International Resource Panel

Think Piece by the International Resource Panel (IRP)

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TACKLING GOVERNANCE AND FINANCING FOR SUSTAINABILITY TRANSITIONS

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TACKLING GOVERNANCE AND FINANCING FOR SUSTAINABILITY TRANSITIONS

FOREWORD

Mitigating our currentplanetary crisis requires new and transformative solutions. Altering just one system or institution will not solve this complex, system-level problem.

Finance and governance are two of the realms where profound shifts are required.

A think piece by United Nations Environment Programme's International Resource Panel explores how financial institutions currently operate and what needs to change as well as the essential role national governments must play in putting the right policies in place to guide how resources are managed.

Foundations

Systemic change—and a shared understanding of the complexity and nuances of resource management—will be required to achieve a global sustainability transition. On the governance side, targeted national policies are needed alongside international coordination, with policy playing a greater role in steering resource management processes. On the finance side, a wide range of financial institutions must phase out the financing of fossil fuels. Currently, the structure of finance reinforces the misallocation of capital away from activities that could accelerate the sustainability transition.

Challenges

Thereisno single root cause of the current resource management challenges, which include:

Economic lock-ins, with market economies contributing to unsustainable resource governance.

Consumer behaviour, with resource use driven by the consumption of goods and services, and behaviour largely determined by shared routines and practices embedded in dominant structures.

Information and knowledge constraints, with unequal data available and greater understanding not necessarily translating into improved resource governance.

Fragmented governance across geographies and the public and private sectors, resulting in varying weight placed on resource policies.

Policy strategies for the transition to more sustainable

1. Promoting experimentation and learning: For example, by supporting disruptive technological innovations like the Montreal Protocol on Substances that Deplete the Ozone Layer.
2. Scaling up and accelerating sustainable alternatives: For example, by promoting sustainable finance by establishing financial funds like the European Circular Bioeconomy Fund.
3. Managing phase-out of resource-intensive practices: For example, through government regulations to promote the institutional divestment of assets connected to companies involved in extracting fossil fuels like the French Energy Transition.
4. Guiding and coordinating change: For example, with national strategies and roadmaps to establish innovation trajectories, like Chile's Roadmap of Strategic Innovations for Mining 4.0.

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JOINT EXECUTIVE SUMMARY

Twonewthinkpiecestacklegoverningandfinancingsidesofthesustainability transition

The world is complex and interconnected, as are its resource management issues. With biodiversity loss aggravating and climate change impacting wider swaths of the globe, major change is needed to ensure the planet's population and ecosystems can thrive.

Mitigating our current planetary crises requires new and transformative solutions across the globe's many resource-dependent systems. There is no one solution, nor will altering just one system or institution solve the problem.

Governance and finance are two of the realms where profound shifts are required. Governments must put the right policies in place to help steer the sustainability transition. Financial systems must be reconfigured to ensure that capital is redeployed from the current unsustainable consumption and production patterns.

Two new papers from the International Resource Panel think critically about governance and finance, diagnosing why needed shifts towards more sustainability haven't occurred, and offering necessary context, contemporary theories and sets of solutions.

Understanding the financing of sustainability transitions in a resource-dependent world explores how financial institutions currently operate and what needs to change. The structure of finance reinforces the misallocation of capital away from activities that could accelerate the sustainability transition, and the paper provides an overview of the dynamics of the financial system, the role of commodity trading and the exchange of natural resources, and what shifts have occurred since the 2007/2008 global financial crisis.

Governing sustainability transitions in a resource-dependent world explores the essential role national governments must play in instituting new, transformative policies that guide how resources are managed. It provides an overview of persistent problems, and discusses the prominent current theories of change. Specific natural resources governance approaches are discussed, along with the challenges and opportunities.

They both provide knowledge to be used as building blocks in the sustainability transition. While the major changes to policies and financial flows necessary to advancing environmental sustainability have not yet happened, in conversation, these think pieces offer an idea of the breadth of change required and how to move forward.

FOUNDATIONS

Transitions research offers a shared understanding of the characteristics and dynamics of systemic change—the kind of change required to achieve a global sustainability transition. It recognizes that systems change is complex and uncertain, and can take decades.

On the governance side, national policies are needed alongside international coordination. On the finance side, a wide range of financial institutions must phase out the financing of fossil fuels, thereby avoiding built-in pressures that hinder the sustainability transition and finance must be redirected towards sustainable, renewable and restorative value creation.

Suggested policy interventions to address climate change concerns have traditionally focused on influencing the market forces that shape resource management. Sustainability transitions research indicates that policy needs to play a greater role in steering these processes. The resulting policies would necessarily be new.

Four major transition concepts are discussed:

1. Socio-technical: This type of research focuses on transforming the systems that provide core societal functions, meeting needs for energy, food, mobility and housing. Transitions are seen

as long-term, co-evolutionary processes that mobilize multiple actors to reconfigure the institutional, organizational and material structures of societal systems.

2. Socio-ecological: This research emphasizes the mutual dependencies and dynamic relationships between humans and the environment, building on ecosystem theory and complex systems analyses (Levin et al. 2013). Interactions between society and ecosystems are analysed at various scales, from community management of the local environmental commons up to the global scale (Steffen et al. 2015). This cross-cutting approach has influenced the European Union's policy strategies addressing the circular economy (European Commission 2015), zero pollution action (European Commission 2021) and the European Green Deal (European Commission 2019) .

3. Socio-economic: This is a multi-disciplinary topic that spans political economy, historical sociology, environmental economics, ecological economics and institutional economics. The analysis is concerned with changes to dominant power relations and the institutions that structure economic and financial systems that have resulted in patterns of individual and collective behaviour that can be environmentally unsustainable and harmful to human well-being. Ideas for governing range from encouraging the development of grassroots complementary economies (Kemp et al. 2017) to the rerouting of financial flows (Dasgupta 2021).

4. Just transitions: This responds to the need to ensure that efforts that steer society toward a resource-efficient, low-carbon future pay attention to issues of equity and justice. It recognizes that transformation will result in winners and losers as new sectors emerge and polluting or resource-intensive industries are phased out. Of the range of governance options that exist to promote a just transition, on one end is the EU's Just Transition Mechanism, which works with current structures and emphasizes the need to foster education, skills and employment to serve social needs (European Commission n.d.). At the other end are academic discourses favouring a restructuring of the global financial systems and a re-conceptualizing of the role of the state (Swilling and Annecke 2021).

What these have in common is the need to move beyond incremental improvements and to focus on a more fundamental transformation in the ways in which society meets its needs and organizes its economic structures.

With finance,thepaperdescribesthestructureand dynamics of the global financial system, with both public and privatefinancialinstitutionsresponsiblefortheway capital is allocated in the global economy, suggesting that interventionsarerequiredatvariouslevels.

It exploreshowbanksarecreatorsofmoney,an understanding that is undisputed in the financial system but largelymissinginthedebateaboutfundingthe sustainability transition. The role of commodity trading as thenexusbetweentheuseofnaturalresourcesand finance is foregrounded as an issue that is rarely mentioned in the literature on sustainability transitions.

CHALLENGES

Global resource governance is a so-called "wicked problem" (Levin et al. 2012). Currently, those who are causing the problem are also seeking to provide solutions, and there is no central authority to address this majorglobalissue.Furthermore,thereisnosingle root causeofthechallenges.

Knowledge about resource extraction and flows is often incomplete or contradictory. Production and consumption systems have multiple actors and diverging positions. People operating at different points along the supply chain are motivated and governed by different values and institutions. And, responses typically create new challenges. For example, using biofuels to replace fossil fuels results in competition over agricultural and forested lands, possible intensification of land use and further environmental and social impacts.

Considering the systems change needed, the key challenges are:

1. Economic lock-ins: The structure and function of market economies can contribute to unsustainable resource governance.

2. Lifestyles and consumption behaviour: Resource use is driven by the consumption of goods and services, and consumer behaviour is largely determined by shared routines or shared practices, which are deeply embedded in the dominant structures (McMeekin and Southerton 2012).

3. Information and knowledge constraints: High expectations are placed on data, indicators, uniform measurement systems and knowledge in general to advance sustainability in prominent environmental science-policy processes. Although understanding has increased across various scales, the continual improvement of knowledge on resource stocks and flows has not translated into sustainable resource governance.

4. Fragmented governance: Resource governance is fragmented geographically and into sectors that comprise both public and private actors. This results in varying weight placed on resource policies, depending on the region's or country's resource dependence and history of governance. Resource-rich countries can place their abundant resources at the core of national economic policies, or resource governance can be in the hands of a limited political elite resulting in non-transparent arrangements.

5. Quality of institutions: Governments often have a central role in shaping the structure of production-consumption systems, but frequently state interventions contribute to unsustainable outcomes. In many instances, governments lack the information and resources to design and implement effective policies.

The sustainability transition will depend on the redeployment of capital from activities that reproduce unsustainable consumption and production practices to those that reinforce and accelerate sustainable modes of consumption and production. To do so, the financial system needs to be overhauled, as it cannot be assumed that finance will automatically follow new directions in environmental policy.

The finance sector is a large and complex network of interrelated balance sheets of public, social and commercial financial institutions. And there is an ongoing unequal exchange of natural resources in favour of the global North, with structural reasons for this unequal exchange.

To demonstrate this, recently published studies on the net balance of embodied raw materials, final energy, land and labour between high-income countries are analysed. In a set of eight tables, it is shown that the general direction of the net balance of raw materials, land, final energy and labour is consistently from South to North (See Table A).

Table A

Resources embodied in goods and services trades	North → South flows 2015	South → North flows 2015	Net trade from South to North in 2015	Cumulative net trade from South to North from 1990-2015
Raw material equivalents [Gt]	3	15	12	254
Embodied land [mn ha]	527	1,349	822	32,987
Embodied energy [EJ]	22	44	21	650
Embodied labour [mn py-eq]	31	219	188	5,957

Source: Hickel et al. (2022)

Overall, the pattern is consistent: the global South is a net exporter of resources to the global North and the global South (apart from China) pays more for its imports from the North than it receives from its exports to the North. While China has achieved a high monetary trade surplus, it has nevertheless exhibited a trade deficit in terms of natural resources by acting as a net provider of embodied materials, energy, and labour.

From a sustainability transition perspective, the global finance regime appears two-faced. On the one hand, there are public commitments of support by a wide range of financial institutions to invest in the sustainability transition. On the other hand, the financing of fossil fuels, unequal resource exchange, capital flight and the financialization of commodity trading carries on unabated. The large bulk of capital continues to be allocated in ways that hinder rather than catalyse sustainability transitions.

Global finance is configured to ensure that investment decisions are governed by risk and reward incentive structures that fundamentally counteract what is required to realize a sustainable world. Until finance gets fully recoupled to the real economy, this problem will persist.

SOLUTIONS

Transitionsresearch shows ways policy can advance the transformationofresource-dependent systems (Box A.1). This inturninforms a set of key messages for policymakers(BoxA.2).

How can thefinancial system be reconfigured to ensure that capitalgetsallocated to support a sustainability transition?Asrecognised in the United Nations EnvironmentProgramme's Green Economy Report, it is ultimatelytheallocation of capital that will determine the directionanddepth of the sustainability transition.

Box A.1: Policy strategies for the transition to more sustainable resource governance

1. Promoting experimentation and innovation: Policy strategies can support disruptive technological innovations, for example the Montreal Protocol on Substances that Deplete the Ozone Layer and the EU Sulphur Directive for Marine Fuels. They can work to bring together coalitions of actors, like France's Citizens Convention for Climate, and spur technology-specific funding, like China's New Energy Vehicle Policy.
2. Scaling up and accelerating sustainable alternatives: This requires policies that support adoption, diffusion to new geographical areas and sectors, and the institutionalization of new products, services and business models. Examples include sustainable public procurement initiatives like the United States EPA's Comprehensive Procurement Guideline Programme and promoting sustainable finance by establishing financial funds like the European Circular Bioeconomy Fund.
3. Managing phase-out of resource-intensive practices: The disruption, phase-out and reorganization of established practices can be triggered by external shocks and also deliberate policies. Examples include the 'duty of care' to limit the disposal of overstock and returned goods in Germany, and government regulations to promote the institutional divestment of assets connected to companies involved in extracting fossil fuels like the French Energy Transition.
4. Guiding and coordinating change: Shared priorities signal the direction of change and provide an orientation by outlining specific priorities and strategic policy approaches. International programs can structure and coordinate multi-sectoral policy initiatives toward a common goal, like the Comprehensive African Agricultural Development Programme. And national strategies and roadmaps can establish innovation trajectories, like Japan's plastic resource circulation strategy and Chile's Roadmap of Strategic Innovations for Mining 4.0.

Box A.2: Key messages for policymakers on resource governance

- Adopt a sustainability transition approach to help ensure sustainable natural resource use and management

  Examine assumptions, integrate transitions thinking, generate new knowledge

- Support ambitious long-term goals and strategic frameworks to steer sustainability transition

  Introduce directionality, support shared visions at the national and international levels, facilitate networking

- Offer alternative policy sequences for advancing sustainability transition in a positive and engaging fashion

  Support the development of pathways, provide a long-term narrative, regulate, phase out, incentivise, empower

- Provide tools and support to coordinate sustainability transition across systems and internationally

  Evaluate and communicate sustainability, set up platforms, support coordination

Questions that should be asked are which investments are needed for the common good, for providing adequate and affordable housing, education and health services to all and for decarbonizing our energy systems. Policy interventions will be required that put in place an alternative set of rules that results in a redirection of capital into the real economy, and into programs aimed at achieving the Sustainable Development Goals.

From an IRP perspective, commodities are at the centre of the sustainability transition. Many metals such as copper, lithium, cobalt and nickel will be needed in vastly larger amounts to decarbonize the global energy system.

Central Banks now increasingly understand the risk that the climate crisis poses for the stability of global financial markets, and slowly they have begun to embrace their potential roles in allocating capital to climate change mitigation and adaptation, see e.g. Central Banks and Supervisors Network for Greening the Financial System1. This has yet to be extended to include responses to enforce sustainable resource use and biodiversity protection.

There are suggestions for further research that could result in a better alignment between sustainability transitions and the global financial system. And the finance paper writes that the IRP should focus on what it will take to reverse the “gross misallocation of capital” cited in the Green Economy Report, as well as the unequal resource exchange referred to in recent IRP research.

The planet’s resource use is dependent on manifold global factors, as will be the solutions. Employing systems transformation theory to ground the discussion about the global sustainability transition provides a framework that recognizes the scale of action required and the complexity.

A new generation of policy and financial system reforms will be required to align the financial system with the sustainability transition. These two new papers demonstrate why, and offer suggestions as to how.

[1] http://www.ngf.net/en

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Think Piece by the International Resource Panel (IRP)

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UNDERSTANDING THE FINANCING OF SUSTAINABILITY TRANSITIONS IN A RESOURCE-DEPENDENT WORLD

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1

INTRODUCTION

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1 INTRODUCTION

Human civilization as we know it is threatened by multiple environmental crises. Climate change is only one of three critical dimensions of the global planetary crisis – the other two being biodiversity loss and pollution. Unsustainable consumption and production of natural resources is a cross-cutting driver of these three dimensions of the environmental crisis. While the Intergovernmental Panel on Climate Change (IPCC) reports focus attention on climate change (IPCC 2021; IPCC 2022a; IPCC 2022b), and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) on biodiversity loss (IPBES 2019), the Global Resources Outlook brings into focus the challenge of unsustainable resource use (United Nations Environment Programme [UNEP] and International Resource Panel [IRP] 2019; UNEP 2024).

Now that there is a sufficiently broad scientific and societal consensus that fundamental change is a priority given the negative consequences of the multiple environmental crises, a growing body of research focusses on the complex dynamics of 'sustainability transitions' (Loorbach, Frantzeskaki and Avelino 2017; Schot and Kanger 2018; Swilling 2020) and 'social-ecological transitions' (Fischer-Kowalski and Haberl 2007; Feola 2014). The adoption of the SDGs in 2015 as a shared set of goals and targets has focused attention on the need for pathways towards what was referred to in the Preamble to the approved SDG document as a "transformed world".

The essence of the problem statement this paper addresses is captured in a number of UNEP reports:

> "The causes of these crises vary, but at a fundamental level they all share a common feature: the gross misallocation of capital. During the last two decades, much capital was poured into property, fossil fuels and structured financial assets with embedded derivatives. However, relatively little in comparison was invested in renewable energy, energy efficiency, public transportation, sustainable agriculture, ecosystem and biodiversity protection, and land and water conservation." (UNEP 2011:14 – emphasis added)

> "Financing sustainable development will require capital flows to be redirected towards critical priorities and away from assets that deplete natural capital." (UNEP 2015:xi)

What these quotes reflect is the fact that substantive change would depend on the redeployment of capital from those activities that reproduce unsustainable modes of consumption and production to those activities that will reinforce and even accelerate the sustainability transition.

While the earlier UNEP report does not go on to explain why there was this gross misallocation of capital (UNEP 2011), the latter report, nevertheless, goes some way further by discussing the financial system as a distinct system with its own rules and routines (UNEP 2015). To redirect these financial flows, sustainability-oriented policy changes will need to address the way the financial system works rather than assuming that finance will automatically follow new directions in environmental policy. This paper contributes specifically to a better understanding of this link between sustainability transitions and finance .

The Bank for International Settlements has taken the discussion much further and is attempting to coordinate initiatives by Central Banks to bring climate change in particular into the mainstream of the banking industry. According to a report from the Bank of International Settlements: "Our framing of the problem is that climate change represents a green swan: it is a new type of systemic risk that involves interacting, nonlinear, fundamentally unpredictable, environmental, social, economic and geopolitical dynamics, which are irreversibly transformed by the growing concentration of greenhouse gases in the atmosphere. Climate-related risks are not simply black swans (also called tail risk events, i.e. risks with low probabilities of occurrence, corresponding to the tails of a normal distribution). With the complex chain reactions between degraded ecological conditions and unpredictable social, economic and political responses, with the risk of triggering tipping points, climate change represents a colossal and potentially irreversible risk of staggering complexity." (Bolton et al. 2020:6)

The need to redirect capital flows to support the sustainability transition draws attention to the fact that it is (private and public) financial institutions that are responsible for the way capital is allocated in the global economy. They operate, however, within a specific set of rules and a wider set of framing narratives that have reinforced the misallocation of capital (Turner 2010). The wider community engaged in promoting sustainability needs to better understand the global financial system if serious measures are to be taken to redirect capital flows to support sustainability transitions.

In a recent contribution to the academic literature on sustainability transitions1, it is argued that "to date no studies exist that conceptualise and explicitly analyse the role of finance for transitions in detail, using the MLP [Multi-Level Perspective] perspective" (Geddes and Schmidt 2020:2). It is concluded that the finance sector is in fact a regime "because the financial sector has a selection function and can be thought of as a selection environment: when investors invest in a firm or project, the technologies and/or designs in that project, are selected into the system." It is argued that the finance regime has "its own actors and institutions, set of norms, rules and heuristics and organization and cognitive routines that affect incumbent actor's resistance to or compliance with system change…" (Geddes and Schmidt 2020:3-4). The question then, of course, is how the finance regime can be reconfigured to ensure that capital does, indeed, get allocated to support a sustainability transition aimed at achieving the SDGs.

The argument put forward in this paper develops in four steps:

Firstly, an analytical description of the structure and dynamics of the global financial system is provided to substantiate the claim that finance is indeed a regime in its own right and not a set of mere intermediation mechanisms.

Secondly, the role of commodity trading as the nexus between use of natural resources and finance is brought into focus as an issue that is rarely mentioned in the broader literature on sustainability transitions and on sustainable use of natural resources in particular.

Thirdly, we show empirically the ongoing unequal exchange of natural resources in favour of the global North and briefly discuss structural reasons for this unequal exchange.

Fourthly, recent shifts that have taken place since the global financial crisis in 2007-2008 are critically discussed. We conclude with suggestions for further research that could result in a better alignment between sustainability transitions and the global financial system.

[1] For a comprehensive review of literature see Loorbach, Frantzeskaki and Avelino (2017)

2

FINANCE, TRANSITION

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2 FINANCE, TRANSITION AND INSTITUTIONS

Financialandcapitalmarkets continue to reward highly liquid, leveraged trading over investment with potentially higher, though less liquid, longer-run returns. This bias toward short-term returns can serve as an impediment to investment in infrastructure, needed for the sustainability transition (UNEP 2015).

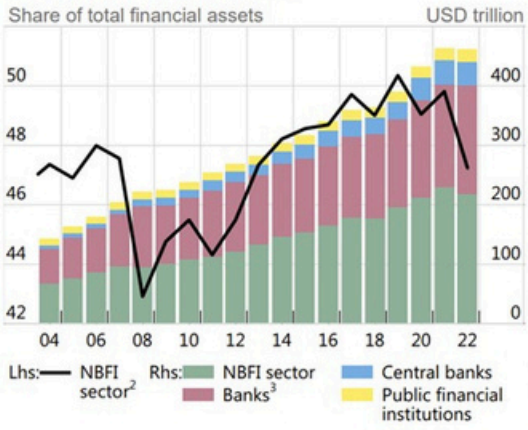
2.1 CHARACTERISING THE GLOBAL FINANCIAL SYSTEM

According to the Financial Stability Board, the financial system comprises a set of private, public and non-profit financial institutions that collectively owned and/or controlled US$461.2 trillion dollars' worth of assets in 2022 (see Figure 2.1) (Financial Stability Board [FSB] 2023). This was equal to 455% of global GDP in that year. Central Banks and public financial institutions together held only 13% of these assets in 2022, but play key roles in the way the global financial system has been responding to various crises. The privately owned financial institutions comprise commercial banks, investment banks, portfolio equity investors, portfolio bond investors, pension funds, insurance funds, private equity investors and hedge funds. As can be seen in Figure 2.1, the non-bank financial intermediation (NBFI) sector – composed of all financial institutions that are not central banks, commercial banks, or public financial institutions – had high growth rates since 2009. The size of the NBFI sector decreased in 2022, largely attributed to the impact of higher interest rates (FSB 2023). In 2022 this non-banking financial institution (NBFI) group together held 47 % of total global financial assets. The rather large group of OFIs (other financial intermediaries) includes investment funds, captive financial institutions and money lenders, central counterparties, broker-dealers, finance companies, trust companies and structured finance vehicles (FSB 2023).

Contrary to common perception, international financial markets did not emerge spontaneously in a regulatory vacuum. As shown by Rawi Abdelal (2007), a complex network of laws and regulations have been progressively put into place since the 1980s in order to favour the "free" mobility of financial capital: tax-based nation-wide protectionist policies hindering the free flow of capital have been dismantled by joint efforts from (often

Figure 2.1

Total global financial assets[1]



Composition of the global financial system[4]

	Total global financial assets	Central banks	Banks[3]	PFIs[5]	NBFI sector
Size at end-2022 (USD trillion)	461.2	39.0	183.2	21.0	217.9
Share of total global financial assets (%)	100.0	8.5	39.7	4.6	47.2
Growth in 2022 (year-over-year, %)	-0.4	-6.0	6.9	8.0	-5.5
Growth 2017–21 (annualised growth, %)	6.5	11.0	5.3	4.6	6.9

[1] Includes data for Russia up until 2020. [2] NBFI includes ICs, PFs, OFIs and financial auxiliaries. [3] All deposit-taking corporations. [4] Does not include data for Russia. [5] Public financial institutions.

Source: Jurisdictions' 2023 submissions (national sector balance sheet and other data) and 2021 submission for Russia; FSB calculations.

Source: FSB (2023)

social-democratic) governments, the European Commission, the International Monetary Fund (IMF), and the World Trade Organization (WTO), while in parallel a digital international infrastructure has been put into place that enables capital to flow smoothly from one institution to another with low transaction costs.

The finance sector is essentially a large and complex network of interrelated balance sheets of public, private and non-profit financial institutions (Shin 2017). However, no comprehensive account of this global network of interrelated and inter-dependent balance sheets exists. Very simplified illustrations can be found in Soramäki et al. (2007) and McLeay et al. (2014a). Recent scholarship uses interrelated and interdependent balance sheets to conduct complex network analysis to simulate interconnectedness, stability, instability and contagion using empirical data for parts of the global finance system (Battiston et al. 2016; Bardoscia et al. 2021).

This global network of balance sheets is highly asymmetrical comprising a few very large actors (systemically relevant banks, non-banking financial institutions and Central Banks) and many small actors and it is highly dynamic because of the speed and number of transactions and valuations. High Frequency Trading (HFT), for instance, relies on computer programs which send selling and buying orders every micro-second. Financial assets, such as shares, bonds, loans and derivatives, are held and traded by financial actors in myriad and complex forms and often via specialized markets. This is a highly competitive system aimed exclusively at maximizing financial profit. Hence the rise in value of financial assets relative to GDP from 30-50% in the 1950s to 455% by 2022 (FSB 2023). After finance was incorporated as a source of value into the definition of GDP in the 1990s, making money from money rather than productive value was effectively legitimized (Assa 2016; Mazzucato 2018).

Despite the rhetoric about the inherent efficiency of financial markets, it has been established now for some time that perfectly competitive and perfectly liquid equilibria in complete[2] markets represent an idealized state that never exists in practice. Instead, markets are always inefficient to some extent and always subject to sunspots (Geanakoplos and Polemarchakis 1986; Geanakoplos 1989; Balasko 1995; Giraud and Pottier 2016). A sunspot is a price variation that is not related in any way to variations in the fundamental value or risks of the underlying financial assets, as discussed in more detail below in the section on commodity markets. Financial markets are regularly subject to sunspots, e.g. when the market value of equities rises above the value of the underlying assets because of speculation. Of course, financial innovation is a way to reduce these market imperfections, but does not lead to completely efficient markets. Furthermore, general equilibrium theory demonstrates that, since incompleteness cannot be eliminated, financial innovation does not necessarily reduce market inefficiencies (Elul 1995). Financial innovation can go both ways: it sometimes reduces inefficiency, sometimes increases it. Sunspots and inefficiency are therefore intrinsic to financial markets, and the overall usefulness of financial innovation remains, and will always remain, questionable.

Nevertheless, it is often claimed that the existence of many sellers and buyers in financial markets and, therefore, high trading volumes, maximum liquidity and deepening markets is a positive attribute. This makes it possible, it is maintained, for prices to quickly correct in response to supply and demand dynamics, thus avoiding dangerous bubbles caused by large and sustained overvaluation of assets. This narrative, however, is not supported by the evidence.

This depiction only holds for perfectly liquid and perfectly competitive markets. Sometimes, the common narrative purports, less ambitiously, that any technical or institutional design that increases market liquidity should improve their efficiency. This claim, again, is unfounded. There is no consensus about the way market liquidity should be measured: the bid-ask spread[3] is one of several possible measures (Duffie et al. 2005; Giraud and Grasselli 2021) but is not universally accepted. In fact, increased liquidity is not indicative of market

[2] In economics, in a complete market everything has a price, there are no transaction costs and all market participants have perfect information.
[3] That is, the gap between the bid-price (the demand price, i.e. the price one is willing to pay) and the ask-price (the supply price, i.e. the price at which one is willing to sell). Perfectly liquid markets should exhibit a zero bid-ask spread at all times. No financial market ever exhibits this property.

efficiency (Turner 2010).

The long history of financial bubbles and subsequent crises (which have become increasingly frequent over the decades since 1929) – most dramatically the global financial crisis of 2007-2008 – provide ample evidence that the global financial system is inherently unstable (Hunter, Kaufman and Pomerleano 2001; Perez 2009; Wolf 2014; Turner 2016; Tooze 2018; Buckham, Wilkinson and Straeuli 2022; Hernández de Cos 2023). Arguments relating to the positive social attributes of the financial system have been challenged on both empirical and theoretical grounds (Turner 2010; Borio 2014; Tooze 2018; Wullweber 2020; Tooze 2021). Nevertheless, they remain firmly in place as key rationale for justifying the way capital is allocated.

The current increasingly unstable dynamics of the financial system was the outcome of specific policy decisions. Since the 1980s banks have been operating in a fundamentally changed legal environment that they actively lobbied to achieve and that, in turn, altered their business models (Hunter, Kaufman and Pomerleano 2001; Sorkin 2009; Turner 2010; Blyth 2013; Tooze 2018). Deregulation, the introduction of derivatives and securitization, trade liberalization and high-speed computing boosted financial transactions globally, increased their profitability and accelerated their global interconnectedness. It opened up new markets and new financial instruments leading to a sharp rise in the financial sector's contribution to GDP growth (Turner 2010). The inclusion of finance into the calculation of GDP from the early 1990s despite the fact that financial transactions do not create productive value helped legitimize the positive economic role of an expanding financial sector (Assa 2016). The repeal of the Glass–Seagall Act in 1999 that had hitherto separated commercial and investment banking in the US, coupled with similar deregulations across nearly all other jurisdictions, cleared the way for commercial banks to trade in derivatives and many other financial and non-financial assets, especially real estate (Turner 2010; Tooze 2018).

Since leverage mechanisms4 enable trading in financial products to be more profitable than lending to households and businesses, banks increasingly engaged in dealing with financial instruments issued by other banking and non-banking financial institutions to increase profits (Turner 2010; Tooze 2018; Blyth 2013; Mazzucato 2018). The consequence was that as

[4] Leverage is an investment strategy of using borrowed money to invest. Leverage can multiply potential profits but also multiply risk of insolvency. The extremely leveraged business models of large financial actors (both commercial banks and shadow banks) underpinned the subprime mortgage crises of 2007-2008 that, in turn, led to a global financial crisis.

investments in the real economy declined, investments in financial assets rapidly grew to make up a dominant share of GDP. This, in turn – turbo-charged by the way borrowed money came to be used to trade in derivatives – was part of the growth in 'leverage' which entailed using borrowed money to invest in mainly speculative financial assets.

The huge volume of trade in financial derivatives cannot be justified in terms of the need to hedge against price volatilities (e.g. in basic commodities) and are a clear sign of the dominance of speculative trading (see section below on commodity trading as a case in point). The controversies about the effects of massive derivatives trading on price volatility is critically discussed in the academic literature and it is now increasingly accepted as a source of instability of the financial system (Hunter, Kaufman and Pomerleano 2001; Turner 2010; Simsek 2021; Tucker 2019).

The financialization of the global economy has corresponded to increasing inequalities of income (Kus 2012; Bauluz, Novokmet and Schularick 2022) that has, in turn, reinforced pre-existing wealth inequalities over the past decades (Stiglitz 2013), in particular across the spectrum of private households in all countries (Čihák and Sahay 2020). That said, it is incorrect to assume that the decoupling of finance from production is a recent phenomenon that manifested itself uniformly across all world regions. Instead, the financialization of the global economy and shifting of investment away from the productive sector has characterized many global South economies since the start of the colonial era (Koddenbrock, Kvangraven and Sylla 2022).

In the low interest rate environment that prevailed after the global financial crisis of 2007-2009 until very recently, real estate was considered safe for lending banks and a preferred investment by private households. This created another real estate boom that, in the case of residential buildings, was further boosted by the COVID-19 pandemic. Analysis by the IMF shows that real estate prices have been overvalued in major economies, increasing the likelihood of a price correction that would deeply affect the real economy owing to the importance of the real estate sector for the real economy (Deghi, Natalucci and Qureshi 2022). This represents a positive feedback cycle of credit demand, credit supply and real estate prices (for a graphical representation see Turner 2016:72). Economists like Hayek and Minsky recognized credit cycles as a substantial threat to the real economy. The evidence supports their views – real estate credit cycles have supercharged the volatility of credit cycles (Sun, Mitra and Simone 2013).

During the boom phase leading up to the global financial crisis in 2007/2009 house prices and rents increased significantly while real wages stagnated or even declined. As a result, poor and middle-income households had to spend a larger share of their income on housing or they had to move to more distant and less quality housing which, in turn, resulted in higher commuting costs. In addition, many middle- and working -class households had to borrow more money in order to afford buying a house or, simply, maintaining their living standards (Giraud and Grasselli 2021). The end result was over-leveraged household balance sheets in the middle class, while homelessness increased amongst the poorest households.

The entry of the Chinese economy into globalized trading during the 1990s, and its quick transformation into the 'manufacturer of the world', has been argued to have induced wage repression in the West that led to the decoupling of real wages from labour productivity. This was due to the fact that middle-skilled western workers had to compete with Chinese workers resulting in the stagnation of their real wages or alternatively only slow increases relative to labour productivity growth. As a result, the wage share (i.e., the fraction of GDP induced by wages) declined in all OECD countries from the end of the 1990s (Guschanski and Onaran 2021), and in middle developing countries like South Africa (Forslund 2013). In parallel, profits for shareholders as a percentage of GDP rose significantly, contributing to the rise of income inequalities and inducing a rise in savings that needed, in turn, to be reinjected by the banking sector into the financial system (Mishel 2013).

At the same time, until 2009, most of the commercial surplus of China (more than $2 trillion in 2007) was

reinvested in the Western financial system, partially through the purchase of US Treasury bonds (Turner 2016:127). In other words, the money spent by Western households in purchasing cheap Chinese products was not accompanied by an increase in the purchasing power of these households because of their real wage stagnation. At the same time, this was accompanied by inflation of the value of financial assets whose price essentially depended upon the quantity of money injected into the financial sphere. This resulted in a globalized circular flow of money benefiting the small minority of Western households who owned financial assets (Stiglitz 2013). This circular flow was brutally interrupted by the subprime crisis. After 2009, realizing that unregulated Western financial markets were not reliable, China changed its global commercial strategy and reduced the fraction of its commercial surplus invested in the West. The (increasing) retained earnings, plus a mountain of debt, was then re-invested in the domestic Chinese market in order to create a middle class capable of absorbing an increasingly significant portion of the Chinese industrial surplus. Wages therefore rose in the Eastern coast of China.

This structural shift caused by the global circular financial flows that prevailed from the 1990s up to 2009 had major consequences for the Western financial sphere. As mentioned above, since the start of the second decade of the 21st century, the injection of 'fresh money' from the Chinese economy started shrinking as China embarked on a credit-fuelled growth stimulus of its own economy after the global financial crash (Turner 2016; Buckham, Wilkinson and Straeuli 2022). As a consequence, the major source of new money in the Western financial sphere from this time onwards derived from the non-conventional Quantitative Easing (QE) monetary policy implemented by most Western Central Banks from 2009 onwards. At the aggregate level, since the world economy, aside from China, grew at a slower pace, the financial sphere has had little additional sources of income arising from the real economy. One result was the historically rapid growth of financial asset prices as a purely monetary phenomenon. This bubble is largely disconnected from the real economy and has now been revealed in the new inflationary environment that has forced Central Banks to end QE-oriented monetary policies in favour of traditional measures to combat inflation. In 2022 central banks had to abandon non-conventional policies and started to raise interest rates in order to fight inflation. First signs of instability in the financial system emerged, with the collapse of Silicon Valley Bank, Silvergate Bank, Signature Bank, and Credit Suisse in early March 2023.

After the global financial crisis of 2007-2008, debt overhang led households to reduce demand – indeed, the higher the leverage the larger the demand reduction when house prices fell. This, in turn, led companies to cut business investment in response to declining demand which, in turn, drove the real economy into a recession and rising unemployment. Due to falling tax revenues and increased social spending, public debt increased (Mian and Sufi 2015). The leverage, whilst still there, has shifted from the private to the public sector, in a pattern replicated in several countries (Turner 2016).

The policy response to the 2007-2008 financial crisis was to shore up support for the banking system and to introduce austerity measures to cut public debt. A private sector banking crisis therefore became a crisis of the sovereign state (Blyth 2013). The adverse social consequences were evident (Tooze 2018). But at a deeper level, the problem lies in how we understand the role of banks (Werner 2016).

[5] This refers to the way Central Banks injected money into the economy by buying government bonds and various other financial assets, in particular those that were regarded as non-performing financial assets.

2.2 BANKS AS CREATORS OF MONEY

According to traditional economic theory, banks act as intermediaries, taking deposits with short maturities and low interest rates and lending with long maturities and higher interest rates. In short, they only reallocate purchasing power, but do not create it. However, there is recognition that the modern banking system operates in a different manner. The Bank of England has maintained that rather than banks receiving deposits when households save and then lending out these funds, bank lending creates deposits for the borrowers. In normal times, the central bank does not fix the amount of money in circulation, nor is central bank money 'multiplied up' into more loans and deposits (McLeay, Radia and Thomas 2014b; Turner 2014). Studies investigating the accounting practices that take place when loans are granted have found the money creation theory of banking to be inconsistent with the empirical findings (Werner 2014; Werner 2016).

It is worth noting that in modern economies, different types of money exist (McLeay, Radia and Thomas 2014a). A very small part of the money used in modern economies is in the form of cash (notes or coins), the dominant part is deposit money, i.e. the money value of bank deposits (McLeay, Radia and Thomas 2014b). Banks create deposit money, not cash money. While this understanding of money creation is undisputed in the financial system, and is increasingly also accepted in the academic literature, it is largely missing in the debate about funding the sustainability transition or other wider public debate about debt, fiscal stabilisation and investment6.

The notion that banks create money has important implications. It effectively means that money is not in reality a scarce resource. As Mazzucato points out, in abnormal times like war or financial crashes, money is effectively created to address the problem (Mazzucato 2018). From this, one may conclude that countries, including low-income countries, could reduce the extent to which they have to save and borrow from foreign banks in order to invest, if local banks can create the money needed. This could help alleviate the debt burden on governments budgets. With less needed to be spent on interest payments they can ill-afford, countries can limit the adoption of austerity policies that cut down expenditures for education, health care, social protection and infrastructure maintenance.

From this perspective, domestic banks can fund domestic investment – which is exactly what has prevailed for the bulk of the modern industrial era in the developed world. The real questions are which investments are needed for the common good such as achieving the SDGs, for providing adequate and affordable housing, education and health services to all and for decarbonizing our energy systems. Beckert argues that when decisions are made by financial institutions to invest capital in a particular way, they are in fact assuming that the economic activities they envisage will generate a return on their investment occurring in what is in reality an unknowable future. These are the 'fictitious expectations' of returns from future economic activities to which he refers (Beckert,

The role of banks in traditional economic theory

[6] France might be one exception (Giraud 2013 and various other publications).

2016). The question, of course is, who decides on the investments? What futures do they have in mind? Who, in short, allocates capital in economies and according to what criteria? Prevailing policy commitments may influence these decisions, but they are not a sufficient driver for redirecting the allocation of capital if market conditions run contrary to policy commitments because of the rules that govern the way the financial sector works. Sophisticated policy interventions will be required that put in place an alternative set of rules that results in a redirection of capital into the real economy, and into programmes aimed at achieving the SDGs. But since the 1970s, it is increasingly independent Central Banks that make the rules, not policymakers.

Just like the reforms of the 1980s resulted in the financial system that exists today, so too will a new generation of policy reforms be required to align the financial system with the SDGs and sustainability transitions in general. This will mean questioning the "Central Bank Narrative (CBN)" which tends to deny the money creation role of banks (with the exception of the Bank of England), and the resulting negative consequences of hyper-financialization (Werner 2013). For policy-driven reforms to work, much deeper institutional changes of the global banking sector will be required. This means going back to first principles, in particular the quantity theory of money.

Underlying the CBN is the highly controversial quantity theory of money. This can be summarized in the following accounting identity:

$$Mv=pY$$

(referred to below as Equation 1)

where M is the quantity of circulating money (usually the aggregate M17), p is the level of prices and Y is the real volume of trades, while v is the velocity of money (i.e. the rate of turn over, i.e. how often money is transferred to other parties via purchasing and selling transactions in one year), and is defined by this equation. Monetarist economic theory (associated with writers like Milton Friedman and other proponents of the virtues of the free market) interprets this equation by assuming that, in the short run, v and Y are constant. As a consequence, p and M=pY/v evolve in a linear manner resulting in the following fundamental propositions underlying the CBN:

1) money creation is, therefore, ipso facto inflationary:

2) money is neutral, which means that the quantity of circulating money has no other impact than the corresponding linear increase of prices – more specifically, it has no impact whatsoever on the real economy.

These two claims are widely falsified by empirical studies: money creation need not always be inflationary and money is not neutral[8]. There are, of course, situations where the narrow interpretation of this accounting identity adopted by monetarist economics holds. The huge increase of M induced by Central Banks (i.e. QE policies) and the generous banking credit during the second decade of this century made possible by very low interest rates did not lead to general inflation, but led to a sharp and sustained increase in real asset prices. We formally argued, if additional investments increase Y (which is reflected, e.g., in the rise of real GDP), then an increase of M need not increase p with respect to non-financial assets which is why inflation was low until end of 2022. If, on the contrary, new investments are misallocated (by avoiding financing of real value creation in the real economy), Y will remain constant (or even decline) and v will not catch up to prevent p from rising.

The monetarist misunderstanding of Equation 1 above has led to the popular idea that printing money always leads to inflation. This is incompatible with the simple fact that commercial banks create money each time they create a credit. In other words, they are not just intermediating depositors and lenders, they are creating deposits in the bank accounts of lenders (Werner 2016). Thus, given that high inflation is usually considered to have damaging social impacts, if the monetarist

[7] M1 is a narrow measure of the money supply that includes currency, demand deposits, and other liquid deposits, including savings deposits (https://www.investopedia.com/terms/m/m1.asp). Accessed March 2023.

[8] For the empirical evidence on short-run neutrality see Sheehey 1984; for an overview of the unresolved debate about short- and long-run neutrality see May-Jean 2016; on the need for different analytical assumptions for understanding short- and long-run neutrality see Maevsky 2021.

interpretation of Equation 1 was correct, commercial banks should theoretically be closed. Unless, of course, if one is convinced that banks do not, indeed, create money but act merely as financial institutions which lend the money they have borrowed/received from elsewhere. As Werner argues and demonstrates, the CBN is at odds with the way banks really function every day (Werner 2016).

A simple question that is often asked of the defenders of the neutral money theory is: where does the rise of M come from? If savings create investment, one must explain why savings increase over time. Of course, the conventional answer is: because profits increase. The question then becomes: where does the increase of money feeding (via investments) additional profits come from? The unique satisfactory answer is: from new investments funded by the allocation of credit to businesses by bankers whose risk analysis tells them that future returns on investment will make it possible to pay back the interest and capital, and still make a profit. But this answer makes sense only once it is acknowledged that banks create the money that becomes available to the lender (against a credible business plan) in the first place.

An alternative standard monetary theory relies on the money multiplier notion. It acknowledges that commercial banks create money but claims that the quantity of money created by the private banking sector is a linear function of the quantity of money created by the central bank. This theory is again falsified by empirical evidence: there is no evidence that a money multiplier or equivalent has ever existed in reality. The quantity of money created via banking credit depends on the demand for credit, not the assumptions about money supply held by the Central Bank. Indeed, commercial banks are not allowed to create money for themselves: in order to provide new credits, they need a customer asking for this credit. In other words, money is endogenously created by the demand for credit (Beckert 2016).

And allocating credit, in turn, is a 'fictitious expectation': based on a risk analysis and his/her own subjective value inclinations about what are and are not preferred futures, the banker is betting on returns from economic activities that must still happen in the future (Beckert 2016). Indeed, it is those very same economic activities that effectively make the future possible. Surely, then, it follows that if their preferred future took into account the calls for a more sustainable world that benefits future and not just present generations (i.e. the SDGs), credit (i.e. capital) would be allocated to those activities that would make that future possible. This, in turn, would mean changing the parameters used in risk analysis over the past century that have collectively made it possible to build a global financial system that puts at risk the greatest asset of all, namely the planet.

In short, once it is accepted that it is not deposits that create loans, but loans that create deposits, then it follows that banks play a crucial role in shaping the future. As the primary allocators of capital in accordance with what they imagine to be preferred (i.e. less risky) futures, banks can fundamentally influence the directionality and pace of the sustainability transition. They are not mere intermediaries following a neutral script; they are shapers of futures.

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3

COMMODITY TRADING: THE RESOURCE-FINANCE NEXUS

Annie Spratt—Unsplash

3 COMMODITY TRADING: THE RESOURCE-FINANCE NEXUS

Commodity trading has been financialized over the past decade (Seddon 2020; Baines and Hager 2021). Raw materials are traded continuously by a small handful of global commodity trading companies. The four largest agricultural commodity traders – Archer Daniels Midland (ADM), Bunge, Cargill and Louis Dreyfus – control between 75% and 90% of the international grain trade; just three commodity traders – Vitol, Glencore and Trafigura – handle the equivalent of half of OPEC's total oil output; and Glencore alone accounts for 55% of the global zinc market and 36% of the global copper market; while Wilmar accounts for 45% of the world trade in palm oil. As Baines and Hager point out, "[o]ver the past decade, the annual revenues of the major commodity trading firms have been comparable to, and in some instances even exceeded, those of the Wall Street banks as well as the major mining and oil companies" (Baines and Hager 2021:2).

Commodity traders are also highly concentrated in a few jurisdictions, for example in Switzerland, where commodity trading has grown substantially since 2000 and transit trading (the business of handling trade activities without typically importing or exporting products to or from the country where the transit trade resides), surpassed the Swiss Bank's financial services as the country's top service exporter (Swiss Academy of Sciences 2016).

Commodities dominate the physical composition of global trade, with oil, gas and coal alone contributing over 40% percent of the physical trade volume in 2020 (own calculations based on United Nations 2020). It has long been understood that globalization has led to larger trade volumes and more complex and fragmented global supply chains (Baldwin 2009). More recently, with the COVID-19 pandemic and Russia's invasion of Ukraine, the supply risks inherent in the global trade network have become apparent. From an IRP perspective, commodities are, of course, at the centre of the sustainability transition. Many metals such as copper, lithium, cobalt and nickel will be needed in vastly larger amounts for decarbonizing the global energy system (Ambrose and Kendall 2020; Campbell 2020). At the same time the mining industry must urgently reduce its heavy pressures on the environment and abandon socially, culturally and politically disruptive practices (IRP 2020). World food production is sufficient to feed the entire global population, but hunger persists due to the dysfunctional way the global food system is configured (Patel 2008; McGreevy et al. 2022). To end hunger, affordable food prices are key and this, in turn, is dependent on the reconfiguration of the global food system (IRP 2016). For all these necessary and beneficial functions that commodities have for human societies, stable and affordable prices are key. However, in the past decades we observed extreme price volatility in almost all commodity markets, creating political and macro-economic instability when prices drop sharply, and challenging the ability of poorer households to fulfil basic consumption needs when prices spike (Bordo and Jeane 2002). Hence the food riots of 2008-2009 were the upshot and a key demand of the Arab Spring protestors was for affordable bread. Many protests around the world today, including major political crises such as the one in Sri Lanka in 2021-2022, are related to the price hikes of basic commodities.

Commodity traders have always occupied a key role as market intermediaries between suppliers and buyers of commodities. However, over the past two decades commodity trading has been substantially financialized as commodity traders increasingly trade in derivatives (options and futures) of various kinds. This was enabled by the conversion of commodity exchanges from non-profit financial enablers into for-profit exchanges. At the same time, there has been greater concentration of market participants as larger commodity traders bought up smaller companies. As a consequence of the

combination of these processes of financialization and concentration, price setting in commodity markets has been decoupled from the fundamentals of physical supply and demand. It has been argued that this is a core reason for price shocks in commodity markets in recent years (Baines and Hager 2021). For example, data from the London metal exchange shows that the ratio of the volume of trading in copper derivatives to the physical production of copper increased from 40:1 in 1982 to 2000:1 in 2014 (Seddon 2020). A similar example may be provided by the evolution of oil prices during the 2008 financial crisis: a barrel of oil went from $60 to $140 before plunging to $40 and eventually, went back up to $80. These erratic movements cannot be explained by movements of aggregate supply and demand on the spot markets for oil at the world level since both supply and demand evolve in a relatively smooth and regular manner. These price spikes can only be explained by huge movements of capital into and out of the markets for derivatives on oil (whose size, in 2008, was approximately 30 times larger than that of the spot market). During the 2008 financial crisis, traders who were withdrawing capital from credit derivatives invested in oil (as well as gold and the Swiss Franc), leading to a peaking of the oil price around $140, before withdrawing their money once again from oil in order to invest in new financial assets, inducing a sharp drop in the price of a barrel of oil.

These powerful traders have now built elaborate inflated futures markets that profit from speculation about the direction of price changes. Normative commitments to achieving sustainable resource use – by decoupling resource use from economic growth and wellbeing – are unlikely to materialize if the existing global commodity trading system continues to operate in this manner.

Even though the theory of incomplete (but perfectly competitive and perfectly liquid) markets recognizes the inefficiency of financial markets, there are controversies in the empirical literature about evidence of malfunctioning markets due to speculation (Quemin and Pahle 2021). However, the reliability of available studies that seek to distinguish hedging from speculation is limited by the fact that important data is not disclosed that would allow distinctions to be made between the extent of beneficial hedging of conventional trades and purely speculative trading of derivatives for the purpose of short-term capital gains. The Commitment of Trader (COT) reports in both the US and the EU only record daily open future positions. A meaningful distinction between hedging and speculative trade would require hourly data. Hedging requires the holding of future contracts for longer periods of time (weeks or months, because the goal is to trade the underlying commodity at a predictable price) whereas speculative trading would open and close positions often within a day9.

Even if we do not know the amount of speculative trading in relation to conventional hedge trading, available information supports a number of conclusions.

Firstly, price volatility in major commodity markets has increased, damaging producer countries and poor and middle-class households alike.

Secondly, the volume of trading in commodity derivatives is now 2 to 3 times larger than the volume of trade in the physical commodities themselves. This is compelling evidence that purely speculative trading must represent the majority of those trades, because hedging is inevitably limited by the production volume in the real economy.

Thirdly, it follows logically that the volume of speculative trading is not linked to the real economy. In addition, the incentives of exchanges and brokers have changed because of the way the previous not-for-profit

[9] Since 2018 the EU COT requires disclosure of trader types [risk reducing vs. "other", i.e. speculators], allowing for new ways to empirically detect the effects of speculative trade (Quemin and Pahle, 2021).

exchanges were transformed into for-profit public companies. The end result is a business model that links profit margins to increases in trade volume rather than trade value. Inevitably, that introduces incentives to create a multiplicity of trading instruments that become increasingly detached from the real economy of buying and selling actually existing physical commodities that are to a large extent essential for the everyday subsistence of people around the world.

As stated by Kharlamov and Flassbeck (2019):

"As a result, the more commodity pricing becomes financially intermediated and the more commodities turn from mere raw materials into investable assets, the more their markets get manipulated, intertwined with, and sometimes displaced by the global investment agenda, financial market dynamics, and other phenomena unrelated to the fundamentals of supply and demand.

The implications are manifold:

Prices are inflated for end users when too much capital flows into bullish positions and depressed for producers when investors dump futures; uncertainty is increased for both.

Producers don't get the right cues from the market, which leads to wrong economic decisions (e.g., which crops to seed, plants to build, capacity to add).

Wealth destruction and bankruptcies for communities, businesses, and those who put too much faith into investment research (and ignore the fact that issuers of such research may trade for their own account).

The shareholders of producing companies, especially public, may be encouraged to redeploy capital elsewhere (e.g., correlated financial indices or businesses unaffected by financial markets).

Perversely, the more sway financial investors hold over price formation, the more hedging becomes regulated, expensive, and indispensable to the real economy." (FT, June 14, 2019).

A recent study showed how this financial architecture of commodity trading in combination with the shareholder value principle successfully dis-incentivizes shareholders of large commodity trading companies from supporting environmental, social and governance (ESG) requirements (Baines and Hager 2021). Protecting shareholder value is the all-pervasive goal across the entire commodity value chain. At the same time, commodity producers have been able to shield themselves from divestment pressures advocated by social and environmental groups. This is achieved by increased outsourcing of activities to cut costs and avoid reputational risks. There are reported cases of outsourcing to firms employing child labour under conditions where fatal accidents are commonplace, or where extraction entailed deforestation and human rights abuses (Kollbrunner 2020 and Freidberg 2017, quoted in Baines and Hager 2021). Better disclosure and transparency of the commodity supply chain to conform to ESG requirements would be necessary to hold companies responsible for their outsourcing activities (and their supply chains in general). However, these activities are costly and are likely to be rejected for violating the sanctity of shareholder value.

In short, the financialization of commodity trading sits at the nexus between the global financial system and global resource flows. The instabilities of resource prices caused by the financialization of commodity trading contradicts the logic of resource decoupling and the wider goal of sustainable production and consumption.


Daniela Paola Alchapar—Unsplash

4

GLOBAL RESOURCE USE & UNEQUAL EXCHANGE

Mahdi Soheili—Unsplash

4 GLOBAL RESOURCE USE AND UNEQUAL EXCHANGE

The IRP's flagship publication, the Global Resources Outlook 2024 (GRO2024), paints a grim picture of total global resource use (UNEP 2024). Global extraction of material resources (i.e. biomass, fossil fuels, metals and non-metallic minerals) grew from 30 billion tons in 1970 to an estimated 106.6 billion tons in 2024 (UNEP 2024), an average annual growth of 2.3%. This increase in demand for resources has taken place despite a decrease in annual global economic growth rates. The key driver of this increased demand is accelerating materially intensive economic development in certain low- and middle-income countries since the mid-1990s, plus sustained high levels of consumption in the global North that show few signs of abatement (UNEP and IRP 2019).

The average resource demand per capita grew from 8.4 tons per capita in 1970 to 13.2 tons per capita in 2024. This, however, masks the inequalities in resource consumption between richer and poorer countries. Using the material footprint (MF) calculation that attributes the resources used to produce goods and services to the end-consumer rather than focusing only on territorially delineated physical flows within national boundaries, the GRO24 report clearly describes the inequalities in resource use. The MF of the high-income group of countries was 24 tons/capita/y in 2020, which was around 25% higher than the MF of 19 tons/capita/y of upper-middle income group of countries. A MF of 24 tons/capita/y is 6 times the MF of the low-income group of countries (at 4 tons per capita/y) (UNEP 2024).

The Global Resources Outlook 2019 (GRO2019) drew attention to the dimensions of unequal exchange between the Global North and South. It noted that "after re-attributing all extraction according to final consumption, the trade of this [high-income] group in fact was equivalent to a net virtual transfer equivalent [in 2017] of 11.8 billion tons of primary extraction from elsewhere in the world into this group." (UNEP and IRP 2019:49)

The more fundamental question is this: how are the costs and benefits of global trade in natural resources being distributed between the global South and the global North? Globalization in the past decades has led to longer and more fragmented international supply chains (Dallas, Ponte and Sturgeon 2019). As a result, the consumption of final goods in a specific country often depends on natural resources extracted in many different countries (WTO 2010). Consumption-based approaches, also called environmental footprint accounting, based on multi-regional input-output analysis, allow for tracing resource use and emissions generated anywhere in the world to the final consumption of individual cities, countries or world regions (Hertwich and Peters 2009; Pichler et al. 2017).

According to a 2020 UNEP-IRP report making use of the IRP material flow database, trade is responsible for much larger amounts of material extraction than direct trade flows indicate, when accounting for the additional materials, energy, water and land used in the extraction and production of traded goods but left behind as wastes and emissions in the exporting country (UNEP and IRP 2020). In 2017, the material requirement for trade was three times the direct trade as more than 35 billion tons of material resources were extracted globally to produce 11 billion tons of directly traded goods. This means that one-third of the total 92 billion tons of material resources extracted in the global economy that year were destined to produce goods for trade.

Such analysis by the International Resource Panel of the materials embodied in trade reveals that resource-intensive processes have shifted from high-income importing countries to low-income exporting countries, with a corresponding shift in associated environmental burdens. The extraction and processing of resources for export depletes natural assets, while increasing waste, emissions, loss of biodiversity, land degradation and water pollution.

The environmental footprint accounting approach has

also been used to calculate net transfers of resources embodied in traded goods between the global North and the global South. We assess the results from two recently published studies of the net balance of embodied raw materials, final energy, land and labour between high income countries (as defined by the World Bank for 201810) and the rest of the world (Dorninger et al. 2021; Hickel et al. 2022). Because both studies use the same MRIO model Eora (Lenzen et al. 2017), and given that multi-regional input-output models are known to have significant uncertainties (see, for example, Stadler et al. 2018), we reproduced the analysis of Dorninger et al. and Hickel et al. using the newest version of the MRIO model EXIOBASE. We use exactly the same distinction between North and South as in Dorninger and Hickel, i.e. Global North equals high income countries and global South equals high-middle, low-middle- and low-income countries following World Bank (2018) but we cover a slightly different time frame, namely 1995 to 2019 instead of 1990 to 2015. This additional analysis adds to the robustness of the results, because EXIOBASE has the highest resolution in the extractive sectors, an important factor determining the reliability of environmental footprint results obtained from MRIOs (Stadler et al. 2018). It also allows for direct comparisons with other IRP reports, e.g. the 2022 report on natural resource use in West-Asia (Kulionis et al. 2022), which also used EXIOBASE (Tukker et al. 2013). The results are summarized in Tables 4.1a to 4.4b.

As expected, there are differences in the individual results between the two models. However, the general direction of the net balance of raw materials, land, final energy and labour is consistently from South to North. The largest differences are in the results for raw materials, land and labour. Eora estimates more than twice the amount of S-N transfer of raw materials and land than EXIOBASE for 2015 (12 GT vs. 3,9 Gts, and 822 vs 344 million ha respectively), leading to estimates for the percentage of raw materials extracted in the South for consumption in the North between 24% and 43% of global South production. The percentage of land embodied in net trade flows from South to North is roughly the same in both models, around 20% of total land available, due to a much lower overall land estimate in the EXIOBASE model. The reverse is true for embodied labour, where EXIOBASE gives a higher result (316-million-person year equivalents vs 182) leading to 38% vs 28% of labour from the South embodied in consumption in the North. If we exclude China from the analysis, the net transfers from South to North only slightly decrease but for land they increase, reflecting the much lower transfer of embodied land from the North to countries in the global South other than China.

Table 4.1a (Dorninger et al. 2021)

Resources embodied in goods and services trades	North ⟶ South flows 2015	South → North flows 2015	Net trade from South to North in 2015	Cumulative net trade from South to North from 1990-2015
Raw material equivalents [Gt]			10.20	212.73
Embodied land [mn ha]			823.13	31,538
Embodied energy [EJ]			22.11	568.05
Embodied labour [mn py-eq]			182.44	5,575.8

Table 4.1b (Dorninger et al. 2021)

Resources embodied in goods and services trades	North consumption in 2015	Net S-N transfer as % of Northern consumption in 2015	Northern consumption 1990-2015	Net S-N transfer as % of Northern consumption 1990-2015
Raw material equivalents [Gt]	29.4	35%		
Embodied land [mn ha]	4150	20%		
Embodied energy [EJ]	226.6	10%		
Embodied labour [mn py-eq]	645	28%		

10 https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html

Table 4.2a (Hickel et al. 2022)

Resources embodied in goods and services trades	North → South flows 2015	South → North flows 2015	Net trade from South to North in 2015	Cumulative net trade from South to North from 1990-2015
Raw material equivalents [Gt]	3.37	15.39	12.02	254.40
Embodied land [mn ha]	527.42	1,349.01	821.59	32,987.23
Embodied energy [EJ]	21.55	43.51	21.06	650.34
Embodied labour [mn py-eq]	31.11	219.22	188.12	5,956.62

Table 4.2b (Hickel et al. 2022)

Resources embodied in goods and services trades	North consumption in 2015	Net S-N transfer as % of Northern consumption in 2015	Northern consumption 1990-2015	Net S-N transfer as % of Northern consumption 1990-2015
Raw material equivalents [Gt]	28.06	43%	676.77	38%
Embodied land [mn ha]	3,878.80	21%	112,416.80	29%
Embodied energy [EJ]	217.43	10%	6,137.42	11%
Embodied labour [mn py-eq]	630.06	30%	17,365.49	34%

Table 4.3a (EXIOBASE reproduction, authors' own calculation)

Resources embodied in goods and services trades	North → South flows 2015	South → North flows 2015	Net trade from South to North in 2015	Cumulative net trade from South to North from 1995-2015
Raw material equivalents [Gt]	2.16	6.04	3.88	92.7
Embodied land [mn ha]	296	640	344	11400
Embodied energy [EJ]	51.6	72.6	21.0	719
Embodied labour [mn py-eq]	41.3	358	316	6790

Table 4.3b (EXIOBASE reproduction, authors' own calculation)

Resources embodied in goods and services trades	North consumption in 2015	Net S-N t as % of Northern consumption in 2015	Northern consumption 1990-2015	Net S-N transfer as % of Northern consumption 1995-2015
Raw material equivalents [Gt]	16.4	24%	383	24%
Embodied land [mn ha]	1860	19%	41500	27%
Embodied energy [EJ]	332	6%	7340	10%
Embodied labour [mn py-eq]	842	38%	16600	41%

Table 4.4a (EXIOBASE excluding China, reproduction, authors' own calculation)

Resources embodied in goods and services trades	North → South flows 2015	South → North flows 2015	Net trade from South to North in 2015	Cumulative net trade from South to North from 1995-2015
Raw material equivalents [Gt]	1.37	4.82	3.44	71.9
Embodied land [mn ha]	178	566	388	11200
Embodied energy [EJ]	36.8	53.9	17.1	563
Embodied labour [mn py-eq]	30.4	292	261	5690

Table 4.4b (EXIOBASE excluding China, reproduction, authors' own calculation)

Resources embodied in goods and services trades	North consumption in 2015	Net S-N transfer as % of Northern consumption in 2015	Northern consumption 1990-2015	Net S-N transfer as % of Northern consumption 1995-2015
Raw material equivalents [Gt]	16.4	21%	383	18%
Embodied land [mn ha]	1860	21%	41500	27%
Embodied energy [EJ]	332	5%	7340	8%
Embodied labour [mn py-eq]	842	31%	16600	34%

Acronyms used in tables 1a to 4b:
Gt: Giga tons = 109 tons, mn ha = million hectare, EJ: Exa Joule = 10^{18} Joule, mn py equ = million-person year equivalents.

Analogous to the calculation of resources embodied in trade, the global supply chain distribution of value added can be calculated. This rather new indicator is called "trade in value added" and it measures how much of the value added of a country or world region is contained in the consumption of another country or world region (Johnson and Noguera 2012; Stehrer 2012). In other words, "trade in value added" considers the value added by each country in the production of goods and services that are consumed worldwide (OECD11). By calculating the value of total two-way trades between countries or world regions, it is possible to estimate who gains and who loses over time. Dorninger et al. (2021) found cumulative net trade in TiVA over the period 1990 to 2015 to be 1.2 trillion USD in favour of high-income countries and 2 trillion in favour of China. The countries that did not benefit from global trade include: upper- middle-income countries that lost US$1 billion; low- middle-income countries that lost US$500 billion; India that lost US$400 billion, and low-income countries that lost US$750 billion. Our own estimate, based on EXIOBASE, amounts to 1.7 trillion Euro (current prices) of accumulated net trade in TiVA from the South to the North between 1995 and 2019. Overall, the pattern is consistent: the global South (apart from China) is a net exporter of resources to the global North and the global South (apart from China) pays more for its imports from the North than it receives from its exports to the North. This is a question that is controversially discussed in the literature. On the one hand there is ample evidence from economics that the South has in general less resource efficient technologies, the basket of goods exported to the North is more dominated by raw materials, and labour productivity, agricultural productivity and wages are lower in the South. To a certain degree this justifies lower average prices.

On the other hand, a number of researchers from fields including political science, international relations and development studies have maintained that the institutional arrangements that determine the terms of trade in world markets are biased towards benefiting the North. This especially applies to global trade in commodities.

However, neither of these well-known economic structural differences between North and South nor the MRIO based results presented above, explains the persistent inequalities in the underlying terms of trade in the way world markets work.

A large body of literature on the resource curse hypothesis (Auty 1993) has attempted to statistically prove a universal inverse relationship between resource abundance and economic growth with so far inconclusive results (Badeeb, Lean and Clark 2017). However, Rosser (2006) and Deacon (2011) criticize the narrow focus on aggregate economic indicators in many resource curse studies and their general neglect of political and institutional factors. This body of research attributes the high environmental burden on exporting countries in the South to dependence on the export oriented extractive industries, weak governance, poor institutions, price volatility, corruption, conflict, rent seeking and elitism in those countries (e.g. Frankel 2012). Wenar (2017) provides numerous examples and several causal pathways that explain why high economic

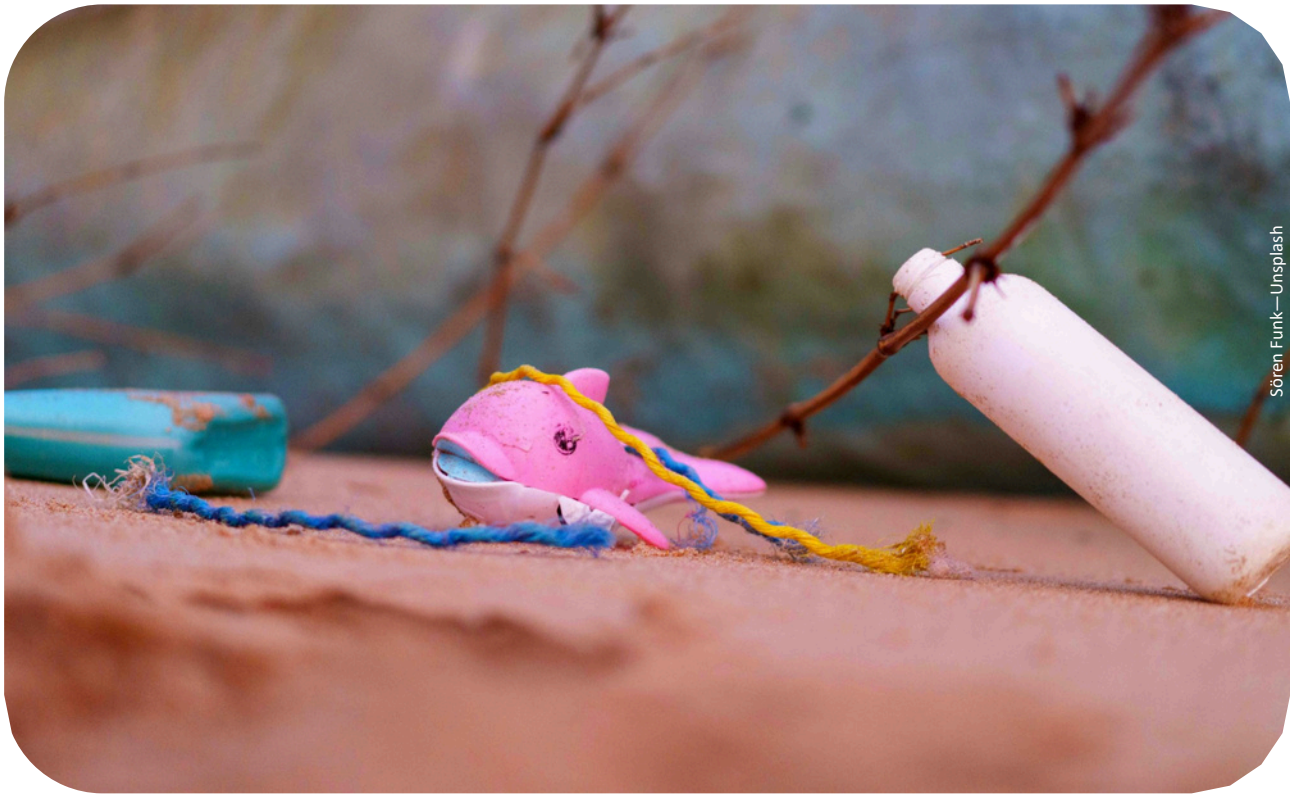
[11] https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm

dependence on exports of basic commodities is often associated with authoritarianism and civil war. Other authors point to the role of power relations, including the imbalance of bargaining power and expertise.

Unequal power relations at the global level may result in unfair trade agreements. However, they also create a context for 'capital flight' that is closely associated with trade in raw materials. Ndikumana and Boyce (2022) reveal how the global financial system enabled 'capital flight' out of Africa equal to $2 trillion between 1970 and 2014, of which $600 billion was transferred after the turn of the millennium. These capital outflows tend to relate in some manner to the financial transactions required for enabling resource exports from resource-rich African countries such as Côte d'Ivoire, Angola and South Africa. If the interest earned by this offshored capital is added to this net amount, then by 2018 the total financial value of the capital outflow from Africa was $2.4 trillion which was, in turn, three times higher than total debt owed by African countries in 2018 (Ndikumana and Boyce 2022:17)12. To put this in perspective, total Overseas Development Assistance during the period 1990-2015 was $2.66 trillion (Hickel et al. 2022b:8).

As mentioned above import exposure also created wage depression and job losses in Western countries (Autor and Dorn 2013; Dauth, Findeisen and Suedekum 2014; Malgouyres 2017) leading to increased voter support for the extreme right. These insights, once considered heterodox thinking, have since been acknowledged within the top of the international political agenda. As the 2022 report of the Secretary General of the United Nations on Progress towards the Sustainable Development Goals clearly demonstrates:

> "Developing countries bear a large part of the climate, biodiversity and pollution impacts of resource intensive production processes, while not reaping their benefits. This situation has been made worse by the impacts of the pandemic. As part of sustainable global pandemic recovery strategies, the implementation of Sustainable Consumption and Production (SCP) will maximize the socio-economic benefits of resource use while minimizing their impacts." (United Nations 2022:20).


Sören Funk—Unsplash

[12] Capital flight is defined by these authors as "capital outflows that are illicit by virtue of illegal acquisition, illegal transfer, and/or illegal concealment from tax authorities" (Ndikumana and Boyce 2022)

5

INVESTMENT, TRANSITION FINANCE & THE JUST TRANSITION

Scott Webb—Unsplash

5 INVESTMENT, TRANSITION FINANCE AND THE JUST TRANSITION

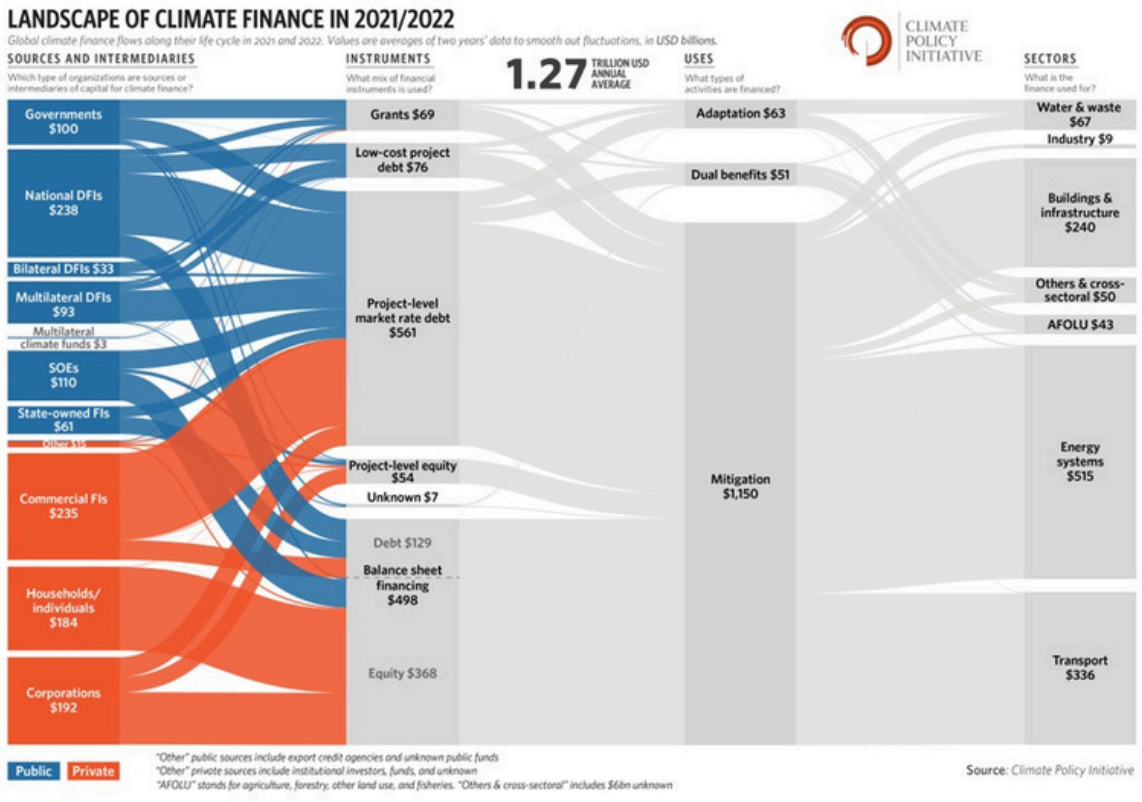
Theoriginsof thediscussionabout the role public funding should play to leverage private funding to catalyse sustainability transitions dates back to the 1972 Stockholm Declaration and the Brundtland Commission in 1987 (Naidoo 2022). Nevertheless, it is only over the last decade that there has been a marked increase in investments in sustainability transitions. Climate finance is the dominant form of sustainability transition financing. According to the Climate Policy Initiative (CPI), climate finance reached US$1.27 trillion in 2020-2021, doubling from US$632 billion in 2019-2020 (Buchner et al. 2021).

Significantly, around half ($626 billion) came from private investors, while the other half (US$638 billion) came from public sector investors (see Figure 5.1). As argued by Mazzucato, public sector funding has served to de-risk renewables over time, creating opportunities for private sector investments as technologies transit from high- to low-risk categories (Mazzucato and Semieniuk 2018). According to the CPI total annual investment from all sources needs to rise to US$8-9 trillion annually if climate goals are to be reached (Buchner et al. 2021).

Funding for adaptation lags far behind the funding available for mitigation. US$63 billion was invested in adaptation in 2020-2021 which was 28% higher than 2019-2020, but far below UNEP's estimate of the required US$160-340 billion by 2030 (Buchner et al. 2021; UNEP 2022).

In addition to increases in sustainability-oriented funding, signing up to sustainability-related commitments has become increasingly popular. The IMF estimated that in 2021 ESG-related debt issuance reached US$1.6 trillion, 116% higher than 2020 (Galaz and Collset 2022:12). Following an initial phase of widespread adoption of ESG reporting, a significant number of banks and asset managers withdrew from the PRI and GFANZ in late 2024 and early 2025. The six

Figure 5.1: Global climate finance flows in 2021/2022



Source: Buchner et al. (2023)

largest US banks, four major Canadian banks, and BlackRock, the world's largest asset manager, departed from the alliance. This development marks the second withdrawal from one of the three globally dominating asset managers, following Vanguard's departure in 2022. According to the magazine Corporate Knights, an escalating number of boycotts and lawsuits targeting ESG investment practices contributed to this mass departure.

In addition, there is increasing concern about a widening credibility gap between the public commitments of financial institutions and their actual investment commitments. Semieniuk et al. traced 1.8 million companies who are the ultimate owners of 43,439 oil and gas production assets that could soon become 'stranded assets'. Worth US$1.4 trillion (of which US$1 trillion is owned by stock market listed oil and gas companies), the majority of these assets are owned by companies with OECD-based investors (Semieniuk et al. 2022). These shareholders, therefore, stand to lose the most from 'stranded assets' and therefore may have least to gain from a transition to net zero emissions.

In a report entitled Fossil assets: the new subprimes?, Giraud et al. estimate that the total value of the fossil fuel assets of 11 of the biggest European banks is 520 billion Euros, which represents, on average, 95% of their total shareholders' equity13 (Institute Rousseau, les Amis de la Terre France and Reclaim Finance 2021). This would suggest that these banks – and, indeed, the largest banks around the world – would want to avoid the threat of stranded assets that will result from decarbonization by unexpectedly divesting from fossil fuels in line with their public commitments. But the evidence suggests otherwise. According to the 2022 Banking on Climate Chaos Report, sixty of the world's largest banks invested US$4.6 trillion in fossil fuel assets in the six years since the signing of the Paris Agreement in 2015 (Reclaim Finance, 2022).

These slow and hesitant adaptations is what UNEP's Financial System report refers to optimistically as a "quiet revolution". The rising levels of investment in the sustainability transition referred to above (mainly in energy and transport) would seem to substantiate this contention, together with the rise of ESG reporting, new Net Zero alliances, and so forth. Furthermore, there is a proliferation of new terms that are used to refer to the

From a sustainability transition perspective, a Janus-faced global finance regime seems to be emerging. On the one hand, there are public commitments of support by a wide range of financial institutions for the need to invest in the sustainability transition. On the other hand, the financing of fossil fuels, unequal resource exchange, capital flight and the financialization of commodity trading carries on unabated, while in the background the financially calamitous prospect of stranded assets looms ever larger. The only reasonable explanation for this institutional contradiction is that the global financial regime may still be robust and fully functional, but a complex set of landscape pressures are forcing it to adapt in ways that are aimed at avoiding the fundamental changes that are needed. Hence the high-profile public pronouncements, but only gradual increases in sustainability transition investments compared to what is needed.

Anxiety about the future of banking in light of sustainability challenges is no longer only the concern of individual academics and experts. The Bank for International Settlements (BIS) goes into considerable detail in criticizing the mainstream financial sector's response to climate change of 'internalizing externalities' (Bolton et al. 2020). The report demands a wider recognition of the economy as embedded in society and the natural environment ('strong' or 'dark green' sustainability as proposed for decades in ecological economics and industrial ecology) as opposed to the 'weak' or 'light green' sustainability approach that remains dominant in mainstream economic analyses that have merely recognized the significance of sustainability challenges. Most importantly, the BIS report advocates the use of non-equilibrium models (i.e. models that assume that markets tend towards disequilibrium) and seriously considers proposals from Modern Monetary Theory (MMT) proponents who favour substantial increases in fiscal spending to address social and environmental challenges (Bolton et al. 2020).

[13] Shareholders' equity is the net amount of a company's total assets and total liabilities (debt) as listed on the company's balance sheet. It is the net worth of a bank.

[13] Equity is typically a small percentage of a bank's total assets.

Table 5.1: Sustainability-related finance terms and periods of emergence

1988 – 1998	2000 – 2010	2020 – present
Social finance Environmental finance Responsible investment Socially responsible investment Sustainable investment Sustainable finance Green finance	Impact finance Carbon finance Climate finance Adaptation finance Mitigation finance	Impact investing Transition finance Regenerative finance Transformative finance Nature-based finance

Source: Naidoo (2022:188)

contention. Furthermore, there is a proliferation of new terms that are used to refer to the range of financial innovations that are driving this 'quiet revolution'. Following Naidoo (2022), these are the changing terms since the late 1980s: see Table 5.1.

However, in practice, evidence confirms that the bulk of capital continues to be allocated in ways that hinder rather than catalyse sustainability transitions.

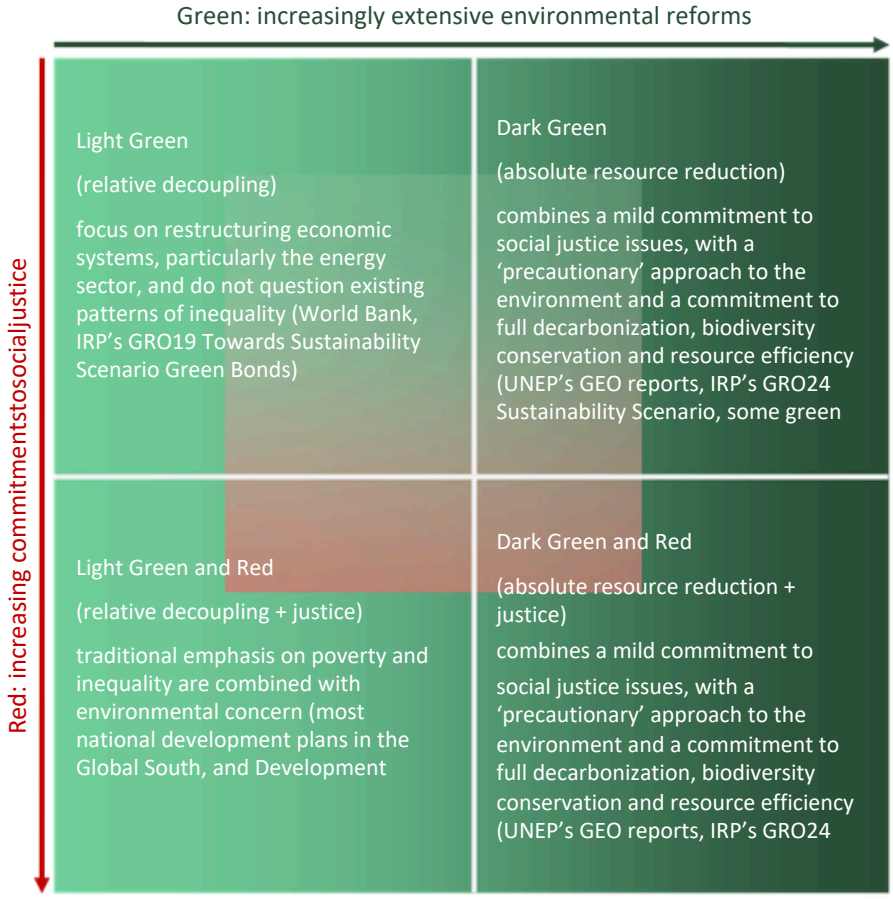
Transition finance is a relatively new term that has rapidly emerged to deal with a reality that was not previously anticipated. Up until recently there were two primary financial drivers of transition: climate finance that was channelled mainly into mitigation, and divestment from fossil fuels. However, as the landscape pressures have mounted and socio-technical regimes concluded they need to adapt to survive (in particular in the energy and mobility sectors), a range of incumbents emerged with commitments to transition to avoid the threat of collapsing (Heiskanen et al. 2018; Stirling 2018). For these incumbents pivoting in response to both landscape pressures and new niche innovations, neither climate finance nor divestment may have been suitable. The upshot was the emergence of the notion of 'transition finance', i.e. finance that could be allocated to fossil fuel companies who, nevertheless, are transitioning into post-fossil fuel markets. Many energy utilities moving out of fossil fuels and into renewables fall into this category (e.g. Italy's ENEL, South Africa's Eskom). The OECD, EU and the BIS have developed 'taxonomies of sustainable finance' for guiding this kind of transition finance which, in its latest version, includes gas and nuclear as valid post-fossil fuel alternatives (Ehlers, Gao and Packer 2021). There is now a fierce debate as to whether transition finance really will help drive the sustainability transition, or whether it is mere greenwashing to legitimize funding fossil fuel companies – or worse, whether it is a redirection of climate finance into sustaining carbon-intensive industries (Naidoo 2020; Heffron and McCauley 2022).

A new category has emerged most recently, which is 'just transition finance'. This notion came to the surface at COP 26 in Glasgow when a US$8.5 billion 'just transition' package was announced to support the South African energy transition. The Just Energy Transition Partnership between the USA, UK, France and Germany has catapulted the South African notion of 'just transition finance' onto the global agenda (Winkler et al. 2021; Naidoo 2022).

In light of the argument that the global financial regime is a complex system in its own right that has become increasingly detached from the real economy, how can we expect this regime to react to increasingly serious sustainability-oriented landscape pressures? To help answer this question, Spratt distinguishes between four stylized transition pathways: 'light green', 'light green plus red', 'dark green', and 'dark green plus red' located within a matrix with increasing commitments to social justice along the vertical axis, and increasingly extensive environmental reforms along the horizontal axis (Spratt 2015) (Figure 5.2).

The 'light green' transition pathway envisages a relatively limited set of environmental reforms that would leave existing inequalities intact. From a resource-use perspective, the focus would be relative decoupling, thus enabling richer countries to continue to increase resource use at rates that are below GDP growth rates. Unequal exchange would continue under these conditions, thus reproducing global inequalities. The

Figure 5.2



Source: Adapted from Spratt (2015)

GRO2019 Towards Sustainability Scenario envisages relative decoupling and is, therefore, consistent with this 'light green' approach. The 'light green plus red' approach would envisage limited environmental reforms (such as relative decoupling) plus commitments to social justice that range from limited forms of social inclusion (e.g. most Development Finance Investment programmes) to far-reaching anti-poverty programmes (e.g. NGO- or cooperative-driven programmes in Asia such as Grameen Bank, or state-driven redistribution programmes in Latin America). A 'dark green' agenda entails a limited social justice commitment (maybe extending into a mild form of social inclusion) coupled to commitments to achieve Net Zero, reverse biodiversity loss and reduce resource use in absolute terms in developed countries, with relative decoupling in less developed countries. The GRO2024 Sustainability Scenario is consistent with this approach, with an emphasis on social inclusion that hovers between the top right and bottom right quadrants. 'Dark green plus red' is the same as the 'dark green' commitment to environmental reform, but with more radical social justice commitments, greater state intervention, extensive community-based development, non-profit modes of accumulation, expansion of the commons and wealth redistribution.

In addition to the transition pathways, Spratt (2015) identifies nine primary modes of financing distinguished according to 'lower to higher returns', and 'shorter to longer maturities', to help predict how the financial regime may respond to sustainability-related pressures. (Figure 5.3)

For Spratt, most commercial finance would be found in cells 1, 3, 5 and 6, while non-commercial finance is

mainly in cell 9. He argues that funding for any form of 'dark green plus red' transition from mainstream financial institutions is highly unlikely because of the scepticism about growth and debt in this quadrant of actors. Funding for 'dark green' is also unlikely – albeit less so – because it implies redefining economic growth, and planning for 'stranded assets'. But as environmental crises worsen, funding in this quadrant becomes more likely if the external risks are internalized into risk analyses (as pioneered by the Bank of England in recent years) (see McLeay, Radia, and Thomas 2014b; Kedward, Gabor and Ryan-Collins 2022). Funding for 'light green' transitions are more likely and are gradually increasing, but the question becomes why the funding levels for 'light green' transitions remain low relative to what is required. Spratt provides four reasons:

- the prevalence of short-term investor time horizons means the long-term investments required are regarded as too risky;
- appropriate investment vehicles that reduce the risk and transaction costs for large financial institutions to invest substantial amounts in a multiplicity of smaller projects are often missing;
- whereas financial institutions aim to maximize risk-adjusted returns, many sustainability-oriented projects are regarded as low return/high risk projects; and
- the long-term commitment to a 'green transition' by many governments is not sufficiently trusted, making the risks of (co-)investing (i.e. 'blended finance') seem too high.

What is clear is that a particular conception of risk – reproduced by generally accepted models of risk analysis – lies at the heart of this conundrum (Walter and Wansleben 2020).

In short, fundable projects that contribute to a 'light green' sustainability transition are what Geddes and Schmidt refer to as 'fit-and-conform' projects (Geddes and Schmidt 2020). They distinguish this from 'stretch-and-transform' projects that could contribute to a darker green sustainability transition. Like Mazzucato (Mazzucato and Penna 2015), they see publicly owned Development Finance Institutions (DFIs) playing a key role in facilitating 'stretch-and-transform' projects using a range of mechanisms aimed at reducing the risk for

Figure 5.3

Maturities—increasing

Financial Returns—decreasing

1. Institutions that aim for high returns, take high levels of risk and have very short time horizons: high frequency trading firms, hedge funds and the trading arms of investment banks.	2. High returns are targeted, but over a slightly longer time-frame – up to a year: Equity and bond investors with high-risk strategies.	3. Combines high return expectations with time horizons beyond a year, and would include aggressive private equity and venture capital funds, and some high-risk/high-return commercial
4. Lower return expectations but with very short time horizons. Here we would find similar institutions, but employing less risky investment strategies than those in cell 1.	5. Would contain equity and bond funds, but with less risky portfolios, perhaps based on diversified exposure to mainstream indices. Socially responsible investment (SRI) funds would also be located here. Potentially supportive of light green investments.	6. FIs that take a longer-term view. Pension funds, insurance funds, SWFs, commercial bank lending, most microfinance funds and DFIs aiming to create a 'demonstration effect'. Potentially supportive of light green investments.
7. Due to the low financial return expectations, this row contains only non-commercial institutions. Investors tend to take a relatively long-term view.	8. Would contain lending by community banks, as well as some development bank loans and impact investors. Potentially supportive of light green investments.	9. The bulk of activities would consist of maturities lasting well beyond a year, as would most equity investment by DFIs. Potentially supportive of light green investments.

Source: Adapted from Spratt (2015)

private sector investments (Geddes, Schmidt and Steffen 2018; Geddes and Schmidt 2020). But it remains unclear whether 'stretch-and-transform' would require a fundamental transformation of the global financial regime. For this to happen, much will depend on the interventionist roles of Central Banks, policies that explicitly incentivize rapid increases in the quantity of debt and equity finance to accelerate the sustainability transition, and the financial implications of future systemic shocks (Werner 2016; Kedward, Gabor and Ryan-Collins 2022).

There are four sets of financial institutions that may have sufficient leverage to potentially move the dial: the Index Funds that have emerged as major players since 2007; the Sovereign Wealth Funds (SWFs) that have increased rapidly since 2007, near tripling in size (Global SWF 2024); the Public Financial Institutions; and Central Banks that have become increasingly influential and powerful. Although Index Funds are expanding rapidly as a percentage of total assets, public financial institutions and central banks only accounted for 13% of the US$461.2 trillion worth of assets held by all public and private financial institutions in 2022 (FSB 2023). SWFs accounted for nearly US$11.2 trillion worth of assets by 2023, or 2% of the total value of all financial assets in 2022 (Global SWF 2024; FSB 2023). When seen in relation to each other, the changing size and role of these four sets of FIs since the start of the global financial crisis in 2007 points to significant dynamics of change within the overall global finance regime that may have consequences on how the financing of sustainability transitions could evolve over the next few decades. They could well play a key role in redefining risk in an increasingly uncertain world - escalating the levels of investment in sustainability transitions is unlikely as long as risk analyses continue to exclude planetary risks.

5.1 INDEX FUNDS

As discussed above, the rise of the Index Funds is a distinctive mega-trend in the post-2007 era. Index Funds are Asset Managers who manage investments on behalf of investors in return for a fee. They are different to traditional asset managers because investment decisions are made algorithmically according to indexes that are applied across all stock exchanges in every sector. This means their fees can be very low compared to traditional asset management companies who must hire highly skilled and therefore expensive asset managers to make the investment decisions. Whereas less than $3 trillion was invested in Index Funds in 2007, this had reached over $15 trillion by 2021 (Galaz and Collset 2022).

BlackRock, State Street and Vanguard are the top three and if current trends continue, they will hold 34% of the stocks on the S&P 500 by 2028. By 2021 Index Funds managed assets located across the globe worth 3.5% of the value of total financial assets in 2020. This gives Index Funds enormous power, in particular when it comes to voting rights with respect to Board membership and influence on corporate strategy of the largest companies via private engagements.

BlackRock is the largest of the Index Funds. In his now famous 2020 letter to CEOs, Larry Fink, BlackRock's CEO, declared that BlackRock would be using its leverage to influence the flows of global investments. "I believe we are on the edge of a fundamental reshaping of finance", he wrote. And continues: "The evidence on climate risk is compelling investors to reassess core assumptions about modern finance." To explain why Index Funds like BlackRock are adopting ever-more interventionist positions to align investments with sustainability goals like the SDGs, the Stockholm Resilience Centre and co-authors suggest in their report on finance for a just future that:

> ''...the 'Big Three' [BlackRock, State Street, Vanguard] could be seen as 'universal owners' – investors that hold shares in virtually all publicly listed companies, and thus, in all industries. As a result, the cumulative long-term return of a universal owner is essentially determined not just by the performance of each individual firm it holds, but by the performance of the economy as a whole. This means that financial giants – in principle – have an incentive to mitigate negative externalities, such as biodiversity loss and climate change." (Galaz and Collset 2022:38).

In short, as algorithmic power has enabled Index Funds to become the world's largest investors on behalf of the richest people in the world, possibly for the first time the interests of the wealthiest can potentially be aligned with a more sustainable world. However, as the withdrawals of BlackRock and Vanguard from net zero or ESG commitments suggest, Index Funds will more likely continue to align the richest people in the world with the incentive to maximize short term capital profits against the compelling scientific evidence that exactly these short term profits erode the long term habitability of our planet. Indeed, greenwashing is always the cheapest option and greatest danger. A recent paper analysing the voting decisions of the 'Big Three' revealed that The Big Three "much more often than not oppose rather than support shareholder resolutions aimed at improving environmental governance" (Baines and Hager 2022).

5.2 SOVEREIGN WEALTH FUNDS AND THE FIDUCIARY STATE

By 2018 there were 80 active SWFs in the world. As already indicated, since 2007 their assets have nearly doubled from US$3.9 trillion in 2008 to US$7.67 trillion by August 2018 (Bahoo, Alon and Paltrinieri 2020). Unlike Index Funds, they own their assets, rather than managing them on behalf of others. And they are, of course, owned by their respective states – prompting Megginson and Fotak (2015) to refer to the 'rise of the fiduciary state'. Except for Norway's SWF (which is also the largest SWF), the world's ten largest SWFs are in the Persian Gulf and Asia. Despite the differences, the best definition of a SWF is the following:

> "Sovereign wealth funds are investment funds that are directly or indirectly owned, controlled and/or monitored by a government organization or arrangement (national or sub-national) to stabilize macroeconomic fluctuations due to the imbalance of payments. They can have multiple objectives, such as stabilization, savings, revenue generation, and pension payments." (Bahoo, Alon and Paltrinieri 2020:8)

In general, the rise of SWFs can be understood as a response to two dynamics of the global financial regime: to mitigate the risks of increasingly frequent financial crises that negatively affect the autonomy of sovereign states, and to take advantage of the potential returns from investing in global financial markets to supplement/stabilize public sector revenues in a low-taxation world.

Like the Index Funds, as SWFs grow they become increasingly sensitive to climate-induced economy-wide vulnerabilities and, therefore, the impact on the global financial regime they depend on. But what is distinctive about them, though, is their long-termist perspective (Bolton, Samana and Stiglitz 2012). It is against this background that there is evidence of a shift in mandates. In 2020 the International Forum of Sovereign Wealth Funds (IFSWF) partnered with One Planet Sovereign Wealth Funds (OPSWF) to survey how SWFs were responding to the climate crisis. Only 24% had incorporated ESG criteria into their investment frameworks and only 18% had ESG teams. A year later in a follow up survey, 71% had adopted ESG frameworks and less than 10% said that they did not consider climate change factors in their investment approaches (Bahoo, Alon and Paltrinieri 2020).

In 2022, a Commission appointed by the Norwegian Government recommended that Norway's giant SWF should divest from fossil fuels while also at the same time increase pressure on the 9,300 companies it invests in to commit to the Net Zero by 2050 goal. As one of the largest single investors on the world's stock exchanges whose funds were originally derived from the proceeds of oil production, this is a significant move.

In short, the long-term perspective of SWFs may be aiding in drawing them increasingly into investments in sustainability transitions to mitigate the environmental threats facing the global economy and finance.

5.3 DEVELOPMENT FINANCE INSTITUTIONS

According to the first database on publicly owned development finance institutions (DFIs) managed by the

[14] The term Washington Consensus refers to development strategies recommended by the international financial institutions and the U.S. Treasury to countries in the Global South in 1980s-1990s, focusing on privatization, liberalization, and price stabilization.

Institute of New Structural Economics (INSE) at Peking University, there were 527 of these kinds of institutions across the globe in 2019. Their collective assets in that year amounted to USD$13 trillion (Marodon 2022:270). Since 2007, the loan commitments of the largest multi-lateral development banks (MDBs) have tripled (Ocampo and Ortega 2022:230). While nine of the largest MDBs hold two thirds of the total assets of US$13 trillion, there are 166 micro national-level DFIs that account for 0.1% of these assets. Despite their relatively small size, they play a key catalytic role in their home contexts. Of the 527 DFIs, 25% are African, and 20% are Southern Asian. National-level DFIs account for 70% of the 527 DFIs, while the MDBs account for only 9%.

Although the first DFIs date back to the nineteenth century, they flourished after World War II when Keynesian economics validated the developmental role of the state. However, with the consolidation of the 'Washington Consensus'14 from the late 1970s onwards, the number and role of DFIs went into decline. This changed after the 2007 global financial crisis, reinforced by the adoption of the SDGs and the demands for post-pandemic recovery. In 2011, 27 leading DFIs established the International Development Finance Club (IDFC) to take forward the emerging post-Washington Consensus agenda15, with special reference to implementing the SDGs after 2015.

Based on empirical analyses of several DFIs, Geddes and Schmidt (2020) identify eight strategies that DFIs have applied to date to change the definition of risk, four of which are about 'fitting-and-conforming' and four are oriented more towards 'stretching-and-transforming'. The 'fit-and-conform' strategies include (a) de-risking and capital provision to entice private sector co-investments; (b) size and capital aggregation, which refers to packaging a multiplicity of smaller projects into a single fundable project by a large investor, or creating vehicles for small investors to invest in large projects; (c) DFIs have accelerated learning by standardizing codes, contracts, processes and monitoring procedures for new kinds of projects that private funders had hitherto not handled; and (d) building a track record – by investing in projects that had previously failed to secure commercial funding, DFIs helped project developers and new technologies to build successful track records that then made them attractive to private investors. The more 'stretch-and-transform' interventions include: (a) industry coordination, which refers to the way DFIs have identified industry weaknesses and intervened to build capacity, strategic knowledge and partnerships; (b) educating the financial sector about new innovative mechanisms in response to new markets; (c) learning by co-investing with the private sector, not only to de-risk, but also to ensure learning to remove unfounded perceptions of risk; and (d) trust building, which stems from the way private funders sufficiently trust the investment abilities of the DFIs and therefore feel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[15] The post Washington consensus points to the failures of the Washington consensus. These include failing to understand economic structures in developing countries and not recognizing the important role of the government – by undertaking industrial policies and increasing domestic savings – in fuelling domestic economic growth (Stiglitz, 2004).

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comfortable following the DFI into what would otherwise be regarded as an unacceptably risking venture.

Like in the case of SWFs, the original rationale for DFIs (i.e. counter-cyclical investing and financing of policy implementation) is changing in response to the landscape pressures on the global finance regime. Even more so than SWFs and Index Funds, DFIs have increased their focus on financing sustainability transitions. Several have taken decisions to divest from fossil fuels, in particular coal and oil. The IDFC has initiated a joint research project with several research institutes to investigate how to ensure that investments in renewable energy projects achieve the social equity goals of the just transition. Morodon's research, that was done in partnership with the IDFC, concludes that DFIs need to play a leadership role with respect to mainstreaming transition finance, mobilizing and redirecting private finance, channelling transition funds to ensure development impact, promoting responsible demand and building a new global financing architecture (Marodon 2022:275).

5.4 CENTRAL BANKS

After the gold Bretton Woods monetary regime16 was abandoned in the early 1970s and in response to the perceived need to re-establish price stability by taming inflation, Central Banks became the primary anchors of the global financial regime. From the 1970s onwards, Central Banks largely succeeded in entrenching the notion that they were independent (from politicians and organized labour) and therefore had sole authority to determine monetary policy. As democratization spread through Latin America in the 1980s, Eastern Europe and Africa in the 1990s, the independence of Central Banks was an unquestioned part of the package. Their role: keep inflation low. Their primary instrument: interest rates. The price: rising unemployment and growing inequality. The beneficiaries were, as intended, the investors and shareholders whose profits (thanks to cheap capital) as a percentage share of GDP grew faster than wages for three decades. However, as Adam Tooze (2020) has argued, over time Central Banks were so successful in beating inflation that when it came to stimulating economic recovery after the global financial crisis and the pandemic, their traditional instruments were no longer useful. Faced with ineffectual fiscal policies, many Central Bankers followed the US Federal Reserve into quantitative easing. By buying government bonds and mortgage-based securities to increase the money supply, Central Banks became the primary drivers of global economic recovery. As a result, as Tooze observes, "central banks have become more powerful than ever." He continues:

> "But with the expansion of their role (and their balance sheets) has gone a loss of clarity of purpose. The giant increase in power and responsibility that has accrued to the Fed and its counterparts around the world in reaction to COVID -19 merely confirms this development." (Tooze 2020)

As Central Banks have shifted their focus to countering financial instability and stimulating economic recovery, Tooze (2020) argues that they have become the most significant economic policy actors with real control of the levers that could transform the global finance regime. They now face two primary challenges:

> "One is the financial legacy of the COVID-19 crisis, which will burden us with gigantic debts. The balance sheet of the central bank is a pivotal mechanism for managing those debts. The other issue is the green energy transition and the need to make our societies resilient to environmental shocks to come. That will require government spending but also a reorientation of private credit toward sustainable investments. In that process, the central bank also has a key role." (Tooze 2020:23)

[16] Under the Bretton Woods internal monetary system, the US dollar was convertible into a fixed quantity of gold, while other currencies had fixed, but adjustable, exchange rates to the dollar.

When he was Governor of the Bank of England, Mark Carney clearly recognized this reality when he argued that "[a] new, sustainable financial system is under construction." He describes how the Bank of England decided to be the first Central Bank to overhaul its supervisory role of the global financial regime by prescribing the following methods (Carney 2019):

Governance: clearly defined Board and management responsibilities for climate risk and related action;

Risk management: reinventing risk analysis by incorporating "cutting-edge risk management techniques …. [that] will make the heart of the global financial system more responsive";

Scenario analysis: constant review at firm and system level to "test strategic resilience" in relation to changing landscape pressures;

Climate risk disclosure: ensuring that firms disclose actual and potential risks to all stakeholders.

The Network for Greening the Financial System (NGFS) comprises over 90 Central Banks and financial supervisors. NGFS has recognized that environmental threats like climate change and biodiversity loss are "sources of financial risk" and that "central banks and supervisors should … ensure that the financial system is resilient to these risks". (Galaz and Collset 2022:40) The Stockholm Resilience Centre report proposes the following actions for Central Banks:

Assessment of environment-related financial risks to price and financial stability using various new modelling techniques, new risk analysis methods and mandatory disclosures of carbon risks;

Prudential policy to address system-wide vulnerability, including punitive capital requirements for carbon-intensive sectors, climate-related system risk buffers, restriction of credit to carbon-intensive industries, exposure limits on certain carbon-intensive industries, and supervisory limits on certain 'dirty' asset classes;

Aligning monetary policy with broader greening policies, including exclusion of non-green assets from Central Bank asset purchases;

Interventionist policy actions, including liquidity supply schemes configured to incentivize priority lending to green projects, and green credit guidance that stipulates maximum lending ceilings for undesirable industries and minimum lending floors for green industries.

It is, however, doubtful that Central Banks can become a means for re-allocating capital towards a just sustainability transition if their current institutional configuration remains unchanged, including their mandate to independently implement monetary policy using the means they use to achieve policy goals. Research has shown that the Central Bank's monetary policies have by no means been distributionally neutral, as was assumed by the so-called 'New Keynesian Consensus' that established modern Central Banking in the 1990s, nor do they enable financial stability when viewed over a longer time perspective (Schularick 2012).

A new generation of hybrid agent-based macroeconomic models shows that the conventional and unconventional monetary policies of the last decades hugely increased wealth inequality (Bauluz, Novokmet and Schularick 2022). Low interest rates and QE increased asset prices, and in particular housing prices, as discussed above. Since the ownership of assets is concentrated in the richest income bracket, the wealth difference between the rich and poor widens as a direct consequence of Central Bank's loose QE monetary policies. This has particularly negative effects on inequality in jurisdictions such as the Euro area, where the Central Bank, the ECB, has only one mandate i.e. keeping inflation at below 2% per year. A number of other Central Banks, including the Federal Reserve, have at least a dual mandate of inflation prevention and maximum employment, which can be used to legitimize monetary policies that purport to be aimed at reducing inequalities (e.g. maximizing employment).

Another intrinsic trade-off in the current institutional setting of Central Banks lies in their role of backstopping

over-leveraged segments of the financial system. The stabilization policies of Central Banks since the Global Financial Crisis have led to expectations that Central Banks should insure systemic risks, which in turn invites more leverage and risk taking, which in turn produces more financial instability (Boyarchenko, Favara and Schularik 2022). Indeed, available data from IMF and BIS show that governmental, household and business debt have surpassed pre-2008 debt levels in both advanced and emerging economies (Boone et al. 2022).

Recent research has revealed the infrastructural interdependencies between shadow banking17 and Central Banks that reinforce the disconnect between finance and the real economy. Central Banks implement their monetary policies via asset purchases to inject liquidity, but then resell assets into different segments of the financial system where shadow banking institutions play a major role. To execute their mandates they are, therefore, dependent on the liquidity and deepening of these financial market segments that are, in turn, facilitated by the shadow banking system. This is why the Federal Reserve and the ECB have actively promoted the development of shadow banking institutions that have, in turn, been identified as the key catalysts of financialization and the consequent amplifier of financial crises (Braun and Gabor 2020).

In short, as Central Banks have become the most powerful central coordinators of the global finance regime, their roles have diversified. As Mark Carney, former governor of the Bank of Canada and the Bank of England, argued, they are now in a position to introduce a "new sustainable financial system" (Carney 2019). The Bank of England has meanwhile broadened its core mandate to include environmental sustainability and transition to net zero. Christine Lagarde, Chair of the European Central Bank (ECB), insisted "that central bankers think beyond narrow definitions of their mandate", while at the same Green Swan conference FED chair Jerome Powell remarked: "As far as monetary policy is concerned climate change is not a main consideration" (quoted in Tooze 2021).

Clearly, Central Banks are on the move. To what extent the urgently needed "reorientation of private credit toward sustainable investment" (Tooze 2020) can be achieved remains to be seen. Central Banks are navigating a very small space that is strongly constrained by political forces, mandate, and policy instruments (Boneva, Ferrucci and Mongelli 2021). However, as we have shown in our analysis and as pointed out by Tooze they are probably even more constrained by the political economy of their jurisdictions (Tooze 2020). Examples that we have discussed are the large fossil fuel assets held by major banks, which if rapidly devalued, would destabilize the entire financial system, seriously disrupt the interdependence between Central Banks and the shadow banking system, and catalyse even greater increases in wealth inequality that are, in turn, a direct consequence of Central Bank's monetary policies. For these reasons we should not expect Central Banks to become by themselves a major driver of a just sustainability transition. For this to happen, policy interventions to change their mandates will be required.


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[17] Shadow banking refers to the lending of funds by non-banking institutions such as, for example, Hedge Funds. Sometimes referred to as non-banking financial intermediation, these institutions are not regulated, for example, by the Basle agreement, nor are they easily regulated by sovereign governments.

6

CONCLUSIONS & IMPLICATIONS FOR THE IRP

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6 CONCLUSIONS AND IMPLICATIONS FOR THE IRP

After more than ten years during which the IRP has produced compelling evidence about the unsustainable use of natural resources and, to some extent, its unequal distribution, the IRP should now take the next step by exploring the dynamics of the global financial regime. This powerful, large, dynamic and complex system is what ultimately determines the allocation of capital within the global economy. As recognised in UNEP's Green Economy Report cited in the introduction to this paper, it is ultimately the allocation of capital that will determine the directionality and depth of the sustainability transition.

The size and scope of the scientific literature that analyses the structure and dynamics of the financial system has exploded since the global financial crisis of 2007-2008. This new literature uses new data sets and new models to produce a large body of new evidence that is essential for accurately assessing the potential for relative decoupling and absolute resource reduction at the global and national levels. The global financial regime in its current form is configured to ensure that investment decisions are governed by risk and reward incentive structures that fundamentally counteract what is required to realize the SDGs and the vision of a 'transformed world'. Until finance gets fully recoupled to the real economy, this problem will persist. That, however, will require far-reaching policy reforms.

The economic and risk assessment models that financial decision-makers rely on, and which legitimate their power to allocate capital, have been challenged in light of their failure to predict the global financial crisis and by compelling empirical scientific evidence generated by the new scientific literature on the way the global financial regime works in practice. The meltdown induced by the sudden bankruptcy of Silicon Valley Bank (SVB) and Signature Bank mid-March 2023 is another testament to the inability of the banking sector to self-regulate and provide adequate financing for the sustainability transition. This is particularly true for SVB, which used to finance a significant number of green tech companies in California. Early signs were entirely neglected, including by the very father of the Dodd-Franck regulatory law, Mr. Franck, who acted as a member of the board of trustees of the now defunct Signature Bank.

This report has attempted to describe and analyse the dimensions of the global financial regime, including the roles of key institutions such as Central Banks, Index Funds, DFIs, Sovereign Wealth Funds and commercial banks. They all play different roles, are constrained by their respective mandates, operate according to different incentive structures, and exercise their enormous power to allocate capital in different but ultimately complementary ways.

At the top of the global financial regime hierarchy are Central Banks. The legal and operational mandates of Central Banks have fundamentally changed since they were invented in the 19th century. Their current mandates, although differing between jurisdictions, are the result of political decisions taken in the 1980s/90s. According to what we previously referred to as the Central Bank Narrative (CBN), Central Banks should be shielded against political capture; thus they must be independent, and comply with a rather narrow mandate. For the ECB this has been implemented in an extremely narrow way - the ECB has a single goal, i.e. inflation control. This is different to the Federal Reserve which has a dual mandate, namely inflation control and minimum unemployment.

Central Banks now increasingly understand the risk that the climate crises pose for the stability of global financial markets and slowly they have begun to embrace their potential roles in allocating capital to climate change mitigation and adaptation. This has yet to be extended to include responses to enforce sustainable resource use and biodiversity protection.

So far, the policy recommendations of the IRP have

directly addressed environmental, sustainability or resources use policies. The core insight from our study is that these policies will only be implemented if the incentives for allocating capital are changed to align with the policy priorities recommended by the IRP.

As of early 2024, sustained geopolitical conflicts have created dynamics that counteract the long-term focus of Central Banks on lowering interest rates. After a long period, inflation rates are back to levels not seen since the 1980s due primarily to rising resource prices. In response, the Federal Reserve and ECB have raised interest rates.

However, Central Banks are clearly constrained by their legal mandate. The role played by the step increase in interest rates in the financial meltdown of March 2023 is an illustration of the dead-end in which independent central Banks find themselves today. Their mandate dictates that they guard against inflation and, at the same time, to ensure financial stability (which requires keeping interest rates low). Changing this mandate is, in turn, a policy decision and, in some cases, might even involve constitutional change (as, for example, in South Africa).

The above-mentioned developments create real fears of another 'Volcker moment'. The 'Volcker moment' of 1981/82 fundamentally shifted the power balance from labour unions to big capital as the drive to tame inflation increased unemployment (Tooze 2018:44). As reflected in our analysis of unequal exchange, the balance of power presently concerns the relationship between the rich and the poor throughout the Global North and South, and it is also, from a sustainability transition perspective, between present and future generations. In the face of another 'Volcker moment', today's poor who are the vast majority of the world's population, have neither the financial means nor the organizational capacity to defend their interests. The young and future generations lack political voice, as they are either too young or have not yet been born. The poor and the next generation face persistent poverty, conflict, climate change, biodiversity loss, and resource depletion. They are not responsible for causing these crises, but they will inherit the consequences. In the meantime, the global financial regime continues to function in ways that remain non- aligned with the world's commitment to a 'transformed world' as articulated in the Preamble to the Sustainable Development Goals.

We acknowledge and appreciate the IRP's work to date in attracting global attention to the resource use challenge and the need for decoupling. Nonetheless, our conclusion is that the IRP should now focus on what it will take to reverse the 'gross misallocation of capital' referred to by UNEP's Green Economy Report, as well as the unequal resource exchange referred to in recent research. One means of achieving this would be for all IRP work streams to actively engage with appropriate experts to include an analysis of the financial and distributional implications of their policy recommendations.

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Hans Isaacson—Unsplash

Think Piece by the International Resource Panel (IRP)

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GOVERNING SUSTAINABILITY TRANSITIONS IN A RESOURCE-DEPENDENT WORLD

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EXECUTIVE SUMMARY

Theworld facesunprecedented resourcegovernance challenges. Resource extraction and processing exert growing pressure on planetary boundaries, accounting for more than 90% of global biodiversity and water stress impacts, and approximately 55% of all greenhouse gas emissions (United Nations Environment Programme [UNEP]2024). Policy responses since the 1970s, largely based on regulation and market-based instruments, have generally failed to deliver sustainable resource use and management. The complex and systemic nature of resource management problems necessitate new, more transformative, governance responses. As a crucial science-policy actor in the area, the IRP can play an active role in advancing policy strategies for system-level sustainability transitions.

Research into sustainability transitions, or transformations, contends that unsustainable resource use is ultimately rooted in the fabric of our societies and lifestyles – in the systems that meet our need for food, energy, housing and mobility, and in our ways of living, working and thinking. Consequently, achieving sustainable resource management will require profound social and economic change. Drawing on foundations in diverse research fields, transitions research offers a broadly shared understanding of the characteristics and dynamics of systemic change. This understanding centres on the emergence and spread of new innovations and practices, as well as the managed phase -out of unsustainable practices. Transitions are hugely complex and uncertain processes of change that can take decades to unfold.

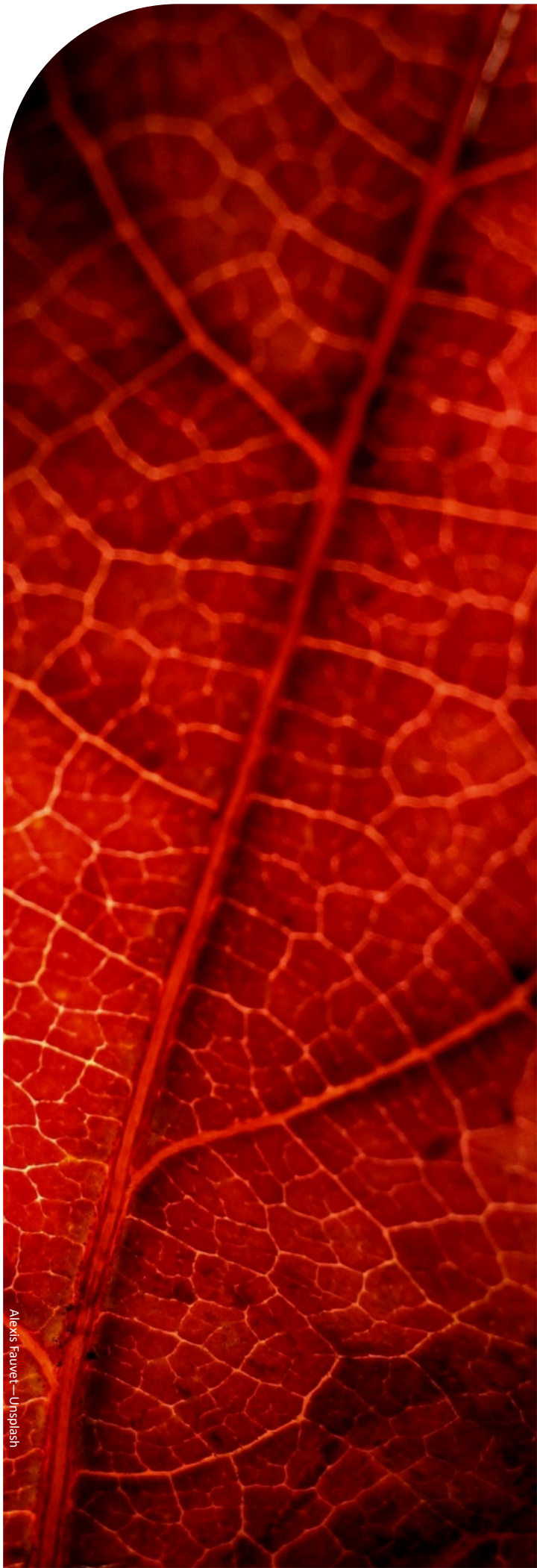
National governments have an essential role in facilitating and orienting systemic change through coherent policy action, mobilizing and guiding change. Achieving sustainability will require policies at all levels to understand and manage the inter-connectedness and interdependency of the resource-dependent systems that support our wellbeing. While regulations and market-based instruments remain important, a number of policy areas—from innovation, health, environment and climate, to financial, fiscal, education and welfare policy —need to be designed and sequenced in ways that enable a socially just transition.

Sustainability transitions research provides valuable insights for sustainable resource governance, shining light on the complex and systemic nature of the challenge. It helps to explain the limitations of past resource governance approaches and the opportunities for better governance. However, a transitions approach does not, by itself, offer a complete solution to resource governance. First, understanding the policy implications of transitions thinking is still quite limited; much research focuses on Europe, with far less evidence from other developed regions (e.g., the U.S.), or from the Global South, where the challenges and opportunities are often very different. Second, existing knowledge systems are inadequate; governments lack the necessary ‘understanding of resource flows, provisioning systems and innovations to support transitions governance. Third, there is a mismatch of scale between the policy recommendations in transitions research, which address local, national or regional (e.g., EU) levels, and the global character of many resource governance problems. As a consequence, in addition to national governance, international coordination remains essential, for example through more focused intergovernmental agreements, knowledge sharing, and coordination on a range of issues, including emissions reductions, trade, finance, standards and technology transfer and deployment. At the same time, transitions can benefit from knowledge co-production efforts that engage scientists, policymakers and practitioners.

Ivan Bajura — Unsplash

This Think Piece presents ideas from theory and practice regarding the role of policy in advancing sustainability transitions. The Think Piece does not report a systematic assessment, but it builds on theoretical and conceptual underpinnings and empirical examples. The Think Piece closes with key messages for policymakers, decision-makers and other stakeholders engaged in resource governance along the following lines:

- Adopt a sustainability transition approach to help ensure sustainable natural resource use and management
  - Examine assumptions, integrate transitions thinking, generate new knowledge
- Support ambitious long-term goals and strategic frameworks to steer sustainability transition
  - Introduce in policies/strategies clear intended path (directionality) towards sustainability, support shared visions at the national and international levels, facilitate networking
- Offer alternative policy sequences for advancing sustainability transition in a positive and engaging fashion
  - Support the development of pathways, provide a long-term narrative, regulate, phase out unsustainable policies/ practices, incentivise, empower
- Provide tools and support to coordinate sustainability transition across systems and internationally
  - Evaluate and communicate sustainability implications of consumption and productions patterns/systems, set up platforms, support coordination



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Dynamic Wang—Unsplash

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1

INTRODUCTION:
THEROLEOF POLICYIN TRANSITIONING TOWARDS SUSTAINABLE MANAGEMENT OF RESOURCES

1 INTRODUCTION:

THEROLEOF POLICYINTRANSITIONING TOWARDS SUSTAINABLE MANAGEMENT OF RESOURCES

1.1 RATIONALEFORPOLICY INTERVENTION TO ENABLE SUSTAINABILITY TRANSITION

Natural resources have long underpinned economic development and improvements in human well-being. Yet, since the Industrial Revolution, the acceleration of economic activity, increase in wealth and living standards, and rapid technological change have also led to compounding environmental, social and economic challenges Since 1970, global natural resource use has more than tripled, while the world population has doubled (UNEP 2024). Furthermore, disparities in income and wealth and environmental degradation across the world, between and within regions and countries, add to natural resource governance challenges.

In 2007, the International Resource Panel (IRP) was formed with a mission to build and share knowledge needed to improve natural resource use and management worldwide, by generating an understanding of how to decouple economic growth and human wellbeing from natural resource use and environmental degradation. The IRP has developed a substantial knowledge base that highlights the systemic nature of environmental and social problems that natural resource governance must address. Decoupling environmental impacts from economic growth has been primarily addressed by optimising the efficiency of existing production and consumption systems, with current emphasis placed on moving toward a circular economy and a more equitable distribution of the benefits and impacts of resource use. To this end, the Global Resources Outlook 2024 calls for optimizing provisioning systems such as mobility and housing, including through resource efficiency, climate change mitigation, carbon removal, and biodiversity protection policies (UNEP 2024).

Therehas beenan increasing realization in academic and policy communities that addressing sustainability challenges requires fundamental changes in production, distribution and consumption systems and practices. During the last few decades, scientific studies and science-policy platforms have been increasingly taking up the notions of sustainability ‘transition’ and ‘transformation’. This new language is especially prominent within the international policy discourse. For example, the United Nations 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals aim to ‘transform our world for the better by 2030’ (United Nations 2015); the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) states that

Denis Shchigolev—Unsplash

the sustainable use and conservation of nature “may only be achieved through transformative changes across economic, social, political and technological factors” (IPBES 2019); and the Intergovernmental Panel on Climate Change (IPCC) calls for unprecedented and far-reaching transitions in energy, land, urban, infrastructure and industrial systems (IPCC 2018). The emergence of these calls reflects a recognition of the need to achieve fundamental, systemic change in human-nature interactions, to achieve decent standards of living while operating within planetary boundaries. As a crucial science-policy actor in the area, IRP can play an active role in formulating and advocating for policy strategies to enable sustainability transitions. The IRP acknowledges in its decoupling reports, that achieving systemic change necessarily entails significant policy challenges (UNEP 2011; UNEP 2014). This Think Piece adds to these considerations, by identifying opportunities and policy strategies .

Policy interventions suggested by researchers, including IRP experts, have traditionally focused on influencing the market forces that shape resource management. They have, in particular, drawn attention to the need to correct market failures such as information asymmetries, knowledge spillovers, the externalization of costs and over-exploitation of the commons. Sustainability transitions research suggests that policy needs to play a greater role in steering transition processes. This involves setting a common goal and direction for innovation and policy processes, coordinating sectoral and multi-level governance policies, advocating for and stimulating demand for sustainable modes of producing and consuming, and developing reflexivity through continuous monitoring (Weber and Rohracher 2012).

1.2 AIM OF THE THINK PIECE

This Think Piece aims to support policymakers and other relevant actors, by offering insights into how a transitions perspective can inform policy strategies promoting sustainable resource management. The Think Piece seeks to trigger new thinking about how to address resource governance challenges and to illustrate how public policy can leverage and accelerate the shift from current unsustainable modes of producing and consuming to new ones that respect planetary boundaries and distributional justice concerns.

2

PERSISTENT PROBLEMS WITH GLOBAL RESOURCE USE & GOVERNANCE

Christina Zhang—Unsplash

2 PERSISTENT PROBLEMS WITH GLOBAL RESOURCE USE AND GOVERNANCE

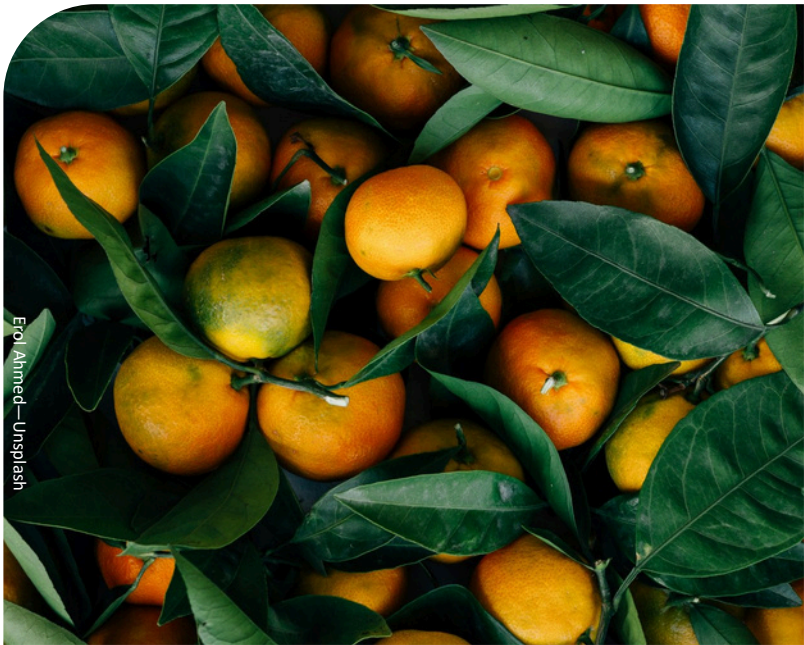
Natural resource use is driven by production and consumption trends, which are in turn linked to population growth, higher material living standards, resource-intensive consumption patterns, single use 'disposable' products, and built-in product obsolescence. Material resource use has more than tripled since the 1970s (UNEP 2024). Since 2000, material extraction has accelerated despite slowing global population growth and disruptions to global economic growth (Schandl et al. 2018). Meanwhile, the benefits and impacts of resource use remain unevenly distributed across countries and regions, and natural resource governance approaches tend to focus on the production end of value chains (Campese et al. 2016; Cumming et al. 2020; IRP 2020).

Globally, natural resource use has continued to place pressure on planetary boundaries (Steffen et al. 2015). For example, resource extraction and processing account for more than 90 per cent of global biodiversity and water stress impacts, and approximately 55% all greenhouse gas emissions (not including climate impacts related to land use) (UNEP 2024). The most direct resource consequence of population growth is the need for land area for food production. Agriculture is the primary driver of global water stress and, particularly through land-use change, an important reason for biodiversity loss. While population growth remains an important reason for increasing resource use, increasing wealth and consumption also have a very significant impact globally. Growing wealth results in resource intensive lifestyles both through private consumption and demand for infrastructure. Indeed, infrastructure generates important lock-ins and infrastructure development is a key global driver of climate impacts from resource use. Efficiency improvements remain limited and market prices often communicate limited information about resource scarcity or the environmental and social impacts of production and

consumption.

The negative and positive environmental and social impacts of resource extraction, processing, use and end-of-life are unevenly distributed. For example, Asia, especially China, has become a regional assembly platform for goods mainly destined for markets in North America and Europe. This has integrated East Asia tightly into the global economy. This has not only provided economic and social benefits from employment, but also transferred the environmental impacts of production and consumption. Globally, North America and Europe have relatively more value-added economic activities, Asia and the Pacific have the most significant employment impacts, biodiversity impacts are relatively higher in Latin America, water stress is highest in Western Asia, whilst climate impacts are more evenly distributed (IRP 2019). These unevenly distributed impacts are poorly accounted for along the value chain. In economic terms, the final prices of products and services do not include the negative impacts of production, so they remain externalities. At the same

time, benefits from resource use, processing and trade are accounted for in numerous ways: added value, turnover, income and employment, knowhow and innovation, and professional competence and identity. Correcting the unequal distribution of impacts and accounting for externalities alongside benefits requires an understanding of the underlying reasons behind the unsustainable resource trends. And turning the unsustainable trends around needs new approaches, for which policy plays a key role.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3

APPROACHES TO GOVERNING TRANSFORMATIONS

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3 APPROACHES TO GOVERNING TRANSFORMATIONS

Transformation and transition are about system change. A growing body of research and knowledge about complex systems and systemic change stems from a mixture of academic disciplines, focusing on different kinds of societal systems. Transitions can broadly be categorized into socio-technical, socio-ecological, socio-economic (European Environment Agency [EEA] 2017), with the concept of the 'just transition' also growing more prominent in recent years.

While emerging from different disciplines, the approaches share common elements. Each stresses the need to move beyond incremental improvements in efficiency and to focus on a more fundamental transformation in the ways in which society meets its needs or organises its economic structures. They all recognise that the co-evolution of elements in complex societal systems produces major lock-ins and barriers, which slow down and hinder rapid far-reaching change (see Section 4.2). These same characteristics imply that transition processes are often non-linear and characterised by feedbacks, trade-offs and uncertainties, and each approach points to the importance of innovation in triggering systemic change. They imply that the governance of transitions requires the emergence and diffusion of new ways of producing, consuming, living and thinking, and an ability to cope with disruption.

Section 3.1 briefly outlines some of the prominent concepts, concentrating on theories of change and governance. Section 3.2 connects this discussion with natural resources governance, outlining resource governance approaches evident in IRP reports – including the Global Resources Outlook – and identifying howtransitionsthinkingcan inform resource governance strategies.

3.1 TRANSITION AND TRANSFORMATION DISCOURSE

3.1.1 SOCIO-TECHNICAL TRANSITIONS

Socio-technical transitions research focuses on transforming the systems that provide core societal functions, meeting needs for energy, food, mobility and housing. Transitions are seen as long-term (30-50 years), co-evolutionary processes that mobilize multiple actors to reconfigure the institutional, organizational and material structures of societal systems. Whilst the analyses of sustainability transitions have predominantly focused on specific systems (Geels et al. 2017), the study of deep transitions focuses on series of connected and sustained fundamental transitions of a wide range of socio-technical systems, with a recognizable direction (Schot and Kanger 2018). Deep transitions are comparable to Polanyi's Great transformation (Polanyi 1944)18.

Sustainability transitions research emphasises that many barriers hinder the emergence and diffusion of potentially transformative innovations. For this reason, policies and initiatives have an important role in creating protected spaces for experimentation and learning about novel ways of meeting society's needs through new technologies, business models or social practices. Contributions from the fields of policy studies and innovation policy go further in highlighting the need to design, evaluate, and implement policy mixes to shape the directionality of systemic change (Edmondson, Kern and Rogge 2019). A variety of key policy intervention points have been identified, notably: stimulating niche

[18] Polanyi's "Great Transformation" refers to the social and economic changes that accompanied the rise of industrial capitalism in Europe during the 19th and early 20th centuries. His analysis remains influential in understanding the historical development of capitalism, its social consequences, and the ongoing debate over the role of markets versus state intervention in modern economies.

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innovations (e.g., through research, development and innovation funding or regulatory shielding); accelerating niches (e.g., subsidising adoption through feed-in-tariffs or creating markets via public procurement or labelling schemes); destabilising regimes (e.g., by regulating or taxing dominant environmentally harmful technologies); destabilization (e.g., by providing financial and educational support for structural unemployment and skills mismatch); coordinating multi-regime interaction (e.g., by policy integration and coherence between sectors); and tilting the policy landscape (e.g., through international agreements) (Kanger, Sovacool and Noorkõiv 2020).

Furthermore, the science, technology and innovation (STI) policy community has highlighted the role of transformative innovation policy in responding to specific social challenges (Schot and Steinmueller 2018), mission-oriented innovation (Mazzucato 2018) and the need to address transformative policy failures by promoting directionality, articulating demand, ensuring policy coherence and reflexivity (Weber and Rohracher 2012).

3.1.2 SOCIO-ECOLOGICAL TRANSFORMATIONS

Research into socio-ecological systems emphasizes the mutual dependencies and dynamic relationships between humans and the environment, building on ecosystem theory and complex systems analyses (Levin et al. 2013). Interactions between society and ecosystems are analysed at various scales, from community management of the local environmental commons up to the global scale, where planetary boundaries define the safe operating space for human activity (Steffen et al. 2015).

Socio-ecological approaches relate system transformations to concepts such as adaptation and resilience (Folke 2006; Gunderson and Holling 2001). Transitions are characterized as ‘a discrete process that fundamentally (but not necessarily irreversibly) results in change in the biophysical, social, or economic components of a system from one form, function or location (state) to another, thereby enhancing the capacity for desired values to be achieved given perceived or real changes in the present or future environment' (Park et al. 2012).

Rather than focusing on the transformation of individual sectors or systems of production and consumption, the socio-ecological approach entails a cross-cutting perspective. For example, the food-water-energy nexus focuses attention on interactions and trade-offs across different systems and resource uses within a particular area (Endo et al. 2017). Such thinking has influenced policy design, for example in the integrated and cross-cutting policy strategies of the European Union addressing the circular economy (European Commission 2015), zero pollution action (European Commission 2021) and the European Green Deal (European Commission 2019). At the same time, tools such as life cycle assessment can help in coherently managing the environmental impacts of production and consumption, including carbon emissions, resource depletion and

pollutants (Kloepffer 2008). Such tools can provide policymaking processes with a systematic consideration of the trade-offs and synergies in different production and consumption systems, as well as in different environmental impact management strategies.

Resource governance challenges in socio-ecological systems often take the form of collective action problems (Ostrom 1990; Ostrom 2007), necessitating coordinated responses based on negotiations, targets and monitoring with feedback mechanisms. Other similar approaches, such as adaptive governance, focus on building knowledge and understanding of resource and ecosystem dynamics, feeding ecological knowledge into adaptive management practices, supporting flexible institutions and multi-level governance systems, and dealing with external perturbations, uncertainty and surprise (Folke et al. 2005). The Earth-system governance approach extends adaptation further to institutions, and highlights the importance of accountability and legitimacy, allocation and access (Biermann et al. 2009). At the heart of governing social-ecological system transitions is collaboration, building on balanced interests and learning (Bodin 2017; Cumming et al. 2020). Similar mechanisms apply to governing ecosystem services (Primmer et al., 2015).

3.1.3 SOCIO-ECONOMIC TRANSFORMATIONS

'Socio-economic transformations' is not a distinct academic field. Rather, it is a topic studied by multiple disciplines, such as political economy, historical sociology, environmental economics, ecological economics and institutional economics. Empirically, the approach is frequently applied in critical analyses of political change and market liberalization, but these ideas are also embedded in ecological economics and even environmental economics, as recently powerfully synthesized by Sir Partha Dasgupta (2021). Socio-economic transformations analysts are concerned with changes to the dominant power relations and multi-layered institutions that structure economic and financial systems, which have resulted in patterns of individual and collective behaviour that can be environmentally unsustainable and harmful to human well-being.

Socio-economic transformations are related to multi-agent, complex, very long-term processes of institutionalization (40-60 years) and their proponents seek ways to initiate and speed-up change in a specific direction. Systemic changes are empirically analysed or are proposed to counter problems created by the marketization of society and the commodification of labour, land and money. The approach therefore challenges core assumptions of mainstream economics, for example relating to human nature and motivation, and the growth paradigm (EEA 2021), as well as questioning the societal values that underpin materialistic and consumerist lifestyles (EEA 2017).

Diverse ideas exist for governing the transformation of socio-economic systems. These range from encouraging the development of grassroots complementary economies (Kemp et al. 2017) or promoting transformative social innovation (Pel et al. 2020) to the rerouting of financial flows throughout the economy, for example by developing markets for natural capital and ecosystem services (Dasgupta 2021), using public-private financing programmes to support investment in green projects, and developing 'green' and 'responsible' investment funds.

3.1.4 JUST TRANSITIONS

The idea of a just transition has increasingly featured in policy and political discourse (e.g., European Commission 2020; International Labour Organization [ILO] 2015) responding to the need to ensure that efforts that steer society toward a resource-efficient, low-carbon future pay attention to issues of equity and justice. In Europe, the concept of just transition often centres on the need to protect workers or regions that are impacted by the structural economic change. The transformation to a carbon neutral and circular economy inevitably creates winners and losers, as new sectors emerge and polluting or resource-intensive industries are phased out. Similar equity and justice concerns are relevant across regions and at the global scale and resonate with global justice concerns.

A just transition can be understood more broadly as a process that 'reconciles sustainable use of natural resources with a pervasive and meaningful commitment


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to sufficiency', recognising the need to address the trade-offs between competing needs and priorities in an equitable manner (Swilling and Annecke 2012, p. xviii). These perspectives challenge ecological modernist approaches, on the basis that current green development trajectories do not address the ecological limits of existing production and consumption systems or the needs to include inclusive and equitable growth

A diverse range of governance options exist to promote a just transition, reflecting the different interpretations of the concept. On one extreme, the European Union's Just Transition Mechanism works within current institutionalized structures, emphasising the need to foster education, skills and employment that serve social needs, equality and fair working conditions (European Commission n.d.). At the other end of the scale, academic discourses favour restructuring the global financial system and a re-conceptualizing the role of the state (Swilling and Annecke 2012).

3.2 IRP APPROACHES TO RESOURCE GOVERNANCE

Between 2007 and 2024, the IRP has produced many scientific assessment reports and think pieces offering policy-relevant, science-based information for government policymakers, industry and society, to develop practical solutions to resource governance problems. This extensive body of knowledge shows an evolution of approaches, methods and types of policy recommendations, aligning with other major science-policy processes, such as the IPCC or IPBES.

A large body of the IRP's work has been targeted at providing an evidence base on global stocks and flows of resources (e.g., metal, land use, water) and their impacts on the environment. These have, for the most part, been analytical exercises in developing a knowledge base to inform priority setting for investment, and more broadly, to describe in clear terms the scale of the global resource governance challenge. The dominant logic running through IRP assessments and knowledge is captured in the Global Manual on Economy Wide Material Flow Accounting, which states that "developing policy which promotes a circular economy and decoupling economic growth can only be done through tracking how materials are being used and identifying opportunities for improving efficiency, reducing material use and waste, promoting recycling and changing processes" (UNEP 2021).

The Material Flows Manual also notes, however, that while technological innovation and efficiency improvements are important, they are not sufficient to achieve the required decoupling of economic growth, resource use and emissions. System-level innovations are required, necessitating significant changes in institutional frameworks, government policies, corporate behaviour and consumption patterns. An emphasis on systems and transitions is becoming increasingly prominent in IRP work. IRP reports on food systems and cities, for example, have drawn on transition and transformation concepts in analysing how policy, lifestyle, political economy and resource use interrelate in complex ways. Looking at cities as complex systems highlights the role of

experimentation as a mode of urban governance and the need for flexibility in institutional frameworks governing cities (IRP 2018a). The food system approach allows for identification of concrete policy options that target leverage points and allocate responsibilities throughout the entire system, moving beyond the myopic focus on farmers and fishers to attain a more efficient and sustainable use of resources (UNEP 2016a).

The IRP evidence base has also evolved to include a greater focus on policy and governance messages, rather than simply acting as a 'supplier' of scientific evidence and data (Catalysing Science-based SCP). Recent work on themes such as coastal resources (IRP 2021), biodiversity (IRP 2021), minerals governance (IRP 2020), resource efficiency and climate change (UNEP 2017) points to the systemic challenges of resource governance. These include, for example, the complexity of specific regional, national, local and sectoral circumstances that create barriers to coordination mechanisms; and the protection and definition of resource-related rights and respect for the international rules-based order.

IRP policy recommendations range in character, from very detailed to extremely broad. In general, the policy recommendations within IRP reports reflect the primacy of command and control and market-based approaches, centred on correcting price incentives via economic policy instruments (e.g., environmental and resource tax reforms, removal of harmful subsidies). Metrics, monitoring and standards are identified as tools for improving material efficiency. In keeping with the growing focus on systems and transitions in IRP assessments, however, there is an increasing emphasis on innovation governance, including the need to support niches and visioning exercises, as well as the role of policy mixes and strategic planning in bringing about socio-technical change (IRP 2018a; 2018b). Furthermore, whilst the IRP corpus of natural resource governance actions has primarily focused on national-level policy making, there has been growing attention on the role of cities (IRP 2018a) and international trade (UNEP and IRP 2020) have received increasing attention.

As mentioned, IRP has expanded its focus from the provision of policy-relevant information on the global stocks and flows of resources and their environmental impacts to a perspective increasingly addressing governance and policy responses to the identified resource problems. This shift is coupled with a change in analytical tools, from a focus on individual systems to include the feedback and interactions between complex systems and a greater recognition of the 'social' aspects (e.g., policy frameworks, actors' strategies and consumer behaviour) of these systems. In conclusion, the IRP plays an important role, as a science-policy actor, in disseminating policy messages that can accelerate the transition toward more sustainable global resource governance.

4

CHALLENGES FOR GOVERNING SUSTAINABLE RESOURCE MANAGEMENT & USE

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4 CHALLENGES FOR GOVERNING SUSTAINABLE RESOURCE MANAGEMENT AND USE

4.1 GLOBAL RESOURCE GOVERNANCE AS A WICKED PROBLEM

Global resource governance constitutes a wicked problem (cf. Levin et al. 2012). Resource governance is an urgent problem, with those who cause the problem also seeking to provide a solution. There is no central authority to address the problem and irrational discounting occurs – whereby decision-makers tend to undervalue future costs and benefits in favour of immediate gains or avoidance of immediate costs – that pushes necessary actions to address pressing issues into the future. Knowledge about resource extraction, flows, uses and end-of-life is often incomplete or contradictory. The accounting of resource stocks, extraction, trade and consumption are not systematically connected to one another, and prices do not reflect all impacts of resource use, resulting in the poor accounting for resource scarcity. Production and consumption systems are characterized by multiple actors and diverging positions. Actors operating at different points along the supply chain are motivated and governed by different values and institutions. Responses to such wicked problems typically create new challenges. For example, using biofuels to replace fossil fuels results in competition over agricultural and forested lands, possible intensification of land use and further environmental and social impacts.

The relevance of different kinds of policy responses and actions is also strongly contingent on the political economy and institutional logic of the region and system in which they are implemented. Globally, there are huge variations in the role of natural resources in national economies and policies. Property ownership and rights (private/public), and state control over private landowners, extractors, traders and processors vary across regions and countries, as do cultures and institutions framing collective action, public engagement and the rule of law. Variability is apparent also in public budgetsfor resource management and control, as well as in investments in research, innovation and skills. With these variations seldom in focus in governance, global negotiations addressing resource governance appear narrow, with trade negotiations focusing on prices and tariffs, and multilateral environmental agreements focusing on specific environmental conditions and improvements.

Characteristic to wicked problems is their lack of a single root cause. Section 4.2 identifies some of the key systemic challenges that hinder sustainable resource governance. Economic lock-ins prevent the emergence and diffusion of alternative, more sustainable ways of producing and consuming. Lifestyles and consumption behaviour are often deeply embedded in identities, cultures and worldviews, including the dominant economic discourse that links consumption to well-being. Information and knowledge to support sustainable resource governance is often either lacking or not targeted at the appropriate and actionable intervention points. Fragmented governance, vertical and horizontal, inhibits systematic and integrated approaches to resource governance. The quality of institutions can hinder action in society's collective interests, for example because of vested interests, political incentives and corruption. The issues identified are overlapping and interconnected. For example, production and consumption systems are intrinsically linked, being shaped not only by economics and material flows, but also by culture and values, rules and power. Addressing wicked problems requires cohesive governance strategies across different systems. In the sections below, we categorize resource governance challenges according to their underlying drivers, rather than using a production and consumption system approach. The subsections aim to illustrate the systemic challenges that are faced, rather than comprehensiveness.

4.2 RESOURCE GOVERNANCE CHALLENGES

4.2.1 ECONOMIC LOCK-INS

Market economies are perhaps the best systems for allocating scarce resources. However, the structure and function of market economies can contribute to unsustainable resource governance in a variety of ways. By incentivising the division of labour and specialization, markets can lead to long and complex value chains, with widely dispersed social and environmental impacts. Furthermore, market prices often fail to reflect the environmental impacts of production and, as a result, may incentivise harmful modes of producing and consuming.

Governments are frequently constrained in their ability to correct unsustainable market incentives because of structural lock-ins and strong economic interests in maintaining the status quo. For example, public and private investments in machinery and infrastructure (e.g., for resource extraction, refinement and distribution) are often very large, long lasting and tailored to particular modes of production. They constitute deep sunk costs that incumbent industries are likely to protect and reproduce. The costs of transitioning to new, more sustainable, modes of producing and consuming can also be a major barrier, at the level of households, businesses and whole sectors. Different forms of infrastructure have generated sunk costs and add to the lock-ins. Efforts to transform socio-technical systems will also have major impacts on labour markets, with job losses sometimes concentrated in particular regions or among those with specialized skills and knowledge. The risks to livelihoods and regional prosperity are likely to generate significant resistance from, industry groups, trade unions and citizen groups.

At the national macroeconomic scale, governments may also be reluctant to disrupt sectors that are important sources of fiscal revenues, particularly if stricter policies cause industries to move offshore. Feedbacks within economic systems can also make it hard to achieve sustainability objectives. For example, efficiency improvements might not deliver expected cuts in resource use because they also reduce prices, thereby incentivising increased consumption and resulting in the so-called ‘rebound effect’. Economic lock-ins also relate to the metrics by which social welfare progress is measured. Gross domestic product (GDP)—the monetary, market value of all final goods and services produced in a country over a period of a year—is often considered to be a proxy for social welfare and is an important source of information to measure economic progress. Spurred on by decades of criticisms, complementary indicators have been suggested, e.g., the UN’s Human Development Index (HDI), the World Bank’s Genuine Savings Indicator (GSI), and the Index of Sustainable Economic Welfare (ISEW). Yet, GDP clearly

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dominates as the indicator for success in government policies, and for guiding investment.

4.2.2 LIFESTYLES AND CONSUMPTION BEHAVIOUR

Resource use is ultimately driven by the consumption of goods and services. The rational choice model embedded in neoclassical economics assumes that the consumption of goods and services is driven by autonomous preferences and the expected utility for individual wellbeing. The assumption is that aggregated preferences and consumption result in collective wellbeing. This is supported by global data suggesting that there is a weak positive correlation between GDP per capita and self-reported life satisfaction. Jackson (2005) suggests that the insatiability of consumer desire is an ideological assumption at the heart of economics and also politics (Jackson and Michaelis 2003). The drivers of consumption include both social factors (e.g., individual motivations and social norms) and material factors (e.g., functionality, longevity, upgradeability, repairability).

Policies that address sustainable consumption and production range from government actions steering production and value chains to information generation and delivery. At the extraction and processing end of the value chain, environmental regulation can establish resource use targets (caps) to restrict natural resources consumption. For example, in 2021 Finland committed to restricting the use of renewable natural resources, so that the total consumption of domestic primary raw materials in 2035 will not exceed 2015 levels. Influencing the consumption end of the value chain, information is delivered through reporting requirements, services and campaigns. While such information has some value, the idea that rational consumers will respond to information by making responsible social and environmental choices is questionable; in fact, consumer behaviour is largely determined by ‘shared routines’ or ‘shared practices’, which are deeply embedded in the dominant system structures (McMeekin and Southerton 2012).

Somewhat more ambitious policy proposals include voluntary agreements that aim at green production; market-based instruments to correct market failures and internalize externalities, and the removal of barriers to efficient sustainable markets. More disruptive policies include the removal of harmful environmental subsidies, shifting taxation from employment and investment to pollution and resource use, and creating markets such as cap and trade greenhouse gas emission permits. System-level change could also stem from Environment Social Governance (ESG) linked-activities focusing on sustainable natural resource flows due to pressure from consumer movements.

Addressing consumption is vital to reducing societies’ impact on the environment, with increasing calls for “transformative changes in lifestyles and consumption behaviour” (UNEP 2016b). Resource use and impacts associated with the fulfilment of material needs such as food and housing, remain a significant challenge. However, increasing focus has been placed on the material input to other needs, such as identity and affection, as these needs imply no minimum level of material throughput. The key challenge is to steer consumption patterns toward less resource intensive lifestyles without reducing living standards or life satisfaction. Meeting the minimum life-standard for all without increasing material consumption in all income classes is a critical challenge. Meeting it will require a reflexive discussion on sufficiency and moving beyond a myopic focus on efficiency (Potočnik et al. 2018).

4.2.3 INFORMATION AND KNOWLEDGE CONSTRAINTS

The old dictum ‘If you don’t measure it, you can’t manage it’ rings especially true for natural resource governance. High expectations are placed on data, indicators, uniform measurement systems and knowledge in general in advancing sustainability in prominent environmental science-policy processes, such as the IPCC or IPBES. Although the understanding of society's metabolism (Fischer-Kowalski and Hüttler 1998) has increased across various scales, the continual improvement of knowledge on resource stocks and flows has not translated into sustainable resource governance. Knowledge production remains distanced from its practical application (Agrawal 2001; Primmer, Saarikoski and Vatn 2018).

Information on resource extraction, trade, consumption and productivity can be found at varying levels. At the


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global and national levels, knowledge on domestic extraction, raw material consumption, material trade between regions, etc. can be used to understand socio-metabolic profiles of countries (Schandl et al. 2018; Wiedmann et al. 2015), with the aim of attracting policy attention (Schandl et al. 2020). At the regional level, accounting frameworks have been applied. For example, the EU Water Framework Directive has been implemented to govern flows at the system level, in each river basin. At the city and urban scale, metabolism studies (e.g., Kennedy, Cuddihy and Engel-Yan 2007) have shown the scale and trajectory of cities' resource demands and can be used to support governance. At the product level, accounting frameworks for the environmental footprint of products, e.g., Product Environmental Footprint Category Rules, have been established to support the mitigation of a product's impacts thought its life cycle and to inform consumers of the environment impact of their purchase.

A significant challenge for resource governance is that knowledge production is, for the most part, not targeted at the intervention points that polycentric governance19 requires (Dasgupta 2021). Information decays rapidly in globalized value chains. A multitude of metrics exist for resource governance (Corona et al. 2019), and the selection of indicators is an exercise in political and moral ordering (Turnhout et al. 2016; Völker et al. 2019). Supply chain traceability and transparency have become increasingly important, for example, in food and clothing systems, given the increasing publicity of sectoral governance challenges, such as production conditions and human rights violations. Although information systems serve resource governance particularly in Europe and North America, in many areas even information about extraction volumes can be hard to acquire. This fragmented information on—e.g., chemical, pollution, health, resource use, and carbon emissions—severely limits the impact of knowledge in steering resource governance. Information needs to be produced, interpreted, communicated and understood beyond mass units of accounting.

4.2.4 FRAGMENTED GOVERNANCE

Resource governance is fragmented geographically and into sectors that comprise both public and private actors, and form what can be referred to as "fragmented architectures" (Biermann et al. 2009). The institutions that are designed to address specific local sustainability challenges with distinct knowledge systems and actors tend to result in this kind of fragmentation (Young 2002). This produces mismatches in the spatial, temporal and jurisdictional ways of organising and addressing resource governance (Cash et al. 2006). At the same time, the institutionalization of sectors and organizational fields across public and private domains results in uniformity and rigidity within sectors (Scott 2013), hence, contributing to boundaries between sub-systems, and fragmentation. National and international resource policies are segregated into sectors, such as agriculture, forestry, water, minerals or energy, and climate or biodiversity, with each having their institutions that span across local, national and international levels and frame policy options. Siloed resource governance results in vertical communication of interests and implementation of agreed principles within sectors but these are poorly communicated to other sectors. Organizational structures, competencies and professions also align with sectors. Industries and other stakeholders connect with their own sectors and form coalitions.

The fragmented governance results in varying weight placed on resource policies, depending on the region's or country's resource dependence and history of governance. At two ends of the spectrum, resource-rich

[19] Polycentric governance is characterized by multiple, overlapping centres of authority, with different organizations, institutions or levels of government sharing

countries can place their abundant resources at the core of national economic policies, or resource governance can be in the hands of a limited political elite resulting in non-transparent arrangements and prioritising, including deals with commercial interests. The focus on dominant resource uses can undermine the governance of those resources that do not have a central position.

There have been many successful efforts to enhance policy consistency, integrate different types of governance, and foster collaboration between public and private sectors, as well as among various organizations to address important issues that span multiple sectors, such as protecting biodiversity and combating climate change. Nevertheless, solutions triggering system-level resource governance transition are still missing. The globalisation of resource markets has resulted in a division of labour across countries and regions. Local socio-economic and environmental impacts of resource extraction and production are often disconnected from governance arrangements in importing countries. A manifestation of this is that resource efficiency policies which aim at lowering domestic material consumption (e.g., the total amount of materials directly used by an economy) do not influence upstream hidden flows related to imports and exports of raw materials and products (Wiedmann et al. 2015).

4.2.5 QUALITY OF INSTITUTIONS

Governments often have a central role in shaping the structure of production-consumption systems and their socio-economic and environmental impacts. Frequently, however, state interventions contribute to unsustainable outcomes. In many instances, governments lack the information and resources to design and implement effective policies. This can be due to policies not matching the societal norms, or due to lack of resources for enforcement. In some cases, governments may lack ambition or incentives for good governance. For example, governments may be reluctant to impose regulations or remove environmentally harmful subsidies if this imposes costs on particularly influential constituencies. Long-term benefits might not be weighed strongly against immediate or short-term costs.

Electoral cycles can also hinder the introduction of costly policies, and effective resource governance may be affected by vested interests or lobbying. Groups may use corporate political strategies to shape policies in their favour and to the detriment of the public interest and sustainability. More direct instances of corruption are also a major contributor to unsustainable outcomes in global resource management. As noted by the IRP Decoupling Report "Rent-seeking and corruption are widespread phenomena in many countries specializing in resource-intensive sectors, with local elites often spending revenues on consumption or foreign investment rather than investing in domestic sectors which are crucial for sustainable development" (UNEP 2011).


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5

OPPORTUNITIES FOR CATALYSING & SUPPORTING TRANSFORMATIONS

Izuddin Helmi Adnan—Unsplash

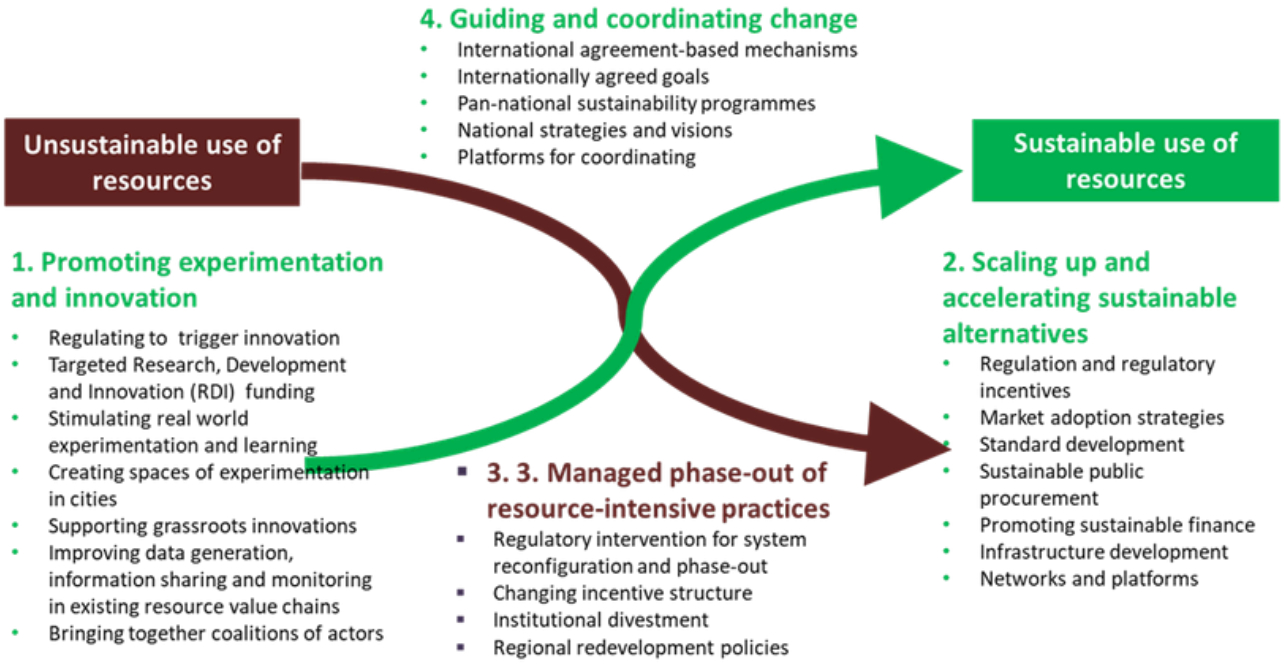
5 OPPORTUNITIES FOR CATALYSING AND SUPPORTING TRANSFORMATIONS

5.1WAYS OF TRANSFORMINGRESOURCE GOVERNANCE THROUGH POLICY

Addressing the persistent problems of resource governance calls for fundamental, structural transformation of societal systems. Transitions and transformations research points to four interrelated entry points for policy support, which can advance the transformation of resource-dependent socio-technical systems (Figure 5.1). Diverse, yet coherent policies are needed to (1) promote the emergence of new ways of producing and consuming sustainably through experimentation and learning (2) help these innovations to scale up and diffuse across the economy and society, nationally and internationally (3) reconfigure existing resource-intensive modes of producing and consuming and support a socially just phase-out of unsustainable sectors (4) coordinate policies and ensure alignment with common strategic goals.

Thefour entrypointsfor transformational policy strategies require coherent implementation to effectively promote sustainable resource governance. For instance, innovation development in protected spaces helping explore different design options and functionalities, should be followed up by policies supporting scaling up. This will allow sustainable technologies and practices entering and forming markets, and spreading geographically. This wholesale adoption of proven new technologies, practise and business models needs simultaneous phase-out of resource intensive unsustainable systems, in a just fashion. This kind of coherent implementation requires coordination, which is why coordinating and guiding change is also identified as a policy strategy, as summarized in Box 5.1 and detailed in Sections 5.2-5.5.

Figure 5.1: Policy strategies for the transition to more sustainable recourse governance



Source: Adapted from Loorbach et al. (2017)

Box 5.1: Policy strategies for the transition to more sustainable resource governance

Promoting experimentation and innovation

Enabling transformative change requires going beyond incremental improvements to established new modes of producing and consuming. Focus should be reoriented to support the emergence of path-breaking innovations that challenge and reconfigure current practices, to offer fundamentally new ways of living, working, and using resources. Policy strategies can support disruptive technological innovations (e.g., blockchain, battery storage, micro grids), new business models (e.g., sharing platforms, product-service systems) and social innovations (e.g., the Fab Lab movement, prosumerism). These alter social practices or organisational structures, thereby creating opportunities to meet society's needs in more resource efficient ways.

While incumbent businesses and industries have an essential role to play in enabling sustainability transitions, they often have strong incentives to promote and defend existing products, services and business models, even if they are unsustainable. As such, alternatives to current modes of production and consumption often emerge in protected spaces ('niches') away from mainstream market and cultural selection pressures. Globally, governments have a lot of experience in creating such spaces through R&D funding, the promotion of regional or industry innovation clusters and innovation ecosystems.

However, Innovation is inherently uncertain and there is always indeterminacy embedded in innovative arrangements, technologies and practices. It is not possible to say in advance what novelties will emerge or, even more importantly, what effects they will have—positive and negative—once they are adopted and used in society. For example, initial enthusiasm about the resource-efficiency gains offered by sharing economy and mobility platforms have been met by concerns about their rebound effects, working conditions and fair wages. As a consequence, channelling the transformative potential of innovation towards sustainable outcomes depends critically on experimentation with diverse alternatives, learning and adapting or selecting promising initiatives for further support.

Scaling up and accelerating sustainable alternatives

To achieve international and national environmental and sustainable development commitments within their given timeframes, functional and cost-effective new modes of production and consumption need to scale up and spread across society. Scaling up innovations requires policies that support adoption, diffusion to new geographical areas and sectors and the institutionalization of new products, services and business models. Through these processes, competitive, more sustainable production and consumption systems can challenge and replace unsustainable ones. Exogenous shocks also have an important role in creating windows of opportunity for innovations that are at the appropriate readiness level, to enter mainstream markets or even lead to system change. For example, COVID-19 appears to have greatly accelerated the shift to new modes of remote working and communication, with potentially important implications for resource use, and the war in Ukraine has hastened a shift to renewable energy.

Managing phase-out of resource-intensive practices

Supporting the emergence of novel ways of producing and consuming resources implies the need to discontinue support for unsustainable practices (for instance, phasing out/reforming fossil fuel subsidies). The disruption, phase-out and reorganization of established practices can be triggered by external shocks and also deliberate policies. Actors and networks learn from disruptions in other systems and can adapt their behaviour and practices. Such reconfiguration and phase-out actions are likely to have wide ranging economic and social implications, which need to be addressed. The decline of industries needs to be deliberately managed in ways that are considered societally just. Coherence and foreseeability increase the legitimacy of reconfiguring policy.

Guiding and coordinating change

Transformative change requires guiding the change with collectively set priorities. Shared priorities signal the direction of change and provide an orientation by outlining specific priorities and strategic policy approaches. Climate change policies exemplify successful global goal-setting that has guided reorientation across sectors and governance-levels, and also in the market and civil society. Policy strategies, programmes and other formal long-term commitments can also help to steering incumbent actors and entire sectors and systems. Furthermore, the multi-dimensional nature of transition processes means that they are influenced by a diverse array of policy domains including environment, innovation, fiscal, and education policies. Policy programmes and instruments are layered on top of existing institutional frameworks. Thus, policy formulation and implementation are a complex and messy processes that need overarching structures and support. As new trajectories for socio-technical systems are created, their alignment, and coordination across systems, at different levels is especially important.

5.2 PROMOTING EXPERIMENTATION AND INNOVATION

The reorientation of policy is an important ingredient for societal change in a more sustainable direction. Policy can promote innovation and experimentation by channelling direct support to pilots and experiments. Experimentation with a broad range of innovations—incremental and radical technological innovation, business model innovation, social or grassroots innovation, and frugal innovation—is required.

Policy strategies are needed to support the creation of protected spaces for experimenting with alternative modes of resource efficient production and consumption. Governments can support private sector experimentation and innovation by regulating to guide and incentivize the private sector to innovate along less resource intensive trajectories of change. The public sector can also experiment with novel, risky policy and governance arrangements with less political risk and more opportunity for ex post evaluation. (Table 5.1)

Table 5.1:Policy strategiesforpromotingexperimentationandinnovation

Policy Strategy	Description and examples
Regulating to trigger innovation	Although regulation is often viewed as a hurdle, regulation can have a positive impact on innovation by generating demand for sustainable alternatives and providing certainty through regulatory standards. Examples include emission regulations, (e.g., Montreal Protocol on Substances that Deplete the Ozone Layer, and the EU Sulphur Directive for Marine Fuels), sectoral regulation (e.g., end-of-life vehicle regulations, waste regulations) or product regulation (e.g., Single Use Plastics regulations).
Targeted research, development and innovation (RDI) funding	Targeted RDI funding can provide a direction to knowledge creation, development and diffusion, and promote entrepreneurial experimentation. Innovation policy can target RDI funding (through grants, loans, innovation finance) for systemic solutions to grand societal challenges (e.g., the EU Horizon 2020 R&I programme targeting Climate Action, Environment, Resource Efficiency and Raw Materials) and specific 'missions' (e.g., the EU Horizon missions related to, among others, climate-neutral and smart cities, and soil health and food). RDI funding can also be technology specific (e.g., China's New Energy Vehicle Policy).
Stimulating real world experimentation and learning	Innovations to support systemic change need regulatory support, as they often seek to challenge mainstream market selection environments and institutions. Pilots, experimentation, demonstration projects and living labs require financing mechanisms (e.g., EU Innovation Fund) and regulatory shielding/easing (e.g., the Netherlands' Energy Experimentation Decree) to test innovative solutions in real-world contexts.
Creating spaces of experimentation in cities	Cities are prime spaces to nurture urban experimentation and learning. Globally many cities are implementing resource efficiency and circular economy initiatives. Public administrations can create new policy spaces within the cities to promote experimentation (e.g., Living Labs, urban mobility experiments). Cities often have flexibility to adapt public procurement and planning regulations to support experimentation.
Supporting grassroots innovations	Grassroots level innovations for inclusiveness of local communities in terms of knowledge, processes and outcomes. Local communities can be supported by providing seed money, funding for citizens groups, providing access to resources (e.g., land), facilitating knowledge circulation, stimulating partnerships with public authorities and enhancing their public visibility. Examples of notable initiatives include community energy projects, which involve local communities actively participating in the production and management of renewable energy. Additionally, there are micro renewable energy generation efforts, focusing on small-scale technologies like solar panels and wind turbines for individual or small community use. Furthermore, agroecology practices integrate ecological principles into farming to enhance biodiversity and soil health, while eco-housing designs prioritize sustainability by using environmentally friendly materials and energy-efficient systems. Generating and sharing
Generating data, sharing information, and monitoring in existing resource value chains	information helps create a level playing field for new innovation actors. Publicly funded information services and regulation can improve access to data and information. Education and vocational training also promote information and knowledge literacy. As an example, the Costa Rican government published a step-by -step guide for local government and other regional actors to facilitate the transition to a circular economy through public, social and industry level actions.
Bringing together coalitions of actors	Innovation for systemic change needs to create new coalitions of actors to supplement and counterbalance traditional policy networks. Potential initiatives include allocating parts of innovation budgets to enable participation in policy processes; diversifying the actors in RDI advisory bodies (such as including the third sector and new entrants); convening knowledge institutions, NGOs, the both private and public sectors in public-private platforms and innovation partnerships. Mission-oriented initiatives (like Innovation Fund Denmark's Mission- Driver Partnerships), and the establishment of citizen councils, panels and juries (e.g., France's Citizens Convention for Climate) are also key examples.

5.3 SCALING UP AND ACCELERATING SUSTAINABLE ALTERNATIVES

As many countries establish more ambitious sustainability targets, the focus on experimentation needs to be coupled with the upscaling and expansion of proven innovations that can lead to systemic change. Public policy can support the increase of user adoption, local and trans-local replication, and institutionalisation of innovations (that have emerged in protected spaces and in markets) to accelerate the adoption and implementation of more resource effective systems. Policy makers can actively engage in scaling up innovations and creating new markets through the design of policy-mixes (e.g., including regulation, economic instruments, standards, public procurement) and also utilise systemic shocks (e.g., COVID-19, China's 2017 waste import ban) and changes in the political landscape as windows of opportunity. (Table 5.2)

Table 5.2: Policy strategies for scaling up and accelerating sustainable alternatives

Policy Strategy	Description and examples
Regulation and regulatory incentives	Regulation can be used to advance the scaling up of resource efficiency innovations by establishing eco-design requirements (e.g., the EU Ecodesign directive); energy efficiency and labelling requirements (e.g., the EU's energy label and the U.S. 'Energy Labeling Rule'), product lifetime extension regulations mandating access to or quality of repair; extending consumer protection regulations and access to repair and maintenance information (e.g., the EU light passenger and commercial vehicle regulations, U.S. Federal Vehicle Repair Cost Savings Act); extended producer responsibility with recycling & recovery targets (e.g., the EU Packaging and Packaging Waste Directive); national, sectoral targets for reuse, recycling (e.g., ELV policy in Japan and the EU); recycled Content Mandates (e.g., California Bill 793 plastics).
Market adoption strategies	Policy can support the broad scale adoption of more sustainable alternatives. Consumer demand can be influenced by providing adoption incentives through regulatory change (e.g., access to bus lanes for EVs, changes to planning regulations for car sharing e.g., in San Francisco and Vancouver); providing economic incentives through both targeted economic instruments (e.g., subsides [wind power in Denmark], feed-in tariffs [wind power, biomass, hydropower, geothermal power and solar photovoltaics in Germany], public procurement, export credit guarantees), or general ones (e.g., environmental taxes or the EU ETS); and informational instruments such as information and social media campaigns (zero waste, waste to wealth).
Standard development	Standards can be implemented through a mixture of top-down regulation, bottom-up voluntary measures and hybrid mechanisms to prescribe the performance of products, materials and systems. The coordination of common standards and definitions for waste, reuse, remanufacturing, recycling is essential to the global governance of waste flows, as differing standards of recovered materials and goods across industries and countries inhibits trade. Standards can be developed along the value chain, such as: sustainable mining standards (e.g., national Towards Sustainable Mining standards, UNEP Global Industry Standard on Tailings Management); building standards and certification systems for material efficiency, lightweighting, reuse and novel building systems (e.g., LEED standard, International Code Council Ad Hoc Committee on Tall Wood Buildings); fuel economy and emission standards measures (e.g., US Corporate Average Fuel Economy standards, EU performance standards on light passenger and commercial vehicles); ecodesign (e.g., EU's Ecodesign Directive), energy labelling standards (e.g., EU Energy Label), remanufacturing standards (British Standard BS ISO 8887-1:2017).

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Sustainable public procurement	Sustainable public procurement involves considering the environmental, social, economic and resource use impacts of products and services over their entire life cycle. Preferential purchasing by public entities can create or expand markets for products and materials designed for material efficiency. It can encourage more intensive use through product service systems, or for products containing recycled materials. Examples of sustainable public procurement initiatives include: guidelines and best practise (EU's CE Public guidance), purchasing recycled content products (e.g., US EPAs Comprehensive Procurement Guideline Programme), along with other broader green purchasing regulations (e.g., Japan's Act on Promoting Green Procurement), product procurement standards (e.g., ASEAN Green Public Procurement standards), and networks of public authorities connecting, exchanging and acting on sustainable procurement and innovation procurement (encouraging development and adoption of new and improved products, services, and processes) (e.g., the European Procura+ Network).
Promoting sustainable finance	Financial recovery packages and the financial sector need to invest in developing systems that use resources more sustainably. Governments can provide the financial sector with incentives and an enabling policy and legislative framework to accelerate a systematic and scalable approach to integrating resource considerations into financial products and services. For example, by creating incentives to redirect financial flows towards activities and sectors that promote sustainability (e.g., the EU taxonomy for sustainable activities), standards for financial products (e.g., green bonds), fiduciary duties of investors and asset managers, company disclosure responsibilities, stronger ESG standards and reporting, and establishing financial funds (e.g., European Circular Bioeconomy Fund).
Infrastructure development	The public sector can enable resource efficiency by setting standards for infrastructure design and delivery, and providing infrastructure to support the adoption of innovations. investing in infrastructure that enables material reuse, repair, refurbishing and recycling. Governments can also adopt near zero waste strategies and waste-to-energy; and provide subsidies for digital infrastructure and technology that enables connectivity, automation and optimisation of the circular economy value chain and digital platforms to link resource suppliers with the demand for secondary materials.
Networks and platforms	The creation and expansion of new networks is a core factor in supporting knowledge exchange, and the expansion of innovations to new geographical contexts. Policymakers can make resources available to support the translocal replication of innovation among cities at the global/regional level (e.g., Resilient Cities Network, ACR+, African Circular Economy Network, ICLEI, EU Covenant of Mayors), national level (e.g., Circular Norway, CIRCWASTE Finland, the UK's National Industrial Symbiosis Program), and local scale (e.g., 'twin town' or 'sister city' initiatives that function as horizontal communicative and learning platforms).

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5.4 MANAGED PHASE-OUT OF RESOURCE INTENSIVE PRACTICES

Policy intervention can be used to reconfigure unsustainable systems as well as the systemic lock-ins and path-dependencies that contribute to unsustainable practices. Governments can use a range of regulatory and economic instruments in strategies ranging from placing pressure on current resource intensive systems to the deliberate, predictable and managed phase-out of technological systems. This kind of rapid transition can be achieved through a number of strategies such as phase-out policies and directly intervening in markets or changing the operational environment for the market actors. Governments can modify regulations to enforce the polluter pays principle. This can be done through measures such as ecological compensation, where polluters must offset their environmental damage, or through regulations that ensure mining companies are held responsible for the remediation of mining sites.

A rapid reconfiguration will inevitably lead to the loss of jobs and decline of resource intensive, linear industries. Tackling these negative social and equity impacts of sustainability transitions needs measures to support workers and enterprises. This can be done through actions including early retirement packages, adjustment allowances and compensation schemes, and education and re-training policies. Also, regional development policies may be needed to support and promote a just transition. The revenue raised from any environmental or resource taxes can help mitigate these and other negative distribution effects. Care is needed to ensure transition processes pay attention to issues of social justice which can undermine the legitimacy of the transition. (Table 5.3)

Table 5.3: Policy strategies for reconfiguring resource intensive systems

Policy Strategy	Description and examples
Regulatory intervention for system and practice phase-out	The deliberate phase-out of unsustainable systems can be triggered by regulatory interventions. Examples of phase-out policies include: the phase-out of coal fired power generation through either bans (e.g., Finland) or emission caps to make coal unprofitable (e.g., France); the phase-out of over intensive animal production through voluntary compensation (e.g., the Netherlands); the phase-out of unsustainable products through complex policy-mixes of bans, restrictions on use and producer responsibility obligations (e.g., the EU's Single Use Plastics Directive), and the phase-out of unsustainable practices to combat overproduction, e.g., bans on the destruction of unsold goods (e.g., France); and a 'duty of care' to limit the disposal of overstock and returned goods (e.g., Germany).
Changing incentive structures	Changing the incentive structure within systems can place pressure on existing modes of production and consumption. This can be done through economic instruments such as green-tax reforms, introducing new taxes or restructuring existing taxes (e.g., on energy or transport), to reflect the polluting characteristics of the taxed products or activities; raising taxes and levies on minerals, virgin materials and fossil fuels (e.g., copper and silver in Poland); market based instruments (e.g., the EU's Emissions Trading Scheme) and the removal of harmful subsidies and tariff exemptions for emission intensive sectors; providing financial regulatory agencies/audit agencies with greater powers to mandate increased transparency; and establishing extended producer responsibility schemes (e.g., EU Packaging Directive, WEEE Directive).
Institutional divestment	The institutional divestment of assets connected to companies involved in extracting fossil fuels can place pressure on the fossil fuel industry by restricting their access to capital. Governments can regulate to promote the institutional divestment of assets connected to companies involved in extracting fossil fuels, (e.g., French Energy Transition and Green Growth Act.) Banks and financial institutions can take direct divestment actions (e.g., the European Investment Bank has stopped financing fossil fuel projects).
Regional redevelopment policies	Regional development policy packages can be implemented to address the negative impacts of transitions. For example, the Ruhr region in Germany transformed from a production-based coal and steel region to a more diversified service economy through a regionalized structural policy, empowering local actors to implement projects designed in cooperation with national and state authorities. Successful conversion projects include the Zollverein Coal Mine Industrial Complex that has become a UNESCO World Heritage Site, Emscher Landscape Park that led to the creation of 5,000 jobs and 7.500 new homes, alongside various technology centres and green energy initiatives.20

[20] https://www.wri.org/update/germany-ruhr-regions-pivot-coal-mining-hub-green-industry-and-expertise

5.5 GUIDING AND COORDINATING CHANGE

Achieving sustainability transitions requires coherent action across policy domains and scales of governance. Rather than promoting unsustainable models of economic growth and then seeking to address the resulting harms using social and environmental policies, it is necessary that all areas of policy contribute to systemic transformation in a coherent fashion. Achieving this kind of coordination requires that governments and societies more broadly define and agree on a direction for change, set collective priorities and create appropriate policy frameworks and institutions to guide policymaking and action. The WTO and free trade agreements may be conduits to move forward resource efficiency and circular economy.

Visions and strategic goals are key elements in establishing the direction of sustainability transition in resource use. Collectively defined visions of ways of meeting material needs in the future can channel public resources, spur innovation and mobilize the public. Distinctive national and local visions of positive and desirable futures are influential and have already driven decades of socio-technical change. Establishing a contextualized vision for a sustainable future is a fundamental task for policymakers because the narratives inherent in strategic policy frameworks filter down through the hierarchical decision-making systems.

In addition to affecting policy goals and instrument choice, the sustainability narratives also shape institutional practices and social action with the broader organizational context.

Because resource production and use transcend system boundaries, interaction across sectors is essential. A transition to sustainable resource governance means that science-policy actors also need to reach beyond traditional sectoral governance with vertical hierarchies. Policy coherence and coordination can be sought through information sharing, negotiation platforms and mechanisms as well as co-learning processes.

The complexity, uncertainty and ambiguity of transformative change, requires continuous monitoring of progress towards long-term goals. Reflexive and adaptive policy responses are only possible if impacts are anticipated, monitored and assessed. Creating spaces for public deliberation is essential to foster reflexivity at the societal level. Collectively, this has important implications for actors at the science-policy interface. Effective resource governance will require a knowledge base that extends beyond evidence concerning the scale, impacts and costs of environmental and resource management challenges. Achieving sustainability transitions will require a new knowledge system capable of generating a diverse array of solutions-oriented evidence. (Table 5.4)

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Table 5.4: Policy strategies for guiding and coordinating change

Policy Strategy	Description and examples
Internationally agreed goals	Internationally agreed goals can provide a framework for national action and global cooperation. Global development goals, such as the UN's Sustainable Development Goals, especially SDG 12 on Responsible Consumption and Production, can expedite advancements in addressing interconnected and multifaceted development challenges. Governments can set SDG aligned medium-term targets and develop detailed policy pathways for achieving these targets. The SDG indicator framework can also be applied in reporting, monitoring and as criteria for project financing.
International agreement-based mechanisms	International agreements can drive national and industry pledges and roadmaps. International agreements (e.g., the Montreal Protocol, and Paris climate agreement) can prompt countries to enact legislation aimed at addressing global problems. They can also provide a framework and objectives through which countries and international networks (e.g., Global Covenant of Mayors for Climate and Energy) can alight policy initiatives. International policy initiatives, roadmaps and programmes can
International sustainability programmes	structure and coordinate multi sectoral policy initiatives toward a common goal. For example, the EU Green Deal or Comprehensive African Agricultural Development Programme provide multi-lateral coordination for goals that span across sectoral silos.
National strategies and visions	National strategies and roadmaps and programmes establish visions and mobilise resources along innovation trajectories. For example, Japan's plastic resource circulation strategy and Act on promoting plastic resource circulation, Finland's Circular Economy Roadmap, and Chile's Roadmap of Strategic Innovations for Mining 4.0 aim at coordinating national responses to implement resource efficiency solutions. Global and multinational institutions can coordinate data collection and serve as information hubs for
Platforms for coordinating	global resource flow data, emission reduction efforts and policy frameworks. For example, the REDD+, FAO, IRP and Europe's ERA-NET provide data services which can support policy design and implementation.

5.6 UNCERTAINTIES AND LIMITATIONS IN APPLYING TRANSITIONS THINKING TO RESOURCE MANAGEMENT

Research into sustainability transitions and transformations offers a new understanding of sustainability challenges and responses. In highlighting the systemic nature of problems such as unsustainable resource management, it helps explain the limited successes of policy responses over recent decades. Drawing on evidence about historical or ongoing processes of transitions, it offers insight into the dynamics and drivers of systemic change, and the potential contributions of public policies and institutions to these processes.

Such insights are relevant across the world. Yet, it is clear that transitions thinking, and policy guidance, only provide a partial response to today's resource management problems. Most research focuses on Europe and the transitions discourse in EU policy, e.g., the European Green Deal and sustainable finance policy that is gaining traction. For developing regions, the knowledge base is substantially less advanced. This implies that there are uncertainties and gaps in guiding policy. On the other hand, developing areas have undergone fast socio-economic changes, and could potentially apply the ideas of governing sustainability transitions in more agile ways than European countries.

Another concern relates to a potential mismatch between the scale of the problem and the proposed governance response. Much of the transitions research addresses systems at local or national levels and the messages for policy are oriented towards public authorities at these scales. Governments clearly have a much better chance of ensuring coherent policy interventions to stimulate innovation and manage the disruption of structural economic change if the system boundaries lie within their jurisdictional limits. In cases where the systems extend beyond national jurisdictions it becomes much harder to achieve effective coordination. These realities point to the need for

complementary intergovernmental and global sectoral efforts and coordination. Such international coordination is more difficult in the current global geopolitical context with tensions emerging in areas such as trade and security. Yet, new cross-boundary and cross-sectoral solutions can emerge from such tensions, as transitions research suggests.

A third important issue relates to the systemic focus of transitions research. Much empirical analysis has focused on individual socio-technical systems, such as energy, food, mobility or buildings. In reality these different systems are closely interlinked, not least because they rely on a shared natural resource base. Changes in individual systems will often have implications for other, so it is important that both research and policy pay attention to potential trade-offs, interactions, and cumulative impacts. This presents difficulties. Analysing transition processes across multiple, interconnected systems increases the complexity of designing and analysing the impacts of policy mixes for sustainability transitions Furthermore, the political realities of governing across jurisdictional and sectorial boundaries (as is often the case for resource flows) are much more difficult. Lastly, the specific design of transformative policy programmes and policy mixes requires an incredibly detailed policy and policy implementation knowledge. Transitions research can benefit from knowledge co-production efforts that actively involves policymakers and practitioners.

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6

SUMMARY & KEY MESSAGES FOR POLICYMAKERS ON RESOURCE GOVERNANCE

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6 SUMMARY AND KEY MESSAGES FOR POLICYMAKERS ON RESOURCE GOVERNANCE

ADOPTASUSTAINABILITYTRANSITION APPROACHTO HELP ENSURE SUSTAINABLE NATURAL RESOURCE USE AND MANAGEMENT

Natural resources constitute the material structure of systems, and resource flows convey impacts across these systems as well as sectors and geographical regions. Overcoming the systemic barriers to sustainable resource governance will require new policy approaches that support the emergence of new systems (such as circular economy initiatives, and green technologies) and the phase-out of existing ones (such as fossil fuel subsidies, and single-use plastics and packaging). The dominant narratives in strategic policy are grounded in assumptions that deserve careful scrutiny. For example, narratives promoting green growth implicitly assume that societies will be able to decouple economic growth from resource use and environmental and social impacts, despite scant evidence of absolute decoupling to date. The science-policy community therefore needs to:

- Critically examine the assumptions behind the dominant narratives and consider ways to formulate and promote alternatives. A narrative pursuing the need for systemic change in socio-technical systems and a broader societal transformation that changes the relationship between growth, resource use and wellbeing is fundamental for successful governance of sustainability transitions.
- Integrate transitions thinking into resource governance and corresponding policy design and implementation. Regulations and economic instruments in diverse policy areas (including innovation, education, welfare, and industrial policy) are important tools for achieving sustainable management of resources.
- Promote the development of new knowledge to support transitions. Information about resource flows andassociated environmental and social impacts remains essential to guide and motivate policy responses. But effective resource governance also requires new ways of producing knowledge and new kinds of knowledge about the dynamics of systems driving resource-related pressures, lock-ins and barriers to change as well as the emergence of innovations advancing sustainability and the effects of phasing out unsustainable practices.

SUPPORT AMBITIOUS LONG-TERM GOALS AND STRATEGIC FRAMEWORKS TO STEER SUSTAINABILITY TRANSITION

Sustainable resource governance is a precondition for a sustainable world. Yet resource policy is fragmented and incoherent, not capturing the systemic nature of material flows, nor the urgent sustainability challenges. Resources are governed at the extraction end by national resource policies that are mostly sector and resource specific. Resource processing and transfer are governed by industrial and trade policies that constitute their own sectors. At the consumption end, resources are governed with product and waste regulations and standards. Material cycles are increasingly governed with circular economy policies. For policymakers and the science-policy community to advance sustainability transition, they need to:

- Introduce directionality for sustainability into all policies, to connect sectors and support system level transition and promote the adoption of consolidated policy frameworks for sustainable use of natural resources.
- Support international and national efforts to agree on ambitious shared visions, long-term goals and binding targets to provide directionality for sustainability transition.
- Facilitate and support networking among cities,

companies and civil society organisations to promote innovation, co-learning and upscaling of sustainable solutions.

OFFER ALTERNATIVE POLICY SEQUENCES FOR ADVANCING SUSTAINABILITY TRANSITION IN A POSITIVE AND ENGAGING FASHION

Transition is inherently complex and entails uncertain processes of societal change, demanding reflexive and adaptive policy approaches. Policy design and implementation needs to take a plan-do-check-act approach. If suggested policies are not sufficient for meeting sustainability goals or if they do not advance overall sustainability because of trade-offs, prepare to readjust plans. System transition requires reconfiguring and phasing out unsustainable practices, which will redistribute benefits and losses. To manage such changes, policy needs to be predictable, enforceable and engaging. Alongside policy, the science-policy community should also:

Support the development of alternative pathways and sequences of policy changes for sustainability transition, which can be assessed and reoriented if necessary.

Provide a narrative for the long-term pathways with a strong positive message about building sustainable future and fair transition, to motivate sectors and actors to adapt.

Prepare to regulate, incentivise and empower, but also manage the phase-out of unsustainable practices and the social impacts of system changes.

PROVIDE TOOLS AND SUPPORT TO COORDINATE SUSTAINABILITY TRANSITION ACROSS SYSTEMS AND INTERNATIONALLY

The currently fragmented natural resource governance arrangements need to be coordinated. Sustainability transition needs a shared information basis, commitment and opportunities to deliberate and co-learn. Toward this, the science-policy community needs to:

Evaluate and communicate sustainability implications of global consumption across systems and different scales of governance.

Set up information platforms to support assessing the directionality of system level sustainability transition, and facilitate negotiation to support governance.

Help engage the administration and actors of different sectors, including economy and finance, societal and social welfare. Support coordination at different levels: global, national and local.

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