical role of phosphorus in food provision and water security, essential in our fight against the Covid virus. The impacts of the Covid Pandemic for phosphorus is already apparent. The World Bank report that we are amid a significant price spike for phosphate fertilizers, meaning that the price of food is likely to follow in the course of this project. This represents significant challenges for countries reliant on phosphorus fertilizers and represents a unique opportunity to drive reductions in emissions, reduce food waste, and increase recycling. To achieve this, we will focus discussions with stakeholders to identify opportunities to reduce environmental pressures associated with unsustainable phosphorus use to support more sustainable patterns of production and consumption. Through public awareness-raising in the Villarrica Basin, we will pilot a green cities approach designed to increase resilience in the context of sustainable phosphorus use.

The following risks were identified:

- Direct effect of COVID-19 restrictions on project activities. Disruption to travel remains the main direct risk to the project. National and international travel has been significantly affected by COVID restrictions since 2020, although to a large extent these restrictions are lighter now than a year ago. Given the future of international travel remains uncertain, this represents the single greatest risk to project delivery.

Mitigation measures include:

- The program of work has been designed in such a way that it may be delivered remotely, with strong on-the-ground leadership teams in Chile, and global partners who are well equipped to utilize virtual communications platforms should this be necessary.

- We expect a high level of hybrid communication as the norm in the project including during inception and final meetings. This is with the exception of stakeholder meetings in Chile, were face-to-face meetings will be encouraged to aid engagement.

- Field trips will be planned to coincide with major project meetings and to avoid locations experiencing outbreaks or sever travel restrictions or lockdowns. In addition, we plan international meetings during northern and southern hemisphere ?summers? to avoid autumn/winter high infection rates expected to occur.

- The conference facilities identified by the Chilean Ministry for the Environment, for national scale stakeholder meetings in Chile, have excellent hybrid communication infrastructure to aid international cooperation.

- We will ensure that all vulnerable staff with underlying health issues are not excluded form project meetings, using hybrid facilities where necessary.

- Advances in the roll out of COVID 19 vaccinations have been achieved in all countries associated with the project. Full vaccination rates continue to increase, for example in the UK (73%), the Netherlands (70%), the USA (67%), China (87%), and Chile (92%). We will create a supporting environment to raise awareness of the positive benefits of vaccination within this project.

- Risk of infection during day-to-day operations. Data generation will be conducted in Chile, around the Villarrica Basin and this could be disrupted should Chile impose social controls through lockdowns during COVID 19 outbreaks. The last notable such event occurred more than one year ago, indicating low risk of occurrence.

Mitigation measures include:

- Risk Assessments will be prepared for the project drawing on experiences of research teams from the project partners to manage the risk of infection between field teams for the purposes of the project.

- All subcontractors will be required to agree to conform to the project level risk assessment, and to provide evidence of their own measures being taken during day-to-day operations.

- The generation of additional single use plastic (e.g., PPE) waste streams has emerged as a result of COVID 19 mitigation measures. The use of PPE is recommended in many countries, including in Chile in medical centres and public transport.

Mitigation measures include:

- Where possible, we will encourage project staff to wear appropriate mitigation PPE while considering reduction of single use PPE wastes.

- We will also request that project staff use personal drinking containers, to reduce the use of single use plastic materials during meetings, although this issue is not specific to COVID 19, there is a perception that the use of single use plastics in catering has increased during face-to-face meetings.

Climate Change Risk Mitigation Plan

This Climate Change Risk Assessment follows the guidelines set out by the GEF STAP Guidance on Climate Risk Screening, June 4, 2019, GEF/STAP/C.56/Inf.03.

With respect to the risk on the outcomes of the project it is important that we embed in our methodology a climate smart planning and projection approach. Where appropriate, our nutrient

emission models will include the effects of RCP scenarios coupled with future nutrient loading scenarios to 2050, as requested by GEF STAP. This approach has been developed and applied previously for this approach within the World Water Quality Alliance on a global scale. We expect that in accounting for the effects of climate change as outlined below, within future ecosystem restoration and sustainable phosphorus management plans we will ensure that the objectives of the project are met.

We draw on authoritative reports on the effects of Climate Change on freshwater ecosystems as presented by the Intergovernmental Panel on Climate Change (IPCC, 2022; Figure below).

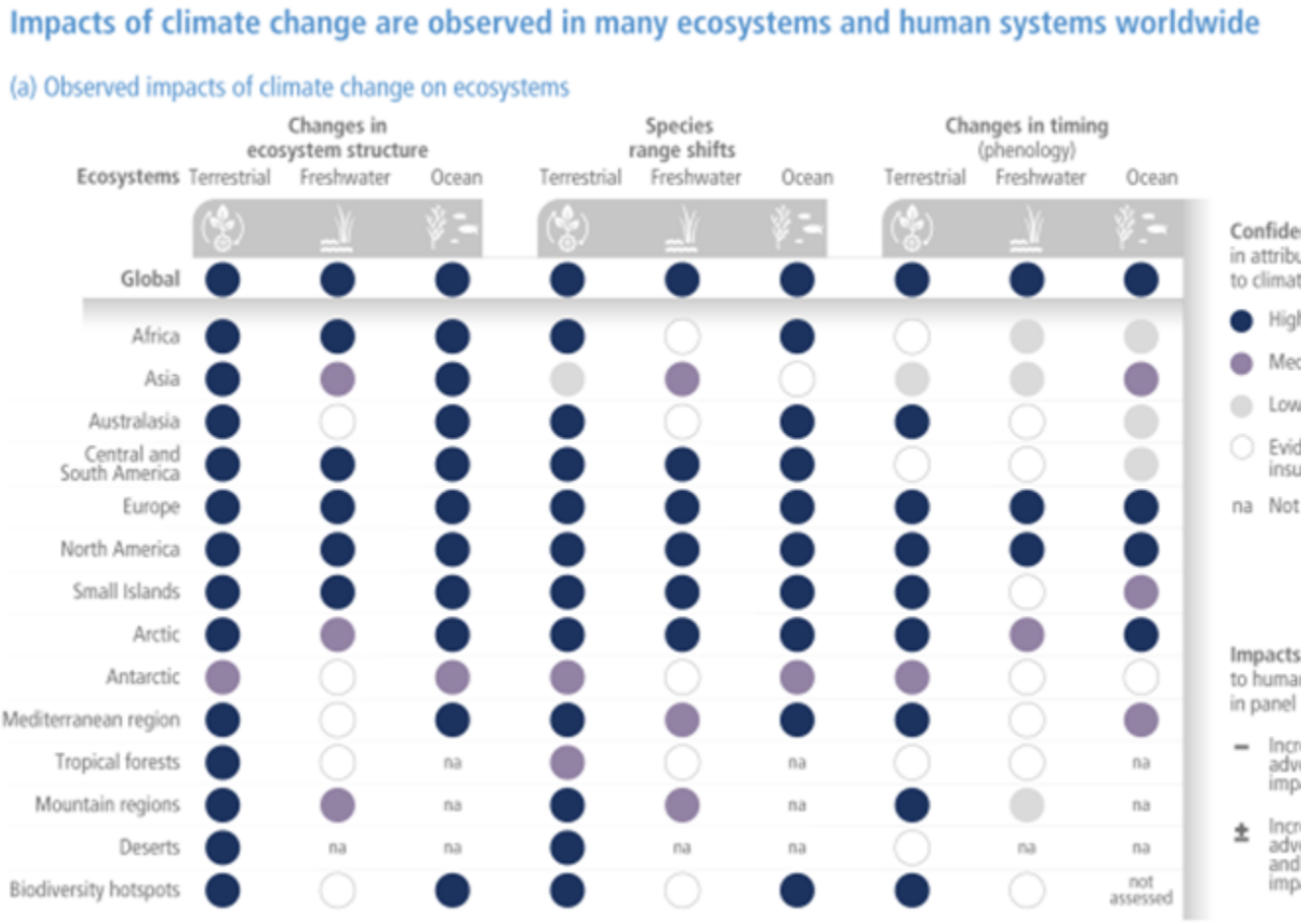


Figure 10. IPCC (2022) assessment of the impacts of climate change on global terrestrial, freshwater, and coastal ecosystems:

The Our Phosphorus Futures report (www.opfglobal.com; Chapter 5) presents a review of the literature on the global impacts of climate change on phosphorus loading and lake ecosystem responses as summarized in the following excerpts:

- The temperature of lakes, oceans and the atmosphere is rising, atmospheric concentrations of greenhouse gases have increased, snow and ice have diminished, and sea levels have risen. The spatial

and seasonal distribution of fresh water will change under the pressures of a changing climate. Understanding how these changes will affect the quality and ecology of freshwater and coastal ecosystems at a global and regional scale is complex due to the variation in the geographical, hydrological, and climatic systems involved.

- Interactions between climate change?s effects on nutrient delivery and increased nutrient input to agricultural systems associated with intensification are unclear but are likely to exacerbate P pollution. We outline some of these complex interactions and their impacts on P delivery but stress that a comprehensive global-scale analysis of the effects of climate change on P delivery to freshwater and coastal ecosystems is beyond the scope of this chapter.

- An increase in atmospheric temperature may cause an increase in precipitation intensity and alter rainfall patterns regionally. An increase between 1.5 and 4.5 ?C in global temperature is predicted to increase global mean precipitation by 3 to 15%. Precipitation is expected to increase in higher latitude regions and some areas of the tropics and decrease in sub-tropical regions in the coming century, resulting in expected significant changes in rates of P transfer from land to water.

- Increased rainfall may have dual effects: in the short-term, it can reduce nutrient concentrations and algal blooms in lakes due to greater flushing of the system (shorter hydraulic residence time) but in the long-term, it can stimulate blooms due to increased nutrients associated with runoff. In arid and semiarid landscapes, a decrease in precipitation and an increase in the occurrence of droughts are expected. The drying of soils may increase P transport via erosion following heavy rain. Increased air temperatures in some regions will increase evapotranspiration and may cause a reduction in surface runoff.

- A decrease in surface water flow may reduce dilution of point source pollution in waters, so increasing nutrient concentrations, but may also reduce the mobility of soil-bound P, and thus reduce diffuse pollution to proximal waters. Increased rainfall will result in greater nutrient delivery to coastal zones, potentially enhancing eutrophication and hypoxia (i.e. low or depleted oxygen in a waterbody).

- An expected rise in sea level caused by anthropogenic warming may increase P inputs to coastal areas due to the exposure of more land for erosion, the loss of natural buffers such as wetlands and mangroves, and P mobilization through greater soil water saturation. The interactions between these drivers are complex and make predicting the overall impact of climate change on nutrient transport difficult.

- The World Bank Group (2021) reviewed the country profile for potential climate change effects in Chile including key adaptation options for consideration. These are largely relevant here as evidence to support the processes outlined by the OPF report listed above. The following excerpts from the World Bank Country Profile for Chile are of relevance**[1]**:

- Climate change is expected to change water availability and seasonality as well as temperatures, which could also impact snowmelt and accumulation in the Andes. Changing temperatures are expected to have the highest impacts on the water systems in the Andean regions, especially in latitudes 30?40? and decrease in intensity from north to south.

- The majority of the population is concentrated in the center north while the southernmost areas of the country are sparsely populated, in large part due to historically challenging climatic conditions. Ensemble projection models estimate that annual severe drought likelihood for the country will increase by 34% by mid-century and by 63% by the end of the century.

- Some regions of the country are expected to experience desertification as the Atacama grows in surface area while other regions may experience scarcity. The areas between Coquimbo and O?Higgins are projected to see a 20%?25% decrease in precipitation by mid-century. Concurrently, the southern regions of the country may experience consistent or increased water availability on an annual basis with light decreases in spring and summer.

- The Chilean government estimates that precipitation in the Altiplano and regions of Arica and Parinacota could experience a 15%?25% increase in precipitation by the 2050s.

- Drought and water scarcity are projected to be concentrated in the central and northern regions compared to southern regions. Standardized Precipitation Evapotranspiration Index (SPEI) projections estimate that precipitation in Chile will be ?1.42 standard deviations from the historical mean by the 2050s. However, while projections estimate a decrease of ?1.41 standard deviations in Antofagasta in the North, the southernmost areas of the country, such as Punto Arenas are expected to see no change in mean annual drought. Chile is projected to experience significantly heightened dry conditions and significant drought severity, which will likely increase pressure on water resources for the country and region.

Summary of risks to the uP-Cycle Project posed by COVID-19 and Climate Change

A summary of risks to the project from Climate Change and COVID-19, their rating (e.g. low, medium or high) and potential mitigation strategy are provided in Table 5.

Table 5 Risk Assessment for the uP-Cycle project

Risk	Rating	Mitigation Strategy
Failure to agree on common global approaches for indicators and models (C1)	Low	Development and utilization of inclusive networks of scientists and policymakers to ensure that demand for relevant information is met by the supply of appropriate data and indicators

Limited buy-in from global partners (C1-C4)	Low	Working with global key partners (which will contribute to the Zero P Lakes Network) include the International Lake Environment Committee (ILEC), UNEP?s World Water Quality Alliance (WWQA), The Society for Ecological Restoration (SER), The World Resources Institute (WRI) and UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) and FAO?s Committee on Fisheries (COFI), to facilitate the global dialogue on phosphorus.
A limited willingness by countries/stakeholders to develop strategies for problems of too much or too little phosphorus (C2-C4)	Medium	Close co-operation with countries and stakeholders across the phosphorus cycle will assist in identifying opportunities to mitigate phosphorus pollution. This will be facilitated by the Integrated Catchment Management Groups for the Pilot Lake Case and supported by the expertise of Zero P Lakes Network.
The impact of climate change and variability on conclusions	Medium	Specific attention to include effects of regional climate variation and global climate change will be examined and communicated in the context of uncertainty around the impacts of emissions reductions.
Inadequate communication between science assessment and policy development processes	Medium	Improved awareness and dialogue between researchers and policymakers through the development of the Zero P Lakes Network and Integrated Catchment Management Groups, which will specifically target the development of a process of science-policy support.
Lack of interest of private sector in activities related to reducing their phosphorus emissions due to the cost of the measures	Medium	Development of a private sector engagement strategy focused on the benefits of being part of the project to improve the image of the industry as a sustainable industry, for example, in the case of aquaculture in Villarrica Lake. Work with International Industry Bodies to communicate best practice guidance on more sustainable practices on the ground. We will work with established science-policy-industry communication platforms (e.g. Sustainable Phosphorus Alliance and European Sustainable Phosphorus Platform) to develop an engagement strategy for the private sector. This is likely to include regular communications through established networks as listed in the baseline section. We have established connections with relevant international bodies including the fertilizer (i.e. Fertiliser Europe, IFA), waste water (i.e. Veolia, International Water Association), and aquaculture sectors (i.e. FAO). Under Component 1, the project will work to bring these parties together to establish and implement a communication strategy as a key output.
Lack of interest of the public organization to participate in the project	Medium	Develop an early engagement strategy informing the different public services.

Establish relationships with indigenous communities	High	Develop an early engagement strategy with CONADI, to achieve a correct approach to the indigenous communities and to assure their participation in the project.
Interactions with other stressors	Medium	The development of ?Future World? scenarios to set ambitions and identify priority actions will include assessing linkages with other global stressors interacting with phosphorus. Opportunities will be identified to optimize and future-proof existing plans for each Pilot Lake Case to enhance multiple benefits and ensure an adaptive management approach that considers multiple stressors (e.g., including climate change).
New valuation and decision tools, and sustainable finance mechanisms do not clearly show benefits to major partners (inter-governmental organizations, regional organizations, governments and private sector) to secure their participation in the interventions.	Low	Communications products and supporting analyses will be designed to make a compelling case for why these mechanisms are in the interests of these different constituencies to promote/adopt/design.
Natural disasters (e.g., hurricanes) affect the capacity of local communities to participate in intervention activities.	Low	Consultations with stakeholders and technical advisors to develop intervention activities that have greater potential for quick recovery after a natural disaster.
Effect of COVID-19 restrictions on project activities.	Medium	National and international travel was significantly affected by COVID restrictions. Given the future of international travel remains uncertain, the program of work has been designed in such a way that it may be delivered remotely, with strong on-the-ground leadership teams in Chile, and global partners who are well equipped to utilize virtual communications platforms should this be necessary. We expect a level of hybrid communication as the norm in the project.

[1] Source: Climate Risk Profile: Chile (2021): The World Bank Group.

https://climateknowledgeportal.worldbank.org/sites/default/files/2021-07/15916-WB_Chile%20Country%20Profile-WEB%20%281%29.pdf

Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
Appendix 5 - SRIF	**CEO Endorsement ESS**	
SRIF	**Project PIF ESS**	

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Please refer to the Roadmap: Annex A - Project Results Framework of the CEO Doc. When pasted here, the Project Results Framework looses the format.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Not applicable

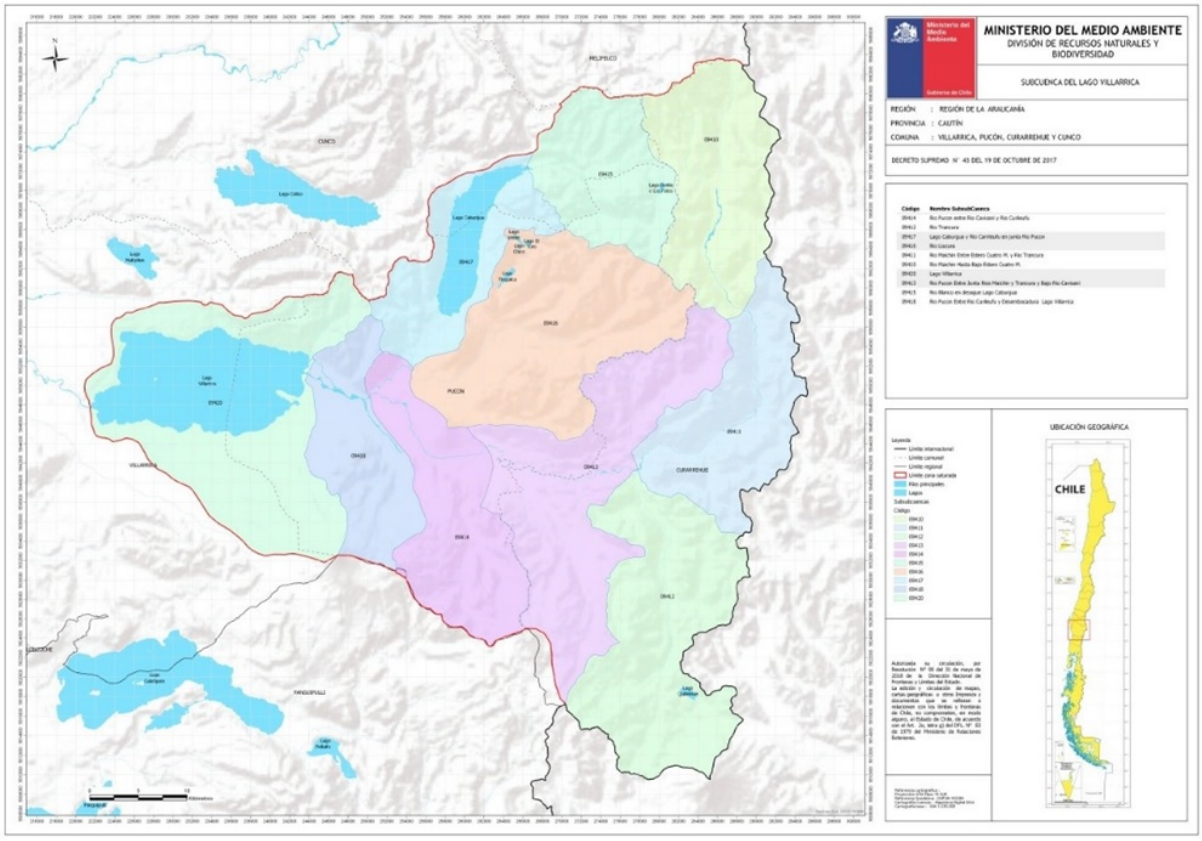
ANNEX C: Status of Utilization of Project Preparation Grant (PPG). (Provide detailed funding amount of the PPG activities financing status in the table below:

Project Preparation Activities Implemented	*GETF/LDCF/SCCF Amount ($)*		
	Budgeted Amount	*Amount Spent To date*	*Amount Committed*
Regional Coordinator and Technical expert * 8 months @ $5000/month	40,000	0	40,000
Inception/Validation workshop - interpretation services, venue, catering etc.	10,000	0	10,000
Total	**50,000**	**0**	**50,000**

ANNEX D: Project Map(s) and Coordinates

Please attach the geographical location of the project area, if possible.

Villarrica Lake Basin - 39.2585? S, 72.1179? W



ANNEX E: Project Budget Table

Please attach a project budget table.

			Total	Comp. 1	Comp. 2	Comp. 3	Comp. 4	M&E: Comp. 5	PMC	Y1	Y2	Total
			US$	US$	US$	US$	US$	US$	US$	US$	US$	US$
STAFF AND PERSONNEL												
1100	**Project Personnel**											
1101	Project director		**111,818**	0	0	0	0	0	111,818	55,909	55,909	111,818
1102	Financial management expert		**30,000**						30,000	15,000	15,000	30,000
1103	Gender and diversity expert		**15,000**						15,000	7,500	7,500	15,000
1104	Administrative Support		**20,000**						20,000	10,000	10,000	20,000
		Subtotal	**176,818**	0	0	0	0	0	176,818	88,409	88,409	176,818
1200	**Consultants w/m**											
1201	Global sustainable nutrient management experts		**87,500**	35,000	42,500	0	15,000	0	0	58,750	33,750	92,500
1202	Ecosystem restoration experts		**127,500**	0	72,500	35,000	15,000	0	0	72,500	50,000	122,500
1203	Long term monitoring experts		**82,500**	0	42,500	40,000	0	0	0	52,500	30,000	82,500
1204	Data science and portal experts		**123,182**	28,182	5,000	90,000	0	0	0	91,137	32,046	123,182
1205	Knowledge exchange experts (web developer, comms consultant, production)		**190,000**	10,000	35,000	10,000	135,000	0	0	71,250	118,750	190,000
		Subtotal	**610,682**	73,182	197,500	175,000	165,000	0	0	346,137	264,546	610,682
1600	**Travel on official business (above staff)**											
1601	Travel for project personnel		**80,000**	30,000	0	20,000	30,000	0	0	35,000	45,000	80,000
		Subtotal	**80,000**	30,000	0	20,000	30,000	0	0	35,000	45,000	80,000
SUB CONTRACT COMPONENT												
2100	**Grants issued to Implementing Partner (IP) on official business (above staff)**											
Global												
2101	Grant to support global phosphorus emissions and ecosystems impact assesment		**112,500**	90,000	22,500	0	0	0	0	72,500	40,000	112,500
2102	Grant to develop emissions portals and develop global stakeholder engagement		**107,500**	85,000	22,500	0	0	0	0	68,750	38,750	107,500
2103	Grant to develop Net zero P assessment		**102,500**	0	102,500	0	0	0	0	80,000	22,500	102,500
2104	Grant to support establishment of the Global lakes practitioner network		**122,500**	0	122,500	0	0	0	0	90,000	32,500	122,500
Chile												
2105	Grant to facilitate catchment to national level stakeholder engagement & knowledge		**112,500**	0	12,500	100,000	0	0	0	50,000	62,500	112,500
2106	Grant to support the assessment of national governance and the producton of national policy strategies		**107,500**	0	12,500	95,000	0	0	0	45,000	62,500	107,500
2107	Grant to support long-term monitoring, modelling and data science in Chile		**142,500**	0	12,500	130,000	0	0	0	85,000	57,500	142,500
Audit												
2108	Annual financial audit services commissioned to an external company		**5,000**	0	0	0	0	0	5,000	2,500	2,500	5,000
		Subtotal	**812,500**	175,000	307,500	325,000	0	0	5,000	493,750	318,750	812,500
TRAINING COMPONENT												
3200	**Group training (field trips, WS, etc.)**											
3201	Staff exchanges x 2		**30,000**	0	0	30,000	0	0	0	15,000	15,000	30,000
3202	Field Trips x 2		**80,000**	0	80,000	0	0	0	0	40,000	40,000	80,000
		Subtotal	**110,000**	0	80,000	30,000	0	0	0	55,000	55,000	110,000
3300	**Meetings/conferences**											
3301	Inception meeting		**20,000**	0	0	0	0	20,000	0	20,000	0	20,000
3302	Global stakeholder emissions meeting		**30,000**	30,000	0	0	0	0	0	15,000	15,000	30,000
3303	Villarrica stakeholder engagement meetings		**20,000**	0	0	20,000	0	0	0	0	20,000	20,000
3304	Humboldt Current LME SAP engagement meeting		**20,000**	0	0	20,000	0	0	0	0	20,000	20,000
3305	Final meeting		**20,000**	0	0	0	0	20,000	0	0	20,000	20,000
3306	Targetted media briefing events in Chile and Globally		**10,000**	0	0	0	10,000	0	0	0	10,000	10,000
		Subtotal	**120,000**	30,000	0	40,000	10,000	40,000	0	35,000	85,000	120,000
Supplies Commodities and Materials												
4100	**Expendable equipment (under 1,500 $)**		-	0	0	0	0	0	0	0	0	0
4101			-	0	0	0	0	0	0	0	0	0
		Subtotal	-	0	0	0	0	0	0	0	0	0
4200	**Non expendable equipment**											
4202	Software		**10,000**	0	0	10,000	0	0	0	5,000	5,000	10,000
		Subtotal	**10,000**	0	0	10,000	0	0	0	5,000	5,000	10,000
MISCELLANEOUS COMPONENT												
5200	**Reporting costs (publications, maps)**											
5201	Translation		**20,000**	0	0	10,000	10,000	0	0	0	20,000	20,000
5102	Printing		-	0	0	0	0	0	0	0	0	0
		Subtotal	**20,000**	0	0	10,000	10,000	0	0	0	20,000	20,000
5300	**Sundry (communications, postages)**											
5301	Web hosting, image licences etc		-	10,000	0	0	0	0	0	17,500	2,500	20,000
			-	0	0	0	0	0	0	0	0	0
		Subtotal	**20,000**	10,000	0	0	10,000	0	0	17,500	2,500	20,000
5400	**Monitoring and evalutation**											
5401	Midterm		**15,000**	0	0	0	0	15,000	0	15,000	0	15,000
5402	Terminal evaluation		**25,000**	0	0	0	0	25,000	0	0	25,000	25,000
		Subtotal	**40,000**	0	0	0	0	40,000	0	15,000	25,000	40,000
TOTAL COSTS			**2,000,000**	318,182	585,000	610,000	225,000	80,000	181,818	1,090,796	909,205	2,000,000

ANNEX F: (For NGI only) Termsheet

Instructions. Please submit an finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

ANNEX G: (For NGI only) Reflows

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agencys is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on the Project and Program Cycle Policy. Partner Agencies will be required to comply with the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

ANNEX H: (For NGI only) Agency Capacity to generate reflows

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies? capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).