UN environment programme

50 1972-2022

Reflecting on the Past and Imagining the Future:

A contribution to the dialogue on the Science-Policy Interface

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Foreword

The 50th anniversary of the United Nations Environment Programme (UNEP) is an opportunity to reflect both on our successes and on the challenges we will face in the years to come. We must first be honest and admit that progress towards achieving the Sustainable Development Goals (SDGs) and addressing the triple planetary crisis – of climate change, nature and biodiversity loss, and pollution and waste – has not advanced at the pace and intensity required to reach internationally agreed environmental goals. Planning for the future gives us the opportunity to accelerate social, financial and economic transformations to meet these goals and secure a healthy planet for all.

UNEP's mission to inform evidence-based environmental policies and decisions requires feasible solutions. The scientific products UNEP has produced throughout its history have made the case for action clear. Now, this science needs to be transformed into actionable tasks and deployed with a renewed Science-Policy Interface. The interface must tackle today's environmental crises with the latest science and the latest digital tools and technologies. It is also vital to have engagement with a broader range of stakeholders and a transparent, agile and inclusive process.

This new Science-Policy Interface must support implementation and track progress. The challenges ahead are significant and require governments, the scientific community, civil society and private enterprise to work together. A key part of this work will be ensuring there is a voice for women, children and youth, indigenous peoples and local authorities.

UNEP exists in a very different world from that of 1972. The next fifty years will see a host of disruptions that will provide both opportunities and challenges. As the authoritative global environmental organization, it is important that we consider future global trends, so we can respond and grow in an effective manner. This will ensure we can continue to advocate with impact on environmental issues and continue to address the environmental dimension of the SDGs.

Inger Andersen
United Nations Under-Secretary-General and
Executive Director, United Nations Environment Programme

Photo: UNEP

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The Purpose of this Paper

This paper outlines UNEP's role in the Science-Policy Interface, reflects on past successes and considers the challenges ahead. It also explores how UNEP's work can be strengthened in the science-policy field in the medium to longer term.

The paper draws on analysis and findings from a UNEP product survey, as well as impact reports, empirical literature and insights from a recent consultative process led by the UN Committee of Experts on Public Administration on developing strategic guidance for the Science-Policy Interface[1].

The paper focuses on proposals for new models for a more effective Science-Policy Interface; the role of technology; behavioural change; equity; and participation in enhanced management of the environment. The new models propose ways to strengthen the Science-Policy Interface to support global environmental governance. These new models would ensure processes that are both socially relevant and economically robust, and contribute to inter-generational equity. The paper then introduces a select number of issues that need consideration by UNEP and its stakeholders to secure the future of the planet.

The paper should be viewed as the beginning of a dialogue to support UNEP's approach to the Science-Policy Interface in commemoration of the organization's 50th anniversary, as well as the basis for dialogue with Member States and other stakeholders on Science-Policy Interface approaches in the coming decades.

1 United Nations Department of Economic and Social Affairs. 2021. CEPA strategy guidance note on the Science-Policy Interface. March 2021.

Introduction

The story of global environmental governance dates to the Stockholm Conference of 1972. The United Nations Conference on the Human Environment, and the scientific conferences preceding it, ushered in a new era of international cooperation. The United Nations Environment Programme (UNEP) – born out of the 1972 conference – was among the first tangible expressions of an idea that has become increasingly vital: environmental decisions must rest first and foremost on informed discourse, expert knowledge and the best available scientific information. In the early 1970s, the concepts of global environmental change and international environmental governance were in their infancy. Scientists were just beginning to understand the Earth system and recognize the degree to which humans were transforming it.

In the 50 years since UNEP was founded, the understanding of the science underlying environmental problems has significantly expanded. The availability of scientific knowledge and evidence alone, however, has not been sufficient to greatly influence day-to-day individual and collective choices or environmentally sound public policy.

There remains a disconnection between science and policy. The disconnection is explicitly recognized in the UN Secretary General's recent report, Our Common Agenda, which describes the stark and urgent choices now facing humanity, and points to the 21st century's collective challenges that have put the multilateral system under considerable stress.

A call for a more relevant UN system – with a more prominent science voice. In the report, the Secretary-General calls for the transformation of the UN system into a new version, able to offer relevant and system-wide solutions to the challenges of the 21st century. This transformation will be accelerated through a "quintet of change" focused on: data, analytics, and communications; innovation and digital transformation; strategic foresight; behavioural science; and performance and results orientation. Throughout the report, the Secretary-General calls for

change to ensure a prominent voice for science and expertise, where policy and budget decisions should be backed by science.

Keys to success: Co-creation and bottom-up. This paper argues that two fundamental changes are needed for the networked multilateralism envisioned in Our Common Agenda to be effective and inclusive. First, priority setting on environmental issues needs to be based on co-creation (collaboration). Secondly, local priorities need to be heard during decision-making.

There is a big opportunity for the upcoming Medium-Term Strategy (MTS) 2022 – 2025 to bring the issue of the Science-Policy Interface to the fore. The new MTS plots the direction that UNEP will take in the pursuit of an inclusive and effective Science-Policy Interface, where science can "drive financial, economic and behavioural shifts towards sustainable consumption and production patterns to enable transformation at the pace and scale required". Improving the delivery, coherence, and uptake of science for transformative action, and closing environmental data gaps, are key priorities outlined in the MTS.

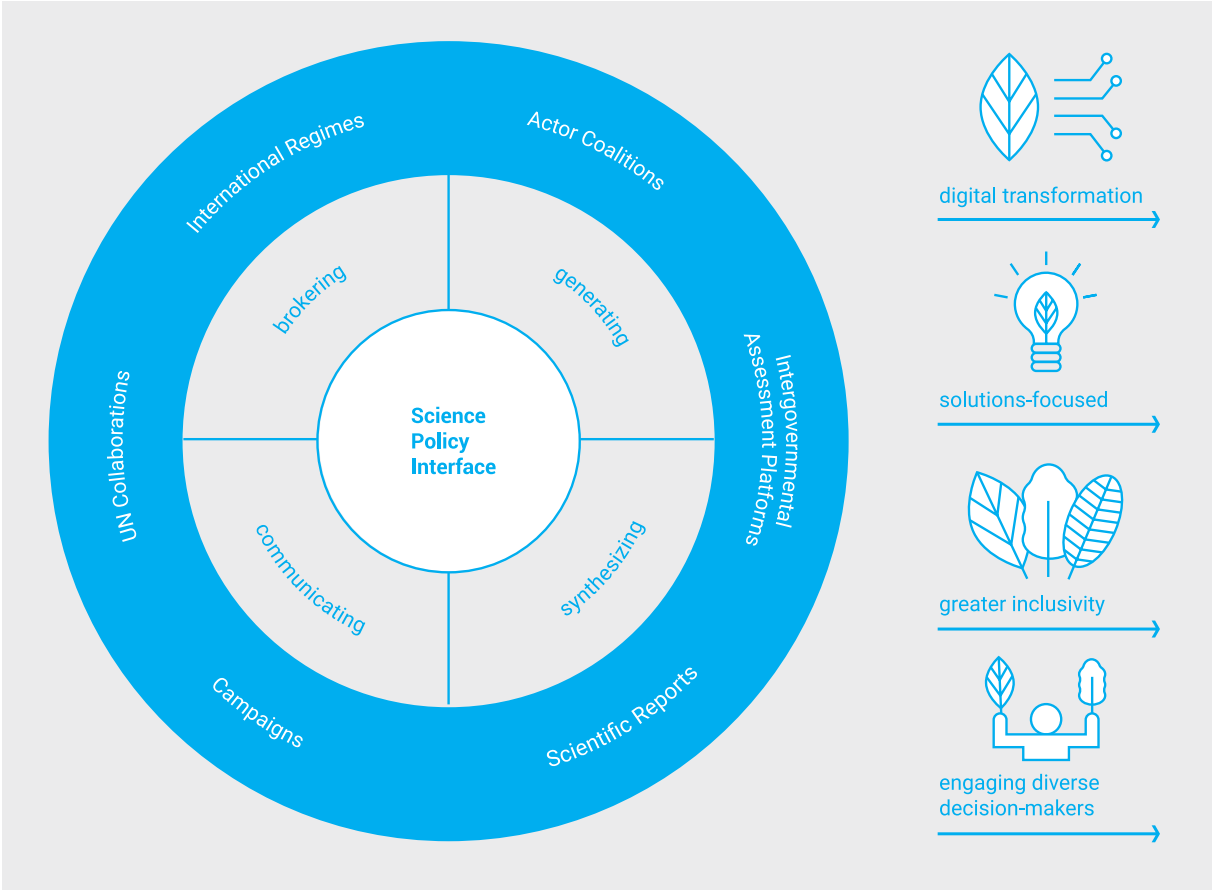
Science-Policy Interfaces and UNEP

The Science-Policy Interface — a definition. This paper draws on the generally accepted definition of Science-Policy Interfaces, which was put forward by Van den Hove[2] in 2007:

Science-Policy Interfaces are defined as social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making.

The Science-Policy Interface has formed the backbone of UNEP's work for the past 50 years. It has supported a multitude of mechanisms, channels and tools in UNEP's attempts to foster the science-to-policy link. Illustrative examples of UNEP's work in the science-policy field include (see Figure 1): scientific reports, intergovernmental assessment platforms, actor coalitions, advocacy campaigns, formal UN collaborations, international regimes and Multilateral Environmental Agreements (MEAs)

Figure 1 – Key Science-Policy Interface mechanisms employed at UNEP (outer ring), core functions (inner ring) and four preconditions for success.



2 Van den Hove, S. (2007). A rationale for science–policy interfaces. Futures, 39(7), 807-826. http://dx.doi.org/10.1016/j.futures.2006.12.004

Science-Policy Interfaces are multi-dimensional, diverse and strongly influenced by social and political contexts. One of UNEP's roles is to clarify complex scientific issues so that they are accessible to policy-makers. This necessitates an agile tailoring of efforts for each Science-Policy Interface context. Such tailoring needs to consider technical and policy related issues where there are varying values, beliefs and perspectives, with regard to the issues being considered [3].

Global regimes and key MEAs play a critical role in ensuring coherence across and within internationally agreed goals, and that the evidence base is used for policy uptake. They work closely with intergovernmental panels and a range of actors, coalitions and expert stakeholders to ensure the best quality and timeliness of science, while embracing different knowledge systems.

Implementation and uptake: The challenge of the Science-Policy Interface. There is evidence of a gap between the uptake of a policy and its implementation. This has emerged as a key issue in achieving both influence and impact. Addressing the gap requires new mechanisms that go beyond the diagnosis of challenges and recognize the interdependency and shared values between science and decision-making [4].The core questions to be answered, therefore, centre on how Science-Policy Interfaces can help policy-making and programme development be more solution-focused, implementable and effective in pursuit of inclusive, fair and equitable decisions.

Imperative of exchange of evidence and lessons learned. Other commentators on Science-Policy Interface theory stress the importance of a productive exchange of evidence between individuals who can use this information to influence the outcomes of policy decisions on the environment. Given UNEP's mandate and operating context, a dynamic Science-Policy Interface can support informed decision-making on the environment, while also engaging a broader array of stakeholders to drive progress on the Sustainable Development Goals (SDGs).

3 United Nations Department of Economic and Social Affairs. 2021. CEPA strategy guidance note on the Science-policy interface. March 2021.

4 Cvitanovic and Hobday, 2018. Building optimism at the environmental science-policy-practice interface through the study of bright spots. Nature communications, 9(1), pp.1-5.

Box 1

The Climate and Clean Air Coalition (CCAC) to reduce Short-Lived Climate Pollutants – an increasingly relevant initiative in the Science-Policy Interface

Over the past nine years, UNEP's CCAC has consistently emphasized the importance of mitigating methane as a target in its own right, as this will provide a near-term reduction in warming and reduce the impact of ground-level ozone on health and ecosystems.

This was augmented substantially with the launch of the Global Methane Assessment (GMA) by UNEP and the CCAC in 2021. The assessment focused on the need to cut 45 per cent off methane emissions by 2030. This led to a massive increase in the focus on methane during 2021, with the development of a new European Union Methane Strategy (European Commission 2020) that references the work of the CCAC Scientific Advisory Panel (the initial findings of the GMA then under development) and an increased emphasis on methane apparent in the Biden administration's plans. The EU and US are promoting a Global Methane Pledge, which has seen over 30 countries pledge to reduce methane emissions by 2030. The EU has also funded UNEP to develop a new data-driven, action-focused International Methane Emissions Observatory (IMEO) to improve the ability to monitor methane emissions from industry and inform EU and other national policy on methane.

From the beginning, the CCAC focused on translating the research findings of the original UNEP and World Meteorological Organization (WMO) assessment for use by policy-influencing organizations and policy-makers in national governments. This is based on the understanding that much of the power and responsibility to reduce emissions lies at the national scale. CCAC activities under the SNAP initiative (Supporting National Action and Planning on SLCPs) has driven a change in national agendas to include mitigation of Short-Lived Climate Pollutants (SLCPs). As a direct result of support provided by SNAP and the emphasis placed on SLCPs by the CCAC, three countries – Mexico, Colombia and Chile – have included mitigation targets for black carbon in their Nationally Determined Contributions (NDCs). Importantly, Colombia has said that this is additional to their commitments to reduce CO2 and other greenhouse gases. In its recent NDC, Bangladesh referenced the national SLCP plan developed with support from the SNAP initiative, stating that it is an important resource to help achieve its emission reductions.

What are the main Science-Policy Interface functions and where does UNEP fit in?

Four science-policy functions. Science-Policy Interface functions can be defined in a four-part classification, which can help organizations position themselves and determine what they should focus on.

Given UNEP's mandate and reach, different units or components within the organization collectively fulfil all four functions: synthesizing, brokering, communicating and, to a limited extent, knowledge generation (Table 1).

It has been argued that combining these functions requires the integration of science, policy-making, and civil society[5,6]. This means simultaneously accepting both scientific methods and social values as sources of legitimacy, even when they might make contradictory claims. Balancing this tension in the Science-Policy Interface is known as "boundary work"[6,7]. In view of the above functions and definitions, this paper argues that as far as science-policy related work is concerned, UNEP is and should be considered a "boundary organization".

A core mandate of boundary organizations is to protect the integrity of science from political influence, while also protecting values-based input from potential technocracy[7]. Such a mandate is further supported by the UN Secretary-General's statement in Our Common Agenda that: "now is the time to end the 'infodemic' plaguing our world by defining a common, empirically-backed consensus around facts, science and knowledge". Box 2 outlines how a UNEP-supported science-policy platform co-produces knowledge through its boundary function.

Table 1:
UNEP Science-Policy Interface Mechanisms and Functions

SPI Mechanism \ SPI Functions	Generating	Synthesizing	Brokering	Communicating
Scientific reports	o	o		o
Intergovernmental assessment platforms		o	o	
Actor coalitions	o		o	o
Advocacy campaigns				o
UN collaborations			o	
International regimes (e.g., MEAs, UNEA)			o	o

5 Gluckman et al. 2021

6 Gustafsson, K.M. and Lidskog, R., 2018. Boundary organizations and environmental governance: Performance, institutional design, and conceptual development. *Climate Risk Management*, 19, pp.1-11.

7 Guston, D. 2001. Boundary Organizations in Environmental Policy and Science: An Introduction. Science, Technology, & Human Values 26(4): 399–408.

Box 2

Inclusive knowledge production and building capacity: IPCC & IPBES

The Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) provide governments and other policy-makers with policy relevant scientific information on climate, biodiversity and ecosystem services. Their reports are produced in response to requests from governments. Their rules of procedure ensure policy relevance by allowing governments to approve the initial scoping report and questions to be addressed in the final report, and, at the end, the summary for policy-makers of the assessment. Governments are also invited to provide review comments on drafts. Non-governmental stakeholders, including local communities and the private sector, are invited to take part in this process, making it inclusive. IPCC assessments provided evidence for the Kyoto Protocol and the Paris Agreement. IPBES assessments supported the development of the post-2020 global biodiversity framework under the Convention on Biological Diversity. Other users of the reports include national governments, UN organizations, other multilateral environmental agreements, global financial institutions, development agencies, business and industry, and civil society.

The work of the IPCC has highlighted how science-policy activities can be distinguished from the production of scientific research. With climate change in particular, evidence alone has not been sufficient to influence political outcomes. Science-policy efforts increasingly reflect this dynamic and seek to promote the use of this evidence in policy development processes. They include the role of stimulating political debate about specific issues, where adequate policy processes to consider that evidence do not exist.

The work of IPBES is based on a conceptual framework approved by governments that ensures an integrated approach to biodiversity and ecosystem services, from the analysis of status and trends to social implications, the direct and indirect causes of biodiversity and ecosystem loss, and the actions that can be taken to ensure a better future for all. Guided by a multidisciplinary expert panel, IPBES builds capacity through specific interventions to enhance the knowledge and skills of institutions and individuals – thus enabling deeper and more meaningful engagement, and an increased uptake of its products.

Success and Failure in using Science to Advance Policy

Gaps between scientific knowledge and uptake. The recent UNEP report *Making Peace with Nature* highlights that society is failing to meet most of its commitments to limit environmental damage. It is important to note that these commitments are based on a generally agreed understanding of the underlying science. The report concludes that: *"The international community has set targets, informed by science, in multilateral agreements for protecting natural assets and limiting harmful environmental change. Despite some progress, efforts to date have failed to meet any of the agreed targets."* [8] Clearly there is a gap between scientific knowledge and policy uptake, with a recognition of the need for new constituency building mechanisms and society's support for reform.

The science is clear. Policy uptake is not. Making Peace with Nature makes the following sobering statements about gaps in the Science-Policy Interface:

- The world is not on course to fulfil the Paris Agreement to limit global warming to well below 2°C above pre-industrial levels, let alone meet the 1.5°C aspiration.
- None of the global goals for the protection of life on Earth have been fully met, including those in the strategic plan for biodiversity 2011–2020 and its Aichi biodiversity targets.
- Society is not on course to achieve land degradation neutrality, where degradation is minimized and offset by restoration.
- Many of the targets for conservation, restoration and sustainable use of oceans, coasts and marine resources will likely not be fully met.[9]

In some areas, science and policy uptake have been in sync. There are examples of successful translation of science to policy. The two most often quoted are the "healing" of the hole in the ozone layer, and the phasing out of lead in petrol (Figure 2 and Box 3). Others include recent action to reduce methane via the work of the CCAC (Box 1) and the Stockholm Convention on persistent organic pollutants.
Other more programmatically oriented success stories such as the United for Efficiency (U4E) and Seed Capital Assistance Facility (SCAF) (Box 3) offer insights into the importance of partnerships and cooperation with non-state and sub-national actors – including the private sector – to catalyse action.

8 United Nations Environment Programme 2021. Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. Nairobi. https://www.unep.org/resources/making-peace-nature. p.22.

9 Ibid, pp-22-23.

Box 3

Science-to-Policy Successes:

United for Efficiency (united4efficiency.org)

United for Efficiency (U4E) was established as a UNEP-led global market transformation initiative, supported by the leading global electrical product manufacturing companies and organizations with a shared interest in transforming markets for lighting, appliances and equipment. U4E supports developing countries and emerging economies to move to energy-efficient appliances and equipment. Examples from Asia and the Global South are further outlined in Annex 2 and 3.

Seed Capital Assistance Facility (SCAF)

The SCAF is a public sector donor-funded Project Preparation Facility (PPF) designed to address the need for early-stage finance for the deployment of renewable energy assets in developing countries. In its first ten years, SCAF has supported 23 partners across 176 projects. These projects are expected to result in the avoidance of 4.68Mt CO2 per annum and create more than 17,000 jobs.

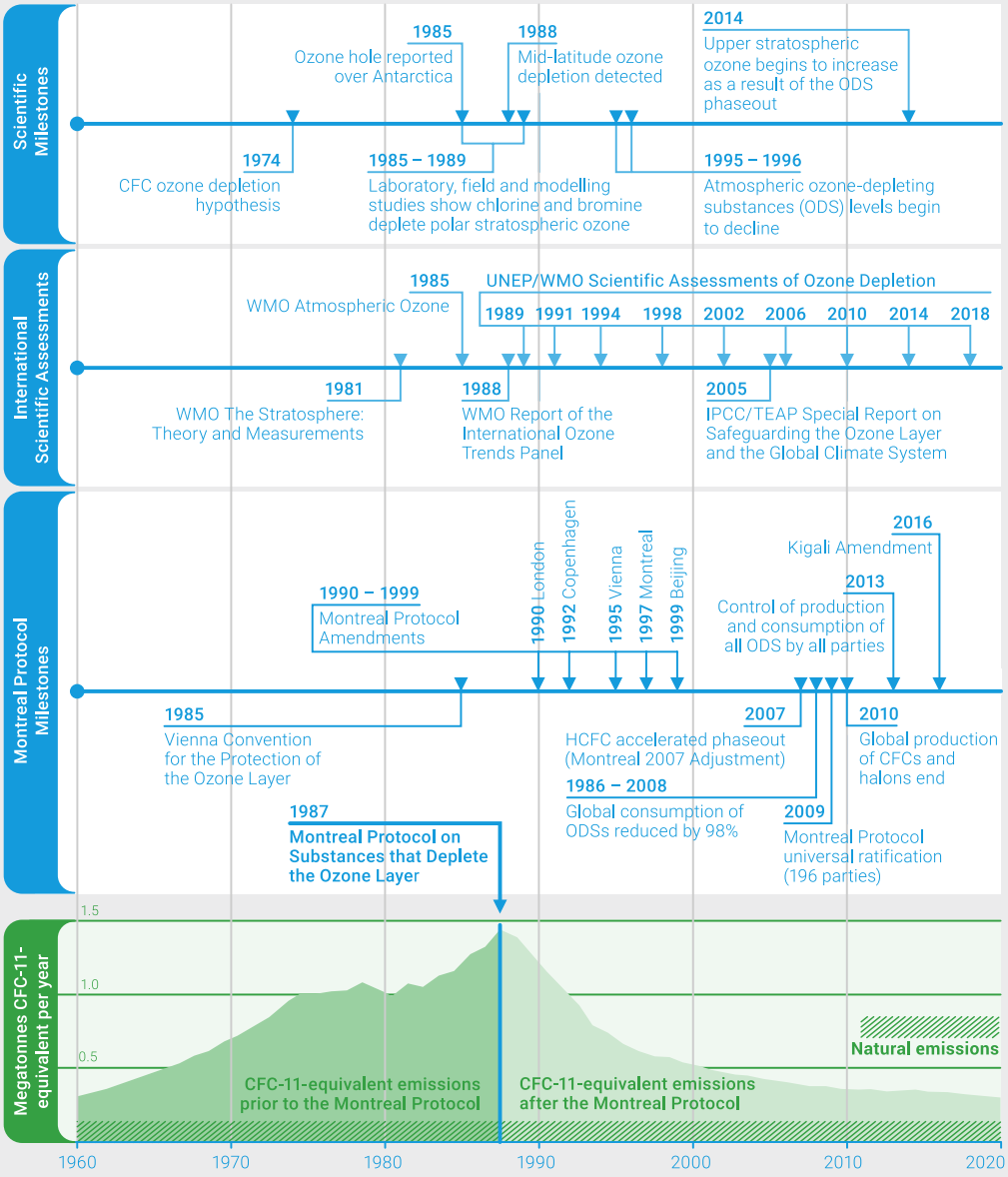
The Era of Leaded Petrol is Over10 (UNEP 2021b)

When the last service stations finally stopped selling leaded petrol in July 2021, the use of leaded petrol ended globally. This followed an almost two decades-long campaign by the UNEP-led global Partnership for Clean Fuels and Vehicles (PCFV). Since 1922, the use of tetraethyllead as a petrol additive to improve engine performance has been a catastrophe for both the environment and public health. By the 1970s, almost all petrol produced around the world contained lead. Lead in petrol was one of the most serious environmental threats to human health when UNEP began its campaign to eliminate it in 2002. Banning the use of leaded petrol is estimated to prevent more than 1.2 million premature deaths each year, increase IQ points among children, save USD 2.45 trillion for the global economy and decrease crime rates

10 UNEP press release, August 31, 2021. Era of leaded petrol over, eliminating a major threat to human and planetary health. https://www.unep.org/news-and-stories/press-release/era-leaded-petrol-over-eliminating-major-threat-human-and-planetary.

Figure 2 Milestones in the History of Stratospheric Ozone Depletion [11]

The Montreal Protocol is widely seen as a successful demonstration of what environmental multilateralism can achieve when science, diplomacy and the private sector cooperate to implement international environmental agreements, and when the multiple Science-Policy Interface channels outlined in Table 1 are used congruently. Our understanding of ozone layer science is strongly supported by the four-yearly Scientific Assessment of Ozone Depletion. It is also important to acknowledge that the process to resolve depletion of the ozone layer started in the mid-1980s, and hence has taken many years to solve. Understanding the complex links between ozone depletion and climate change, and the negative feedback loop discovered by the most recent intergovernmental assessments, was critical to the Protocol's success (e.g., the Kigali Amendment) and brokering consensus on the approach.



11 UNEP 2021. Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. Nairobi.

Why Success and Why Failure?

Unclear what type of science-policy engagement is most effective. Table 1 indicates that different Science-Policy Interface mechanisms fulfil different functions. However, information on how effective these different mechanisms is lacking. As with most initiatives aimed at improving policy outcomes, it is difficult to attribute success and impact to a Science-Policy Interface strategy alone. In policy-making and social debates, scientific evidence is considered alongside other factors (political, social, economic, ethical, etc.). These factors are weighted depending on the context, and so scientific evidence may be in competition with other legitimate interests.

General Principles for successful Science-Policy Interface implementation have been identified by the United Nations Committee of Experts on Public Administration (CEPA), UNDESA[12]:

- *"Science-Policy Interfaces are often issue-specific networks of boundary organizations and individuals nested within the larger national knowledge ecosystem (e.g., commission or expert panels embedded within a statutory agency).*
- *Science-Policy Interfaces are aimed primarily at unstructured (often contentious) policy issues, with the goal of jointly framing and structuring the problem and co-developing evidence to inform solutions.*
- *Boundary work within Science-Policy Interfaces should acknowledge the socially constructed nature of both policy problems and the knowledge brought to bear.*
- *Boundary work in Science-Policy Interfaces is a non-linear and iterative process that can evolve over time as the policy problem evolves in an interdependent (mutually influencing) way.*

What causes policy uptake to be elusive? Absence of iterativity and inclusivity? The social science literature is filled with theories about how the success of Science-Policy Interface approaches might be measured. The predominant theory is that Science-Policy Interface mechanisms that reduce both scientific uncertainty and public controversy – and are credible, relevant and legitimate – can be considered successful. But even when Science-Policy Interface approaches applied to dealing with failures are credible, relevant and legitimate, success can still be elusive. This suggests that there may be other external factors that are necessary to maximize credibility, relevance and legitimacy. Experience gained from the success stories indicates that these factors could be defined as "iterativity" and "inclusivity/representation".

Key ingredient for success: Iterative dialogue – Science, policy and stakeholders. "Iterativity" is defined as "continuous multi-directional interaction that goes beyond simple repetition, building on previous practices, learning from success and failure, and fostering evolution of constructive relationships and knowledge itself among all participants".[13] The argument goes that Science-Policy Interface mechanisms are likely to have greater impact when they facilitate iterative dialogues among science, policy, and stakeholders. This suggests that it is not just the final published product of synthesized knowledge that should be considered, but also the processes and interactions that led to it.

Iterative process — as important as the science itself. Different viewpoints and interests are involved in any process. The iterative process of gathering and negotiating the meaning of scientific findings for policy among a wide array of actors is as much, if not more, a part of the impact of a Science-Policy Interface as the assessment document that is produced. It is suggested that the interactions between actors influences their "beliefs, values and behaviour", and that "enhancing the opportunities by which researchers and government representatives, in multilateral agreements, exchange knowledge in an iterative manner, is decisive to their success[14]".

12 United Nations Department of Economic and Social Affairs. 2021. CEPA strategy guidance note on the Science-policy interface. March 2021.

13 Sarkki, S., R. Tinch, J. Niemela, U. Heink, K. Waylen, J. Timaeus, J. Young, A. Watt, C. Neßho, S. van den Hove (2015) Adding 'iterativity' to the credibility, relevance, legitimacy: A novel scheme to highlight dynamic aspects of science–policy interfaces. *Environmental Science & Policy* 54. pp. 505–512.

14 Riousset P., C. Flachsland, and M. Kowarsch (2017) Global environmental assessments: Impact mechanisms. *Environmental Science & Policy* 77. pp. 260–267.

The Need for More Dynamic and Iterative Approaches to the Science-Policy Interface

Science to policy is rarely a one-way street; it meanders back and forth. The link between science and policy used to be thought of as a linear process in which scientific information is produced by scientists then relayed to decision-makers who develop necessary policy [15]. This "one-way" model does not appear to function well as way of describing how the Science-Policy Interface process works for UNEP in the contemporary world. However, it may still have utility as a normative model in certain circumstances where science is applied to a well-defined situation in which consensus has already been reached on how an issue should be framed and the type of knowledge needed to address the problem.

UNEP's iterative process of science-policy-society, underpinned by practical actions and implementation. For UNEP, science is not often applied to a specific, well-defined situation. A more realistic descriptive and normative model is iterative in nature. In this model of Science-Policy Interface mechanisms, experts, non-experts and policy professionals jointly identify the relevant knowledge gaps and the type of evidence required to fill them. This seems to more accurately describe how UNEP's recent approaches to the Science-Policy Interface have worked, and how Science-Policy Interface strategy should be thought of in the future. Experience in environmental management and governance has shown that Science-Policy Interfaces are most effective when they explicitly link science, policy and society and account for the practical, tangible actions that will impact communities and natural systems in an iterative way[16].

Photo: UNEP

Science does not operate in a social or political vacuum. The COVID-19 pandemic has put paid to any notion of the Science-Policy Interface being an uncomplicated relationship between science and policy, with a linear transfer of knowledge from experts to policy-makers. The pandemic is the latest and most dramatic manifestation of a collective-action problem. It has been a stress test for science and has allowed for deliberation on the prevailing Science-Policy Interface models. The COVID-19 threat demonstrates that science is not static, but influenced by and influences the societies and cultures in which it unfolds [17]. As science continues to unfold in real time, the way evidence is inserted into policy-making requires Science-Policy Interface models that deliberately allow for diverging viewpoints, while protecting independence, transparency and trust, as there are competing scientific views and policy prescriptions.

15 Dunn, G., and Laing, M. 2017, Policy-makers Perspectives on Credibility, Relevance and Legitimacy (CRELE). *Environmental Science and Policy* 76: 146-152

16 United Nations Environment Programme 2021. Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. Nairobi.

17 Ball, P., 2021. What the COVID-19 pandemic reveals about science, policy and society. *Interface Focus*, 11(6), p.20210022. https://royalsocietypublishing.org/doi/10.1098/rsfs.2021.0022


Photo: UNEP

Draw on transdisciplinary social sciences to resolve different viewpoints. Both scholars and practitioners have recognized that policy processes can be complex and contradictory because different stakeholders view the world differently. Beyond providing evidence, science policy activities now seek to promote the use of evidence to build specific policies, as well as offer insights about the implications of certain policy choices, with a far greater role for social sciences – especially economics – and transdisciplinary practices to resolve diverging viewpoints.

The role of political actors representing diverse and often conflicting values and interests must be recognized and addressed. The task of Science-Policy Interface practitioners is to reveal and clarify disputes over policy values and to explore the viability and consequences of policy choices that are available to confront environmental problems.

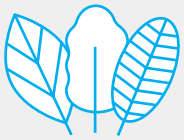
The failure of current Science-Policy Interface strategies to take account of diverse scientific viewpoints when confronting the pandemic situation has led to two positive developments. The first is that it is now abundantly clear that Science-Policy Interface mechanisms must adopt iterative processes that enable consensus on the framing and structuring of problems, to synthesize evidence from multiple perspectives. Science-Policy Interface processes must help facilitate the exchange of scientific evidence and place it in the context of surrounding social values. The second positive development is that the pandemic has spawned a plethora of "evidence-to-policy" tracking systems. The significance of these for UNEP will be discussed later.

Developing a new Science-Policy Interface Strategy for UNEP: Underlying Pre-Conditions

UNEP's future Science-Policy Interface approach should be based on four pre-conditions for success. These are all based on the need for capacity building across the actions and tools:

Digital transformation, enabling open accessible and transparent data, information and knowledge;

Placing significantly more emphasis on **proposing solutions**, as opposed to highlighting the environmental challenges and barriers;



Engaging with a v**ariety of decision-makers**; and

Embracing a more **diverse range of stakeholders.**

Digital transformation

Two-speed transformation: Private sector at high speed; public sector not. Digital transformation is resulting in an unprecedented acceleration in the sharing of ideas, data, and knowledge within and beyond the scientific community, and across the public-private interface. Digitalization is moving exceptionally fast in the private sector, and there is a real risk that the public sector and civil society – including some scientific researchers – will fall even further behind. Should this gap continue to widen, a significant number of opportunities to tackle the triple planetary crises and make progress on achieving the SDGs will be lost.

An effective Science-Policy Interface depends on unfettered access to the best available data, information and knowledge. While information is now instantly available to almost anyone, anywhere in the world, scientists and policy-makers still lack consistent and rapid access to information to enable them to make sound decisions regarding urgent global environment challenges. According to a 2021 UNEP report[18], 58 per cent of the 92 SDG indicators covering the environmental dimensions of sustainable development under the 2030 Agenda could not be measured due to a lack of data.

An open data infrastructure and a digital ecosystem for the planet also requires global environmental data principles, safeguards, standards and norms. There is therefore a need for widespread ownership and use of data, with holders of data being accountable to both governments and people. While open access is an option (see, for example, the ongoing UNESCO Open Science Initiative [19]), users must be

18 United Nations Environment Programme, 2021. Measuring Progress: Environment and the SDGs.

19 UNESCO Open Science Initiative https://www.unesco.org/en/natural-sciences/open-science

able to trust that the data are high-quality and that users' privacy and intellectual property are protected. Users will further want assurances that the algorithms that process those data are transparent, to prevent the spread of fake environmental data that could be used to manipulate policies, markets, and public opinion.

Massive increase in environmental data. There has also been enormous growth in both the number of people and entities (public and private) that collect environmental, economic and other data. This is reflected in the methods they use, which include satellites and drones, remote cameras and other sensors, the Internet of Things and mobile phone applications. The methods of analysing those data have also become increasingly sophisticated, as have the means of communicating such analyses for policy-makers.

UNEP's embrace of the digital transformation. Digitalization is affecting, and will continue to affect, not only how reports are produced and disseminated, but how actor coalitions are organized, how campaigns are undertaken and how intergovernmental science-policy platforms work. The importance of this transformation is recognized in UNEP's Medium-Term Strategy for 2022-2025, which includes a Digital Transformation subprogramme focusing on accelerating and scaling environmental sustainability by applying data, digital technologies and solutions. Accordingly, UNEP will embed a clear focus on the Science-Policy Interface in UNEP's digital transformation engagement, seeking to enhance the tools UNEP can offer to Member States and stakeholders.

Proposing solutions

A decisive move towards proposing and assessing policy solutions. While UNEP will still be expected to highlight the nature of environmental challenges, stakeholders are increasingly expecting UNEP to place greater emphasis on providing solutions and assessing their implications through, for example, scenario-building, predictive analytics and a new generation of integrated assessment models [20], [21]. Science-Policy Interfaces require a constant balancing of the objectivity of science against the need to debate issues in political contexts while also providing policy-makers with the tools to explore alternative solutions to difficult problems in the face of incomplete, uncertain or contradictory information.

From describing the state of the environment to describing possible solutions. Box 4 outlines how the flagship Global Environment Outlook process has evolved over time from a focus on problems to synthesizing evidence from multiple perspectives, which resulted in the provision of policy solutions.

20 Pereira et al., 2021. Advancing a toolkit of diverse futures approaches for global environmental assessments. *Ecosystems and People,* 17(1):191-204.

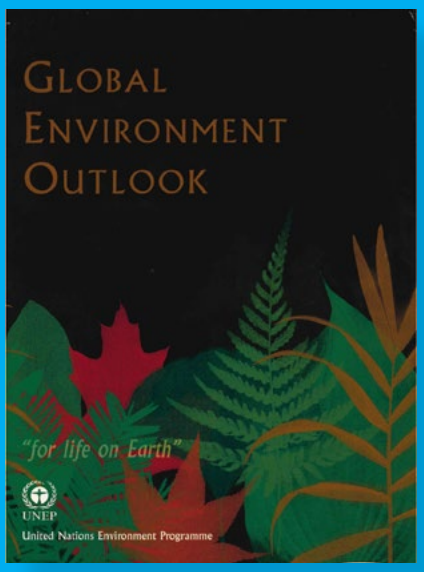
21 Kowarsch, et al., 2017. A road map for global environmental assessments. *Nature Climate Change,* 7(6), pp.379-382.

Box 4

The Evolution of the GEO: From State of the Environment to Policy Solutions

Since its inception in 1995, UNEP's Global Environment Outlook (GEO) has informed many aspects of UNEP's science-policy work. GEO has evolved from a publication that mainly assessed the state of the environment to an iterative co-creation process which looks at different policy solutions and the effectiveness of global policy responses to environmental challenges. The most extensive effort on policy analysis and assessment was published in the sixth edition of GEO, in March 2019. In this publication, 10 chapters were dedicated to developing a policy effectiveness assessment methodology and then applying it to 25 case studies from around the world. The main conclusion of this analysis was that policies that are targeted at cleaning up an environmental problem after it has happened are not very effective, while policies that address the root causes of the environmental problem typically have more impact.

As a result of these findings, Member States have undertaken a two-year effort to determine the future of the GEO process and its publications. One key outcome of this work is that GEO should not only analyse the problems and possible solutions, but that it should expand its work in capacity building, knowledge generation and policy support to Member States. This recognition that UNEP's Science-Policy Interface must expand beyond simple analysis of environmental problems towards providing support services is a new and exciting development. This will allow GEO to not only examine what is happening but also help Member States develop pathways for how to solve these environmental challenges.



Engaging with different decision-makers

A pre-condition for science to influence policy is for broad engagement with an array of decision-makers. Science-Policy Interfaces and socio-political debates draw on and build upon an inclusive and distributive environmental multilateralism at global, regional and national levels. This means that Science-Policy Interface design should be based on the understanding that, while science advances through a rigorous process of testing multiple working hypotheses, effective policy-making must rest on inclusive debate and negotiation. The Science-Policy Interface can in fact be seen as a kind of co-creation of a diverse range of actors, including scientists, policy experts, governmental officials, local communities and private sector interests.

Photo: UNEP

Embracing a more diverse range of stakeholders

UNEP is committed to continue to move in the direction of open science, with a deeper focus on transparent and accessible knowledge and evidence that is developed and shared through collaborative networks.

Beyond tokenism: Ensuring meaningful engagement of youth, women and indigenous people, and ensuring equitable representation. As noted previously, engagement with those with different knowledge and experience benefits the Science-Policy Interfaces and the socio-political debates around them.

Giving young people a meaningful seat at the table. Today's youth bring innovative ideas and solutions to the most pressing global challenges. Their passion, creativity and guidance are needed to strengthen environmental science and policy for a healthier, better future. Leveraging these voices as a force for change will advance Science-Policy Interfaces through advocacy, innovation and pressure for a new social contract between and within generations. Through the Youth 2030 Strategy and Our Common Agenda, the United Nations has set a pathway to work effectively with and for young people, serving as a roadmap to meaningful engagement. Accordingly, and informed by the above, UNEP is seeking to deepen and strengthen youth engagement, building on progress already made.

Ensuring a focus on women. Women's role in science and decision-making has been historically underemphasized. X-rays, environmental movements and even the discovery of dark matter were all due to the work of female scientists, yet in most cases they received little recognition. Women scientists have a vital part to play in scientific leadership and in contributing to stronger, more inclusive Science-Policy Interfaces. Inclusion is about giving a seat at the table to those

groups who are currently not present and supporting them to engage in wider processes of decision-making to ensure that their rights and needs are recognized. An inclusive approach recognizes that people are different and need different support and resources to ensure that their rights are realized. It is vital that UNEP continues to address these gender asymmetries and work towards a future where scientific advancements are unhindered by gender bias and stereotypes.

Science must include adequate geographical representation, including strong engagement from the global south as well as voices with indigenous and local knowledge and be based on the principle of "open science". There is also a clear need to strengthen the science voices from and in the global south through greater inclusion and enhanced public investment. Indeed, more inclusive, diverse knowledge systems may drive more successful transitions from science to policy. Indigenous and experiential knowledge are increasingly recognized as vital sources (Annex 1). Science-Policy Interfaces must look for better ways to co-design research agendas. Scientists should account for the knowledge and experiences of local communities and indigenous peoples because of their intimate knowledge of nature and their experiences in dealing with actions to mitigate and adapt to changing environmental conditions. In the context of pressing planetary and socio-economic challenges, sustainable and innovative solutions require an efficient, transparent and vibrant scientific effort – not only stemming from the scientific community, but from all of society[22]. The recent response of the scientific community to the COVID-19 pandemic has demonstrated how open science can accelerate the achievement of scientific solutions for a global challenge [23,24].

Involving the private sector. There is also a growing recognition of the role of the private sector in environment and development. Expert practitioners and others in the private sector have important knowledge that could help shape effective environmental policies, but that knowledge has remained largely untapped. It is important to bring businesses into the Science-Policy Interface, not only for their knowledge, but because business can often move far faster than governments in response to crises.

Photo: UNEP

22 Gluckman, P.D., A. Bardsley, M. Kaiser. 2021. Brokerage at the science-policy interface: from conceptual framework to practical guidance. *Humanities and Social Sciences Communications,* 8 https://doi.org/10.1057/s41599-021-00756-3.

23 Kadakia, K.T., Beckman, A.L., Ross, J.S. and Krumholz, H.M., 2021. Leveraging open science to accelerate research. *New England Journal of Medicine,* 384(17), p.e61.

24 Guimón, J. and Narula, R., 2020. Ending the COVID-19 pandemic requires more international collaboration. *Research-Technology Management,* 63(5), pp.38-41.

Tools for New Science-Policy Interface Approaches for UNEP

Suggested tools and approaches. The previous section highlights the importance of getting on the digital transformation highway; of moving towards proactively identifying solutions and supporting their implementation; of engaging with a variety of decision-makers and of ensuring the inclusion of a broad set of stakeholders. Based on these pre-conditions, it is suggested that UNEP's Science-Policy Interface engagement include the following tools and approaches. Again, it is recognized that capacity building will be essential to achieve the successful uptake and application of these tools.

Horizon Scanning and Strategic Foresight

All organizations aim to be more proactive in their orientation toward the future. However, visionary organizations are also aware that such a path is not just a case of simply understanding trends sufficiently to make better predictions. Such organizations understand that developing deeper strategic foresight and 'field of futures' studies can enable the development of a wide set of tools useful to support horizon scanning and strategic planning.

UNEP will develop horizon scanning in addition to strategic foresight. Horizon scanning is being adopted globally to identify, assess and prioritize innovations and trends at an early stage of their development. This enables decision-makers to be better informed and to prepare for change. UNEP's 2012 Foresight Report is an example of a qualitative approach to horizon scanning [25].

A formalized approach to horizon scanning involves four steps:

- Developing filtration criteria and methods for discarding "irrelevant signals";
- Prioritization criteria and methods used to assess signals;
- Signal assessment; and
- Dissemination and evaluation of the results of horizon scanning

Horizon scanning AND strategic foresight. Horizon scanning has evolved to become a formalized process that is increasingly being undertaken using Artificial Intelligence. UNEP aims to formalize the establishment of horizon scanning functions in addition to strategic foresight.

Strategic foresight includes horizon scanning but is more process-driven to aid decision-making. It often includes multiple stakeholders and consideration of alternative scenarios. The process of foresight attempts to undertake the sense checking phase (i.e., whether a given issue is important for a given context and whether a response is required). As outlined by Cuhl (2020) [26], foresight encompasses more dialogue and looks at the long-term future, which may influence strategies, activities and planning.

25 The Frontiers Reports for 2016, 2017, 2018/9, and 2020 have focused on emerging issues of concern to UNEP, which have then sometimes become real problems. For example, the 2016 report included a chapter on the risk posed by zoonotic diseases.

26 Cuhls, K.E., 2020. Horizon Scanning in Foresight–Why Horizon Scanning is only a part of the game. *Futures & Foresight Science,* 2(1), p.e23.

Tracing Impact: Evidence-to-policy tracking

UNEP works to fulfil the promise of paragraph 88 of the Rio outcome document, *The Future We Want,* and serve as the leading global environmental authority. Yet with ever increasing environmental challenges, UNEP needs to have an enhanced understanding of the extent to which its science-policy initiatives are positively impacting the environmental dimension of sustainable development. UNEP's work on tracking the impact of its publications has focused primarily on formal evaluations and tracking publication uptake statistics. While ongoing tracking is necessary and valuable, UNEP should expand impact monitoring for all its publications.

Learning from a crisis: COVID-19 related science-policy tracking. Evidence-to-policy tracking has become a significant aspect of COVID-19-related policy research. Examples of newly developed systems include the International Network for Government Science Advice (INGSA) Science-Policy Tracker[27], the International Public Policy Observatory's Living Map, produced by the EPPI Centre at University College London,[28] and the Oxford Supertracker based at Oxford University [29].

The INGSA Science-Policy Tracker lists government policy decisions related to pandemic response in a large range of countries. It also aims to link these decisions to specific points of science-generated evidence, although this aspect of the tracker is not yet complete. This is an interesting observation in and of itself, as it could be due to one or more of three reasons: the difficulty of pinpointing a causal link between a virological/epidemiological conclusion and a specific public decision; the scientific justification for a policy decision does not exist; or the science is unsettled, and so an evidence-to-policy link is not practically possible.

The International Public Policy Observatory says it is "mobilizing global knowledge to address the social impacts of COVID-19" and has produced a "living map" of systematic reviews of social sciences research evidence on COVID-19.

The Oxford Supertracker is a global directory of several hundred policy trackers and surveys related to COVID-19. This meta-tracker is designed to assist researchers and policy-makers in keeping track of the rapidly growing number of data sources.

The advent of these pandemic-focused policy trackers has drawn attention to older policy databases with a natural resource focus such as FAO's Food and Agriculture Policy Decision Analysis (FAPDA) database, [30] which contains more than 10,000 national policy decisions and 2,000 national policy frameworks for 100 countries around the world. The objective of FAPDA is to support stakeholders – such as governments, development partners, regional economic organizations, civil society organizations, researchers, policy-makers and the private sector – to identify policy trends and inform the debate. FAO also has a legal database (FAOLex), that tracks the relationship between FAO policy decisions and regional and national developments in law and regulation.

27 Allen, K., et al (2020), Tracking global evidence-to-policy pathways in the coronavirus crisis: A preliminary report. INGSA

28 covidandsociety.com

29 supertracker.spi.ox.ac.uk

30 www.fao.org/in-action/fapda/fapda-policy-database/fr/

Application of behavioural science

Science-Policy Interfaces have long relied primarily on the physical and natural sciences as the basis for assessments of the global environment. While necessary and often unavoidable, that reliance has led to the exclusion, intentional or not, of other fields of inquiry that may offer valuable insights into how to address the challenges that science has revealed. Changing human behaviour, for example, may be key to many elements of sustainability. However, policy-makers have not turned to advances in the cognitive and behavioural sciences to promote sustainable decisions and behaviours, relying instead on providing information, crafting financial incentives or invoking legal prohibitions. Communication strategies aiming to inform citizens and motivate voluntary sustainable behaviour have often proved inefficient.

State-of-the-art knowledge from the behavioural and cognitive sciences can help identify barriers that impede behavioural shift towards a more sustainable lifestyle. What, for example, motivates people to behave in ways that promote sustainability? New research is exploring that and similar questions and beginning to propose behavioural levers and intervention strategies to increase individual motivation to act on environmental issues and increase sustainable behaviours by overcoming processing limitations, harnessing diverse motivational systems and facilitating decision-making. The systematic application of behavioural science is one element of a broad transformation of the United Nations that will increase its effectiveness.

Measures to consider and mainstream behavioural aspects of environmental management and governance should underpin policies and actions to secure a safe and productive environment. Enhancing capacity for behavioural science will be a key area for UNEP, with efforts to expand its use (and capacity) across workstreams – including integrated assessment, predictive insights/analytics and digitally-enabled tools. The Little Book of Green Nudges, which has been piloted in more than 100 universities to explore how different defaults and incentives can shift behaviours is a good pilot project, but a lot more can be done [31]. In this context, it is useful to recall that UNEP's Medium-Term Strategy 2022 - 2025 recognizes the important role and transformative potential of behavioural sciences to enhance the Science-Policy Interface.

Advanced metrics for assessing impact

Analysis undertaken by the World Bank in 2014 indicated that only 13 per cent of policy reports were downloaded at least 250 times, while more than 31 per cent of policy reports are never downloaded at all. Almost 87 per cent of policy reports were never cited[32] .

Key UNEP reports downloaded hundreds of thousands of times with wide news media pick-up. More recently, UNEP undertook a six-month consultative process to examine the reach, uptake and use of its publications. Surveys of Member States' representatives, as well as in-house surveys of all staff and the authors of selected publications, revealed a wide diversity in the reach and use of UNEP publications. While data was hard to come by and not all was robust, some flagship publications were downloaded hundreds of thousands of times and some technical reports just a few hundred times. Messages from a publication could be picked up by thousands of media outlets and reach a Twitter audience of millions. Citation and tracking databases such as Altmetric and Dimensions indicate that many of these products are mentioned in other publications, in news sources and in policy documents.

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31 United Nations Environment Programme, GRID-Arendal and Behavioural Insights Team (2020). The Little Book of Green Nudges: 40 Nudges to Spark Sustainable Behaviour on Campus. UNEP and GRID-Arendal.

32 World Bank (2014), Which World Bank Reports are Widely Read? Policy Research Working Paper 6851.

The differences in reach and engagement are difficult to specify but correlate generally to the degree of additional communications attention given to a product (more attention leads to more reach), the technical or regional specificity of a publication, whether a publication is standalone or has complementary additional products that adapt or translate the content for easier use, and its topicality and timeliness.

The UNEP Member States survey reveals that shorter and more analytical products are preferred. The Member States survey – of UNEP's target policy-makers and shapers – suggested that many of the publications surveyed are not read in their entirety and that shorter, more analytical and locally adapted products are preferred. Notwithstanding, respondents say they shared the knowledge products and provided many examples of national policy processes where specific publications were used. Publication authors provided evidence that their publications had been translated, used in legislation or otherwise used. The challenge for UNEP is to move from this more ad hoc feedback to a more systematic process where its science and knowledge are being used – both to track and understand use and to improve the pathways that it can use to feed science into policy.

The surveys show there is much reach and uptake of UNEP publications, but it is difficult to determine whether it is at the Science-Policy Interface or in other arenas – in academia, the media or the general public. The challenge is to get beyond these numbers to gain insight into actual use and the demographics of uses and users.

Other UN agencies involved in Science-Policy Interface work have tackled this issue in some detail. For example, a World Bank study encouraged the United Nations Development Programme (UNDP) to invest in a detailed analysis of the impact of its own knowledge products. UNDP is now developing a system to support knowledge products that consists of tracking, feedback, quality assurance and assessment.

NEXT STEPS

To achieve a better Science-Policy Interface, UNEP needs to support Member States more fully, and significantly strengthen the uptake of science in policy, drawing on new and existing pathways, including digital transformation and digital tools, greater engagement with non-traditional knowledge and a broader array of scientists and stakeholders, as well as crafting of performance measures for evaluating impact.

To help achieve this, UNEP will use the following tools:

HORIZON SCANNING:

UNEP will establish a formal "horizon scanning" function. The aim is to provide UNEP with a forward-looking ability to better predict and respond to emerging environmental issues.

EVIDENCE-TO-POLICY TRACKING:

UNEP will work with partners to explore the development of a customized environmental policy tracker. This means adopting a "theory of change" or "impact value chain" approach.

BEHAVIOURAL SCIENCE:

Enhancing capacity for behavioural science will be a key area of engagement with efforts to support staff in enhanced application (and capacity) across all UNEP workstreams, including integrated assessment, predictive insights/analytics and digitally enabled tools.

ADVANCED METRICS FOR KNOWLEDGE PRODUCTS:

In line with the Medium-Term Strategy 2022 – 2025 and the Programme of Work, **UNEP will establish a new set of metrics** and performance indicators for knowledge products and the broader Science-Policy Interface.

Photo: Thomas Bennie/Unsplash

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Annexes

Annex 1:
Annex 1: Wading in from the edge: Indigenous Peoples' journey at COPs

Representatives of Indigenous Peoples of North America first participated in COP4 (Buenos Aires) in 1998, where they presented a declaration on climate change known as the Albuquerque Declaration. This was "the first articulation of indigenous concerns with regard to the disproportionate impact of climate change, variation, and extremes on Native Peoples in the international arena". Indigenous Peoples Organizations became an official constituency to the UN Framework Convention on Climate Change (UNFCCC) in 2001, although their engagement remained limited during the early years as mitigation issues in developed countries dominated the agenda. It was not until 2005 that Indigenous Peoples became more vocal and active, when reducing emissions from deforestation (RED, which later evolved into REDD+) was introduced to the Convention, galvanizing attention on Indigenous Peoples as key rights holders.

In 2008, the Caucus for Indigenous Peoples under the UNFCCC – the International Indigenous Peoples Forum on Climate Change (IIPFCC) – was founded. Through the IIPFCC, Indigenous voices became increasingly influential and Indigenous Peoples' rights "travelled from the margins to the centre" at UNFCCC negotiations. In 2010, their rights and knowledge were acknowledged in the Cancun Agreement as part of REDD+ social safeguards.

COP 16 in 2010 was also a critical juncture as adaptation became an important priority. Indigenous Peoples claimed further space to share their wisdom through the Indigenous Pavilion and side events at subsequent COPs. In 2015, the Paris Agreement became the first international climate policy to include provisions that recognize the rights of Indigenous Peoples, their contributions and knowledge and the need to strengthen their practices.

This led to the creation of the Local Communities and Indigenous Peoples' (LCIP) Platform, a formal space for Indigenous Peoples under UNFCCC with three key functions: knowledge, capacity for engagement and climate change policies and actions. This was followed in 2018 by the establishment of a Facilitative Working Group (FWG) – a constituted body to support its work – and approval of a two-year workplan with 12 activities in 2019.

The establishment of LCIP Platform and FWG marked the first time within the United Nations where Indigenous Peoples could represent themselves in decision-making on an equal basis with State representatives, rather than being represented by "independent experts" selected by State bodies.

Annex 2;
Transforming Markets to More Energy-Efficient Lighting, Appliances and Equipment with the Global Energy Efficiency Accelerator Platform

The UNEP-led United for Efficiency (U4E) initiative showcases the effective application of the boundary between science and policy. By strategically supporting developing and emerging economies (where electricity demand is set to more than double by 2040) to accelerate their transformation to higher efficiency products, substantial financial and CO2 emission savings are achieved.

By bringing together key global and local stakeholders such as technical institutions, leading manufacturers and governmental organizations, U4E can reliably assess global market trends, product innovations and the international best practice needed to deliver large scale financial, environmental, energy and societal benefits for all. This is largely due to the successful implementation of Energy Efficiency Standards and Policies.

U4E's market transformation programmes are a combination of proven science-based policy measures that define the minimum efficiency levels and quality criteria products must satisfy. Based on detailed market research, its public-private partnership approach and collaboration with dozens of experts from various sectors, U4E has developed a wide range of independent tools and resources. The new U4E Model Regulation Guidelines, for example, contain product scope, definitions, test methods, minimum efficiency levels and a set of minimum performance requirements to be considered in countries' regulatory or legislative frameworks.

Country Lighting Market Transformation Example Pakistan

Pakistan is a large, emerging economy, where – in parallel with its population growth – energy consumption has risen steadily. This has led to a national energy crisis, where a large portion of the population still lacks full access to reliable electricity.

The implementation of the first Minimum Energy Performance Standards for lighting products in 2020 was an important step in ensuring increased energy access for all and reducing national CO2 emissions.

According to U4E´s Country Saving Assessment for the Pakistani lighting market, the transformation to more energy-efficient lighting systems will result in annual savings of one million tonnes of CO2 emissions. It will also result in over USD 100 million in annual savings in electricity costs for all residential consumers by 2030.

Annex 3: Delivering Efficient Power Supply Networks for All in the Southern African Region with the Global Energy Efficiency Accelerator Platform

Doubling the global rate of improvement in energy efficiency by 2030 is an underlying target of Sustainable Development Goal 7. In 2014, Sustainable Energy for All launched the Global Energy Efficiency Accelerator Platform to help realize this objective.

Power distribution transformers are used to transfer electrical power; they operate non-stop and often have very long service lifetimes. In African countries some transformers are often used for more than 40 years. This is a problem as older transformers typically consume much more energy because of losses. Today, for example, the Sub-Saharan region has a transmission and distribution loss factor of about 17 per cent, twice the global average. In addition, older transformers contain Polychlorinated Biphenyls (PCBs). PCBs are persistent organic pollutants targeted for phase out in existing equipment by 2025 through the Stockholm Convention.

Electricity consumption is expected to more than double in Africa by 2040. U4E has been coordinating the implementation of dedicated, Green Climate Fund-supported, eco-efficient power transformer projects in eight countries in the Southern Africa region.

These projects are developing the required policy, regulations and institutional frameworks for low-loss power networks. The eight market transformation projects are introducing minimum energy performance standards (MEPS), new procurement specifications for utilities and modern financial mechanisms for much more energy efficient power systems. If these countries switch to energy-efficient transformers, they could save the equivalent of 10 medium-sized power stations and achieve more than USD 500 Million in consumer savings by 2040. By implementing a higher ambition policy [e.g. to current EU power transformer standards], these savings could be increased further.

Savings in the Southern African Region from Eco-Efficiency Power Distribution Transformers

A key component of these projects is minimum energy performance standards. The projects utilize U4E model regulation guidelines to develop their national standards to current international norms and are supported by experts from various sectors and global regions.

U4E has also developed new financing models and a Total Cost of Ownership tool to enable the region's utilities to make the best use of scarce capital resources and to make well-informed purchases of the millions of new transformers that will be installed by 2040.

The Global Energy Efficiency Accelerator Platform is also cooperating with UNEP's Chemicals and Health Branch PCB project to enable the environmentally responsible disposal of PCB oils contained in older power transformers and capacitors across 12 countries in Southern Africa

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