GEF/STAP/C.69/Inf.03
May 20, 2025

69th GEF Council Meeting
June 2-6, 2025
Washington, DC

STRENGTHENING SOURCE-TO-SEA APPROACHES IN THE GEF

Strengthening source-to-sea approaches in the GEF

May 2025

STAP SCIENTIFIC AND TECHNICAL ADVISORY PANEL

An independent group of scientists that advises the Global Environment Facility

gef

UN environment programme

Strengthening source-to-sea approaches in the GEF

Contents

Summary

Over the past decade, the Global Environment Facility (GEF) has been instrumental in advancing the source-to-sea (S2S) concept – an integrated framework that connects land, freshwater, coastal, and marine ecosystems across biophysical and governance boundaries. The GEF has been a frontrunner in promoting S2S approaches and has played a pivotal role in developing, implementing, and advancing them worldwide.

However, despite this significant progress, strongly driven by the GEF, adoption and implementation of the approach remain limited and fragmented, representing a missed opportunity to simultaneously advance environmental and socioeconomic benefits as well as sustainability and resilience. As the GEF prepares for its Ninth Replenishment Period (GEF-9), transitioning to greater implementation of the S2S approach in the GEF Partnership is imperative.

This Scientific and Technical Advisory Panel information note provides an overview of the S2S concept, briefly reviews its uptake in the GEF International Waters portfolio, identifies key challenges to its effective implementation, and offers advice for its better integration into the GEF's work, especially in GEF-9, for which S2S approaches have already been highlighted in various Technical Advisory Group meetings and noted in the draft replenishment document.

Key messages in this information note include the following:

- Traditional and fragmented management approaches that focus on parts of the interconnected land, freshwater, coastal, and marine systems limit environmental gains, exacerbate negative trade-offs, and result in unsustainable outcomes and weakened resilience.
- Addressing these systems in an integrated manner through an S2S approach can facilitate policy coherence: the greater emphasis on policy coherence in GEF-9 may improve implementation and consistently address interconnected challenges along the S2S continuum to advance sustainability, resilience, and equity outcomes.

- Significant progress in advancing the S2S concept and in implementing it through laws, policies and projects has been made on integrated approaches addressing the entire S2S continuum in the last decade, with the GEF as a leader.
- As the GEF moves to GEF-9, there are opportunities to strengthen the adoption and implementation of S2S approaches, including by continuing to promote integrated approaches across the S2S continuum.
- Increasing the adoption and implementation of the S2S approach requires it to be incorporated into project design (in particular into the theory of change), project implementation, and project monitoring. It also requires better capturing and communicating the benefits from engaging in integrated management along the S2S continuum.
- Improved implementation effectiveness; enhanced data, information, and knowledge exchange; and strengthened capacity among relevant actors and stakeholders can facilitate greater adoption, implementation, and upscaling of the S2S approach and help realize its transformative potential.

1. Introduction

Ecosystems from river headwaters to the open oceans form a continuum of interconnected and interdependent hydrological, ecological, and socioeconomic systems, often transcending administrative and national boundaries. These systems are interconnected through flows[1] of not only water but also sediment, nutrients, pollutants, and biota and often provide ecosystem services and foster economic, social, and cultural activities and practices. Hence, environmental health, social well-being, and economic development depend on these interconnected systems and their integrated management.

Traditional and fragmented approaches to managing these interdependent systems result in unsustainable outcomes and weakened resilience. Management approaches that focus only on parts of the systems invariably fail to be sustainable in the long term.[2] Addressing terrestrial, freshwater, coastal, and marine ecosystems in an independent and siloed manner limits environmental gains and exacerbates negative trade-offs between upstream and downstream users and between different ecosystem elements, weakening resilience and challenging sustainable development opportunities.

For instance, hydropower developments upstream, while generating economic value, can disrupt the water, sediment, and nutrient flows essential for delta formation and survival and for coastal ecosystem health, as evidenced, for example, in the Mekong River Basin.[3] Land-based pollution from agriculture and untreated municipal or industrial wastewater, supporting socioeconomic interests in one part of the system, is one of the main contributors to marine degradation,

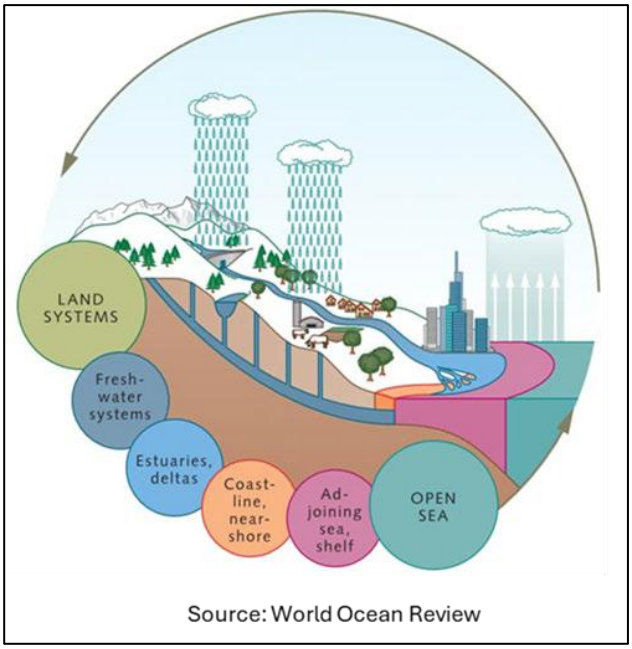
[1] Granit et al. (2017a).
[2] Bierbaum et al. (2014).
[3] Kondolf et al. (2022).

eutrophication, and the emergence of dead zones in coastal water and open oceans.[4] Experiences in many European seas – such as the Baltic Sea, the North Sea, and the Black Sea – illustrate this.[5] Likewise, most plastics, newly emergent pollutants, and pharmaceuticals that put rivers, regional seas, and oceans, as well as the species living in them, at risk travel along the source-to-sea (S2S) continuum.[6] Migratory fish species are affected by the disconnection of marine and freshwater aquatic habitats by infrastructure, both upstream and downstream,[7] negatively affecting not only biodiversity but also the food security of riparian and littoral communities.

2. The source-to-sea approach and the GEF

The S2S approach (Box 1) acknowledges these challenges and the need to address the entire interconnected S2S continuum across ecosystems (land, freshwater, coastal, and marine), actors, sectors, and countries in an integrated manner[8] to prevent environmental degradation, promote environmental and socioeconomic benefits, and enhance sustainability and resilience along the entire continuum.

Box 1: The source-to-sea approach



Source: World Ocean Review

The S2S approach addresses the interlinkages that span land, freshwater, coastal, and marine ecosystems in an integrated manner with the aim of improving environmental outcomes for these ecosystems, promoting holistic natural resource management and socioeconomic development, and ultimately improving overall outcomes for the interconnected systems.[9] The approach considers the many material flows from land to sea, and from sea to land, and therefore involves all inland landforms, geological structures, and processes, as well as relevant actors in freshwater, coastal, and marine ecosystem management (see illustration).[10]

While the approach intends to capture the complexity of the interdependent systems from the source of a river through the various parts of its basin – including lakes and wetlands as well as connected aquifers – to coastal areas, into regional seas and the oceans, the focus in the Global Environment Facility and its agencies is on the interdependencies between freshwater and marine ecosystems and the different flows that connect them. The S2S concept also typically has a transboundary dimension, acknowledging that 313 rivers, more than 600 aquifers, and an unaccounted-for number of marine ecosystems transcend country boundaries.[11]

[4] Hassan (2006).
[5] For example, Wang et al. (2021); Zandaryaa and Frank-Kamenetsky (2021).
[6] Schöneich-Argent et al. (2020); Worm et al. (2017); Zandaryaa and Frank-Kamenetsky (2021).
[7] Green (2014); van Puijenbroek et al. (2019).
[8] Mathews et al. (2019).
[9] Mathews et al. (2019).
[10] Maribus (2021).
[11] McCracken and Wolf (2019); IGRAC (2021).

The international community – with the Global Environment Facility (GEF) in a leadership role – has acknowledged this challenge and committed to more integrated approaches. The international community has long recognized the need to address freshwater and marine ecosystems in a more integrated manner. Legal and political instruments governing freshwater and marine ecosystems have long called for better consideration of land-based and freshwater-related challenges, as highlighted in Box 2.

Box 2: Source-to-sea approach in international treaties and conventions

The 1982 United Nations Convention on the Law of the Sea calls for states to control land-based sources of marine pollution (articles 194 and 207). The freshwater side has also increasingly acknowledged its responsibility for protecting marine environments and made it an explicit objective of upstream freshwater management. Both the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses explicitly recognize the need to protect recipient marine environments as one of the objectives of freshwater management (preamble, articles 2, 9, and 13 of the Water Convention; article 23 of the Watercourses Convention). To translate these legal commitments into action, the United Nations Economic Commission for Europe's Water Convention Secretariat has recently engaged in developing a guidance note on S2S management, expected to be finalized in late 2025.[12]

Conventions addressing related matters, including biodiversity, pollution, and climate change, have also acknowledged the need for integrated approaches. For instance, the 1992 Convention on Biological Diversity – through the Kunming–Montreal Global Biodiversity Framework – underscores the interdependence of aquatic and marine biodiversity.

Multiple regional instruments also promote integrated management from the source to the sea or the consideration of interdependencies between different ecosystems, and their uses by different stakeholders, along the S2S continuum. The 1974 Convention on the Protection of the Marine Environment of the Baltic Sea Area, the 1976 Convention for the Protection of the Mediterranean Sea against Pollution, and the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region all explicitly require action on upstream drivers of marine degradation.

The GEF has been a frontrunner in promoting S2S approaches, playing a pivotal role in developing and advancing these approaches as well as their implementation in various regions, basins, and large marine ecosystems worldwide. It has long supported integrated management approaches across ecosystems that reduce fragmentation and negative trade-offs and enable additional benefits, even before the S2S terminology and concept were invented.[13] Early GEF projects, such as the 1999 regional FREPLATA project involving Argentina and Uruguay, the 2009 follow-up project (Box 3), various projects in the Danube–Black Sea region (Box 4), and the Global Programme of Action[14] with its focus on preventing the degradation of the marine environment from land-based activities, acknowledged the intricate links between freshwater and marine ecosystems and the need to manage these systems in an integrated manner.

[12] UNECE (forthcoming).
[13] GEF (2015a).
[14] https://www.unep.org/topics/ocean-seas-and-coasts/ecosystem-degradation-pollution/global-programme-action-gpa

Box 3: Source-to-sea approaches in the south-west Atlantic

The Patagonian Shelf large marine ecosystem, shared by Argentina and Uruguay and interconnected by ocean currents and marine life, is an area of immense ecological importance. One of the key challenges the area faces is development upstream, specifically pollution from land-based sources and various harmful coastal developments. Addressing environmental challenges and generating environmental benefits, therefore, requires an integrated approach to freshwater and marine water resources, as well as adjacent lands.

Countries have acknowledged this and invested in coordination between the two main management bodies in the area: the Joint Technical Commission for the Maritime Front and the Comisión Administradora del Río de la Plata, both established by the 1973 Treaty of the Rio de la Plata and its Maritime Front between Argentina and Uruguay. In 1994, both organizations adopted a Joint Declaration on Cooperation to jointly address challenges the Rio de la Plata and adjacent maritime areas would face, namely land-based pollution from the La Plata Basin as a whole, fisheries management, biodiversity loss, and sediment management issues.

GEF projects have supported these integrated approaches. The GEF-2 project (GEF ID 613) Environmental Protection of the Rio de la Plata and Its Maritime Front: Pollution Prevention and Control and Habitat Restoration[15] supported the development of a transboundary diagnostic analysis and strategic action program for the region, highlighting that a considerable number of challenges that marine areas faced stemmed from upstream developments and recommending that cross-sectoral, integrated approaches and commitments, based on an informed understanding of shared ecosystem management approaches, should be implemented to address the identified challenges. The GEF-4 project (GEF ID 3519) Reducing and Preventing Land-based Pollution in the Rio de la Plata/Maritime Front through Implementation of the FREPLATA Strategic Action Programme was supported by the GEF to implement the recommendations.

As a result, there have been significant improvements in the management of the marine environment in the south-west Atlantic:[16] the development of a transboundary diagnostic analysis and a strategic action program enhanced integration across and the management of freshwater, coastal, and marine environments and improved joint understanding and collaboration between Argentina and Uruguay, including the establishment of common water quality standards and the improvement of legal bases.

[15] https://www.thegef.org/projects-operations/projects/613
[16] UNDP (n.d.).

Box 4: Addressing joint challenges in the Danube–Black Sea region

The Danube–Black Sea region is a highly integrated region, with developments in the Danube River Basin significantly impacting the health of the Black Sea. Pollutants, contaminants, or other changes in the water characteristics of the Danube impact the environmental balance in the Black Sea ecosystem and, in particular, its North-Western Shelf (with the Danube's discharge into the Black Sea being larger than that of any other river that empties into the Black Sea, contributing 80% of all land-based inorganic nutrients and 50% of all phosphorus to the Black Sea[17]).

Freshwater resources in the Danube River Basin are governed by the International Commission for the Protection of the Danube River, while the Black Sea is governed by the International Commission for the Protection of the Black Sea. The institutions have entered into a memorandum of understanding, establishing the Joint Danube–Black Sea Technical Working Group and providing the basis for joint meetings and the development and implementation of various joint activities. As a result, laws, policies, and practices in Danube and Black Sea countries have been improved with regard to policy coherence, including the reform of national agricultural policies and the establishment of more industrial and municipal wastewater treatment plants.

This has led to a significant reduction in pollutants in the Black Sea, with nitrogen and phosphorus emissions to the Black Sea being reduced by 20% and 50%, respectively, in the late 1990s and early 2000s.[18] These emissions reductions have contributed to fewer and less intense algal blooms, a rise in fish catches, and a return of various species, generating numerous environmental and socioeconomic benefits.

This cooperation started while countries in the region were still engaged in conflict with one another, also highlighting how approaching water challenges in a way that brings together different actors, sectors, and stakeholders can make important contributions to advancing cooperation and peace.[19]

The GEF has supported a range of projects in the Danube–Black Sea region that have contributed to the environmental and socioeconomic improvements in the region, starting in GEF-1 with the Danube River Basin Pollution Reduction Program (GEF ID 342)[20] with more following in GEF-3, for example the Danube Regional Project (GEF ID 2042),[21] the Black Sea Ecosystems Recovery Project (GEF ID 2263),[22] and the Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea (GEF ID 2044),[23] with several consecutive projects across various countries in the region.

The Danube–Black Sea region has become a good example[24] that has inspired others and pushed the S2S concept internationally. More projects aspiring to generate environmental benefits across the freshwater–marine continuum have since been developed. One of several examples is the Western Indian Ocean project (GEF ID 4940),[25] which addressed land-based sources and activities that affect critical coastal–riverine ecosystems through the S2S approach and brought together

[17] GEF (2015b).
[18] GEF (2015a); GEF (2015b); Mănoiu and Crăciun (2021).
[19] STAP (2024).
[20] Developing the Danube River Basin Pollution Reduction Programme, https://www.thegef.org/projects-operations/projects/342.
[21] Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin (Tranche 2), https://www.thegef.org/projects-operations/projects/2042.
[22] Control of Eutrophication, Hazardous Substances and Related Measures for Rehabilitating the Black Sea Ecosystem: Tranche 2, https://www.thegef.org/projects-operations/projects/2263.
[23] Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea – World Bank-GEF Nutrient Reduction Investment Fund: Tranche 3, https://www.thegef.org/projects-operations/projects/2044.
[24] GEF (2015b).
[25] Implementation of the Strategic Action Programme for the Protection of the Western Indian Ocean from Land-based Sources and Activities (WIO-SAP), https://www.thegef.org/projects-operations/projects/4940.

ministries responsible for fisheries, agriculture, forestry, environment, and water in a large effort to enhance policy coherence.

Acknowledging the increasing importance of integrated approaches, in 2017 a Scientific and Technical Advisory Panel (STAP) publication[26] – developed in the context of a broader environmental policy community that promoted the newly emerging approach – conceptualized such integrated approaches into a coherent framework, the S2S framework (Figure 1), which still leads the policy discourse today.

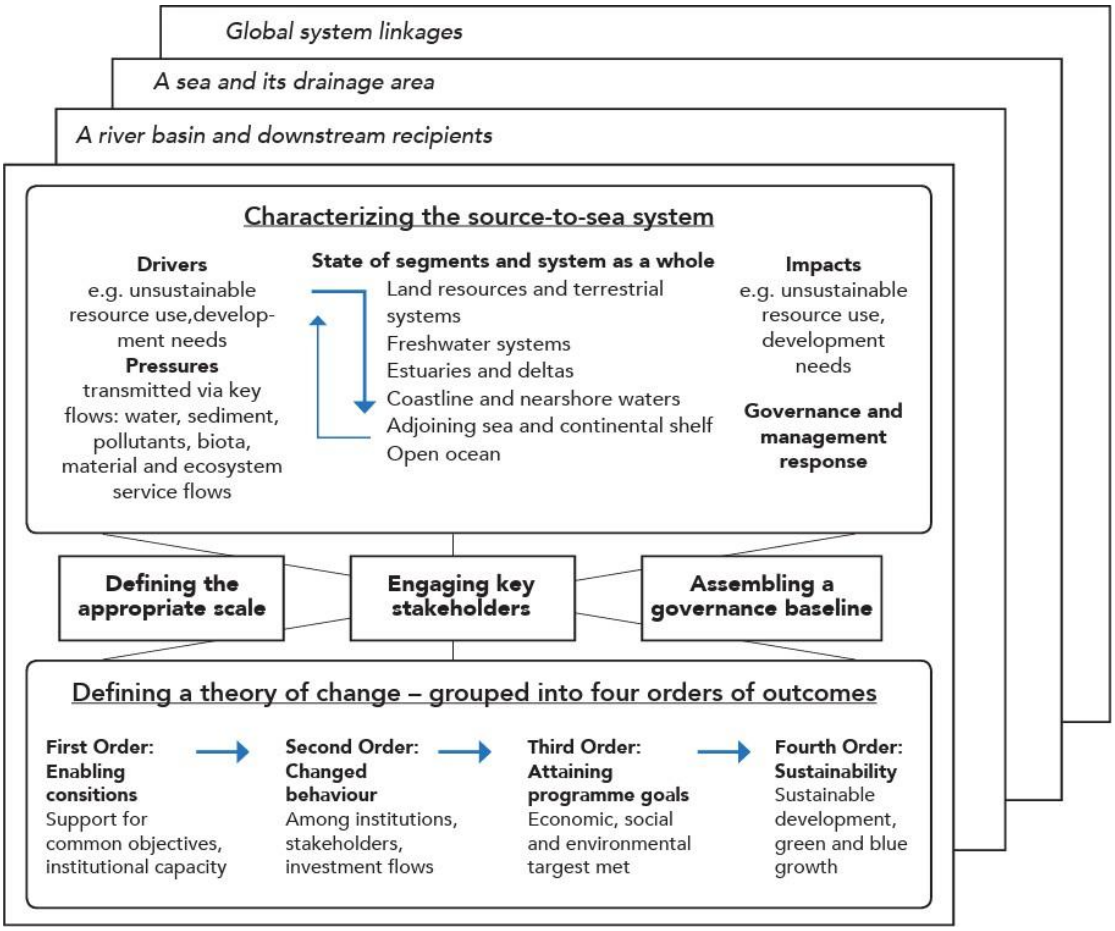


Figure 1: The source-to-sea conceptual framework developed by STAP. The framework includes the following elements: characterization of the source-to-sea system, definition of the appropriate scale for the analysis of the system (local, national, transboundary, or global), engagement of stakeholders, analysis of baseline governance in the system, and application of a theory of change to guide governance and management responses and to track progress towards achieving agreed goals and positive changes in environmental and socioeconomic outcomes. Source: Granit et al. (2017b).[27]

The recent emphasis on promoting policy coherence in the GEF[28] provides an impetus to further embrace the S2S approach, as it brings together actors and stakeholders across different sectors and government

[26] Granit et al. (2017b).

[27] Granit et al. (2017b).

[28] GEF (2023).

departments to address challenges in land, freshwater, coastal, and marine ecosystems in a way that promotes synergies and minimizes trade-offs and leakages[29;30]

More recently, GEF-supported initiatives have promoted S2S approaches more explicitly, including in the Drin River Basin,[31] the Amazon River Basin,[32] and the Incomati and Maputo river basins,[33] all of which aim to address freshwater and marine challenges in an integrated manner.

In addition, IW:LEARN,[34] the GEF's International Waters (IW) focal area learning and knowledge exchange platform, has highlighted the need to manage freshwater and marine resources in an integrated manner, although specific activities beyond awareness-raising and knowledge exchange events – for example, at the 10th International Waters Conference[35] – remain limited.

Overall, the GEF has been a leading actor internationally in advancing the S2S approach – both conceptually and through actual implementation – contributing to greater policy coherence and integrated management that enhances environmental benefits while creating important socioeconomic and possible peace co-benefits.

3. Barriers to adopting and scaling the source-to-sea approach

Despite this important progress over the past decade, significant challenges remain both within the GEF and in the environmental community as a whole. These challenges present an opportunity to enhance the benefits possible through the S2S approach. Doing this largely relates to moving beyond incorporating the S2S concept into project documents to actual implementation and actions and moving to a broader adoption of the approach beyond a few ecosystems.

Various barriers can be identified that explain this limited progress within the GEF. Addressing these barriers could facilitate transformational change in the IW focal area as well as in various Integrated Programs (IPs) and across the GEF as a whole.

First, the **different ecosystem elements along the S2S system are often still considered separately**. Data gathering and analysis, and the generation of knowledge that supports decision-making – including in the context of GEF's transboundary diagnostic assessments – are often still siloed and consider the basin or aquifer (or even only parts of it) and the recipient coastal and marine ecosystems separately. Opportunities for developing and implementing more integrated approaches are therefore often forgone. Although this siloing was acknowledged nearly 10 years

[29] Leakages refer to negative impacts or unintended consequences that occur when policies are not aligned or coordinated effectively across different sectors, levels of governance, or time.
[30] STAP (2023a).
[31] Implementing the Strategic Action Programme of the Drin Basin to Strengthen Transboundary Cooperation and Enable Integrated Natural Resources Management, https://www.thegef.org/projects-operations/projects/10881.
[32] Implementation of the Strategic Action Programme to Ensure Integrated and Sustainable Management of the Transboundary Water Resources of the Amazon River Basin Considering Climate Variability and Change, https://www.thegef.org/projects-operations/projects/9770.
[33] Strengthening integrated and transboundary management of the Incomati and Maputo river basins, https://www.thegef.org/projects-operations/projects/11180.
[34] https://iwlearn.net
[35] https://iwlearn.net/events/conferences/iwc10-2024

ago,[36] the challenge persists. Addressing this siloing will require establishing a coordinated governance framework; strengthening integrated planning tools aligned with the S2S approach that combine integrated water resources management, integrated coastal zone management, and various marine spatial planning and management tools; enhancing multi-stakeholder engagement with both freshwater and marine water actors; and harmonizing policies and regulations across sectors and administrative boundaries. Beyond the core IW portfolio, the work of the Clean and Healthy Ocean IP and the Blue and Green Islands IP provides important starting points for integrated perspectives that should be further pursued.

Second, **governance systems remain fragmented**, with separate legal regimes and institutions responsible for freshwater and marine management at both the national and international levels, and thus limited policy coherence. Only in very few cases do legal instruments governing freshwater resources refer to recipient marine water bodies (e.g. the 1994 Danube River Protection Convention), or vice versa, and few institutionalized cooperation mechanisms address S2S challenges.[37] This often leads to the inclusion of only some actors (e.g. national ministries or agencies, but also economic sectors or stakeholder groups) in the governance of integrated freshwater and marine systems. Projects need to better adopt an integrated approach that considers land, freshwater, coastal, and marine systems when conducting transboundary diagnostic assessments and developing strategic action programs. In other words, projects need to ensure that the ecosystems assessed, the governance framework, the institutions engaged, and the design of project activities consider all ecosystems and actors across the S2S continuum.

Third, beyond mentioning the S2S concept, **projects need to develop a concrete strategy, reflected in the theory of change, to ensure that the concept is implemented** and related barriers are overcome. For instance, projects might hold great potential for an integrated approach but not adopt it. The recent GEF Independent Evaluation Office evaluation of the IW focal area indicates that only about 16% of GEF-5 and GEF-6 IW projects apply S2S approaches.[38] By missing these opportunities to apply S2S approaches, projects may forgo important integration and policy coherence gains.[39] Some projects indicate that the S2S approach will be applied but are insufficiently descriptive of what they actually intend to do along the S2S continuum and with stakeholders along this continuum.[40] And some projects adopt measures that can generate benefits along the entire continuum, such as managing environmental flows, but do not sufficiently consider and account for these benefits, especially for coastal and marine areas.[41]

[36] Granit et al. (2017b).
[37] For example, the Source-to-Sea Working Group under HELCOM: https://helcom.fi/helcom-at-work/groups/source-to-sea-2/.
[38] GEF IEO (2025).
[39] See STAP screen for GEF ID 11429: Blueing the Caspian Sea, https://www.thegef.org/projects-operations/projects/11429.
[40] See STAP screen for GEF ID 11180: Strengthening integrated transboundary management of the Incomati and Maputo river basins, https://www.thegef.org/projects-operations/projects/11180, and STAP screen for GEF ID 11410: Strengthening integrated transboundary source-to-sea management of the Ruvuma River Basin and its coastal zones to ensure ecosystem health and livelihood security, https://www.thegef.org/projects-operations/projects/11410.
[41] See STAP screen for GEF ID 11572: Strengthening Zambezi River Basin management towards climate resilience and ecosystem health, https://www.thegef.org/projects-operations/projects/11572.

Fourth, **projects need to better capture and communicate the benefits of engaging in integrated management along the S2S continuum**. The benefits of S2S approaches for the environment and actors across the continuum need to be better captured. GEF's indicators and subindicators insufficiently capture the upstream–downstream interdependencies and the environmental benefits of addressing those in an integrated manner as well as the socioeconomic and possible peace co-benefits that such integrated approaches can generate. Recent recommendations by the Independent Evaluation Office in its review of the IW portfolio also reflect this need.[42] The planned update to the GEF Results Measurement Framework based on the outcomes of the GEF-9 replenishment process[43] presents an opportunity to address this barrier.

Fifth, the **lack of capacity and knowledge** among implementing agencies, national stakeholders, regional organizations, and other relevant actors can be a considerable impediment to more integrated approaches. While several conceptual guidance documents have been developed in recent years,[44] including by STAP,[45] more can be done to translate this guidance into applicable knowledge among relevant actors. IW:LEARN's recently commenced work to develop guidance on S2S approaches is a promising start but needs to be combined with targeted trainings.

Finally, **inadequate financial resources** can lead to implementation lagging behind aspirations. Consequently, siloed approaches that focus on smaller and seemingly more affordable activities in only one part of the S2S continuum continue to be favoured over more integrated approaches that are not only more sustainable but also more cost-effective in the long term. Often, opportunities to mobilize diverse financial resources, including through blended finance approaches and innovative financial mechanisms, are insufficiently considered.

4. The way forward

The GEF has played a pioneering role in conceptualizing the S2S approach and supporting its application. However, a decade after its formal introduction in international environmental policy circles, the approach is ripe for greater implementation and upscaling to realize its true transformative potential, prevent or reduce the costs of incoherent action on the environment, and increase resilience and sustainable development. This includes upscaling the adoption and implementation of the approach in the broader freshwater and marine communities in partnership with, but also beyond, the GEF.

GEF-9 provides a renewed opportunity to align environmental action across interdependent ecosystems and sectors, especially in times of rapid environmental change and shrinking availability of resources to address them. Discussions at the 10th International Waters Conference,[46] by the Independent Evaluation Office in preparation for its IW evaluation,[47] and

[42] GEF IEO (2025), recommendation 3.
[43] GEF (2025).
[44] Kellock et al. (2023); Mathews et al. (2019); Mathews et al. (2023).
[45] Granit et al. (2017b).
[46] https://iwlearn.net/events/conferences/iwc10-2024
[47] GEF IEO (2025).

during the February 2025 GEF Technical Advisory Group meetings (and the resulting draft strategic and programming direction)[48] confirm this. Fully operationalizing the S2S approach and advancing its effective implementation across the relevant GEF portfolio – while embedding experiences and upscaling solutions to achieve true transformation – is therefore an essential next step. To do so, STAP encourages the GEF to consider the following advice:

- More strongly **embed S2S approaches in GEF project design.**
    - Include S2S considerations more clearly in project design, ensuring that they are well reflected in theories of change and other relevant project design elements.
    - Highlight the various environmental benefits, as well as socioeconomic[49] and potential peace[50] co-benefits that S2S approaches can generate.
    - Consider the relevance of S2S approaches in other focal area projects as well as in relevant IPs, some of which already adopt the approach prominently.[51]
- **Strengthen governance for policy coherence at the national and international levels.**
    - Promote dialogues between sectors locally and regionally, from upstream mountainous water uses via basins and aquifers to coastal, regional seas, and open oceans uses.
    - Foster cooperation between actors managing fresh water and marine waters at the national level and at the transboundary level along the entire S2S continuum.
    - Strengthen legal and institutional frameworks in partner countries and relating to basins and large marine ecosystems to allow for policy coherence along the S2S continuum.
- **Strengthen monitoring and adapt objectives and indicators** to properly reflect freshwater and marine links.
    - Consider including the S2S dimension more specifically in the objectives of the IW focal area to capture links between ecosystems, and track related benefits.
    - Improve GEF indicators/sub-indicators to better represent the possible benefits of the S2S approach across the upstream and downstream ecosystems and the flows that connect them.
    - Strengthen monitoring and reporting systems to better capture S2S adoption and implementation.
- **Strengthen data, information, and knowledge.**
    - Support communication between sectors, countries, agencies, and stakeholders to share S2S-related data, information, and knowledge.[52]

[48] GEF (2025).
[49] STAP (2023b).
[50] STAP (2024).
[51] Specifically, the Blue and Green Islands IP, in which the importance of S2S approaches was emphasized during the February 2025 technical advisory group meetings and is reflected in the first draft of the Strategic Positioning and Programming Directions of the GEF-9 Replenishment, https://www.thegef.org/council-meeting-documents/gef-r-9-05.
[52] This could build on existing platforms, such as IW:Learn: https://iwlearn.net.

- Encourage interdisciplinary activities that cross the freshwater–marine divide and can generate new data and knowledge.
- Better connect data sets and information sources for fresh and marine waters[53] to overcome a siloed knowledge landscape and fill persistent gaps.
-

- **Improve effectiveness of implementation.**
  - As new S2S projects are developed, ensure that potential trade-offs as well as complementarities are identified and, where applicable, harnessed.
  - Ensure inclusion of measures in project implementation that address specific S2S barriers, especially in the context of the transboundary diagnostic assessment/strategic action program process.
  - Monitor to what extent projects systematically address S2S elements at the various steps of the GEF project cycle.
- **Enhance funding and financing.**
  - Ensure that financial resources provided for one element of the S2S continuum do not lead to adverse effects or trade-offs for other elements of the system.
  - Mobilize private investments and blended finance by highlighting the benefits of investing in the S2S continuum.
  - Strengthen the long-term financial sustainability of S2S approaches by ensuring adequate financial commitment on the basis of recognized benefits.
- **Strengthen the capacity** of all relevant stakeholders along the S2S continuum.
  - Support targeted capacity development for S2S approaches in partner countries at all governance levels.
  - Engage GEF agencies and partners in more S2S-specific capacity development, including mutual learning.
  - Organize training and knowledge exchange, for example via IW:Learn, supported by STAP, to enhance S2S knowledge and the sharing of experience.

[53] These sources include environmental monitoring data sets developed at the global level (e.g. the Global Freshwater Quality Database, the United Nations Environment Programme's International Marine Litter Database, and the US National Oceanic and Atmospheric Administration's Marine Microplastics Database), at the basin level, and at the national level but also broader analytical efforts, such as the Transboundary Waters Assessment Programme.

References

Bierbaum, R., Stocking, M., Bouwman, H., Cowie, A., Diaz, S., Granit, J., Patwardhan, A., Sims, R., Duron, G., Gorsevski, V., Hammond, T., Neretin, L., Wellington-Moore, C. (2014). *Delivering Global Environmental Benefits for Sustainable Development*. Scientific and Technical Advisory Panel to the Global Environment Facility, Washington, DC, https://www.stapgef.org/resources/advisory-documents/delivering-global-environmental-benefits-sustainable-development.

GEF (2015a). *From Coast to Coast*. Global Environment Facility, Washington, DC, https://www.thegef.org/sites/default/files/publications/From_Coast_to_Coast_-_Celebrating_20_years_of_Transboundary_Management_of_our_Shared_Oceans.pdf.

GEF (2015b). "Reversal of dead zone: Achieving the world's first reversal of a dead zone in the Black Sea". https://www.thegef.org/newsroom/feature-stories/reversal-dead-zone-achieving-worlds-first-reversal-dead-zone-black-sea.

GEF (2023). "Enhancing policy coherence through GEF operations". Global Environment Facility, Washington, DC, https://www.thegef.org/sites/default/files/documents/2023-06/EN_GEF_C.64_09_Enhancing%20Policy%20Coherence%20through%20GEF%20Operations_.pdf.

GEF (2025). "Draft policy directions for the GEF-9". Global Environment Facility, Washington, DC, https://www.thegef.org/council-meeting-documents/gef-r-9-06.

GEF IEO (2025). "Evaluation of the International Waters focal area". Independent Evaluation Office of the Global Environment Facility, Washington, DC, https://www.thegef.org/sites/default/files/documents/2025-05/EN_GEF_C69_E_02_Eval_IW_focal_Area_Final.pdf.

Granit, J., Liss Lymer, B., Olsen, S., Tengberg, A., Nõmmann, S., Clausen, T.J. (2017a). "A conceptual framework for governing and managing key flows in a source-to-sea continuum". *Water Policy* 19(4), pp. 673–691. doi:10.2166/wp.2017.126.

Granit, J., Liss Lymer, B., Olsen, S., Tengberg, A., Nõmmann, S., Clausen, T. (2017b). *A Conceptual Framework for Governing and Managing Key Flows in a Source-to-Sea Continuum*. Scientific and Technical Advisory Panel to the Global Environment Facility, Washington, DC.

Green, D.R. (2014). "Barriers and solutions: Raising public awareness of fish migration in the rivers around the North Sea". *Journal of Coastal Conservation* 18(2), pp. 75–77. doi:10.1007/s11852-014-0305-4.

Hassan, D. (2006). Protecting the Marine Environment From Land-Based Sources of Pollution Towards Effective International Cooperation. London: Routledge, https://www.routledge.com/Protecting-the-Marine-Environment-From-Land-Based-Sources-of-Pollution-Towards-Effective-International-Cooperation/Hassan/p/book/9781138259225?srsltid=AfmBOoqwFfTj1lgIZCsah33BqwuWDkRGubvxu8A7NI4YuvM2rEi0wHUX

IGRAC/UNESCO/WMO. (2021). Transboundary aquifers of the world, update 2021. Delft: IGRAC https://unesdoc.unesco.org/ark:/48223/pf0000380193).

Kellock, C., Leakey, C., Schröder, C., Melville, N., Khan, J., Mathieson, S. (2023). *Source to Sea – Enabling Coherent, Efficient and Synergistic Outcomes*. Research Report 1343. NatureScot, Inverness.

Kondolf, G.M., et al. (2022). "Save the Mekong Delta from drowning". *Science* 376(6593), pp. 583–585. doi:10.1126/science.abm5176.

Mănoiu, V.-M., Crăciun, A.-I. (2021). "Danube river water quality trends: A qualitative review based on the open access web of science database". *Ecohydrology & Hydrobiology* 21, pp. 613–628. https://doi.org/10.1016/j.ecohyd.2021.08.002.

Maribus (2021). "Marine management – aspiration and reality". In *The Ocean, Guarantor of Life – Sustainable Use, Effective Protection* (World Ocean Review, vol. 7). Maribus, Hamburg. https://worldoceanreview.com/wp-content/downloads/wor7/WOR7_en_chapter_8.pdf.

Mathews, R., Tengberg, A., Sjödin, J., Liss-Lymer, B. (2019). *Implementing the Source-to-Sea Approach: A Guide for Practitioners*. Stockholm International Water Institute, Stockholm. https://siwi.org/wp-content/uploads/2024/01/source-to-sea-guide_webb.pdf.

Mathews, R., Weinberg, J., Murillo, J., Liss-Lymer, B. (2023). *Building Momentum to Accelerate the Adoption of Source-to-Sea Management*. Swedish Agency for Marine and Water Management, Stockholm. https://siwi.org/wp-content/uploads/2023/09/rapport-2023-8-building-momentum-to-accelerate-adoption-of-source-to-sea-management.pdf.

McCracken, M., Wolf, A. T. (2019). Updating the Register of International River Basins of the world. International Journal of Water Resources Development, 35(5), 732-782. doi:10.1080/07900627.2019.1572497

Schöneich-Argent, R.I., Dau, K., Freund, H. (2020). "Wasting the North Sea? – A field-based assessment of anthropogenic macrolitter loads and emission rates of three German tributaries". *Environmental Pollution* 263, 114367. doi:10.1016/j.envpol.2020.114367.

STAP (2023a). *Policy Coherence in the GEF*. Scientific and Technical Advisory Panel to the Global Environment Facility, Washington, DC. https://www.stapgef.org/resources/advisory-documents/policy-coherence-gef.

STAP (2023b). *Incorporating Co-Benefits in the Design of GEF Projects*. Scientific and Technical Advisory Panel to the Global Environment Facility, Washington, DC. https://www.stapgef.org/index.php/resources/advisory-documents/incorporating-co-benefits-design-gef-projects.

STAP (2024). "Fostering cooperation and managing conflict: A STAP information note on GEF transboundary water projects". Scientific and Technical Advisory Panel to the Global Environment Facility, Washington, DC. https://www.stapgef.org/resources/information-note/fostering-cooperation-and-managing-conflict-stap-information-note-gef.

UNDP (n.d.). Terminal Evaluation of Project RLA/99/G31/A/1G/99 "Environmental Protection of the Rio de la Plata and its Maritime Front: Pollution Prevention and Control, and Habitat Restoration". United Nations Development Programme, https://www.gefieo.org/sites/default/files/documents/projects/tes/613-terminal-evaluation.pdf.

UNECE (forthcoming). Guidance Note Source-to-Sea. United Nations Economic Commission for Europe.

van Puijenbroek, P.J.T.M., Buijse, A.D., Kraak, M.H.S., Verdonschot, P.F.M. (2019). "Species and river specific effects of river fragmentation on European anadromous fish species". *River Research and Applications* 35(1), pp. 68–77. doi:10.1002/rra.3386.

Wang, Y., Lindblom, E., Zhu, Y., Mathews, R.E., Malmaeus, M., Lei, K. (2021). "Environmental management in the Bohai and Baltic seas from a source-to-sea perspective: Challenges and opportunities". *Water International* 46(2), pp. 157–175. doi:10.1080/02508060.2021.1889794.

Worm, B., Lotze, H.K., Jubinville, I., Wilcox, C., Jambeck, J. (2017). "Plastic as a persistent marine pollutant". *Annual Review of Environment and Resources* 42, pp. 1–26. doi:10.1146/annurev-environ-102016-060700.

Zandaryaa, S., Frank-Kamenetsky, D. (2021). "A source-to-sea approach to emerging pollutants in freshwater and oceans: Pharmaceuticals in the Baltic Sea region". *Water International* 46(2), pp. 195–210. doi:10.1080/02508060.2021.1889867.