

United Nations University

Institute for Integrated Management of Material Fluxes and of Resources

CHILE: POLICY ROADMAP FOR SUSTAINABLE INFRASTRUCTURE



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**SUSTAINABLE
INFRASTRUCTURE
PARTNERSHIP**

United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES)

Ammonstrasse 74, 01067 Dresden, Germany

Tel.: + 49-351 8921 9370

Fax: + 49-351 8921 9389

Email: flores@unu.edu

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Language editor: Louisa Andrews

Design & Layout (PDF): diamonds network GmbH

Image credits (in order of appearance): Jose Luis Stephens/stock.adobe.com; Joseph Price/UNEP; Joseph Price/UNEP; Denise Misleh/UNU-FLORES; Joseph Price/UNEP; Denise Misleh/UNU-FLORES; EduSalgado/stock.adobe.com; abriendomundo/stock.adobe.com; Cristian Villalobos/stock.adobe.com; Denise Misleh/UNU-FLORES; Alberto Pinto/UNEP; Denise Misleh/UNU-FLORES; Iblinova/stock.adobe.com; jorisvo/stock.adobe.com; Denise Misleh/UNU-FLORES; Anne Richard/stock.adobe.com

This publication should be cited as:

"United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES), 2023.
Chile: Policy Roadmap for Sustainable Infrastructure"

ISBN 978-3-944863-99-3

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Foreword UNEP

Sustainable infrastructure is imperative for tackling the triple planetary crisis of climate, nature and pollution. The world's existing stock of infrastructure is responsible for an estimated 79% of global greenhouse gas emissions and 88% of climate adaptation costs, while its construction consumes vast amounts of natural resources. Governments across Latin America and the Caribbean - and worldwide - have recognised the need for action, adopting a new United Nations Environment Assembly (UNEA) resolution on sustainable and resilient infrastructure. The UN Environment Programme (UNEP) and its partners are supporting countries of the region to identify barriers and develop participatory solutions, harnessing the potential of infrastructure to boost productivity, create jobs and address inequalities.

Chile has demonstrated a commendable commitment to integrating sustainability into its infrastructure systems, building on the many good practices already in place. Chile: Policy Roadmap for Sustainable Infrastructure presents 10 policy options, informed by analysis of key infrastructure sectors and domains which hold great potential to drive sustainability, but which also face barriers. Indeed, globally, the buildings sector influences attainment of 80% of the individual targets of the UN Sustainable Development Goals, energy influences 43%, transport and mobility influences 45%, while water influences 37% of these essential targets.

The Barrier Analysis that underpins the Policy Roadmap has highlighted the importance of cross-sectoral innovations. We know that truly sustainable infrastructure cannot be delivered without accounting for the synergies and trade-offs between sectors, and without active participation of all stakeholders. The policy options represent recommendations put forward by a range of actors in Chile, with support from UNEP and the UN University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES). We hope this Policy Roadmap can serve as a basis for strategic implementation, and for ultimately delivering low-carbon, resource-efficient and nature-based solutions that address the needs of local communities in Chile.

I am grateful to the Ministry of Public Works of Chile, UNU-FLORES, as well as all participants in the research process from across government, industry, civil society and academia. UNEP stands ready to continue the collaboration and support Chile with its national sustainability objectives, and in implementing the UNEA resolution and International Good Practice Principles for Sustainable Infrastructure.



Juan Bello

Regional Director and Representative, Latin America and the Caribbean Office, United Nations Environment Programme

Foreword MOP

The Ministry of Public Works (MOP) has made progress in the implementation and development of various areas of sustainable infrastructure within the framework of the United Nations 2030 Agenda for Sustainable Development and the Paris Agreement and, among others, has had the support of the United Nations Environment Programme (UNEP) in training and dissemination.

The work of the Ministry in these areas has been developed for more than a decade, with initiatives of the different Directorates through efforts to reduce the consumption of materials and energy, maximising the use of renewable resources and extending the life cycle of products. These sustainability criteria have been the result of the initiatives of civil servants convinced of the urgency of this challenging scenario.

The diagnosis outlined in this report is shared, among other aspects, in terms of the need to strengthen institutional capacity to adopt and lead the new challenges with respect to sustainable infrastructure.

From a ministerial perspective, it is necessary to integrate a sustainability approach in the life cycle of MOP projects, with a comprehensive vision that incorporates financial and economic benefits associated with a reduced use of materials and improvements in the prevention of pollution and carbon emissions, among others. One of the actions to be implemented is to raise standards, through

bidding bases, contracts and terms of reference in line with these new requirements.

These criteria must be supported by a multipurpose infrastructure approach, encouraging innovation and incorporating quantitative and qualitative indicators to measure and monitor sustainability for greater transparency of the process, cost balance for users and provision of quality services.

For all this, the Directorate General of Public Works has initiated coordination activities between all the Directorates of the Ministry to generate a common language and to support both the strengthening of institutional capacity that includes the four areas of sustainability: social, environmental, economic and institutional; and to integrate cross-cutting institutional support with the aim that sustainable infrastructure issues are part of the work of the organisation, through a territorial approach that enhances them, with a definition of standards that make it possible to reduce inequalities and environmental impacts.

In this sense, this report allows us to highlight aspects to be improved in the implementation of sustainable infrastructure in the country.



Valeria Bruhn Cruz

Director General of Public Works
Ministry of Public Works of Chile



Foreword Prof. Dr. Edeltraud Guenther

Sustainability in infrastructure, or infrastructure systems that are developed, built, function, and decommissioned to align with economic, financial, social, environmental, and institutional sustainability, is a vital aspect to each of the 17 Sustainable Development Goals, and a topic that deserves widespread attention and investment. The Global Infrastructure Hub, however, has observed that the majority of investments are still allocated to ‘business as usual’ infrastructure. To that end, an inter-UN consultative process was initiated by the UN Environmental Management Group to determine the challenges to, and opportunities for more definite action on sustainable infrastructure in a specific country – in this case, that of Chile.

I am delighted to see this policy roadmap as the final, transferrable, product of the collaborative study to investigate the barriers to sustainable infrastructure in Chile.

This study considered three infrastructural sectors – those being energy, buildings, and mobility; the combination of which accounts for two-thirds of the world’s greenhouse gas emissions, and all of which are connected to high resource use. The most effective way to both investigate these sectors, and to explore the barriers to a country’s implementation of sustainable infrastructure is undoubtedly through talking to the stakeholders involved.

Fortunately for our research team, representatives from government, academia, industry, and local communities were very willing to share their views via interviews and to follow up on action planning in the workshop that culminated the study. We are also very grateful to have benefitted from the support and involvement of the Chilean Government. It is thanks to these actors that the team was able to identify challenges to, and opportunities for, sustainable infrastructure from those with a vested interest in, and first-person perspective of the national context of the study.

It is extremely encouraging to see the prominence of and consideration for the importance of the Resource Nexus interwoven throughout the study – to the extent of ‘water’ later becoming integrated as an important and worthy sector of the study. In viewing the barriers to Chilean sustainable infrastructure through a Resource Nexus lens – whereby the inter-relationships between resources are acknowledged – a holistic approach to tackling these challenges can be carried out, and sustainable solutions developed.

The policy options recommended in this roadmap further build upon the findings of the study – calling for a more thorough sustainability assessment across all stages of infrastructural planning processes, greater stakeholder engagement, and closer adherence to

the 10 Principles for Sustainable Infrastructure developed by UNEP. I am hopeful that this policy roadmap will provide both guidance and inspiration to aid other national governments in striving for sustainable infrastructure (although, of course, national contexts will always vary).

I am greatly encouraged by this collaboration between multiple United Nations entities, and for the highly valued support of both our partners at UNEP SIP and the Ministries of Chile;

I hope this will be the first of many future collaborations. Finally, I would like to express my appreciation to the dedicated team of researchers at UNU-FLORES, who always try to ‘walk the talk’ for sustainability.



Prof. Dr. Edeltraud Guenther

Director of United Nations University Institute for Integrated Management of Material Fluxes and of Resources



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Acknowledgments

United Nations University Institute for Integrated Management of Material Fluxes and of Resources: María de la Garza, Juliane Dziomla, Edeltraud Guenther, Lisa Junge, Denise Misleh

United Nations Environment Programme: Marco Bravo Arriagada, Ana Fernández Vergara, Dominic MacCormack, Beatriz Martins Carneiro, Rowan Palmer, Joseph Price, Himanshu Sharma, Farid Yaker

Chile, Ministry of Public Works: Ignacio Araya Areyuna, Mónica Baeza Condori, Jeannette Ulloa, Fabiola Zamora Calderón

Chile, Ministry of the Environment: Daniel Álvarez, Óscar Betanzo

Sincere thanks are also due to all the research and workshop participants, upon whose valuable insights and recommendations the policy roadmap is based.

The contributors gratefully acknowledge support from the United Nations Environment Management Group Secretariat, and financial support from the Swiss Federal Office for the Environment.



La Moneda Presidential Palace in Santiago, Chile

Source: Joseph Price /UNEP

List of acronyms and abbreviations

TERM	DEFINITION
ACERA	Chilean Association of Renewable Energies and Storage
ANID	National Agency for Research and Development
COMICIVYT	Interministerial Commission for City, Housing and Territory
CONADI	National Corporation for Indigenous Development
CORECIVYT	Regional Commission for City, Housing and Territory
DGOP	General Directorate of Public Works of the Ministry of Public Works
DIPRES	Budget Directorate
EPR	Extended Producer Responsibility
GORE	Regional Government
MIDESO	Ministry of Social Development and Family
Minagri	Ministry of Agriculture
MINVU	Ministry of Housing and Urbanism
MMA	Ministry of the Environment
MOP	Ministry of Public Works
MTT	Ministry of Transportation and Telecommunications
NCRE	Non-Conventional Renewable Energy
OECD	Organisation for Economic Co-operation and Development
PESTEL	Political, Economic, Social, Technological, Environmental and Legal
SDGs	Sustainable Development Goals
SEA	Environmental Assessment Service
SEGPRES	General Secretariat of the Presidency
SEREMIS	Regional Ministerial Secretariats
SI	Sustainable Infrastructure
SI Principles	International Good Practice Principles for Sustainable Infrastructure
SUBDERE	Undersecretariat for Regional and Administrative Development
TCO	Total Cost of Ownership
UNEA	UN Environment Assembly
UNEP	United Nations Environment Programme
UNU-FLORES	United Nations University Institute for Integrated Management of Material Fluxes and of Resources
URS	Regional Units



Introduction

Source: Joseph Price / UNEP

Wind turbines in Chile


1. Introduction

Despite significant progress, Chile – like many countries – faces complex barriers to implementing sustainable infrastructure. The country has achieved strong economic growth since the late 1980s, while reaching near universal access for basic services, such as electricity (Organisation for Economic Co-operation and Development [OECD] 2017). However, infrastructure deficits remain; for instance, there is a deficit of 7% for drinking water access (Government of Chile 2019). The government seeks to improve the sustainability, resilience and inclusivity of its infrastructure systems amid changing national and global circumstances. This document summarises barriers to sustainable infrastructure in Chile across buildings, energy, transport and mobility and water, before setting out context-specific policy options across sectors for potential systems-wide solutions.

Sustainable infrastructure systems are those that are planned, designed, constructed, operated and decommissioned in a manner that ensures economic and financial, social, environmental (including climate resilience) and institutional sustainability over the entire infrastructure life cycle (United Nations Environment Programme [UNEP] 2022). Infrastructure is linked to all 17 of the UN Sustainable Development Goals [UN SDGs], either directly or indi-

rectly influencing 92% of the 169 individual SDG targets (UN Office for Project Services 2018). To achieve systems-wide sustainability, governments can promote integrated and nexus approaches to infrastructure that is responsive to local contexts. Chile has established agendas and guidelines that help maintain a clear state vision for sustainability targets to be achieved by 2030, 2040 and 2050. For example, the Roadmap for a Circular Chile by 2040 (Chile, Ministry of the Environment [MMA] et al., 2021) highlights the need for more infrastructure that enables circular solutions at the territorial level, and the Ministry of Public Works [MOP] has launched a Sustainability Agenda. The latter aligns with the SDGs of the 2030 Agenda and the Paris Agreement, and seeks to address the challenges laid out in the current Programme of Government, such as: a just ecological transition; water scarcity; green public investment; adaptation to the climate crisis; human rights to water and sanitation, among others. However, persistent barriers still must be overcome to reach stated objectives and ensure alignment with international frameworks.

The fifth session of the UN Environment Assembly [UNEA] produced a clear call to action on infrastructure, through its adoption of a resolution on sustainable and resilient infrastructure



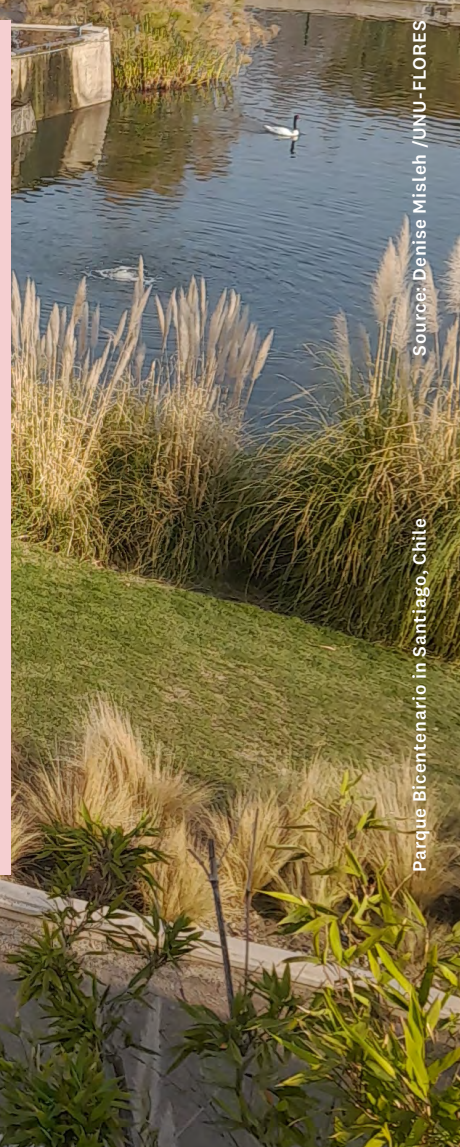
(UNEP/EA.5/Res.9). The resolution recognises the role of sustainable and resilient infrastructure for addressing the interconnected crises of climate change, biodiversity loss, pollution and desertification. It also encourages UN Member States to consider integrating and implementing the International Good Practice Principles for Sustainable Infrastructure (SI Principles) into national policies. The SI Principles cover 10 guiding principles that address all dimensions of sustainability for infrastructure planning and delivery, reflecting countries' good practices and priorities worldwide (UNEP 2022).

In this context, a sustainable infrastructure 'Barrier Analysis' in Chile was conceived out of a cross-UN Consultative Process through the UN Environment Management Group to explore challenges and opportunities related to the SI Principles in a specific country setting. Chile was selected as a pilot study for analysis, with its 11 diverse climatic regions; varied public infrastructure adapted to these regions; progress in regulatory quality and innovation climate; and commitment to improving the sustainability of its infrastructure. Buildings, energy, and transport and mobility represent infrastructure sectors with significant potential for sustainable development, but with sustainability challenges in Chile, together accounting for around 70% of greenhouse gas emissions (Richie and Roser 2018) and substantial consumption of natural resources. Water underpins these sectors as a cross-cutting resource, but an ongoing drought that has lasted over a decade threatens water

supply and needs increased policy attention.

This sustainable infrastructure roadmap is the product of a collaboration between UNEP, UN University Institute for Integrated Management of Material Fluxes and of Resources [UNU-FLORES] and the MOP of Chile. The project used UNU-FLORES' Barrier Analysis methodology, which was conducted in several stages during 2022, comprising: desk-based literature review, expert interviews, stakeholder workshops and a survey questionnaire. 27 individuals from government, industry, civil society, research and consulting were interviewed, while the survey generated 49 responses across the same groups of actors. The research process concluded with a workshop where participants co-created policy recommendations to overcome the barriers identified. These recommendations form the basis of the policy options presented in this document.

The roadmap first summarises the barriers uncovered, before detailing 10 policy options within three strategic axes: 1) Governing sustainable infrastructure, 2) Building capacity for sustainable infrastructure and 3) Mainstreaming sustainability in the infrastructure life cycle. The policy options aim to build on existing good practices in Chile and worldwide, and are mapped to the 10 SI Principles to help enable implementation as per the UNEA resolution. The roadmap concludes by offering some possible directions for strategic implementation and wider next steps.



Barriers

2. Barriers to delivering sustainable infrastructure

The Barrier Analysis identified over twenty barriers to the development of sustainable infrastructure systems in Chile. The barriers were initially classified according to the PESTEL (Political, Economic, Social, Technological, Environmental and Legal) typology which provided an overarching structure of the different types of barriers. However, sub-categories were developed inductively from the barriers identified

during the research (see Table 1), which allowed for a better understanding of overlaps and the composed nature of barriers. Likewise, it is worth noting that the complexity and interconnectedness of the barriers identified are better understood as a network of barriers to sustainable infrastructure. This section presents a summary of the most relevant barriers which orient the development of this policy roadmap.

Table 1. Classification of barriers, Chile

TYPE OF BARRIER	DESCRIPTION	BARRIERS RE-CLASSIFIED (EXACT FORM)
POLITICAL-ECONOMIC BARRIERS	Political coalitions might impede regulatory changes. Distributional conflicts that arise from new policies and excessive power of vested interests	<ul style="list-style-type: none"> • Concentration of economic power/excessive power of a group • Lobby from economic interests • Lack of incentives
POLITICAL-INSTITUTIONAL BARRIERS	Operational issues of formal institutions such as: inadequacies or lack of instruments, outdated logics and organisational culture, institutional inertia	<ul style="list-style-type: none"> • Outdated logics in the social evaluation methodologies • Transparency issues in decision-making and prioritisation of projects • Institutional inertia • Lack of operating instruments for sustainability (lack of definitions, standards) • Low level of innovation in project instruments (Terms of Reference, contracts, bids) • Logic of budget execution
GOVERNANCE-STATE CAPACITY BARRIERS	Issues regarding state capacity for policy design and implementation, planning, regulations, multi-level and intersectoral coordination	<ul style="list-style-type: none"> • Reduced capacity for long-term integrated planning • Lack of intersectoral coordination • Lack of multilevel coordination

POLITICAL BARRIERS	Lack of political mandate, leadership, political conflict, issues of legitimacy and characteristics of the political system	<ul style="list-style-type: none"> • Political cycles/political interference • Lack of political mandate/lack of political will • Legitimacy problem
ECONOMIC BARRIERS	Limited availability of resources and budget constraints	<ul style="list-style-type: none"> • Lack of resources
SOCIO-INSTITUTIONAL BARRIERS	Lack of opportunities for social participation that arise from institutional design; lack of bottom-up approaches	<ul style="list-style-type: none"> • Participatory deficit • Ineffective mechanisms of social prioritisation reinforce structural inequality • Lack of civic education/communication problem
SOCIAL BARRIERS	Attitudes toward change and lack of awareness	<ul style="list-style-type: none"> • Low level of awareness
SOCIO-POLITICAL BARRIERS	Social conflicts, issues of empowerment	<ul style="list-style-type: none"> • Social conflict/disputes
SOCIO-TECHNICAL	Problems that arise from the relationship between people and technical and technological development	<ul style="list-style-type: none"> • Low level of technical capacity • Lack of data/low accessibility • Engineer bias/lack of training for sustainability

Sidenote: The full details of different parts of the Barrier Analysis are available upon request



Museographic Room in Caleta Chañaral de Aceituno, Chile

Source: Joseph Price / UNEP

The political-institutional category has significantly more barriers than other categories, which reflects the internal challenges within government administration to implement a more sustainable paradigm for infrastructure. Political, political-institutional, and governance-state capacity barriers signify the need for directing a transition towards sustainability and the challenges that arise from it. The main obstacles for achieving sustainable infrastructure stem from the path dependency and institutional lock-in created by the predominantly growth-oriented paradigm of the past decades. However, planning infrastructure development to meet the sole objective of economic growth is insufficient for achieving newer and more diverse objectives, such as those of the SDGs and the Paris Agreement.

Path dependency is a self-reinforcing process by which each step along a given path increases the likelihood of further steps in the same direction (Pierson 2000), which explains “resilience and persistence of public policies in the face of intentional reform” (Torfing 2009). To that end, the research found that progress on sustainable infrastructure is hampered by existing instruments including the metrics, logics,

and evaluations of projects that do not incorporate sustainability and resilience criteria comprehensively. Sustainability, as an emerging paradigm, requires a new form of governmental coordination, mechanisms for resource allocation, and instruments relevant to an integrated system of infrastructure. The institutional lock-in appeared throughout the study as different barriers such as ‘institutional inertia’, a ‘lack of operating instruments’, ‘the rationale of budget execution’, and ‘the outdated logic of social evaluation of projects.’

The three barriers that were most frequently mentioned across stakeholder groups were: ‘reduced capacity for long-term integrated planning’, ‘outdated logic in the methodologies of social evaluation’, and a ‘lack of intersectoral coordination’ (see Table 2). These barriers are most pertinent due to their comprehensiveness and interconnection with other barriers. As a result, they have an impact on the implementation of several of the SI Principles (Table 3). In this section, a summary of the most relevant barriers identified and their interconnection to the SI Principles is presented to highlight the main areas that require attention in this policy roadmap.

Table 2. Most frequently mentioned barriers to sustainable infrastructure, Chile

RANKING	BARRIER	TYPE OF BARRIER
1	Reduced capacity for of long-term integrated planning	Governance-state capacity
2	Outdated logics in the social evaluation methodologies	Political-institutional
3	Lack of intersectoral coordination	Governance-state capacity
4	Political cycles / political interference	Political
5	Lack of political mandate / lack of political will	Political
6	Transparency issues in decision-making and prioritisation of projects	Political-institutional
7	Institutional inertia	Political-institutional
8	Participatory deficit	Socio-institutional
9	Lack of resources	Economic barriers
10	Engineer bias / lack of training for sustainability	Social-technical
10	Lack of operating instruments for sustainability (lack of definitions, standards)	Political-institutional
11	Concentration of economic power / excessive power of a group	Political-economic
12	Ineffective mechanisms of social prioritisation reinforce structural inequality	Socio-institutional
13	Lack of multilevel coordination	Governance-state capacity
14	Lobby from economic interests	Political-economic
14	Low level of innovation in project instruments (Terms of Reference, contracts, bids)	Political-institutional
15	Lack of data/low accessibility	Socio-technical
16	Social conflict/disputes	Socio-political
17	Lack of incentives	Political-economic
17	Lack of civic education / communication problem	Socio-institutional
17	Low level of technical capacity	Socio-technical
18	Logic of budget execution	Political-institutional
19	Legitimacy problem	Political
20	Low level of awareness	Social

Note: based on 49 survey responses and 27 interviews

The reduced capacity of the Chilean state for long-term integrated planning is closely connected to the growth-oriented paradigm which favoured economic deregulation and a reduced role of the state, while also giving a central role to private initiatives in the delivery of infrastructure. This legacy affects state capacity for effective planning, which is needed for overcoming current sectoral management and institutional dispersion in infrastructure provision. In practice, long-term planning instruments do exist, and the MOP Planning Directorate has elaborated national, sectoral and regional plans to this end. However, this barrier points to the institutional constraints for implementing those plans, due to limited resources, tools and effective authority. The overarching nature of this barrier also includes the lack of coordinated action among sectors, the lack of a broad territorial perspective and reduced ability to integrate private initiatives into state planning.

Research participants mentioned the need for a strategic planning unit as a means of integrating the sectoral work on sustainable infrastructure; taking advantage of territorial synergies and cumulative effects; and strengthening a technical approach that extends beyond the dynamics of political cycles (policy option 1). This barrier mainly affects the progression of Principle 1 (Strategic planning) and Principle 3 (Comprehensive life cycle assessment of sustainability).

The outdated logic of the social evaluation

methodology of projects also featured prominently, as it is considered one of the main barriers to innovating and establishing a sustainability approach. The Ministry of Social Development and Family (MIDESO) assesses investment projects largely based on cost-benefits and cost-efficiency models; the main guiding principle is the efficient use of public resources, which is important for fiscal sustainability (Principle 8: Fiscal sustainability and innovative financing). However, reducing value for money to financial cost assessments is still anchored in values of short-term economic growth as a primary objective, rather than long term sustainable development. Moreover, current methodologies do not evaluate social and environmental benefits of infrastructure projects. Therefore, the criticism of this latter approach is based on the perception that any attempt to integrate sustainability criteria in the formulation of a project will result in increased financial costs and therefore risk the approval of the overall project. The need for reform has been recognised by different government ministries, including MIDESO, which is responsible for developing the methodologies. However, despite a strong interest in promoting sustainability, they face limited human and financial resources to implement the reform needed.

The current logic was found to discourage the development of particular types of sustainable infrastructure, such as sustainable mobility sys-

tems and natural infrastructure¹. The current approach was also found to be insufficient in terms of creating a more responsive infrastructure system, as its logic is based on current demands and economic valuations; it cannot easily adapt to changing demands and the new risks that can emerge in the context of the triple planetary crisis of climate, nature, and pollution. In fact, it can only respond to risks once they are problems with measurable effects, which is less effective and more expensive in the long-term. Therefore, this barrier mainly affects Principle 4 (Avoiding environmental impacts and investing in nature), as well as Principle 2 (Responsive, resilient, and flexible service provision), as the system is less adaptable to change.

The third most frequently mentioned barrier, lack of intersectoral coordination, was expressed as an outcome of the siloed nature of government administration. Current governance structures and processes do not sufficiently account for the interdependencies across key infrastructure sectors with an integrated perspective. Moreover, some of these sectors are divided across several institutions, creating institutional dispersion – the most paradigmatic in the case of Chile is the dispersion in water

governance, for which there are over 40 public and private institutions responsible (OECD 2012, 2017). However, transport and mobility also face a similar situation.

The lack of intersectoral coordination, as highlighted, closely relates to the challenges for integrated planning. In concrete terms, the lack of intersectoral coordination manifests such that each ministry has its own planning process, which can neglect potential synergies in the investments and projects in the territories. This relates to Principle 3 (Comprehensive life cycle assessment of sustainability), which aims to consider the cumulative impacts of multiple interconnected infrastructure systems and projects. However, the lack of coordination creates additional barriers, such as duplicity of functions and roles inside the government, and low levels of data accessibility and sharing between different ministries – all of which affect Principle 1 (Strategic planning) and Principle 10 (Evidence-based decision-making). Even so, the lack of coordination was articulated by some participants as a reluctance to devolve power and de-concentrate functions. This would entail a reorganisation of roles and a redistribution of responsibilities, which might require consigning functions traditionally executed by one ministry to

¹ The research found some specific cases of sustainable infrastructure being discouraged by the social evaluation methodology, such as obtaining approval for bike lanes and integrating elements of natural infrastructure in roads and buildings. In the first case, the current road methodologies imply that the benefits of projects are determined by the reduction in travel times, hence the speed at which cars travel. Although the methodology aims to value other benefits related to health and reduced environmental pollution, it is still based on the monetary valuation of reduced travel times. At the same time, the methodology is still based on current demand rather than projected demand which complicates further making the case for the benefits of building bike lanes. This is also the case for integrating nature-based solutions, such as green corridors, into road infrastructure. The methodology does not consider the socio-ecological benefits associated with biodiversity, and hence including such elements in the project could be perceived as increasing the overall cost of the project. Rationalising the benefits of this type of infrastructure requires data showing the problem that natural infrastructure aims to solve. Hence, it can only be addressed once it has become a quantifiable problem, which characterises the low responsiveness of the system to newer risks and demands.

another entity. This reluctance might be understood as institutional inertia in the sense that institutions and individuals resist changes. However, this also affects the multi-level coordination and the transfer of sectoral functions to more territorial entities such as regional and local governments, which the research found to be key for Principle 6 (Equity, inclusiveness, and empowerment).

Although most barriers pointed to the need for institutional reform and governance mechanisms for steering a sustainable transition in infrastructure, other barriers specifically reflected socio-political and socio-institutional issues. Socio-institutional barriers highlight obstacles within institutional frameworks for overcoming social problems such as a 'participatory deficit', 'ineffective mechanisms of social prioritisation' and 'lack of civic education/communication problem'. Overcoming these barriers would create opportunities for more effective participation, for improving access to infrastructure and for socialising the relevance of sustainable infrastructure in society.

These barriers are better understood as interconnected issues pertaining to the social dimension of infrastructure projects. Fundamentally, a participatory deficit was uniformly identified across stakeholder groups and - although Chile has made progress in this matter by institutionalising participatory mechanisms, for example through the Environmental Assessment Service (SEA) - there is still space for more effective and timely forms of participation with the public. The lack of bottom-up participatory processes deterritorialises

state action and tends to increase centralism in decision-making (Araya Areyuna 2019). Relatedly, research participants mentioned the possibility of developing a bottom-up approach for identifying infrastructure needs in the territories, as a way of assuring the relevance of the projects to communities, advancing Principle 2 (Responsive, resilient, and flexible service provision) and Principle 9 (Transparent, inclusive and participatory decision-making). This would also help to reduce conflicts in the later stages of the projects' life cycle. Therefore, socio-institutional barriers are linked to socio-political problems like 'social conflicts/disputes' over infrastructure projects.











Socio-political conflicts are also connected to issues of legitimacy, a political barrier, which contributes to the social tensions that may arise in the development of infrastructure. Participants identified problems of legitimacy in the current system of investment associated with the 'lack of transparency in decision-making and prioritisation of projects.' The lack of transparency produces doubts regarding the mechanisms and the role of vested interests in the allocation of resources and prioritisation of projects. The indirect influences from private or non-governmental political and economic actors were found to create dissonance between the long-term plans of institutions and the mechanisms for allocating resources to public infrastructure projects. This barrier impacts the progression of Principle 6 (Equity, inclusiveness, and empowerment) and Principle 9 (Transparent, inclusive, and participatory decision-making).

Political-economic barriers were also identified, such as the role of vested interests, specifically when there is a ‘concentration of economic power/excessive power of a group’, which can prevent reforms toward sustainable infrastructure. The research also found a ‘lack of incentives’ blocking sustainable innovations. Incentives play a key role in strategically managing a coalition of supporters to allow for more

rapid adoption of technologies and operational changes towards sustainable infrastructure.

The Barrier Analysis has proven instrumental for identifying areas for improvement, as defined by research participants, on which public policy can focus for advancing a system of sustainable infrastructure in Chile.

Table 3. Chile barriers as related to the International Good Practice Principles for Sustainable Infrastructure

SI PRINCIPLES	MOST RELEVANT BARRIERS
 1. STRATEGIC PLANNING	Reduced capacity for long-term integrated planning
 2. RESPONSIVE, RESILIENT, AND FLEXIBLE SERVICE PROVISION	Outdated logics in the social evaluation methodologies; political cycles; lobby from economic interests; transparency issues in decision-making and prioritisation of projects; lack of flexibility in rules and norms
 3. COMPREHENSIVE LIFE CYCLE ASSESSMENT OF SUSTAINABILITY	Reduced capacity for long-term integrated planning, lack of intersectoral coordination; outdated logics in the social evaluation methodologies
 4. AVOIDING ENVIRONMENTAL IMPACTS AND INVESTING IN NATURE	Outdated logics in the social evaluation methodologies; engineer bias/lack of training for sustainability
 5. RESOURCE EFFICIENCY AND CIRCULARITY	Lack of flexibility in rules and norms; low levels of innovation in project instruments
 6. EQUITY, INCLUSIVENESS, AND EMPOWERMENT	Participatory deficit; Ineffective mechanisms of social prioritisation; social conflict/disputes; low levels of technical capacity (among local governments as project formulators)
 7. ENHANCING ECONOMIC BENEFITS	Concentration of economic power; excessive power of a group
 8. FISCAL SUSTAINABILITY AND INNOVATIVE FINANCING	Lack of incentives (for integrating sustainability requirements)
 9. TRANSPARENT, INCLUSIVE AND PARTICIPATORY DECISION-MAKING	Participatory deficit; transparency issues in decision-making and prioritisation
 10. EVIDENCE-BASED DECISION-MAKING	Lack of resources (especially for overseeing roles and studies producing new data); lack of data/low accessibility



Two unknown persons riding a electric scooter on bikeway in La Serena, Chile

Source: Oscargutzo /stock.adobe.com

2.1 Barriers to sustainable infrastructure in the sectors:

Buildings

In Chile, urban development is highly deregulated as the market plays a central role in defining urban space as part of long-standing neoliberal urban policies (Navarrete-Hernandez and Toro 2019). Two regulatory issues arose related to governance and state capacity affecting the development of sustainable infrastructure in the buildings sector. First, the General Urbanism and Construction law that contains the principles and norms governing actors involved in the sector was deemed insufficient for strengthening state capacity for urban planning. It was also mentioned that the law is outdated, as it does not explicitly integrate sustainability considerations. Second, land-use instruments at the regional level have historically been of an indicative character only, which has also left a void regarding planning instruments for rural areas. However, a series of reforms aiming to promote de-centralisation of the country (law 21.074) have introduced binding guidelines on the development and land use at a regional scale, and for guiding the system of human settlements.

This could solve remaining issues and ambiguities regarding hierarchy and interconnectedness of planning instruments in rural areas.

There have been advancements in this matter with the elaboration of Strategic Environmental Assessment, and the law 21.074 that strengthens the regionalisation of the country. However, the limited capacity of the state for planning also relates to the perception that real estate actors and private developers are too connected to the political sphere, holding the power to block changes that may affect their interests and operations. In general, the buildings sector is described as having a low level of awareness of the relevance of promoting sustainability requirements in its operations. However, this is due to the current inability of the market in rewarding more sustainable practices in the sector. Therefore, there is a need to introduce financial incentives to integrate sustainability variables to drive innovation in the sector.

Table 4. Barriers in the buildings sector, Chile

MAIN BARRIERS	TYPE OF BARRIER
Economic concentration/excessive power	Political-economic
Lack of long-term integrated planning	Governance-state capacity
lack of regulation or liberal regulation (not strict)	Governance-state capacity
Lack of awareness (industry)	Social
Lack of incentives	Political-economic



Ciudad, Temuco, Valle, Cerros

Source: EduSalgado /stock.adobe.com

Energy

The energy sector has undergone rapid changes in relation to advocating for non-conventional renewable energy (NCRE), particularly solar and wind power. The share of renewables in the production of energy has increased from 6% to 31% during the past 10 years (Chilean Association of Renewable Energies and Storage (ACERA) 2022). The current government has also been promoting the development of green hydrogen, for example through the creation of the inter-ministerial committee for green hydrogen). For this sector, it is evident that electricity companies have changed their business strategies and now play important roles as investors in these new sources. The sector has been stimulated by a change in regulations that established minimum quotas for renewables for the companies. However, the sector exceeded the policy goals stated – those being 20% of renewables sources by 2020 (20/20) (Von Hatzfeldt 2013).

Nevertheless, regulatory frameworks and economic incentives are needed to support the technological developments that are emerging in the field of NCRE, such as supporting the development of geothermal or tidal energy. Through such measures, these other innovative sources of energy can become more cost-effective. The rapid technological development and adoption in the sector presents a challenge with regard to policy development. However, new regulations should be clear from the early stages to avoid regulatory uncertainty. Participants

mentioned that there is room for stricter environmental regulation, as long as there is clarity.

Addressing infrastructure in the energy sector is critical, as this sector has often been associated with large infrastructure projects that pollute and have a broad spatial distribution of negative impacts, thus creating conflict. Hydropower energy, a conventional renewable source of energy, is a sensitive matter for those indigenous populations with sacred relationships with their rivers. Therefore, the rapid development of NCRE is an important opportunity for the country, due to the lack of fossil fuels sources and the possibility to create an energy system with better capability for distribution across territories, and with less environmental impacts. However, it is worth noting that new agglomerations of NCRE have already been emerging. Strategic spatial planning is required to avoid the cumulative impacts of large-scale energy projects in the territories.

In addition, the sector requires a comprehensive life cycle assessment of sustainability (Principle 3). Solar panels and wind turbines have a life span of approximately 20 - 25 years, so the government should consider measures for disposal once this infrastructure life cycle has ended while also observing the materials used for manufacturing. Energy infrastructures are developed by private companies but should nevertheless be integrated into a strategic infrastructure plan across sectors.

Data availability and homologation is a pressing issue in the sector. There is a lack of consolidated data, as data is found in different sources within government and can even contain discrepancies. This is creating problems for accessing ‘official’ data which – in turn – produces complications for developing projects and research in the sector.

A final issue that was highlighted is the need to communicate sustainable transitions to wider

society. If this does not happen there will be resistance to changes, even if they are positive in terms of moving to a more clean and sustainable energy system. For example, there is a need to better communicate the environmental harms of firewood, an extended source for domestic heating in the south of Chile. Likewise, the plan to remove coal-fired plants needs to be conducted closely with the communities that have created a livelihood around the plants.

Table 5. Barriers in the energy sector, Chile

MAIN BARRIERS	TYPE OF BARRIER
Reduced capacity for long-term integrated planning	Governance-state capacity
Lack of intersectoral coordination	Governance-state capacity
Lack of data/low accessibility	Socio-technical
Economic concentration/excessive power	Political-economic
Regulatory uncertainty	Governance-state capacity
Low level of civic education/communication problem	Socio-institutional



Solar Energy Photovoltaic Power Plant over Atacama desert sands, Chile

Source: abriendomundo /stock.adobe.com

Transport and mobility

Transport and mobility as a sector requires strengthened inter-modality in Chile to provide alternatives to fossil fuel-powered vehicles and improve broader sustainability and connectivity - both at the national scale and within urban areas. The challenge is that the promotion of other means of transportation to move goods across the country would disrupt a current dependency on inland road transport, mainly via trucks. The power currently wielded by the trucking guild, however, forms a clear barrier to promoting multimodality, as many transport companies fear negative effects on their business. This is a highly delicate political situation, as a trucking strike could be highly damaging to the economy.

The government has announced a plan to endorse 10 rail projects across the country, and many interview participants confirmed the country's need for this investment when asked about investment priorities for sustainable infrastructure. The initiating of railway projects by MOP would herald a milestone, as transport infrastructure development to date has mainly focused on highways. The public - private partnership for highways has been prioritised in recent years. Therefore, the challenge now is to redirect incentives to promote other modalities, while addressing both passenger and cargo demand.

At the city level, there is a strong commitment to support more sustainable mobility through the

inverted pyramid model, which prioritizes pedestrians, then bikes, public transport, and lastly cars. However, a key barrier for carrying this to practice is the use of outdated social evaluation methodologies. The indicators that are currently used for mobility projects are based on flow, journey times, and fuel usage, which shows a strong car bias. This poses a concrete problem for promoting the usage of bicycles. Moreover, the methodology does not include the projected demand, so formulators must prove the current number of beneficiaries when there is no infrastructure for cycling. However, this methodology appears to be changing to include a wider range of socio-environmental benefits for cycling.

Another relevant barrier for this sector is the institutional dispersion and lack of coordination between institutions. The different modes of transport are based in different ministries. The Ministry of Transportation and Telecommunications (MTT) does not play a coordinating or planning role for the whole sector; its powers are more normative and operative. For example, there is currently no mandate for building bike lanes; most have been built by municipalities, resulting in poor systems integration at a city scale. Hence, while there might be resources for building the committed lanes by the government, participants doubt that this would be achievable because there is a lack of clarity regarding which institution would have the mandate.

Table 6. Barriers in the transport and mobility sector, Chile

MAIN BARRIERS	TYPE OF BARRIER
Lack of intersectoral coordination (institutional dispersion)	Governance-state capacity
Outdated logics in the social evaluation methodologies	Political-institutional
Lack of incentives (redistribution of incentives for inter-modality)	Political-economic
Economic concentration/excessive power	Political-economic
Lack of flexibility in regulations	Governance-state capacity
Social inequality (Santiago vs the regions)	Socio-institutional
Bureaucracy	Political-institutional



A Transantiago public transport bus in downtown Santiago, Chile

Source: Cristian Villalobos /stock.adobe.com

Water

Water is a resource that has been the topic of major political discussions in Chile, given the prolonged drought that the country has experienced. In general, the Chilean economy is highly water dependent. For example, the agroforestry sector alone accounts for nearly 60% of water consumption (Induambiente 2020). Consequently, the ongoing drought brings a new challenge in that a system must be created to adapt to water scarcity – this necessitates both innovation and a change in priorities². The study found a need for further investments in water infrastructure. Aside from drought and water scarcity, there is also the oft-neglected issue of inefficiencies in water use. Although human consumption of the resource accounts only for 8% (MOP 2016), there is a need to make cities more resilient and capable of adapting to climate change. Leak-related water loss estimates reach 30%, and 50% in some acute areas. The renewal of water pipes to reduce current levels of leakages requires major investment. The services for water sanitation are also monopolised by a few companies, with profit levels established by law, and with no current incentives to improve services provided or to maintain infrastructure.

This sector is facing many barriers, the first of which is the institutional dispersion of water governance, with over 40 institutions (both private and public) responsible for managing the resource. This dispersion creates issues for integral management, as well as governance. There is a lack of a strong coordinating and regulatory body to more effectively regulate private entities. The privatisation of water in Chile has been at the core of social conflicts in the country. Currently, the regulation supports mercantilism by granting water rights in perpetuity. The actors with substantial water rights also hold excessive power, and the ability to block changes that counter their interests. The sector faces allegations of water theft and corruption. Power imbalances also create issues of legitimacy towards public and private institutions involved in the provision of services related to water. The allocation of water rights must be better defined and more transparent in order to advance an effective water registry that enables effective resource management. Currently, there is a lack of reliable information regarding a complete cadastre of water rights.

² For example, the reutilisation and treatment of ‘grey waters’ is critical. A change in sanitary regulation to allow watering parks and green areas with treated grey water is ongoing, but not yet complete or implemented. This means that green areas are being watered with water suitable for human consumption in a context of water scarcity.

Table 7. Barriers in the water sector, Chile

MAIN BARRIERS	TYPE OF BARRIER
Lack of data (lack of registry)	Socio-technical
Legal barrier (water code)	Governance-state capacity
Concentration/excessive power of a group	Political-economic
Social conflict (water theft allegations)	Socio-political
Lack of intersectoral coordination (institutional dispersion)	Governance-state capacity



View of the Mapocho river, Santiago de Chile

Source: Denise Misleh /UNU-FLORES



Policy roadmap

Source: Alberto Pinto / stock.adobe.com

Volcan in Chile

3. Policy roadmap

The 10 policy options presented below respond to the barriers discussed, detailing different types of potential cross-sectoral solutions to overcome them. The policy options are organised around three strategic axes, which together allow for advancing more enabling institutional arrangements, capacities and instruments for delivering sustainable infrastructure. The 10 policy options do not seek to be prescriptive, but contain potential actions and time frames for consideration.

Strategic axis 1 ‘Governing sustainable infrastructure’ addresses current limitations for long-term integrated planning, which requires new or updated institutional arrangements for

governing a sustainable infrastructure system throughout the infrastructure life cycle. This axis aims to promote intersectoral and multi-level coordination, while ensuring alignment between different planning instruments within government institutions. Strategic axis 2, ‘Building capacities for sustainable infrastructure’, aims to address limited capacities, especially at subnational levels but also in specific topics that are relevant for sustainable infrastructure, such as nature-based solutions. Finally, strategic axis 3, ‘mainstreaming sustainability in the infrastructure lifecycle’, points to modifications to operational instruments that allow integrating sustainability considerations in the life cycle of infrastructure projects.

Strategic axis 1: Governing sustainable infrastructure

To guide the transition towards a system of sustainable infrastructure, new institutional arrangements may be needed. The Barrier Analysis identified issues around long-term integrated planning and intersectoral coordination

to be main barriers for sustainable infrastructure. Both barriers are intertwined and together they concern the state’s capacity to strategically plan and govern the development of sustainable infrastructure.



Policy Option 1: Strategic planning unit³

The Planning Directorate of MOP has recently strengthened efforts to plan sustainable infrastructure for the sectors within its mandate (transport, water and public buildings). It coordinates planning processes within MOP and, to a degree, with other institutions. However, it does not have all the resources to plan and ensure implementation.

Building on existing efforts, a comprehensive coordinating and planning unit for infrastructure would help address different systemic barriers as an overarching solution that could enable many of the other policy options. Cross-sectoral and cross-governmental strategic planning is central to the implementation of the SI Principles, in particular Principle 1: Strategic planning. A dedicated unit, placed in central government, could address issues of multilevel and intersectoral coordination. Its

mandate could focus on ensuring the coherence of infrastructure plans across relevant sectors in alignment with the policy agendas of the government and international commitments. The coordinating entity could play a central role in advancing a technical and transparent approach, with independence and capacity to articulate a national agenda. Research participants identified that the Interministerial Commission for City, Housing and Territory (COMICIVYT) could play this strategic role, although it would require increased institutional capacity and independence.

A pragmatic alternative for this policy option is to strengthen, or transfer, the existing Planning Directorate of MOP - with increased financial and human resources to expand its mandate and ability to coordinate across ministries and sectors.

Type of policy	Institutional reform/intersectoral coordination
Actions required	Design an appropriate institutional structure (institutional dependency and accountability; enforcement power of its acts and decisions, scope of functions); identify appropriate source of funding; ensure sufficient financial and human resources to perform functions
Key institutions	General Secretariat of the Presidency (SEGPRES), MOP, Ministry of Housing and Urbanism (MINVU), MTT, Budget Directorate (DIPRES), Regional Government (GORE), Ministry of Finance, Ministry of Energy, COMICIVYT/Regional Commission for City, Housing and Territory (CORECIVYT)
Government level	Central; regional
Time frame	Medium-term; long-term

³ The experience of Saint Lucia can provide inspiration for this policy option, including with regard to specific institutional arrangements (UNEP 2021a).



Policy Option 2: Enhanced participatory mechanism for territorial infrastructure planning

Participatory deficits and social disputes are key socio-political barriers to the development of more sustainable infrastructure. Some effective participatory mechanisms exist at the project-level, and are being carefully elaborated in MOP's newly initiated Infrastructure Masterplan. However, to date, there has been a perceived lack of transparency during infrastructure planning and investment decision-making in particular, with persistent problems in integrating local needs into a national investment plan. This can hinder the implementation of Principle 9 of the SI Principles: Transparent, inclusive, and participatory decision-making.

Existing mechanisms are not fully used across the whole life cycle and across all sectors, and more local preferences can be diluted by the centralised nature of the annual national budget event. This policy option suggests a bottom-up participatory approach, including through Regional Planning Directors, to define investment needs in

the territories. An enhanced participatory mechanism should first focus on including more diverse actors in a 'territorial diagnosis' during early government planning phases, as conceived for the Infrastructure Masterplan, with a special focus on addressing the views of indigenous populations. The frequency of the early participation process must also be decided in consultation with local stakeholders. Information regarding sustainable infrastructure objectives should be disclosed upfront, along with baseline data, in ways that are accessible to all stakeholder groups, including indigenous communities and other groups that may not have easy access to information.

Other sectoral or ministerial bottom-up experiences could serve as the basis to develop more participatory investment plans across multiple sectors. For example, MINVU has a Strategic Investment and Resource Management Plan that is employed to integrate regional needs prior to presenting the sectoral budget.

Type of policy	Participatory mechanism/decentralisation
Actions required	<ul style="list-style-type: none"> • Enhance early participatory mechanism for assessing territorial needs • Decide the frequency of early participation process • Improve methodology for requesting and approving funds • Elaborate the Infrastructure Masterplan
Key institutions	MINVU, MOP, MTT, Ministry of Energy, regional and local governments, Regional Ministerial Secretariats (SEREMIS), National Corporation for Indigenous Development (CONADI)
Government level	Central; regional; local
Time frame	Medium-term; long-term



Policy Option 3: Enhanced use of the Strategic Environmental Assessment tool for sustainable infrastructure policies and plans

The Strategic Environmental Assessment process allows for the early integration of environmental assessments within public policies and plans, which supports planners to make decisions about the trade-offs between environmental and economic outcomes. This tool is relevant for the assessment of the overall impact of infrastructure projects in the territories of Chile, and to avoid the negative effects of limited sectoral coordination. Its application is currently mandatory for the design of a limited number of instruments according to the law 19.300, whilst its facultative use can have a far-reaching scope.

The use of this tool could be broadened and mainstreamed, without legal reform, to be applied during the design of many other relevant instruments. However, for expanding its use, the voluntary Strategic Environmental Assessment

needs to be simplified and made less bureaucratic. Furthermore, its general formulation in legal instruments enables the integration of other factors of environmental sustainability, such as biodiversity and ecosystem services.

To facilitate an enhanced use of Strategic Environmental Assessments, an institutional approach for promotion and mainstreaming could incentivise its enforcement and implementation, positively impacting key infrastructure decision-making. While this would likely require increased administrative capacity, it would further improve territorial planning in the development of sustainable infrastructure, accounting for cumulative impacts in territories and improving synergies at the wider landscape-scale (as per Principle 3 of the SI Principles: Comprehensive life cycle assessment of sustainability).

Type of policy	Territorial planning/enhanced use of decision-support tools
Actions required	Ensure institutional buy-ins; offer training for key policymakers; raise awareness
Key institutions	Council of Ministers for Sustainability, MMA, MOP, MINVU, MIDESO, SEA, representatives from academia
Government level	Central
Time frame	Medium-term



Policy Option 4: Task Force on regulatory changes for promoting circularity in infrastructure systems

A key barrier to the advancement of more circular infrastructure systems and a broader circular economy is the lack of regulatory flexibility – affecting both government and private actors. To address this, a dedicated Task Force could be charged with analysing the regulatory barriers that currently obstruct or disincentivise the proper reuse and revalorisation of materials and resources, with close reference to the Roadmap for a Circular Chile by 2050. Such a Task Force could be located within MMA’s Circular Economy Office, as its work would be

closely related to the Extended Producer Responsibility (EPR) law to promote waste reduction and recycling. However, close collaboration with SEGPRES and MOP would be important to drive the required regulatory changes.

This policy option correlates with Principle 5 of the SI Principles: Resource efficiency and circularity, and is especially relevant to built infrastructure across sectors, the life cycle of energy infrastructure assets and the high recorded water losses.

Type of policy	Regulatory changes
Actions required	Data collection for key sectoral barriers; develop an alliance between the Task Force and SEGPRES/other relevant institutions to coordinate regulatory changes
Key institutions involved	MMA, MOP, SEGPRES, in collaboration with sectoral ministries
Government level	Central; regional; local
Time frame	Short-term



United Nations buildings in Santiago de Chile

Source: Denise Misleh /UNU-FLORES

Strategic axis 2: Building capacities for sustainable infrastructure

The Barrier Analysis identified that a lack of sub-national capacities to plan and deliver infrastructure contributes to inequitable access to infrastructure services in different regions of the country. Local governments also struggle to obtain the funds needed to finance in-

frastructure projects. The National Investment System has not been effective in reducing the territorial inequality in the country. Measures are needed for a more equitable access to infrastructure, which is key for social inclusion as stated by Principle 6 of the SI Principles.

Policy Option 5: Local infrastructure support unit and accessible funding systems



A dedicated local Infrastructure support unit could assist subnational governments in the design and implementation of infrastructure projects. Recent modifications have created a ‘Division of Infrastructure and Transport’ within regional governments that require strengthening in terms of resources and mandate. The modifications constitute an opportunity for decentralising and deconcentrating institutional roles towards the regional level. However, despite this advancement at the regional level, the lack of technical capacities for project design among subnational governments poses a significant barrier for more equitable access to infrastructure services. This policy option aims to address the current discrepancy in capacities and resources between municipalities that has perpetuated unequal access to infrastructure, and hence hinders the implementation of the SI Principles, specifically Principle 6: Equity, inclusiveness, and empowerment.

This unit could be created under the arm of the Undersecretariat for Regional and Administrative Development (SUBDERE), in line with its institutional mission of decentralisation and supporting the work of subnational levels. Participants recognised the role that SUBDERE could play in this regard, as currently the regional units (URS) at SUBDERE review the projects formulated by the municipalities. However, this policy option points to a more active role of URS in formulating the projects together with the municipalities to make up for the lack of technical capacities at the local level.

Subnational governments often face budgetary challenges to finance infrastructure projects. In the face of limited resources, local governments must request funding from the central government on a competitive basis. This requires local governments to design projects tailored to the funds for which they are applying,

rather than designing them to meet specific local needs, which risks leaving local infrastructure needs unfulfilled and limits regional integration. The Local Infrastructure Support Unit could provide assistance in formulating projects at the local level, independent of the entity to which the project is submitted, so that it has a role in improving access to resources and funds for the municipalities.

At the same time, funding entities in central government should consider simplified processes to accommodate municipalities with limited resources and technical capacities, with the aim of levelling opportunities. Currently, application processes are considered burdensome and increase the duration of an already long process.

Type of policy	Enhanced capacities/institutional reform
Actions required	Decide the most appropriate institutional arrangement; identify appropriate source of funding for the unit; survey capacity gaps; simplify processes
Key institutions involved	SUBDERE, MIDESO, DIPRES, GORE, Municipalities
Government level	Central; regional; local
Time frame	Medium-term



Policy Option 6: Sustainable infrastructure technical advisory services

This policy option seeks to promote the deployment of sustainable infrastructure solutions, including nature-based solutions, among the different ministries and local actors that execute infrastructure projects. It would address the barriers of lack of training for sustainability, low level of technical capacity and low level of awareness. Advisory services for evaluating and formulating sustainable infrastructure projects could be delivered in a partnership between MMA, MOP and sectoral ministries, as well as academic institutions and international partners.

This policy requires clear guidelines for the identification, planning, implementation and monitoring of different forms of sustainable

infrastructure. To achieve this, sectoral ministries would need to align their policy and operational instruments, down to the level of investment projects.

For delivering this service, increased financial and human resources may be needed within MMA. Technical assistance from international partners may also be required. Along with building internal technical capacities, the policy could include more general raising of awareness among local actors on the role that nature-based solutions can play in complementing or replacing built infrastructure. In particular, it could support implementation of Principle 4 of the SI Principles: Avoiding Environmental impacts and investing in nature.

Type of policy	Capacity building; information provision
Actions required	Establish pool of experts on sustainable infrastructure and identify where gaps lie; compile resources for providing advisory services; consider awareness campaign on natural infrastructure specifically
Key institutions involved	MMA, MOP, MINVU
Government level	Central; regional; local
Time frame	Short-term



Policy Option 7: Digital platform for sustainability

This policy option addresses the reduced technological capacities for the sharing of project-related information and data on the sustainability of infrastructure. The development of a centralised digital platform dedicated to sustainability - along with policy reform to mandate the collection and sharing of life cycle data, project baseline assessments, disaggregated data on infrastructure capacity and infrastructure needs, etc. - would enable accessibility and collaboration between services. Moreover, it would improve the monitoring of infrastructure projects, support infrastructure decision-making and enable the early identification of synergies and cumulative impacts of infrastructure systems. The comple-

xity of new challenges requires technological tools that can assist with multivariate decision support systems with scenario testing. The development of this platform entails a continuous improvement process that may create future savings.

In the context of constrained budgets, this policy could also be implemented through updating and improving existing databases of projects, managed by MIDESO, to host the data and to enable a tracking system of social, environmental and territorial impacts. This policy option would help progress the implementation of Principle 10 of the SI Principles: Evidence-based decision-making.

Type of policy	Technological upgrade
Actions required	Design and approve policy reforms on gathering, collection and sharing of data; develop tailored methodologies; update and align indicators; identify funding sources for the development of a digital platform
Key institutions involved	SEGPRES, MIDESO, SEA, MOP, MMA, sectoral ministries, Ministry of Finance, National Agency for Research and Development (ANID)
Government level	Central
Time frame	Medium-term



Wetland near the ocean in the Maule Region of Chile

Source: Iblinova /stock.adobe.com

Strategic axis 3: Mainstreaming sustainability in the infrastructure life cycle

Mainstreaming sustainability throughout the life cycle of infrastructure is a useful strategy to institutionalise sustainability and ensure that appropriate instruments have been deployed. This strategic axis aims to overcome the cur-

rent situation in Chile in which sustainability in infrastructure projects is often advanced by individual efforts, and faces several barriers related to the design and scope of existing project instruments.

Policy Option 8: Sustainable public procurement of infrastructure



Public procurement is a critical opportunity to improve sustainable infrastructure performance and outcomes, and foster innovation in Chile's private sector.

Awarding contracts based on the lowest cost runs the risk of favouring unsustainable practices, and may compromise attributes such as quality and resource efficiency. Although sustainable infrastructure procurements may increase initial financial costs, they can also be more efficient and easier to operate, maintain or dismantle. They can reduce longer term costs, especially if environmental and social costs and benefits are taken into consideration.

There are existing efforts to include environmental and social criteria in Terms of Reference, bidding and management processes, for instance. Building on good practices, applying a

more consistent procurement approach across government with agreed sustainability principles would ensure alignment of different existing instruments, and hence incentivise sustainable infrastructure projects more comprehensively. Specific measures, such as calculating and taking into account Total of Cost of Ownership (TCO), can help factor in environmental and social externalities in public procurement of infrastructure. TCO considers the costs incurred during the period of possession of infrastructure instead of the cost of purchase alone⁴. TCO could be implemented more widely, along with possible monetisation of greenhouse gas emissions during the use and disposal phases of the life cycle. This policy option primarily addresses Principle 3: Comprehensive life cycle assessment of sustainability and Principle 5: Resource efficiency and circularity.

⁴ Further details and examples can be found in the UNEP Sustainable Public Procurement Guidelines (UNEP 2021b) and UNEP policy brief on driving sustainability through public procurement of infrastructure (UNEP 2021c).

Type of policy	Public procurement
Actions required	Legal modifications; adjust public procurement model for infrastructure; consider wide application of TCO calculations; align sustainability principles and existing instruments
Key institutions involved	MIDESO, MOP, MINVU, MTT, Ministry of Finance, MMA
Government level	Central
Time frame	Medium-term



Construction site in Valdivia, Chile

Source: jorisvo /adobe.stock



Policy Option 9: Multi-criteria methodology for investment evaluations

MIDESO currently evaluates investments focused on cost-benefit and cost-efficiency analysis – the aim of which is to ensure that infrastructure projects deliver value for money. Despite ongoing efforts, the approach does not sufficiently reflect broad social and environmental considerations, such as gender and valuation of ecosystem services. While some sector-specific good practice examples can be identified for certain programmes, the logics of the most used evaluation methodologies are considered outdated. The current approach also does not fully allow for the creation of more responsive infrastructure systems that can adapt to changing demands, and the new risks that can emerge in the context of the climate crisis. This is connected to Principle 2 of the SI Principles: Responsive, resilient, and flexible service provision.

Sustainable infrastructure requires the integration of sustainability considerations into infrastructure investments, thus extending beyond economic efficiency. Integrating social and environmental and considerations, as integral parts of infrastructure projects, into multi-criteria evaluation methodologies would play a central role in mainstreaming sustainability across the life cycle. An enhanced multi-criteria methodology could be adopted across the prioritisation processes and the generation of infrastructure investment portfolios. It would require increased financial and human resources to develop and administer.

Type of policy	Investment evaluation methodologies
Actions required	Strengthen the unit for social evaluation of MIDESO with human and financial resources in order to develop the relevant methodologies, indicators, and processes for application
Key institutions involved	MIDESO, DIPRES
Government level	Central
Time frame	Medium-term



Policy Option 10: Fiscal measures for the adoption of sustainable practices in infrastructure projects

This policy option refers to reform of pricing signals and incentives, and aligning budget design at a national and sub-national level with domestic sustainable infrastructure objectives. It would build further on Chile's significant 2014 tax reform which introduced three environmental taxes. Effective and efficient use of fiscal policy tools and instruments, including tax reforms, can incentivise and facilitate the adoption of more sustainable materials and practices in infrastructure projects. These, in turn, could disincentivise the consumption and production patterns that currently hamper innovations in construction and built infrastructure in particular, and could be designed to be revenue-neutral or revenue-raising for the government.

Such measures could also promote company engagement in data collection concerning the environmental costs of the construction process. At a national level, central government could lead by example by integrating performance and sustainability objectives in the budget design and planning processes, and strengthening natural capital accounting systems to ensure effective investment in biodiversity.

Setting appropriate economic incentives and fiscal policy relates to Principle 8 of the SI Principles: Fiscal sustainability and innovative financing, among others.

Type of policy	Fiscal policy
Actions required	Assess most appropriate fiscal reforms to incentivise sustainable infrastructure; strengthen natural capital accounting systems; adjust the National Investment System to allow for investment in nature
Key institutions involved	MOP, Ministry of Finance, MMA, Office of the Comptroller General of the Republic, DIPRES
Government level	Central
Time frame	Medium-term



Strategic implementation

Source: Denise Misléh / UNU-FLORES

Parque Bicentenario in Santiago, Chile

4. Strategic implementation

The three strategic axes presented imply three levels of possible intervention and next steps. Strategic axis 1 points to adjusting institutional arrangements, which often entail a series of longer term and sometimes complex interventions that require political consensus and a significant mandate. Strategic axis 2 relates to specific programmes and initiatives, while implementation of strategic axis 3 would require modification and alignment of operational instruments. As indicated, the 10 policy options serve as a menu of potential options, whereby different options can be considered at different times, depending on ongoing policy processes and priorities in government.

The 10 policy options touch on the mandates of different ministries and institutions across government, and would therefore require action and collaboration among different actors. MOP, with its central mandate for infrastructure, has an important role to play in the development of some of the proposals and in supporting cross-governmental coordination around sustainable infrastructure. For example, the General Directorate of Public Works (DGOP) of MOP, which promotes the Ministry's Sustainability Agenda, represents MOP before MMA and the Council of Ministers for Sustainability. DGOP's Sustainable Infrastructure Committee will also be

instrumental in reaching a common language, while DGOP's competences for regulating the system of public works contracts, inter alia, are relevant for developing some of the specific policy options. Likewise, the Infrastructure Masterplan - currently being designed by the Planning Directorate of MOP to support decentralisation - represents a key vehicle to address policy option 2, in particular, and to integrate elements of other options. The long-term nature of the Masterplan, up to the year 2055, provides an opportunity to incorporate sustainability considerations at the strategic level and demonstrate investment priorities determined through local consultations.

In ensuring coordination among different institutions and raising awareness about sustainability transitions with wider society, strategic communications will also need to be carefully articulated by MMA and others. New processes beginning in 2023, such as the implementation of the Escazú Agreement, may also represent an opportunity for more sustainable infrastructure.

As immediate next steps, key potential questions for the government to consider include agreeing which policy options are highest priority, and which are most feasible to implement. Advancing the different policy options may re-

quire development of a dedicated workplan or pilots, and further collaboration with international partners. By first recognising barriers to implementing sustainable infrastructure, and co-creating potential solutions, the Govern-

ment of Chile has demonstrated strong commitment to national objectives, as well as the SDGs and UNEA resolution on sustainable and resilient infrastructure.



Cable car cabin moving along the Metropolitan Park of San Cristobal Hill in Santiago, Chile

Source: Anne Richard /stock.adobe.com

5. Bibliography

ACERA (2022). Estadísticas de Generación de Energía.

Available from: <https://acera.cl/estadisticas-generacion-de-energia/>

Araya Areyuna, I. (2019). Desarrollando un Modelo Abajo-Arriba de Planificación en un Estado Centralizado: El Caso del Plan de Infraestructura del Ministerio de Obras Públicas, Chile.

Chile, Ministry of Public Works (2016). Atlas del Agua.

Available from: <https://snia.mop.gob.cl/repositoriodga/handle/20.500.13000/4371>

Chile, Ministry of the Environment (2021). Roadmap for a Circular Chile by 2040.

Available from: <https://economiecircular.mma.gob.cl/wp-content/uploads/2022/01/HOJA-DE-RUTA-PARA-UN-CHILE-CIRCULAR-AL-2040-EN.pdf>

Government of Chile (2019). 'Compromiso País, para que ningún Chileno quede atrás'.

Available from: https://www.desarrollosocialyfamilia.gob.cl/storage/docs/COMPROMISO_PAI%CC%81S_-1.pdf

Induambiente, Revista (2020). Plantaciones y el Agua, no. 166 (September - October 2020): 28-32.

Navarrete-Hernandez, P., and F. Toro. (2019). Urban Systems of Accumulation:

Half a Century of Chilean Neoliberal Urban Policies. *Antipode* 51, no. 3: 899–926.

Organisation for Economic Co-operation and Development (2012). Water Governance in Latin America and the Caribbean: A Multi-level Approach. Paris

Organisation for Economic Co-operation and Development (2017). Gaps and Governance Standards of Public Infrastructure. Paris

Pierson, P. (2000). Increasing Returns, Path Dependence, and the Study of Politics. *The American Political Science Review* 94, no. 2: 251–267.

Ritchie, H. and M. Roser (2018). Greenhouse Gas Emissions by Sector, Chile, 2018.

Torring, J. (2009). Rethinking Path Dependence in Public Policy Research. *Critical Policy Studies* 3, no. 1: 70–83.

United Nations Environment Programme (2021a). Integrated Approaches in Action:

A Companion to the International Good Practice Principles for Sustainable Infrastructure. Nairobi

United Nations Environment Programme (2021b). Sustainable Public Procurement:

How to Wake the Sleeping Giant - Introducing the United Nations Environment Programme's Approach.

United Nations Environment Programme (2021c). Driving Sustainability Through Public Procurement of Infrastructure. Policy brief - September 2021

United Nations Environment Programme (2022). International Good Practice Principles for Sustainable Infrastructure. Nairobi

United Nations Office for Project Services (2018). Infrastructure: Underpinning Sustainable Development. Copenhagen

Von Hatzfeld, S. (2013). Renewable Energy in Chile: Barriers and the Role of Public Policy, *Journal of International Affairs*; 66, no. 2; 199-209.



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