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# REPORT OF THE CHAIRPERSON OF THE SCIENTIFIC AND TECHNICAL ADVISORY PANEL

# STAP CHAIR'S REPORT TO THE GEF COUNCIL

**December 2020**

**ROSINA'S REPORT TO THE DECEMBER 2020 GEF COUNCIL**

**Introduction**

This report provides an update on STAP's work since the last Council meeting in June 2020.

Over the last 6 months STAP has worked on:

1. Initial perspective on GEF-8
2. STAP's enabling conditions for GEF projects
3. Nature-based Solutions
4. Behavior change
5. Technology Critical Elements
6. Delivering multiple benefits through the sound management of chemicals and waste
7. Current and future work program:
   (i) Climate change mitigation and the circular economy
   (ii) Mainstreaming biodiversity
   (iii) Behavior change
   (iv) Mercury
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**1. STAP's initial perspective on GEF-8**

In the last report to the June Council meeting, STAP noted that it was thinking about how best to continue to bring the latest science to the GEF and to bring GEF's needs back to the science community for GEF-8, along the following lines:

- What are the recent and long-term trends which should inform STAP's advice, e.g. COVID-19?
- What are the current and prospective challenges faced by the Multilateral Environmental Agreements? More broadly, what are the implications of systemic risk as well as 'black swan' or 'surprise' events?
- What progress was made during the GEF-7 period in incorporating the latest science into program and project design and implementation, and what are the future opportunities? How can insights from social and behavioral science be better integrated into GEF projects and programs?

- How can GEF secure transformational change at scale? What does this mean for program design and project development?

Over the last 6 months, STAP has reviewed what a science and technology perspective can contribute to the GEF's thinking about replenishment for GEF-8, and the outcome of this work is presented in STAP's initial perspective on GEF-8.

A brief review of the latest science on global environmental change leads to two compelling conclusions.

First, the drivers of global change have contributed to increased systemic risk, despite good intentions and some positive progress. The bottom line is that greenhouse gas emissions are increasing, as is the rate of biodiversity loss, there is still net land degradation, aquifers are being depleted, waste is increasing, most fisheries are overfished, and ocean pollution is becoming more pervasive.

The White Paper on a GEF COVID-19 response strategy sets out the background to the pandemic and the opportunities for GEF investment at the program scale, and in partnership at the global scale. As the White Paper notes:

"The pandemic reinforces the logic behind GEF's transformational programs and underlines the need for a lasting transformation to a sustainable, inclusive, resilient, low-carbon, low-polluting, nature-positive, and circular economy. Such an economy and a society will build resilience to thrive despite the inevitable shocks that will come through climate change and future pandemics." (paragraph 9)

Second, the GEF's resources remain modest compared to the need. The GEF can improve the effectiveness and efficiency of its investment incrementally, as well as by being an effective catalyst for investment by others. But STAP concludes that the GEF needs to evolve, both in its strategic positioning and resourcing if it is to play a bigger role in delivering the transformational change needed to achieve the objectives of the multilateral environmental agreements.

STAP suggests that GEF-8 consider a three-pronged strategy:

(i) Ensure that its investments are efficient, transformative, and durable in producing global environmental benefits (GEBs)

STAP suggests that a strategy of incremental improvement will not be sufficient to deal with increasing rates of global environmental change.

(ii) Ensure that its overall portfolio is more integrated and coherently transformational

Incremental improvements will increase the transformative impact of the GEF's portfolio as a whole, but STAP suggests that is insufficient to truly tackle the root causes of global environmental problems, and will not, by itself, mobilise the greater investment needed.

(iii) Contribute to the transformation of global economic systems, using its convening power and leverage, to form partnerships with others to deliver more environmentally sustainable development.

For example, GEF can help ensure that investors have the information they need to make better decisions, or work with selected groups of countries to enact policies for human well-being rather than only growth in GDP, or engage with policymakers and the private sector to establish stronger incentives for companies to deliver better environmental outcomes.

A. At the project level

STAP, therefore, suggests that the GEF:

- Ensure that projects have a clear rationale and robust theory of change
- Ensure that the risks from climate change are reflected in project design and implementation
- Pay more attention to successful multi-stakeholder processes which are well-designed
- Ensure that GEBs endure beyond the lifetime of projects
- Make more use of lessons from social and behavioural science in designing projects
- Strengthen gender-responsive interventions, and create opportunities for youth
- Be more rigorous and systematic about innovation, additionality, and achieving multiple GEBs, and co-benefits
- Avoid leakage, i.e. ensure that benefits are not undermined by activity shifting elsewhere
- Seek to optimise synergies with the Sustainable Development Goals
- Consider revisiting project design processes for GEF-8 to simplify and consolidate.

B. At the portfolio level

To catalyse transformational change, the GEF could consider changes in the way it does business.

To make the overall GEF portfolio more integrated and transformative, in addition to actions at the project level, STAP suggests that the GEF:

- Employ a toolbox of diverse integrated approaches, such as nature-based solutions, land degradation neutrality, integrated land use planning, the circular economy (including on food, plastics, climate mitigation (forthcoming STAP paper)), mainstreaming biodiversity, and environmental security.
- Make better use of Earth Observation and geospatial technologies for decision-making on interventions, baselines, metrics, and monitoring
- Codify monitoring, evaluation, and learning, and develop common metrics to assess progress and evaluate success and improve the design of investments.
- Decide on a risk appetite for the portfolio, and express this clearly
- Determine what is needed for transformation, rather than incremental improvement.
- Conduct a portfolio-wide approach to improving South-South knowledge exchange

C. At the global level

In addition to changing the way it does business, the GEF could contribute to transforming the global context; this would not only help GEF's own investments to be more durable, but also support a societal transformation towards valuing GEBs and resourcing them better in alignment with the GEF's mission.

The GEF could consider, in partnership with others, participating in actions which would contribute to transforming global economic, and socio-economic, systems, thereby enhancing the durability of its investments, including:

- building the evidence base for the social, environmental, and economic costs and benefits of investment;
- country coalitions to demonstrate the viability of key innovations at scale, for example on Land Degradation Neutrality, and on post-COVID resilient recovery
- policy dialogues to accelerate innovation, additionality, and resilience
- a renewed effort to seek coordinated public and private investment flows.

## 2. STAP's enabling conditions for GEF projects

Much of STAP's recent work has been about how to improve the design of projects, in particular by paying particular attention to several enabling elements which apply to almost all GEF projects and have been developed in previous STAP reports, including on integration, theory of change, innovation, climate risk, durability, and multi-stakeholder dialogue. These elements also underpin STAP's perspective on GEF-8.

The key elements[1] are:

**Apply systems thinking**: devise a logical sequence of interventions, which is responsive to changing circumstances. Address inter-connected environmental, social, economic, and governance challenges across sectors in design and implementation, with an eye towards resilience, transformational, and enduring change.

**Develop a clear rationale and robust theory of change** to tackle the drivers of environmental degradation by assessing assumptions and outlining causal pathways, and by devising responses that are robust to future change and adaptive if desired outcomes do not materialize.

**Choose the innovations to be scaled** (including technological, financial, business model, policy, and institutional innovation).

**Assess climate risk at the project development stage** and develop ameliorative actions to ensure that project outcomes are achieved, and consider how co-benefits can be enhanced by adaptive actions.

**Analyse the barriers to, and enablers of, scaling and transformation**, for example, institutional, governance, cultural, and vested interests. Assess the potential risks, including climate risk, and vulnerabilities to the system, to measure resilience to shocks and changes, the need for incremental adaptation, or more fundamental transformational change.

**Maximise global environmental benefits**, by improving effective integration, and by identifying positive synergies among multiple benefits, and avoid doing harm, by minimising negative interactions, and managing any **trade-offs**, including climate risk and other long-term changes.

**Co-benefits** should be identified and enumerated, including non-GEB environmental benefits, for example, improvements in air quality and water quality, and socio-economic benefits, for example, jobs, food security, and health benefits.

**Develop multi-stakeholder dialogue** from inception and design, through to project completion, ideally building on existing platforms, and flexibly structured to extend and evolve over time towards enduring transformational change.

**Establish a monitoring, evaluation, and learning process** to track the intended innovations, integration, and transformation, as well as indicators of durability. Develop explicit plans and funding for good quality knowledge management including sustainable databases, simple, useful, and usable common indicators; this is essential for assessing 'lessons learned', scaling up, and adaptive management.

[1] B**ehavior change** is a new enabling element – see section 4 below.

STAP is working with The Gordan and Betty Moore Foundation to develop advice on how to take impact to scale in complex conservation projects with a special focus on nature-based solutions, including recommendations for measurement, evaluation, and learning.

**Ensure durability** in project outcomes and impacts by applying all of the above key elements and engaging the right stakeholders; building the incentives for these key actors to act; incorporating adequate flexibility in project design and implementation; and underpinning it all with a systems-thinking approach. Climate risk (see above) and leakage (see below) also threaten the durability of benefits.

### 3. Nature-based Solutions

Nature-based Solutions (NbS) are defined by IUCN as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."

At the request of the GEF Secretariat, STAP held a virtual workshop on May 19 – 20, in conjunction with The Gordon and Betty Moore Foundation, and the Wildlife Conservation Society, which brought together representatives from philanthropy, academia, NGOs, GEF Secretariat, and agencies. The workshop reviewed 50 completed and ongoing GEF projects identified by the GEF Secretariat as containing strong NbS components to determine what lessons could be learned to inform future GEF investments. The main findings were:

- Most projects were generally stronger in describing the environmental components of nature-based solutions, than the societal challenges being addressed. A clear understanding of both, and the links between them, are important in developing a good theory of change.
- Societal benefits are generally regarded as co-benefits, and are not usually specified in much detail, for example air, and water quality, and socio-economic benefits, such as health, and livelihoods.
- All projects referred to synergies, but few addressed trade-offs.
- Better recognition and balance between short and long-term benefits are needed. Benefits need to endure and be resilient to the effects of climate change.
- Monitoring and evaluation were more commonly discussed in recent NbS projects, but relatively little on why something worked or didn't, and adaptive management was usually not mentioned.
- Many NbS projects involve behavior change, both at the individual level, and the institutional level. However, behavior change is often an implicit objective, i.e. the outcome sought was clear, but not how this was to be achieved. STAP believes that projects are more likely to succeed if behavior change is spelt out explicitly.
- And there were also some persistent challenges in enabling conditions:
    - Climate risk was recognized by many projects, but few had screened for the risk and identified mitigation measures.
    - All projects referred to some sort of multi-stakeholder dialogue, but these were sometimes top-heavy with official bodies, and not always clear about roles.
    - All the projects involved behavior change, but this was usually implicit. The desired outcome was clear, but not how behavior change was to be achieved.
    - Durability and scalability were often mentioned, but sometimes without much information about how these were to be achieved.

This analysis, a review of the scientific literature, and discussion at the workshop indicated four key issues were of importance to the GEF:

(i) Societal challenge, and striking a balance with nature

The IUCN defines NbS as a solution to a societal challenge to which nature can contribute, which places the emphasis in favour of society, whereas the GEF's objective is to maximise global environmental benefits; this creates a potential conflict. How should the GEF strike a balance between nature and society? Should the GEF take credit for any socio-economic benefits which might arise, subject to this not diminishing global environmental benefits?

**STAP recommends** that the GEF should approach NbS projects from the standpoints of solving both the societal and the environmental problem. There should have a clear understanding and documentation of the societal problem, as well as the nature problem, and the links between them. Systems thinking needs to cover both the societal problem and the nature elements, as does the theory of change. This means being involved upfront and having a hand in design of the whole project. It is also important to be able to demonstrate that environmental benefits are truly additional, and would not accrue in the absence of the GEF investment, and to be clear about which benefits the GEF can reasonably claim credit for.

(ii) Defining and quantifying co-benefits

A consistent strand of concern in the scientific papers reviewed was the need to quantify co-benefits, particularly to the extent that these can be made bankable for market-based sources of finance. This included the lack of rigorous assessment of the potential of NbS to deliver intended benefits, the need for accurate and comprehensive cost-benefit analyses of NbS, and a robust evidence base. The GEF NbS projects had a similar problem with defining and quantifying co-benefits.

Two consequences follow from this. First, the benefits of GEF investments may be under-reported which means that there are higher returns than those for which the GEF receives credit; and second, it is much more difficult to make sensible and informed trade-offs between different types of benefits, for example, between GEBs, and local environmental, and socio-economic benefits.

**STAP recommends** that NbS projects should have a good understanding of true costs and benefits for both nature - including natural capital, and for people, and make a comprehensive assessment of the outcomes for both society and nature. Projects should contribute to a global database of quantifiable costs and benefits of NbS.

(iii) Trade-offs

Some GEF investments may be win-win, with benefits for both nature and society in balance, and neither nature nor society foregoing any benefits, i.e. both are maximized. However, it would be foolish to claim that this is everywhere the norm. Very few of the GEF sample NbS projects identified trade-offs, but there were many references to synergies and co-benefits.

Many GEF investments, however, involve trade-offs, for example, multi-focal area (MFA) projects, Impact Programs, and other large-scale, or landscape projects. And when scaled up across space and time (and for transformational change), trade-offs become particularly important.

Different actors will approach trade-offs with different perspectives, depending on their primary purpose; this underlines the importance of having a good multi-stakeholder dialogue process. The important thing is to be transparent, recognize that trade-offs exist, and deal with them equitably.

**STAP recommends** that NbS projects place a special premium on good quality multi-stakeholder dialogue in NbS projects because they are likely to involve a wider range of stakeholders, with more divergent interests, e.g. actors more concerned with the societal problem, than nature, and need to bridge the gap. Informed decisions should be made on any trade-offs, balancing the outcomes for different beneficiaries at different scales in space and time. Multi-stakeholder dialogues should not be top-heavy (and top-down) with national, regional, and local government, but include local communities and indigenous peoples, with a clear and equitable allocation of roles and responsibilities.

(iv) Leakage

Avoiding leakage is essential to ensure that GEF investments contribute to reversing overall environmental change, and that the benefits endure in the long-term. For example, projects which reduce deforestation in one area, but which serves only to shift this to another area, either in the next valley or another country. This may be difficult to achieve at the individual project level but should be a very relevant consideration at the program level, and in scaling up.

The Land Degradation Neutrality concept addresses leakage, by carefully specifying that 'no net loss' should be achieved by countries within each category of land. If properly met, this provides a framework to measure and report on, and ideally avoid, leakage.

**STAP recommends** that the GEF should consider developing a concept equivalent to LDN to avoid leakage, which is an issue for all environmental benefits. For greenhouse gas emissions, attention is increasingly paid to allocating emissions to end-users so that export of energy-intensive processing is tracked; for biodiversity, approaches emphasising very low net extinction rates are being proposed; for pollutants, recipient countries are starting to reject dumped waste. Land degradation neutrality (LDN) provides an example where there is a global commitment to LDN, and (gradually) each country also commits to it, such that, in principle, if every GEF project with land degradation benefits was lodged as part of a country's LDN commitment, those benefits would be secure locally and globally, and subject to structured monitoring.

### 4. Behavior change

The Council has often encouraged STAP to ensure that its advice takes account of what social science has to offer in assisting the GEF to achieve its goal of influencing transformational change.

The GEF seeks to address the root causes and consequences of global environmental change by transforming markets and behaviors: unsustainable practices and behaviors are at the heart of the drivers of global environmental change, and responding to these can help to transform systems.

STAP commissioned a review of the literature on behavioral science, and a synthesis of case studies, tools, and approaches (to follow).

STAP's advice, "Why behavior change matters to the GEF and what to do about it", is based on one of the many behavior change frameworks reported in the literature. The framework consists of six different types of strategic levers (Figure 1), to shift behaviors in project design and implementation. Traditionally, three of these levers have been more commonly used to affect behavior:

(i) **material incentives** to make behavior more convenient and accessible, by giving rewards, providing substitutes, or penalties, for the desired, or undesired, behavior.

(ii) **rules and regulations** to require, or encourage, a desired behavior, or restrict, or prohibit an undesired behavior.
(iii) **information** about what the desired behavior is, why it matters, and how to do it.

However, other considerations can influence individuals' decision making and choices. For instance, individuals also make decisions based on the context, emotions, and what others in their social network are doing. This leads to three additional levers that should also be considered:

(iv) **choice architecture**: changing the context in which choices are made, including by providing steps, or options, to streamline complex decisions, and focus on key information or actions.
(v) **emotional appeals** to encourage experiencing an emotion that is known to result in the desired behavior.
(vi) **social influences**: understanding how an actor relates to others in their social system, including those with power and prestige, and leveraging these dynamics to support changes in the actor's behavior.


Figure 1: Rare's Levers of Behavior Change Framework
Source: Bujold, P. M., Williamson, K., & Thulin, E. (2020).

Five case studies demonstrate how these six levers can be used in various combinations to target behavior change: reducing wild meat consumption through economic incentives (Brazil); arresting land degradation by returning to traditional agricultural systems (Mexico); reducing overfishing by strengthening collaboration among fisherfolk (Indonesia); enhancing silvopastoral systems through peer-to-peer learning and payment for ecosystem services (Colombia); and reducing rhino poaching by empowering stakeholders to protect rhinos while improving local livelihoods (Namibia).

Each case study describes the behavioral challenges, targeted behaviors - what was being sought and who should participate, interventions used, outputs and outcomes, and the knowledge and learning achieved by stakeholders.

Based on the scientific literature, and the synthesis of case studies, STAP recommends that a checklist of issues should be addressed, with supporting questions, in designing and implementing GEF projects.

The checklist builds on STAP's enabling conditions, in particular amplifying the need for an overall theory of change and a multi-stakeholder process, which identifies the key stakeholders (point 2 in the checklist), and offers a venue for discussing the desired change in behavior (1) and mapping the desired change (3). Two other elements are also familiar enabling conditions – monitoring, evaluation, and learning (5), and adaptive management (6). Behavior change is a new addition to STAP's enabling conditions.

Behavior change checklist

| |
|---|
| 1) Describe the desired change in behavior<br>Think about the problem.<br>What does success look like?<br>Whose behavior had to change? |
| 2) Identify key stakeholders<br>Bring together stakeholders to identify the problem and solutions.<br>Who needs to be involved to change behaviors?<br>Who can enable, and who might limit decision-making and behavior change? |
| 3) Map the desired change<br>Describe the cause and effect relationships between coupled human-environment systems using systems thinking.<br>What are the barriers, or enablers, of behavior change?<br>What are the behavioral assumptions, or risks? |
| 4) Combine strategies, approaches, tools<br>Use multiple approaches, techniques, and tools to help address barriers to, or motivate, change.<br>What are stakeholders' aspirations, values, and needs and how could the selected strategies support stakeholders' build capacity and agency? |
| 5) Pursue monitoring, evaluation, and learning<br>Develop deliberate learning during project implementation to monitor and evaluate behavior change.<br>What changes need to be monitored? For instance, is the behavioral change in question a direct means to an environmental end (i.e. a change in practice), or is it the end in and of itself (i.e. changed views about the importance of conservation)?<br>What barriers are preventing the desired change, or what factors are enabling it?<br>What type of learning is needed to achieve the project objective? |
| 6) Test and refine assumptions before implementing intervention at scale<br>Assess progress to foster reflection and innovation.<br>What opportunities exist to challenge established behaviors and patterns, and create new ways for scaling, innovation, and transformation? |

## 5. Technology Critical Elements

In its report to the June Council, STAP reported on a virtual workshop held in April which considered: TCEs and climate mitigation, chemicals, water quality, and waste; phytomining; biodiversity, forests, and protected areas in TCE extraction areas; the circular economy; and oceanic minerals and TCE extraction. STAP has now issued two reports, an advisory paper, and a background paper.

Technology critical elements (TCEs) include rare earth elements, the platinum group elements, and other relatively scarce metals. TCEs are used in many emerging and green technologies, including in renewable energy, energy security, energy storage, electronics, urban development, and agriculture.

TCEs are used in high-tech products and everyday consumer products such as mobile phones, thin layer photovoltaics, lithium ion batteries, fibre optic cable, and synthetic fuels. Many advanced engineering applications use numerous TCEs, including clean energy production, energy storage technologies, communications technologies, computing, wind turbines, and solar panels. TCEs are also being used in transportation, e.g. in manufacturing electric vehicles, electric motors use high-powered magnets, emerging technologies such as the Internet of Things (IOT), automation, growing high-biomass plants that accumulate high metal concentrations. and robotics. Avoided carbon dioxide emissions from the transition to renewable energy in the power sector were estimated to be 215 Mt (million metric tonnes) in 2018.

However, the extraction of TCEs can have potentially harmful effects on ecosystems, and human health when released into the environment. Products containing TCEs include electric cars, wind turbines, and solar cells, which are important for dealing with climate change, but their unsustainable mining, processing, and disposal could adversely affect the GEF's objectives in chemicals and waste, land degradation, forestry, and biodiversity.

The costs of TCE mining include loss of biodiversity through direct land clearance and deforestation, leading to direct habitat loss and land degradation. One study found that up to 300 square metres of vegetation and topsoil were removed for every tonne of rare earth oxide extracted. And it is reported that for every tonne of rare earth oxide extracted up to 1000 tonnes of contaminated water wastewater, and 2000 tonnes of tailings, are generated.

Mining in forested areas poses more direct challenges to biodiversity and ecosystem integrity. Several TCEs projects are in forested areas with high biodiversity, in particular in the Amazon and the DRC. Improper disposal of objects containing TCEs may leach out elements into the environment. Mining TCEs may lead to acid mine drainages: acidification can destroy marine and freshwater organisms, disturb aquatic biodiversity, and harm ecosystems. In addition to the impacts on soil and land associated with TCE extraction, dumping e-waste releases significant quantities of TCEs, together with other toxic elements, into subsoils and groundwater.

The mining, processing, extraction, and refining of TCEs can have significant effects on human health. Waste disposal areas exposed to weathering have the potential to pollute the air, soil, and water. Some TCEs contain significant amounts of radioactive elements, e.g. uranium, which can contaminate air, water, soil, and groundwater. Exposure to rare earth metals has been reported to increase the risk of respiratory and lung-related diseases such as pneumoconiosis, and exposure to selenium is hazardous and may cause selenosis. Cadmium is a heavy metal with the potential to bioaccumulate in the human body and the food chain, leading to acute and chronic intoxication due to biomagnification. Beryllium is classified as a carcinogen that can be inhaled as dust, fumes, and mist, and may cause lung cancer.

There are several GEF projects which involve mining, and its environmental impacts, mainly under the Minamata convention and the adoption of cleaner techniques for artisanal and small-scale gold mining (ASGM) which use mercury for amalgamation purposes. The GEF has invested in country-level capacity building, which can also be applied to the mining of TCEs.

The GEF global E-Mobility and Cleantech Innovation programmes both involve the use of TCEs, and issues such as battery recycling, and the management of end of life products and components. The mining of TCEs is also relevant to the Congo and Amazon Basin Impact Programs.

STAP's paper on novel entities recommended that the GEF should inter alia focus on managing the risks and harnessing the opportunities of TCEs.

The GEF should be aware of where its investments involve the use of TCEs, and where its investments are, or could be, affected by the extraction of TCEs. In such instances, STAP suggests that the GEF could consider the following:

(i) Life Cycle Assessments for relevant projects in climate mitigation, food security, and e-mobility, etc., to identify the effects of TCE extraction, use, and disposal, and develop measures to reduce them.

(ii) Adoption of responsible mining methods for projects which involve or are affected by TCE mining to ensure that local environmental impacts, and the effects on local communities, are properly taken into account, for example, the Forest Smart Mining Principles[i].

(iii) Adoption of a circular economy approach, including the future recycling of TCE stocks.

Application of the circular economy concept could focus on many aspects of products containing TCEs, making them: more durable; easily repairable; able to be remanufactured or reused; from recycled materials; more energy and resource-efficient; easier to separate the recyclable components; without toxic or problematic components, or, if present, can be easily replaced or removed before disposal; and with a reduced need for packaging. See STAP's papers, Plastics and the circular economy and A future food system. There is immense potential for battery recycling as e-mobility infrastructure and vehicles gain traction worldwide. The World Economic Forum has launched the Global Battery Alliance to provide cleaner recycling options for the battery industry.

(iv) Assisting Small Island Developing States (SIDS), with very large exclusive economic zones, in balancing extraction and conservation, and in preparing for licensing, and regulatory regimes.

The increasing demand for minerals and declining ore reserves on land, and the ecological impact of terrestrial mining, has led to greater interest in the potential of deep-sea mining for minerals. The UN Convention on the Law of the Sea has established the International Seabed Authority (ISA) to issue licences for mineral exploitation. ISA is developing a range of environmental regulations for mining of the deep sea with a focus on critical metals such as cobalt, manganese, and nickel. A key feature is a requirement for all private ventures to partner with a country that is a party to the Convention.

(v) Keeping under review the possibility of phytomining and phytoextraction becoming a viable approach to land restoration and decontamination when it has been field-tested.

The high price of metals such as cobalt, nickel, selenium, and thallium, and other rare earth elements make them of interest for phytomining – growing high-biomass plants that accumulate high metal concentrations - to derive high purity metals. Phytoextraction can remove hazardous metals from the contaminated soil, and can potentially create revenue from metal recovery, by using hyperaccumulator plants that can take up metals hundreds or even thousands fold greater than “normal” plants.

### 6. Delivering multiple benefits through the sound management of chemicals and waste

The purpose of GEF’s investments in chemicals and waste is to eliminate the use of the most harmful chemicals in accordance with a number of Multilateral Environmental Agreements (MEAs) which were established to protect human health and the environment, for example, the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Minamata Convention on Mercury.

Many projects have been designed to deal simply with a particular chemical, for example, cleaning up a waste dump or materials containing POPs. However, it is rare for these projects not to be related to other environmental and socio-economic issues, for example, cleaning up POPs is likely to have beneficial effects on land, soils, freshwater, and human health. Suitably designed, chemicals and waste projects can deliver multiple benefits: chemicals and waste global environmental benefits (GEBs), the primary purpose; other GEBs, e.g. biodiversity; local environmental benefits, e.g. improved air and water quality; and socio-economic benefits, e.g. jobs, food security, and human health.

Delivering these multiple benefits requires a systems thinking approach to develop a good understanding of the links between the various environmental elements, e.g. chemicals, air, land, and water, and with the societal elements, e.g. human health and well-being. Suitable indicators are also required to measure and monitor environmental and socio-economic benefits.

At the request of the GEF Secretariat, STAP, in collaboration with the International Panel on Chemical Pollution, reviewed the links between the chemicals and waste and other focal areas to identify synergies and trade-offs, to assess potential co-benefits from chemicals and waste projects, and to consider how chemicals and waste projects could be developed to deliver multiple global environmental and socio-economic benefits. This work used a systems thinking approach to gain a better understanding of the underlying drivers of chemicals and waste pollution, and how this understanding could be used to benefit the design of GEF projects.

Two virtual workshops were held, in April and October, which brought together leading experts and practitioners on the links between chemicals and waste concerns and other environmental issues. A background report provided details of the scientific basis for the interlinkages between chemicals and waste issues and the GEF objectives. Additionally, it highlighted how chemicals and waste objectives interact with other environmental issues outside of GEF’s purview, such as air pollution, and socio-economic issues. It also demonstrated how a systems thinking approach can be used in developing projects to deliver multiple GEBs, and also local environmental and socioeconomic co-benefits.

The report identified that the production, use, and management of persistent organic pollutants (POPs), mercury, ozone-depleting substances (ODS) are major drivers of biodiversity loss, climate change, land degradation, and adverse effects on international waters. These chemicals also contribute to other (non-GEF) environmental issues, including air pollution and contamination of local water resources. Chemicals and waste are closely linked with socio-economic issues, including human health, food security, poverty, gender equality, and livelihoods. The sound management of chemicals can deliver multiple benefits in all the GEF's focal areas and yield other environmental (non-GEB) benefits, and socio-economic co-benefits. Using a systems thinking approach to address interlinkages helps in developing projects to deliver multiple benefits, and to achieve transformative changes, by considering the relationships between the different elements of a system, with an eye towards resilience, and enduring change.

In designing near-term projects, the GEF should ensure that STAP's enabling conditions are applied, in particular systems thinking, and also consider: developing a checklist of environmental and socio-economic benefits; using qualitative and (where possible) quantitative indicators of co-benefits; allowing flexibility in using indicators; and building capacity within the GEF partnership on systems thinking, mainstreaming co-benefits, developing indicators to capture co-benefits, and engaging expertise in the social sciences and health.

Looking further ahead, the GEF could consider the following: strengthen the GEF indicators framework to include both GEBs and environmental and socio-economic co-benefits; develop methodologies for assessing the direct and indirect environmental and socio-economic benefits of GEF investments; develop or adopt composite indicators; and develop science-based targets for chemicals and waste.

## 7. Current and future work program

### (i) Climate change mitigation and the circular economy

Circular economy principles are part of the GEF-7 programming directions and are mainly used on projects to reduce the effects of plastic pollution in international waters and chemicals and waste focal areas. STAP has produced two advisory papers on the circular economy - its application to plastic production, use and management, and food and agriculture. However, there are also opportunities for the circular economy to play a significant role in climate mitigation.

At the request of the GEF Secretariat, STAP is working on how the circular economy could contribute to climate mitigation, other GEBs, and local environmental and socio-economic benefits.

A virtual workshop in September brought together leading experts and practitioners, and members of the GEF Secretariat to discuss the scope of work, including target sectors, types of interventions, possible case studies, barriers, enablers, and co-benefits.

The report will include circular strategies in the following areas:

- food loss and waste
- livestock and manure management
- cropland management and land productivity using regenerative agriculture practices (These will build on STAP's earlier work on the circular economy and the food system.)
- bio-based materials, including in textiles, packaging, and construction
- recycling of materials, for example, glass, paper, metals, and plastics (building on STAP's earlier work on the circular economy and plastics)
- separation, collection, and processing of organic waste, e.g., for composting and bioenergy
- design, repair, and recycling of renewable infrastructure, for example, solar panels and electric car batteries
- development of industrial symbiosis and eco-industrial parks
- designing buildings to reduce life-cycle energy demand and energy-efficiency

(ii) non-motorized transport and the sharing economy in the transportation

Advice will be issued in early 2021.

(iii) Mainstreaming biodiversity

STAP continues to work on mainstreaming biodiversity and has commissioned a literature review, and a review of GEF mainstreaming projects. In addition, STAP has developed "causal pathways" for the four generic pathways set out in the GEF Secretariat's theory of change for biodiversity mainstreaming in production sectors. These causal pathways are for: rangeland grazing, intensive agriculture, wildlife harvest, spatial and land use planning, valuation of ecosystem services, tourism, and commercial agriculture. (These are referenced in the STAP's paper on Nature-based Solutions.)

In the new year, a workshop will be held focussing on mainstreaming biodiversity in production sectors, and advancing ecosystem valuation efforts.

(iv) Behavior change

STAP is planning additional work on behavior change and will hold a workshop early next year. The workshop will consider further advice on behavior change, including aggregating best practices, metrics, and how social science can further contribute to the understanding of behavioral science. It will involve academia, business, practitioners, think tanks, philanthropy, NGOs, and the GEF agencies, and Secretariat.

(v) Mercury

STAP will commence a project in January 2021 to facilitate the development of an interactive platform for global mercury data and information. The goal of the platform is to provide a node of mercury data and information that can contribute to developing mercury projects, enhance decision making on management, and assess progress towards achieving GEF objectives in reducing the environmental and health impacts of mercury. STAP will work with scientists, practitioners, data providers, IT experts, and the GEF's chemicals and waste team, and GEF agencies to advance the development of a data platform.

(vi) GEF replenishment

STAP looks forward to contributing to the replenishment process and the development of the TAG process.

## 8. Other STAP activities

Dr. Rosina Bierbaum, the STAP Chair, and Dr. Tom Lovejoy (STAP adviser) are members of the GEF High-Level Task Force on COVID-19 convened to advise on both short-term and longer-term responses to COVID-19 and other pandemics. They participated in the first virtual meeting of the Task Force on 26 May and will continue in this role through the end of 2020. In July, the STAP Chair made a presentation to the Task Force on COVID-19, theory of change, multi-stakeholder dialogue, and behavior change.

In September, Dr. Bierbaum made a presentation to the GEF partnership at a GEF and World Bank training session on climate risk assessment. Her presentation explained STAP's approach to assessing climate risk, explored the questions which STAP posed when screening GEF projects for climate risk, and outlined the guidance available.

In October 2020, the STAP Chair led a seminar with over 140 members of the GEF partnership on theory of change. Dr. Mark Stafford Smith (STAP) made a presentation on why is a theory of change necessary, its purpose, and how to develop a theory of change. This was based on STAP's theory of change primer. Final reports posted on STAP's website:

- Spanish version of Land Degradation Neutrality: guidelines for GEF projects
- French (to follow) version of Land Degradation Neutrality: guidelines for GEF projects
- Harnessing Blockchain Technology for the Delivery of Global Environmental Benefits

9. **December work program**: Observations will be made during the Chair's presentation to the Council meeting, as summary analysis is still underway at the time of this posting.

10. **Personnel news**

Dr. Rosie Cooney (STAP member for biodiversity) left the Panel at the end of November to take up a position as Director of Conservation Research with the ACT (Australian Capital Territory) government.

An announcement about a successor will be made shortly.