FROM SYSTEM-LEVEL TO INVESTMENT-LEVEL SUSTAINABILITY

An epistemological one-way street

Report by
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ACADÉMIE ROYALE
DES SCIENCES, DES LETTRES ET DES BEAUX-ARTS
DE BELGIQUE

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FROM SYSTEM-LEVEL TO INVESTMENT-LEVEL SUSTAINABILITY

An epistemological one-way street

The mission of the SFPI has recently changed to include **supporting the transition of the Belgian economy towards long-run sustainability**. The question that this report seeks to answer is: how can this mission be operationalised? How, in particular, can the SFPI **distinguish between sustainable and unsustainable investments**, so as to reorient its portfolios and thereby help transition the Belgian economy towards system-level sustainability.

The report's first observation is: different public and private players draw this distinction differently. What some consider sustainable investments, others do not. There is no consensus.

Drilling deeper, the report argues that disagreement is not coincidental. In particular, the question of sustainability can only be asked of systems as a whole, and not, in general, of their individual components. Attempts at starting from individual investments, determining their impact on system-level indicators to determine whether or not they are sustainable, are largely doomed to failure, and the report explains why.

Does this mean the question cannot be answered? No, for while there is no reliable method to translate *upwards*, from individual investments to their impact on a system's overall sustainability, the report describes a combination of methods that allows *downwards* translation, from system-level sustainability to identifying individual investments as sustainable (or not). In other words, the link between system-level sustainability and investment-level sustainability is a one-way street: downwards translation is possible, but upwards translation is not. The trick, then, is to travel in the right direction, and the report concludes with a sketch of what this might look like for the SFPI, Belgium, and Europe.

VAN DUURZAAMHEID OP HET SYSTEEM- NAAR HET INVESTERINGSNIVEAU

Epistemologisch eenrichtingsverkeer

De missie van de FPIM (de Federale Participatie- en Investeringsmaatschappij) werd onlangs gewijzigd om **het ondersteunen van de transitie van de Belgische economie naar duurzaamheid op lange termijn** te omvatten. De vraag die dit verslag wil beantwoorden is: hoe kan deze missie worden geoperationaliseerd? Meer bepaald, hoe kan de FPIM **een onderscheid maken tussen duurzame en niet-duurzame investeringen**, om zo haar portefolio te heroriënteren en daarmee de Belgische economie te helpen om te schakelen naar duurzaamheid op systeemniveau.

De eerste waarneming van het verslag is: verscheidene publieke en private spelers maken dit onderscheid op een andere manier. Wat sommigen beschouwen als duurzame investeringen, beschouwen anderen niet als duurzaam. Er is geen consensus.

Dieper doorborend, stelt het rapport dat meningsverschillen niet toevallig zijn. Meer bepaald kan de kwestie van duurzaamheid alleen worden gesteld op het niveau van globale systemen en niet, in het algemeen, op het niveau van hun individuele componenten. Pogingen om te beginnen met individuele investeringen en daarbij, door middel van indicatoren op systeemniveau, te bepalen of ze duurzaam zijn, zijn grotendeels gedoemd te mislukken, en het rapport legt uit waarom.

Betekent dit dat de vraag niet kan worden beantwoord? Neen, want hoewel er geen betrouwbare methode is om de *vertaalslag naar boven* uit te voeren, van individuele investeringen naar hun impact op de algehele duurzaamheid van een systeem, beschrijft het rapport een combinatie van methoden die de *vertaalslag naar beneden* mogelijk maken, van duurzaamheid op systeemniveau tot het identificeren van individuele investeringen als duurzaam (of niet). Anders verwoord, de link tussen duurzaamheid op systeemniveau en duurzaamheid op investeringsniveau is éénrichtingsverkeer: neerwaartse vertaling is mogelijk, maar opwaartse vertaling niet. De kunst is dus om in de juiste richting te reizen, en het rapport sluit af met een schets van hoe dit eruit zou kunnen zien voor de FPIM, België en Europa.

DE LA DURABILITÉ SYSTÉMIQUE À CELLE DES INVESTISSEMENTS INDIVIDUELS

Un sens unique épistémologique

La SFPI (Société Fédérale de Participations et d'Investissement) s'est récemment dotée d'une nouvelle mission : **celle de soutenir l'économie belge dans sa transition vers un futur durable**. Le présent rapport cherche à répondre à la question suivante : comment cet objectif peut-il être atteint ? Plus particulièrement, comment la SFPI peut-elle **distinguer les investissements durables des investissements non durables**, de manière à adapter son portefeuille et ainsi soutenir l'économie belge dans sa transition vers un futur durable.

Ce rapport dresse un premier constat : les différents acteurs publics et privés ont recours à des critères différents. Les mêmes investissements sont considérés comme durables par certains, et non durables par d'autres. Il n'existe pas de consensus à ce propos.

Le présent rapport soutient par ailleurs que ces divergences ne sont pas le fruit du hasard. La problématique de la durabilité ne peut être abordée que dans sa globalité, et non via l'une ou l'autre de ses composantes individuelles. Les tentatives de juger du caractère durable d'un investissement individuel, en identifiant ses impacts sur les indicateurs systémiques, semblent vouées à l'échec, et ce rapport explique pourquoi.

Cela signifie-t-il pour autant qu'aucune réponse ne puisse être apportée à une telle question ? Non. Bien qu'il n'existe actuellement pas de méthode probante qui permette de traduire l'impact réel d'un investissement individuel sur la durabilité du système au niveau global, ce rapport présente une série de méthodes qui, combinées, permettent de faire le chemin en sens inverse, en partant d'une définition de la durabilité établie au niveau systémique afin d'identifier les investissements individuels comme durables ou non. En d'autres termes, le lien entre la durabilité au niveau systémique et au niveau des investissements individuels est à sens unique : seule une démarche macro-micro est fructueuse, l'inverse ne l'est pas. Une partie de l'enjeu réside donc dans le choix de la direction à prendre. En conclusion, ce rapport offre une feuille de route à laquelle la SFPI, la Belgique et l'Europe pourraient avoir recours.

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INTRODUCTION

The new strategy of the *Société Fédérale de Participations et d'Investissement* (SFPI), developed in early 2020, identifies "driving long-term and sustainable economic and social prosperity" as its vision. The coalition agreement of the federal Belgian government formed in September 2020, charged the SFPI with creating a transformation fund (*fonds de transformation*). The goal of this fund shall be *"de soutenir les entreprises essentielles, de renforcer leur solvabilité et de les aider à se réorienter en fonction des défis à long terme auxquels nous sommes confrontés comme la lutte contre les changements climatiques, la numérisation, …"*. Finally, the government has also charged the SFPI with "*élaborer une stratégie d'investissement et de placement coordonnée, durable et ambitieuse*".

All of this points towards a major reorientation in the mission of the SFPI: besides producing good financial results, developing the productivity and competitiveness of the Belgian economy, and anchoring certain strategic sectors in Belgium—all of which were part of the SFPI's original mission—the mission of the SFPI now includes **supporting the transition of the Belgian economy towards long-run sustainability**. What does this mean in practice?

The question that this report seeks to answer is: how can this mission be operationalised? How, in particular, can the SFPI identify **sustainable investments**, separating and distinguishing them from **unsustainable ones**, so that it can reorient its portfolios[1] from the latter to the former?

In trying to answer this question, the report begins with a simple observation: as of today, we lack an agreed-upon, reliable methodology for distinguishing between sustainable and non-sustainable investments. For example, what Norway's sovereign wealth fund—widely considered to be a leader in sustainable

[1] SFPI maintains three portfolios: an **investment portfolio**, for seed, start-up and scale-up investments; a **holding portfolio**, for anchoring investments in strategic assets; and a third portfolio of investments (**delegated assignments**) where SFPI acts as a representative of the Belgian government.

investment—considers to be a sustainable company may not count as such under the EU's draft taxonomy of sustainable economic activities, and vice versa. Similarly, different (sustainability) rating agencies can give conflicting ratings on one and the same company.

Unfortunately, this is not a problem of insufficient data or the imperfect implementation of a theoretically sound methodology. Instead, the problem lies with the basic methodology of the dominant approach that has been used to draw this distinction so far: a bottom-up approach that tries to rate the sustainability performance of individual companies by looking at firm-level performance indicators—such as emissions, the use of land, water, or energy, average and minimum wages, corporate governance structures, and so on—without taking into consideration the wider context into which these firms are embedded.

As the report will show, there are deep, conceptual reasons that stand in the way of determining the contribution that individual investments make to sustainable development. In particular, where we cannot identify counterfactuals, the question of sustainability can only be asked of systems as a whole, and—a few exceptional cases aside—not of their individual components. While there is a combination of methods that allows *downwards* translation, from system-level sustainability to identifying individual sustainable investments, there is no reliable method to translate *upwards*, from individual investments to their impact on a system's overall sustainability, and hence to the (un)sustainability of that individual investment. Concerning this link, the report's central finding is that upwards translation is impossible in dynamic systems. The link between individual investments and system-level sustainable development is a one-way street.

Further, and closely connected to the question of which investments are truly sustainable, once the transition gets underway, a climate of wider uncertainty may emerge that may hamper private investment. As a public body charged with supporting the transition, the SFPI can help to reduce this uncertainty both through financial commitments (which reduce the risk of particular investments) and through sketching out, together with federal, regional and local government, and other important stakeholders, what it believes the trajectory of transition to look like. This has the potential, through creating widely recognised focal points, to reduce the perceived risks of private investments, and thereby facilitate them.

BOX 1. UPWARDS AND DOWNWARDS TRANSLATION DEFINED

The central question of this report is how to take a system-level definition of sustainability and translate it into investment-level criteria or guidance. There are two fundamentally different approaches for tackling this question: upwards and downwards translation.

Upwards translation starts from an individual investment, and seeks to identify the impacts of this investment on the relevant system-level indicators (e.g. greenhouse gas emissions, gender inequality, or land use). It neither presupposes nor involves a comprehensive assessment of what happens elsewhere in the economy.

Downwards translation, in contrast, starts from system-level goals (e.g. reducing net greenhouse gas emissions to zero by 2050), and seeks to translate these into investment-level guidance. Because the yardstick is the achievement of system-level goals, downwards translation necessarily considers the economy as a whole. Judgements concerning whether a particular (kind of) investment is sustainable or not depend on what developments are expected in other parts of the economy.

The key difference between upwards and downwards translation, in other words, is the starting point of analysis. Is an individual investment taken as the starting point, or the economic system as a whole?

Institutionally, upwards translation can in principle be undertaken by anyone and by multiple firms/rating agencies/institutions at once, since it does not presuppose a systemic perspective. Downwards translation, on the other hand, requires the ability to take a systemic perspective, and thus can only realistically be attempted by institutions with both the information and the manpower to analyse an economic system as a whole, such as a central bank, a ministry of finance or the economy, or a national *Bureau du plan*.

These considerations have important implications for the SFPI's new mission: once we accept that upwards translation is impossible, we can see that sustainable investment cannot be about identifying the (sustainability) impact of individual investments. This project amounts to chasing a mirage.

Instead, in order to implement its new mission, the SFPI should focus on the process of downwards translation. Together with other finance practitioners,

civil servants, scholars, politicians, workers, and citizens, it should start from society-level sustainability goals and translate these into investment-level guidance, which it can then apply to identify individual sustainable investments.

Downwards translation is both possible and necessary. It is possible, because although downwards translation is inevitably imperfect—it will never be possible to identify with perfect precision those individual investment projects that correspond to a sustainable functioning of the overall system—it can be refined over time. Via system-level monitoring (of emissions, land-use, species abundance, ocean acidity levels, etc.), any given method of downwards translation can be evaluated, and when found to be imperfect, iterated and improved.

Further, a concerted project of downwards translation is necessary because, despite recent improvements, a gap still exists between the urgent need for a sustainability transition, particularly in the rich industrialised economies of Europe and North America, such as Belgium, and the framework of economic policies in place there, which are not yet commensurate with the magnitude of the task ahead. By spelling out which specific investments contribute to sustainable development—and which ones do not—sustainable finance can demystify this transition, thus facilitating its politics without denying its scale, complexity, or difficulty.

What, finally, would such a process of downwards translation look like in practice? What institutional architecture could implement it? While this report can only give first ideas and proposals in this direction, it outlines a number of key principles. First, **successful downwards translation involves three components**: (1) macro-level monitoring of key indicators, (2) a taxonomy of what counts as sustainable investments, ideally based on an overall plan for the development of the economy, and (3) a system of mandatory firm-level sustainability accounting and taxation.

Second, the design and implementation of a framework that guides investment so as to achieve the sustainability transition will be highly political. The transition will involve deep, structural changes, producing both winners and losers. This means the interests of many firms, workers, households and levels of governments will be touched, and not just peripherally. **Perhaps the most important implementation aspect, therefore, is the process through which such a framework is drawn up, legislated, and iterated**. A promising process could be to follow the French model of a randomly selected *Convention citoyenne pour le climat*, to draw up proposals through discussion and expert input. The resulting framework could then be iterated through proposals from trade unions, employers, the federal or regional governments, or carefully selected civil society

groups, evaluated by Parliament or future citizens' conventions. As the report will demonstrate, ensuring that the process of downwards translation is democratic, inclusive and widely perceived as legitimate, is a precondition for its social sustainability.

Third, concerning the substance of a possible overall framework, existing frames and past work provide much guidance already: the SDG indicator set is an excellent blueprint on which a Belgian or European macro-indicator framework could be based, and the EU taxonomy could fulfil a similar role for a Belgian taxonomy. Substantively, then, the development of a sustainable finance framework for Belgium's transition would likely be less about drawing up new systems from scratch, and more about adapting and adopting ideas and blueprints already in circulation.

To facilitate this process of adapting and adopting, it would likely be useful to develop an **overall strategy or plan** for the Belgian economy's transition to sustainability. This could guide the translation of European or other blueprints to the Belgian context and give it coherence. Such a plan should include visions for five key sectors—energy, housing, transport, industry, and food—charting realistic transition paths and goals; it should also identify areas where Belgium could become a leader and an exporter, as well as other areas where relying on trade partners and imports may be more advantageous. Examples of such plans exist for the US[2] and Germany[3], which could provide inspiration.

Fourth, **concerning the financial sector**, regulation could be used both to guide financial flows towards the right kind of investments, and to reduce the systemic risks likely to emerge from the transformation. On the basis of a finalised taxonomy, investments in taxonomy-conforming activity could be provided with cheaper credit, for example by providing banks with cheap, long-term central bank refinancing for the relevant loans. Equally, a penalising factor could be imposed on "dirty list"—or all non-taxonomy—conforming investments, requiring banks to hold more capital against them in order to reflect their higher risks. To protect the financial system as a whole against the likely deflation of the carbon bubble[4],

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[2] Griffith S., Calisch S., Fraser L., *Rewiring America*, 2020.

[3] Wuppertal Institut, *CO2-neutral bis 2035: Eckpunkte eines deutschen Beitrags zur Einhaltung der 1,5°C-Grenze*, Wuppertal, Bericht, 2020; GermanZero, *Der 1,5-Grad-Klimaplan für Deutschland: Gemeinsamer Aufbruch gegen die Klimakrise*, Berlin, 2020.

[4] The carbon bubble refers to the idea that fossil fuel companies are overvalued, because if and when the world gets serious about dealing with climate change, these companies will be prevented from extracting the carbon reserves on which their economic value (in stock market valuations and elsewhere) is based.

higher capital and liquidity requirements could be introduced for leveraged investors holding fossil fuel assets. Regulators could also phase out the use of fossil fuel stocks and bonds as collateral for swaps or as underlying assets for derivatives or other structured financial products, to reduce linkages and hence spill-over effects from carbon stocks and bonds towards other parts of the financial sector.

Finally, what would the role of individual investors be in such a framework? Concerning private investors, although this may be a somewhat deflationary conclusion, the general answer is: to continue investing profitably. Concerning the SFPI, a hybrid role might be appropriate: on the one hand, to contribute its experience in the process of drawing up a Belgian framework; on the other hand, and within a perspective that continues to value (long-term) profitability, to take on certain risks that private sector firms are unwilling to assume.

The most important conclusion of this report is the following: the road between system- and investment-level sustainability is a one-way street. Starting from system-level sustainability concerns, it is possible to develop a framework—imperfect, and in need of constant, iterative improvement—that gives investment-level guidance. It is impossible, in contrast, to start from individual investment projects and reliably determine their system-level sustainability impacts. The trick, then, is to travel the road in the right direction.

PART I

CLEARING THE DECK

Part I introduces the report's central problem and provides analytical background. In chapter 1, I show that there is currently no agreed methodology for distinguishing sustainable from unsustainable investments, and why this is no coincidence. Chapter 2 then takes a step back and asks: what does sustainability look like at the system level? Setting out from the Sustainable Development Goals, it offers two amendments, one concerning our understanding of the sustainability of public finances, the second concerning our understanding of social sustainability. With this context established, the report moves on to ask how a system-level understanding of sustainability can be translated into the identification of individual investments, the subject of Part II of this report.

CHAPTER 1

EXISTING DEFINITIONS OF SUSTAINABLE INVESTMENTS FALL SHORT

How can we distinguish a sustainable from an unsustainable investment? This is the central question of this report. It can be broken down into two components: What is sustainable development, or, more generally, what is the larger definition of sustainability at stake? Second, given such a definition, which particular investments conform to it, i.e. contribute to sustainable development, or are consistent with a system that is overall sustainable?

Significant progress has been made on the first question, most notably with the elaboration of the Sustainable Development Goals. While the next chapter will offer two amendments to definitions of sustainable development, at this point the harder question is the second: presupposing a working definition of sustainability at the system level—such as the SDGs or other similar frameworks—how can we identify the particular investments that would move the system in the right direction?

This translation, between system- and investment-level, is challenging in the extreme. The crux of the matter is that the sustainability results of an investment depend decisively on the system it is embedded in: for example (focusing, for simplicity, on environmental sustainability), whether or not investments in localising food production contribute to sustainable development depends on whether or not transport is decarbonised[1]; whether or not the electrification of

[1] Given the transport system as it stands, investments to localise food production and consumption are very likely sustainable because they shorten transport routes and so reduce CO_2 emissions. However, if the transport system were to be decarbonised, localised agriculture may in fact be *less* sustainable than regionally specialised agriculture coupled with long-distance transport: the latter industry structure, allowing farms to specialise in whatever crops or livestock best fit the ecosystem of their particular region, is likely to produce higher food yields with lower total land use and biodiversity impact.

heating or steel production contributes to sustainable development depends on what happens in power generation and electricity storage; whether or not the production of non-organic materials at scale is compatible with sustainable development depends, among other things, on the recycling infrastructure in place—but whether it makes sense to invest in major recycling capacities in turn depends on whether the relevant materials will still be used at scale, and so on. Systemic interactions, cross-dependencies, and multiple equilibria are abundant.

This is not a purely theoretical complication: Norway's Government Pension Fund Global (GPFG), the largest sovereign wealth fund in the world (Figure 1, overleaf), and the only one with a reference to sustainable development written directly into its mandate[2], is widely perceived to be a leader in sustainable development. Under a dedicated environmental investment mandate, it is required to invest in "environmentally-friendly assets or technology[3]". The fund defines this as firms that "have at least 20 percent of their business" in "low-carbon energy and alternative fuels, clean energy and energy efficiency, and natural resource management[4]". Operationally, this translates into investments in utilities, e.g. Iberdrola, National Grid PLC, or Engie, industrials and technology firms, such as Siemens Gamesa Renewable Energy, Infineon, or Tesla, or waste management firms like Waste Connections Inc[5].

[2] The Norwegian fund's mandate states: "A good long-term return is considered dependent on sustainable development in economic, environmental and social terms" (Government of Norway, "Management mandate for the Government Pension Fund Global", Oslo, 2019, p. 2).

[3] NBIM, "Responsible Investment 2019", Oslo, 2020, p. 97.

[4] *Idem*, p. 81.

[5] *Idem*, p. 84.

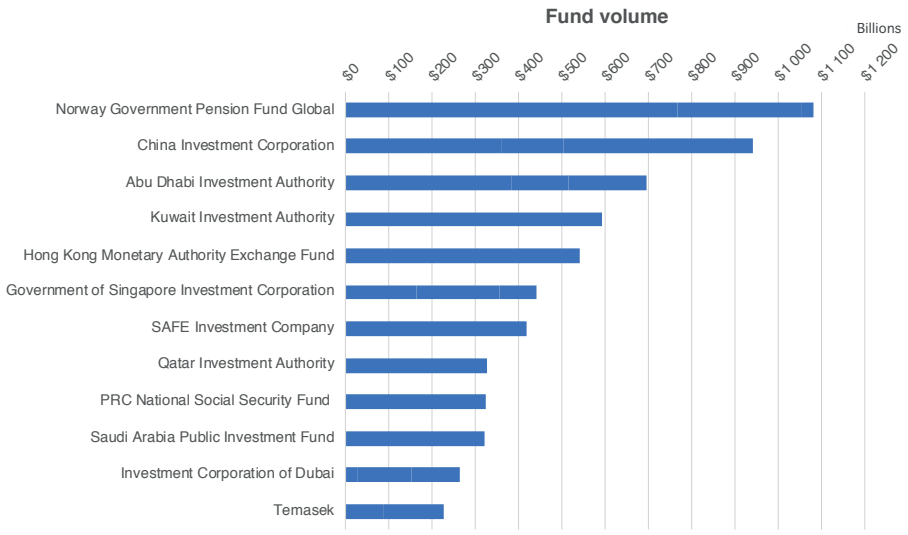

Fig. 1 — The ten largest sovereign wealth funds in 2020.
Source: author, based on Sovereign Wealth Fund Institute[6]

And indeed, from one perspective these are environmentally leading firms: Iberdrola, for example, generated electricity with an average emission intensity of 110 g CO_2e/kWh in 2019[7], well below the EU grid average of 260 gCO_2e/kWh[8]. Or take Engie SA, which, while not quite as low-emission, has rapidly reduced its carbon intensity from around 360 g CO_2e / kWh in 2017 to 250 in 2019, a cut of more than 30% in two years[9]. Relatively speaking, both companies look good: the first when compared to European averages, the second when compared to its own performance in the recent past.

From another perspective, however, it is unclear whether these firms are actually sustainable: the draft version of the EU taxonomy of sustainable economic activities, for example, considers electricity generation sustainable only at emission intensities below 100 g CO_2e/kWh[10], which neither Iberdrola nor Engie have achieved so far. Compared to the EU's draft standards, which aim to identify

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6 Sovereign Wealth Fund Institute, "Top 91 Largest Sovereign Wealth Funds Ranking by Total Assets", 2020.

7 Iberdrola, "Integrated Report 2020", Bilbao, 2020, p. 34.

8 IEA, "Power carbon intensity in key regions in the Stated Policies Scenario, 2000-2040", *International Energy Agency*, 2020.

9 Engie, "2020 Integrated Report", Paris, 2020, p. 67.

10 EU Technical Expert Group on Sustainable Finance, "Taxonomy Report: Technical Annex", Brussels, 2020, p. 205.

those economic activities that make a "substantive contribution" to Paris Agreement-aligned development[11], the two companies do not look sustainable.

Further, what about wider environmental impacts—e.g. land use changes driven by hydro power—or the firms' social impacts? Both of these companies may be sustainable on these other dimensions. Or they may not be. There is currently no agreed, systematic, and transparent way to verify this. As a result, even companies that specialise in sustainability assessments, like MSCI, Sustainalytics, or ISS, disagree intensely about which companies qualify as sustainable and which ones do not: "Data vendors' rating systems can vary dramatically, which leads to drastically different ratings for the same company", and "even two well-known, well-established providers with robust methodologies can assign different ratings to the same company[12]".

Studying "six prominent rating agencies" (KLD, Sustainalytics, Vigeo Eiris (Moody's), RobecoSAM (S&P Global), Asset4 (Refinitiv) and MSCI), Berg et al. find an average correlation of only 0.54 between their respective ratings. Moreover, the divergence of their ratings is not primarily driven by different rating agencies applying different weights to E, S, or G (or their subcomponents), which would be easy to correct or render coherent. Instead, divergences are driven by measurement differences (the choice of indicator to measure a certain concept, e.g. workforce turnover versus number of labour-related court cases as indicator of poor labour practices) and scope divergences (the scope of attributes on which the ratings are based, e.g. some rating agencies may choose to include lobbying expenditure as a negative indicator under social, while others may ignore it). These indicate deeper disagreements[13].

Which classification, then, should we trust? That of Norway's sovereign wealth fund, which classified Engie and Iberdrola as sustainable, or the EU's draft taxonomy, which does not? What about some of the other standards that have been drawn up in recent years, such as the Sustainable Development Goals, the Belgian Febelfin standard for sustainable and socially responsible financial products, or the French SRI and Greenfin labels? Or the proprietary systems of MSCI, Sustainalytics, or other private ratings providers? The answer is not obvious.

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[11] In particular, the technical expert group sought to identify any activity that "substantially contributes to the stabilization of greenhouse gas concentrations in the atmosphere at a level which prevents dangerous anthropogenic interference with the climate system … consistent with the long term temperature goal of the Paris Agreement" (*Idem*, p. 15).

[12] Li F., Polychronopoulos A., "What a Difference an ESG Ratings Provider Makes!", Newport Beach, CA, 2020, p. 5;13.

[13] Berg F., Kölbel J., Rigobon R., "Aggregate Confusion: The Divergence of ESG Ratings", *Working paper*, 2020, p. 2, 4-5.

CHAPTER 2

WHAT DOES SYSTEM-LEVEL SUSTAINABILITY LOOK LIKE?

To know whether or not a firm or an asset contributes to sustainable development or the sustainability transition, we first need a definition of what sustainability means at the system-level. What criteria must the Belgian economy, the European economy, or indeed the world economy meet in order to be considered sustainable?

Fortunately—and in contrast to sustainable investment—there is a widely agreed definition of sustainability: "Meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs". This definition was first laid out by the United Nations in its 1987 Brundtland Report[1]. It is conceptually clear. What it means in practice has been contested for many years, but with the development of the Sustainable Development Goals, a tentative consensus has formed around an operational meaning, too. With 17 specific goals[2], whose attainment is measured by 169 specific targets and 231 unique indicators, the SDGs specify in detail what sustainable development means in practice, and what sustainability at the systems-level looks like in practice.

Before moving on to the report's central question—how to translate this system-level definition of sustainability into a method for distinguishing between sustainable and unsustainable investments—however, two shortcomings of prevailing definitions of sustainable development will be identified and discussed. In particular, both the *sustainability of public finances* and *social sustainability*

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[1] World Commission on Environment and Development, *Our Common Future,* Oxford, Oxford University Press, 1987, p. 43.

[2] The 17 goals are: 1. No poverty. 2. Zero hunger. 3. Good health and well-being. 4. Quality education. 5. Gender equality. 6. Clean water and sanitation. 7. Affordable and clean energy. 8. Decent work and economy growth. 9. Industry, innovation and infrastructure. 10. Reduced inequalities. 11. Sustainable cities and communities. 12. Responsible consumption and production. 13. Climate action. 14. Life below water. 15. Life on land. 16. Peace, justice and strong institutions. 17. Partnership for the goals.

remain imperfectly understood. The former is not directly included in the SDGs[3]. Other dominant frameworks, such as the European fiscal rules, do a poor job of tracking it. While not central for the identification of individual sustainable investments, fiscal sustainability is a key enabling factor for the transition as a whole, and hence merits discussion.

Social sustainability has the opposite problem: the number of SDG indicators that plausibly link to it is so large that no clear definition of what ties them together has emerged[4]. This has facilitated a certain "catalogue-of-rights" understanding of social sustainability that, I argue below, is flawed. To prevent social sustainability from slipping or being ignored, a clearer, more convincing account of its essence is required. A process- and trust-based understanding, as I argue below, could provide such an account.

THE SUSTAINABILITY OF PUBLIC FINANCES

The economic sustainability of private entities is fairly straightforward[5]. Ascertaining the economic sustainability of public entities, however, is less straightforward. Since it is central both to the functioning of SFPI, and to the success of the sustainability transition, a clear understanding of what makes public finances sustainable or unsustainable is essential.

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[3] A number of public-finance related indicators exist (e.g. 10.4.2., 12.7.1., 16.6.1., 17.1.1., 17.1.2, or 17.4.1.). None of them, however, provide a good overall picture of the financial sustainability of public debt or deficits.

[4] For example, scanning only the first three SDGs, the following indicators could all be interpreted as speaking to social sustainability: proportion of the population living below the international poverty line (1.1.1.), proportion of the population living in households with access to basic services (1.4.1.), proportion of total government spending on essential services (education, health and social protection) (1.a.2.), prevalence of undernourishment (2.1.1.), prevalence of moderate or severe food insecurity (2.1.2.), maternal mortality ratio (3.1.1.), neonatal mortality rate (3.1.4.), coverage of essential health services (3.8.1.), health worker density and distribution (3.c.1.).

[5] While all accounting systems are "soft" to a certain degree (Thomas A.L., *The Allocation Problem in Financial Accounting Theory*, Evanston, IL, American Accounting Association, 1969; Thomas A.L., *The Allocation Problem, Part Two*, Evanston, IL, American Accounting Association, 1974; for an accessible summary, see Wolff R.P., "The Future of Socialism, Part Two", The Philosopher's Stone, 2019; Wolff R.P., "The Future of Socialism, Part Three", The Philosopher's Stone, 2019), the economic sustainability of private firms and households can be determined with reasonable accuracy by inspecting their P&L statements and balance sheets: if there are positive (or net zero) profits, while capital/the stock of savings remain stable or grow, the entity is—or the time being—economically sustainable.

The first problem that complicates the economic sustainability of public finances is the existence of multiple equilibria. These arise through the following mechanism:

— Investors' expectations affect the interest rates that governments must pay on their bonds. Sceptical investors will demand higher interest rates, investors that are confident in a government's solvency will be content with lower interest rates.

— The level of interest rates on government bonds, in turn, affects a government's fiscal balance. Higher interest rates will push the budget into deficit; lower interest rates will move the budget towards surplus.

— A government's fiscal balance, third, affects investors' expectations. When the budget is balanced or exhibits only a small deficit, investors will generally be confident in the government's solvency. When the budget shows a large deficit, investors are likely to become more doubtful.

In sum: expectations influence interest rates; interest rates affect the budget balance; the budget balance shapes expectations.

Due to this circularity, there are multiple equilibria or self-fulfilling-prophecy-effects concerning the sustainability of public finances. Italy, for example, has run primary budget surpluses of 1-2% of GDP p.a. in recent decades[6]. Prior to COVID, Italy's public debt was around 130-140% of GDP. At an interest rate of 0%[7], this debt is not only sustainable but will fall automatically as the debt is repaid from the primary surplus, and as the debt burden shrinks relative to a growing economy. This would hold even if the primary surpluses were converted to a balanced or slightly negative (primary) budget balance, e.g. due to a post-COVID public investment initiative[8]. Since credible expectations of stable or falling debt levels justify a low interest rate, this is a stable equilibrium.

At an interest rate of 5%, however, interest payments would amount to nearly 7% of GDP (5% of 130-140%), overwhelming any reasonable primary surplus and rendering the debt unsustainable. Since credible expectations of non-repayment justify a high interest rate, this, too, is an equilibrium.

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[6] The primary budget balance is the government's balance before debt and interest payments.

[7] As of December 2020, Italian bonds up to 5-year duration traded at negative yields. 7-year bonds traded at around 0.2% yield, 10-year bonds at around 0.5% (The Wall Street Journal, "WSJ Markets", December 21st, 2020).

[8] Blanchard O., "Public Debt and Low Interest Rates", in *American Economic Review* 109, n° 4, 2019.

The uncertainty associated with multiple equilibria is boosted by two further factors: first, unlike a company or a private household, a country can increase its revenue through increasing taxes. Debts that looked unsustainable when seen against one tax regime may become sustainable when seen against another, particularly where much of the debt is held domestically so that wealth taxes can drive a dramatic decrease in debt-to-GDP ratios.

Second, where a country has its own fiat currency and central bank, such as the UK, US, or Japan, it can always pay back its debt in money terms, for its central bank can book new money ex nihilo. And even where a country lacks its own fiat currency, such as in the Eurozone or the West African Monetary Union (*Union monétaire ouest-africaine*), debt sustainability depends on the actions of the currency-controlling central bank as an independent actor. Here, too, the central bank in question can honour any amount of nominal debt, simply by crediting the debt holder's account with the relevant amount of currency, or by purchasing outstanding bonds on the market.

Does this mean that public finances are unconstrained? No. Both taxes and the actions of central banks have certain limits.

Concerning taxes, these limits are not so much the direct effects of higher tax rates on economic activity, as is sometimes argued. As the combination of very high taxes and very high growth rates during the *Trente Glorieuses* show, real economic activity is not significantly hindered even by very high marginal rates, when these are seen as legitimate. However, where a government loses the trust and consent of its citizens, taxes will be seen as increasingly illegitimate. As many a developing country has experienced, tax collection becomes harder and harder as firms and citizens engage in more and more tax evasion, and as the efforts and loyalty of the tax administration weakens. Eventually, once the erosion of consent and trust reaches a critical point, it becomes impossible to increase tax receipts through higher taxes, because the drop in practical compliance exceeds the expected increase from higher rates.

Concerning central bank action, here too the deep constraint is trust. The well-recognised constraint on monetary finance, both in heterodox and orthodox economics, is capacity usage. If the net injection of purchasing power—i.e. what the government spends minus what it takes out in taxes, bonds, or via other purchasing-power reducing actions, such as restrictive regulation on private sector credit creation—is considerably larger than the spare productive capacity for real goods and services that is present in the economy, prices will tend to rise and the value of the currency will decline, both when measured against real goods and

services, and when measured against other currencies. If this process continues, people's willingness to hold and transact in the official currency will decline, and inflation will begin to accelerate, eventually turning into hyperinflation.

But here, too, the ultimate foundation of the sustainability of public finances is trust. If the government in question has sufficient legitimacy, it can remove purchasing power from the economy, through taxation or other means (e.g. restricting credit growth via financial regulation), and thereby arrest the inflationary spiral. Because nobody likes to have purchasing power taken away, this is only possible where citizens trust their government to act in the general interest.

This analysis yields a clear, if difficult to operationalise, understanding of the sustainability of public finances: **it is trust and consent that ultimately underpin fiscal sustainability**.

This has important implications for the management of public finances in the context of the sustainability transition: a narrow focus on financial consolidation, e.g. in pursuit of meeting European fiscal rules, may well be misplaced. Indeed, where austerity undermines trust and legitimacy, as in the UK or the Southern Eurozone in the 2010s, it is likely to be counterproductive, not just because of the well-known negative multiplier effect[9], but also because it erodes the deeper preconditions for fiscal sustainability. Focusing on the preservation of social trust and government's legitimacy—for example through assuring social and environmental sustainability, securing full employment, and providing a well-funded care economy—is both practically and conceptually the right road to fiscal sustainability.

SOCIAL SUSTAINABILITY

As the previous section explored, the sustainability of public finances depends to a large extent on the trust, consent, and legitimacy that a government holds in the eyes of its citizens.

But far more than just public finances depend on these: where trust, consent, and legitimacy are absent, there is unlikely to be a functioning state, and, as a result, instability and high levels of uncertainty. High levels of uncertainty lead to a shortening of time horizons and a further erosion of trust, as people adapt their

[9] Blanchard O., Leigh D., "Forecast Errors and Fiscal Multipliers", in *American Economic Review* 103, n° 3, 2013; Blanchard O., Leigh D., "Learning about fiscal multipliers from growth forecast errors", in *IMF Economic Review* 62, n° 2, 2014.

actions and beliefs to a low-trust, high-volatility equilibrium[10]. High uncertainty is also linked to low investment, a connection that will be explored further below[11]. This in turn poisons efforts at environmental sustainability, which require thinking in long time horizons and trusting that, if one does one's part, others will do theirs too, so that one's own efforts are not wasted. It is also detrimental for economic sustainability: where conditions are seen as unstable, lenders will refuse to lend, firms and households will refrain from starting new projects, and so investment will decline, impairing tomorrow's prosperity[12]. In addition, a climate of distrust encourages scams and hucksterism, Ponzi schemes and fraud: the very epitome of economically unsustainable activities.

These considerations yield a particular interpretation of *social sustainability*. On this interpretation, social sustainability is defined as high levels of trust, consent, and legitimacy; socially sustainable activities as those activities that either maintain or raise those levels; and socially unsustainable activities as those that do the opposite, undermining trust, consent, and legitimacy.

This interpretation of social sustainability differs from two other families of definitions: on the one hand, a set of definitions that view social sustainability as being primarily about achieving a *fair distribution* of the burdens of the sustainability transition, either across societies[13] or within a single society (this is prominent in the Just Transition discourse). On the other hand, a set of definitions that, in one form or another, build on *human rights*. This latter model appears to predominate today, informing the EU's taxonomy of sustainable investment, NGO proposals for a taxonomy of socially sustainable economic activity[14], and the "social foundations" part of *Doughnut Economics*[15], among others.

While a full analysis of social sustainability and a defence of one approach over competing ones would go beyond the scope of this report, I believe a trust and legi-

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[10] Coleman J., *Foundations of Social Theory*, Cambridge, MA, Harvard University Press, 1990; Putnam R., *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton, Princeton University Press, 1993.

[11] Robinson J., *The Accumulation of Capital*, London, Macmillan, 1956; Robinson J., *Essays in the Theory of Economic Growth*, London, Macmillan, 1962.

[12] Keynes J.M., *The General Theory of Employment, Interest, and Money*, London, Macmillan, 1936; Akerlof G.A., Shiller R.J., *Animal Spirits*, Princeton, Princeton University Press, 2009.

[13] Bourdeau P., Moreau R., Zaccai E., *Le développement non durable*, Brussels, Académie royale de Belgique, 2018.

[14] Schneeweiss A., *Menschenrechte sind Investorenpflichten: Vorschlag für eine soziale Taxonomie des nachhaltigen Investierens*, Bonn, SÜDWIND e.V., 2020.

[15] Raworth K., *Doughnut economics: seven ways to think like a 21st-century economist*, London, Random House, 2017.

timacy-centred approach to be preferable over a justice- or human rights-based one. In particular, such an approach offers a better account of *why* the substance of the approach is a matter of sustainability[16]. If it is asked of the human rights account: why is the substance of this approach, i.e. the particular catalogue of human rights, linked to sustainability, it is not obvious that a compelling answer can be given. From a sustainability perspective, protecting human rights might be neither sufficient—high inequality or exclusionary political structures, for example, can undermine legitimacy and trust even where a basic catalogue of human rights is respected[17]—nor necessary: in times of severe crisis, certain restrictions of human rights (e.g. on freedom of movement during a pandemic such as COVID, violating Article 13 UNHR) may be essential to preserve the future viability of a society.

The trust-and-legitimacy account, on the other hand, centres on a causal mechanism that runs directly from the social substance that it foregrounds (levels of trust and legitimacy) back to the question of sustainability: if levels of trust and legitimacy fall, cooperation becomes precarious, time horizons will shorten, and the overcoming of collective action problems—essential to achieve environmental sustainability—will become harder and harder. Below a critical threshold, public finances and the division of labour will collapse, and with it much of society as we know it. As such, in my judgement this account presents a better linkage than the human rights approach between sustainability and the particular social features it focuses on.

Regarding practical implications, a trust-and-legitimacy account of social sustainability is compatible with the majority of the recommendations issued by the other approaches. Maintaining social safeguards, ensuring a just distribution of costs and benefits, and protecting human rights are surely central ways in which governments, firms, and other actors can protect both their own legitimacy and help create and preserve high levels of social trust. However, unlike the human rights-based approaches, this approach also foregrounds the importance of *processes* and *institutions*: since trust is built through transparency and inclusion in decision-making, it requires that all affected stakeholders have a voice in the

[16] By "the substance of the approach" I mean: what features of the social world does the approach identify as salient. The human rights approach will ask, to see if an investment or an undertaking is socially sustainable, "does this undertaking respect this particular catalogue of rights?". The trust-and-legitimacy approach will ask "does this undertaking support or undermine trust and legitimacy?". They therefore ask substantively different questions to determine whether an investment or activity is socially sustainable.

[17] Moyn S, *Not Enough. Human Rights in an Unequal World*, Cambridge, MA, Harvard University Press, 2018.

process and the institutions that shape the sustainability transition.

At the micro-level, a focus on trust and legitimacy highlights the importance of tackling not just corporate behaviour (emissions, wage levels, hiring practices, etc.), but also corporate *governance*. One important way to increase social sustainability in this area is the democratisation of firms, for example through economic bicameralism[18]. Firm-level decision-making has a major influence over workers' lives as well as the lives of other stakeholders. Since the personal investment of workers into the particular firms they work at is too high for the 'exit' mechanism[19] to provide sufficient power to enable labour investors to voice their own views about the firm's internal organization and strategic goals, giving workers a voice can increase the trust and legitimacy that firms have in the eyes of their workers as well as the general public[20]. Where, on the other hand, workers are excluded from

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[18] Ferreras I., *Firms as Political Entities: Saving Democracy through Economic Bicameralism*, Cambridge, Cambridge University Press, 2017. Economic bicameralism is the idea that the government of firms—their highest decision-making body, responsible for selecting senior management, determining remuneration, dividends and investments, and approving the firm's overall strategy—should be structured around a double veto: both capital *and* labour investors, i.e. both shareholders *and* workers must agree to any major decision. Legally, this could be implemented through replacing mono-cameral governance structures through two separate bodies, for example a board of labour investors and a board of capital investors; or through adding workers' representatives to a mono-cameral structure and adding a double-majority requirement, where a majority of both workers' and shareholders' representatives must approve any major decision.

[19] Hirschman A.O., *Exit, Voice, and Loyalty*, Cambridge, MA, Harvard University Press, 1970.

[20] A variety of authors have highlighted the fact that firms are political entities, in many ways comparable to states. Although different in the nature of their governments—states are structured through public governments, firms generally around private governments—both are power structures that exercise considerable influence over the lives of those connected with them (Landemore H., Ferreras I., "In defense of workplace democracy: Towards a justification of the firm–state analogy", *Political Theory* 44, n° 1, 2016; Ferreras I., *Firms as Political Entities: Saving Democracy through Economic Bicameralism, op. cit.*; Anderson E., *Private Government: How Employers Rule Our Lives (and Why We Don't Talk about It)*, published by Stephen Macedo, Princeton, Princeton University Press, 2017). Although private firms are constituted by two kinds of investments, labour and capital investments, in the prevailing forms of corporate governance today, only capital investments hold power in their governance structure. This explains why profits are distributed in a way that favours returns on investment for capital, and not labour (Piketty T., *Capital and Ideology*, translated by Arthur Goldhammer, Cambridge, Massachusetts, Harvard University Press, 2020, chap. 11, esp. p. 493-513), and clarifies the importance of inclusive, i.e. democratic, decision-making at *both* the macro *and* the micro-level: at both levels, governing without accountability is illegitimate and likely to cause resistance and alienation. In addition, at the micro-level, excluding labour from decision-making may further increase already unsustainable levels of inequality.

decision-making in their firms, or are included only on a consultative basis, alienation and a loss of trust are more likely to emerge. This is increasingly recognized in the economic literature: Harvard economist Dani Rodrik, for examples, argues that "If firms, as social and political actors, are to serve the public good, workers and local communities in particular should have a much bigger say in their decisions[21]".

Understanding social sustainability as being a matter of trust and legitimacy therefore adds an important component to the sustainability transition: It is not just the destination that matters—lowering carbon emissions, reducing gender inequality, providing good health care for all—but also the *journey* to this destination—are all voices heard in the management of the transition, at both the macro- and the micro-level?

FROM SUSTAINABLE DEVELOPMENT TO SUSTAINABLE INVESTMENT

This chapter started by identifying the Sustainable Development Goals as a clear and tangible interpretation of what sustainable development means in practice. It then proceeded to offer two amendments: a re-interpretation of the economic sustainability of public finances, and a re-interpretation of social sustainability, both of which are centred around trust and legitimacy. Operationally, this had two implications: concerning fiscal policy, it implied that a narrow focus on reaching certain debt or deficit levels, as the European fiscal rules require, is mistaken. Concerning the social aspect of the sustainability transition, it implied that both the destination and the journey to this destination matter: transparency and inclusive decision making, not just lower levels of inequality or higher levels of healthcare, are key.

This report's primary subject, however, is sustainable *investment* rather than sustainable development. Even though the Sustainable Development Goals offer a clear and operational definition of sustainable development, the question remains: how can we identify sustainable investments and distinguish them from unsustainable ones? Since many of the important components of sustainable development are system-level concepts—e.g. *total* emissions, *overall* biodiversity, *social* trust and legitimacy—and since the effects of individual investments on these depend on complicated interaction effects, it is not clear how precisely individual investments contribute to or detract from sustainable development. How

[21] Rodrik D., "New Firms for a New Era", *Project Syndicate*, 2020.

can we tell, in practice, which particular investments contribute to sustainable development, i.e. help resolve environmental challenges, create value without running down capital stocks, and maintain or raise social trust and legitimacy—and which ones do not? The challenges associated with moving from measuring sustainable development to measuring sustainable investment are the subject of Part II of this report.

PART II

FROM SUSTAINABLE DEVELOPMENT TO SUSTAINABLE INVESTMENTS

To invest sustainably, it is necessary to know which specific investments make effective contributions to sustainable development, and which investments do not. Let us presuppose that we have a workable system-level definition of sustainability: the SDGs with the modifications advanced in the previous chapter. How do we move from that to the identification of individual sustainable investments?

Part II analyses three types of information infrastructures—**macro-frameworks**, **sustainability accounting**, and **a taxonomy of sustainable investments**—and evaluates the extent to which each approach allows for the identification of sustainable investments.

Chapter 3 opens Part II by showing why **macro-frameworks**, such as the Sustainable Development Goals, the Planetary Boundaries framework, or the Paris Agreement, do not allow for investment guidance when taken on their own. The problem is that these frameworks (and their associated information infrastructures, e.g. Eurostat's SDG Indicator Set) ask *verification* questions: Is child mortality falling? Are emissions below a certain threshold? Is there a gender gap in income or wealth? Investment, however, is about *choices*, and making choices requires ex-ante beliefs about counterfactuals, not ex-post verification of outcomes. Identifying sustainable investments therefore requires more than what macro-frameworks can offer: it requires counterfactual analysis.

Counterfactual analysis is a hard problem, especially in the context of complex systems. A good approach to tackling hard problems is to look for problems that are structurally similar, but have already been solved. In this case, ordinary, "merely productive" investment is such a problem. Like sustainable investment, it requires counterfactual analysis: identifying which of the many, many investments that could be undertaken in an economy are actually productive. Unlike with sustainable investment, we already have a reasonably well-functioning solution. Chapter 4 describes this solution, giving a brief outline of how the price

mechanism coordinates ordinary investment in market economies today, and why this method works reasonably well.

Next, chapter 5 asks whether the same setup could work for sustainable investment. In particular, could the same decentralised, profit-oriented mechanism that coordinates productive investment also be used to coordinate sustainable investment? The answer given by orthodox neoclassical economics is: yes. By pricing the relevant externalities, the argument goes, the price mechanism can deliver sustainable development. Operationally, this would require bringing sustainability information into firm-level accounting, i.e. the introduction of externality pricing via **sustainability accounting**. Once this has been legislated, an investor like SFPI could then discharge its task of supporting the sustainability transition simply by optimising its investments for (externality-priced) profitability[22].

I argue, however, that, on its own, this approach will not deliver a sustainability transition. Decentralised trial and error, the Schumpeterian heart of capitalist investment, is good for coordinating change at the margin. But major changes in economic structures, such as 19th century industrialisation or the sustainability transition today, are discontinuous. To drive such a systemic transformation, it is not enough to change prices. Instead, *risk* and *uncertainty* are the central obstacles that must be overcome, and sustainability accounting does not offer a solution to these.

Chapter 6 shows how **a taxonomy of sustainable investment**, combined with public investment that is guided by it, can help to overcome the obstacles of risk and uncertainty. The role of public risk taking is emphasised, as is the complementarity between a taxonomy and public investment: the latter can rely on the former, in order not to be haphazard. An institution like SFPI could play a key role in this: through financial investments, assuming risk onto its balance sheet, and through contributing to the process of drawing up a taxonomy via its on-the-ground knowledge.

A taxonomy of sustainable investments, however, and the public investment that is built on it, face problems of their own. They are unlikely to realise all sustainability gains available at the margin, which may add up to a considerable total; and they are far from ideal for measuring ex-post sustainability outcomes. The conclusion to this report therefore highlights the complementarities between the

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[22] It could even support the push for sustainability accounting by asking its portfolio companies to introduce it before binding legislation to this effect, though given that there are a variety of different sustainability accounting methods, this would run the risk of a double effort, if legislation ends up mandating a different one.

three approaches considered, arguing that translating system-level definitions of sustainability into effective sustainable investment at the project level requires a combination of all three: a taxonomy of sustainable investments, and the public investment that builds on it, to reduce uncertainty; sustainability accounting, to realise the potentially important sustainability gains available at the margin, and to provide continuous feedback for the refinement of the taxonomy; and macro-frameworks such as the SDGs, in order to verify that the system as a whole is indeed reaching the desired sustainability goals. Rounding off the report, the conclusion finishes with a sketch of what such a tri-partite structure could look like in practice, highlighting the need for democratic and inclusive decision structures, at the firm- and at the macro-level, as key enablers of social sustainability and a successful transition.

CHAPTER 3

FROM SYSTEMS TO INVESTMENTS (A): MACRO-FRAMEWORKS

The main frameworks of sustainability targets—in particular the Sustainable Development Goals (SDGs) and their associated targets and indicators—are well-suited for tracking macro-level sustainable development[1]. But they do not allow for the easy identification of sustainable as opposed to unsustainable investments. Taken on their own, they do not allow the SFPI to effectively implement its new mission.

The reason the dominant macro frameworks do not give an answer to the investment question is simple. They are not designed to do so. Conceptually, the SDGs, the Paris Agreement, the Planetary Boundaries framework, and other similar frameworks ask: Does the overall system in question conform to a particular set of sustainability criteria[2]? For example: Are emissions at or below the rate or stock consistent with 1.5 °C warming? Are ocean pH levels falling (i.e. is there ocean acidification) or are they stable? Is child mortality above or below 25 per 1000 live births? And so on. These are questions of ex-post *verification*: Is the relevant indicator at, below, or above its target value?

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[1] Given the revised definition of social sustainability defended above, minor modifications to the SDGs or the doughnut framework (Raworth K., *Doughnut economics: seven ways to think like a 21st-century economist, op. cit.*) may be required to track this concept accurately. The same is true for the sustainability of public finances, an important element of economic sustainability, which current frameworks (e.g. the EU's Stability and Growth Pact) track poorly, as argued above. Since this report is focused on (micro-level) investment decisions, however, these questions are left aside here.

[2] Where criteria can be one or more upper bounds, as with emissions or the other Planetary Boundaries; one or more lower bounds, as with many of the Sustainable Development Goals; target points with symmetric or asymmetric valuations of over- or undershooting, as perhaps with food production; or some combination of the above.

The investment question, on the other hand, is: If this particular project or set of projects were to go ahead, would it move the system in the desired direction? For example, does the deactivation of this (set of) nuclear reactor(s), and their replacement by a mix of renewable energy, gas power plants and energy efficiency savings, advance sustainability? Should education spending be focused on employing more teachers, building more schools, getting a laptop to every child, or ensuring each child has adequate nutrition? How should we allocate investments between reforming agriculture, reforming healthcare, and reforming the built environment? Unlike the questions asked by existing sustainability measurement frameworks, these are questions of ex-ante *choice*: Where should an investor invest? Which projects should go ahead?

Verification questions and choice questions have fundamentally different information requirements. To verify if global emissions are consistent with a 1.5 to 2 °C warming trajectory, for example, it is in principle sufficient to collect observational data from the Mauna Loa Observatory, Hawaii, and check if instrument readings are stabilising at or below 430 to 450 parts per million. To choose whether or not to deactivate nuclear reactors, whether to focus on electric- or hydrogen mobility, or where to prioritise education spending, in contrast, not just vastly more but a qualitatively different kind of information is required: information or beliefs about counterfactuals[3]. Not "what is currently happening?", but rather "what *would* be happening, if…?"

This latter kind of information is difficult to produce: "The use of natural resources and emission of substances into air, water and soil takes place at millions and millions of economic production sites all over the world." These "form a complex web of activities reflecting a single, global, interconnected economy which impacts the environment in multi-faceted ways[4]." Understanding the consequences of changing one (or more) element(s) in a complex system is

[3] In addition to information or beliefs about counterfactuals, a decision procedure is required to move from information to a choice: How should various desiderata (e.g. emissions, costs, other environmental goals, economic inequality, etc.) be balanced against each other? What weights should be given to various risks? Whose voice should be heard in the process? The importance of an inclusive and democratic decision-making process, touched upon in the discussion of social sustainability above, is reiterated in the report's conclusion below.

[4] Tukker A., Bulavskaya T., Giljum S., et al. *The Global Resource Footprint of Nations. Carbon, water, land and materials embodied in trade and final consumption calculated with EXIOBASE 2.1,* Leiden/Delft/Vienna/Trondheim, The Netherlands Organisation for Applied Scientific Research, 2014, p. 8.

considerably more challenging than simply collecting observational data[5]. For example, given the transport system as it stands, investments to localise food production and consumption are likely to be sustainable, because they shorten transport routes and so reduce CO_2 emissions. However, if the transport system were to be decarbonised, localised agriculture may in fact be *less* sustainable than regionally specialised agriculture coupled with long-distance transport: the latter industry structure, allowing farms to specialise in whatever is best grown or raised in their particular region, can likely produce higher food yields with lower total land use. But then again, much would depend on the supply chain of decarbonised transport: if decarbonisation takes the form of electric vehicles, and crucial raw materials are sourced from socially and environmentally destructive mining, localised agriculture may be the more sustainable option, after all. Unless, in turn, the battery supply chains were to become sustainable, e.g. because zinc-air batteries become commercially viable; or unless hydrogen mobility takes off. Large-scale hydrogen mobility, however, would only be sustainable if the hydrogen is produced via electrolysis powered from a fully renewable electricity grid. And so on. In sum, producing credible, reliable estimates of how different investments affect the sustainability of an overall system is a daunting task.

It is no surprise, then, that the information infrastructure that has been built in support of the existing sustainability frameworks, e.g. the UNFCCC Greenhouse Gas Inventory, or Eurostat's SDG Indicator Set[6], does not allow the SFPI or other investors—or anyone else, for that matter, including policy makers—to distinguish between sustainable and non-sustainable investments. These information infrastructures were built for one purpose—to answer verification questions—and they cannot be expected to work as-is for an entirely different one—to answer choice questions.

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[5] Holling C.S., "Understanding the complexity of economic, ecological, and social systems", *Ecosystems* 4, n° 5, 2001.

[6] Eurostat, *Sustainable Development in the European Union: Monitoring report on progress towards the SDGs in an EU context, 2020 edition*. *Greener Management International*, vol. 2001, Luxembourg, Publications Office of the European Union, 2020.

CHAPTER 4

ON COORDINATING INVESTMENT IN GENERAL

Note, however, that the problem just described is not unique to *sustainable* investment. It is a problem for investment choices *in general.* Even for "merely productive"—as opposed to sustainable—investments, decisions require beliefs and information about counterfactuals. For example, a potential automotive investor will ask the following question: "If I invest in building this car factory and hiring a labour force, will this enable the production and sale of automobiles at a competitive price, without running down the capital stock? I.e. will the investment be economically productive?" Just as with sustainable investments, ascertaining the truth or falsity of this counterfactual belief about a (potentially) productive investment is difficult. In this case, for example, it will depend on changes in wage levels and the prices and availabilities of raw materials, such as steel, aluminium, plastic, rubber, and oil; on the evolution of consumer tastes, and of complementary technologies (like GPS navigation or good roads) and substitute technologies (like videoconferencing, air travel, trains, or public transport); on the behaviour of suppliers and competitors; on exchange rates, tariffs, and trade regimes; and, particularly in countries where most cars are bought on credit, the state of the financial system.

In other words, the productivity, just like the sustainability, of any one investment depends on the overall system it is embedded in. And yet, despite abundant co-dependencies between individual investments and the system they are embedded in, the coordination of "merely productive" investment has functioned tolerably well, from a productivity perspective, in the market economies of Western Europe, North America, Japan and other OECD countries.

How does this coordination work? Its central mechanism consists in the ability of firms and households to make independent investment, production, and purchasing decisions, and to set prices decentrally. Hayek captured well how this creates an effective coordination mechanism:

> "Assume that somewhere in the world a new opportunity for the use of some raw material, say tin, has arisen, or that one of the sources of supply of tin has been eliminated. It does not matter for our purpose—and it is very significant that it does not matter—which of these two causes has made tin more scarce. All that the users of tin need to know is that [...] in consequence they must economize tin. [...] the effect will rapidly spread throughout the whole economic system and influence not only all the uses of tin, but also those of its substitutes and the substitutes of these substitutes, the supply of all things made of tin, and their substitutes, and so on[1]".

In other words, price increases—whether in tin or oil, in cars or computers, whether driven by new demand, a reduction in supply, new taxes or new regulation—will attract the attention of managers, households, entrepreneurs and investors, and direct them towards economizing on particular inputs, or towards finding new methods to produce them[2]. Through second-round price effects this will percolate through the system, so that adjustments will happen not just in the production and use of tin, in this case, but also of "its substitutes and the substitutes of these substitutes, the supply of all things made of tin, and their substitutes, and so on."

This deals with the information problem—how to identify the subset of *productive* investments from among the vast set of *possible* investments—not via developing a more sophisticated manner for producing information (as lifecycle assessments do for sustainability, for example) but via systematically decentralised trial-and-error. By leaving investment decisions to a large number of different investors, each of whom may use a different method for forming beliefs and collecting information about counterfactuals (i.e. which investments will be productive), the likelihood of catastrophic productivity misjudgements at the system level is reduced. And by allowing for creative destruction via hard budget constraints[3], the influence of investors that turn out, ex-post, to have misjudged what is productive is progressively diminished, while the influence of those that (through luck or shrewd judgement) anticipated correctly is increased.

Decentralising investment decision-making does not, of course, make syste-

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[1] Hayek F.A, "The Use of Knowledge in Society", in *American Economic Review* 35, n° 4, 1945, p. 526.

[2] See also Schumpeter J.A., *Capitalism, Socialism, and Democracy*, New York, HarperCollins, 1942, chap. 7. While the mechanism is real, note that it is not well understood in contemporary economic theory. Strikingly, there is no convincing account of it in neoclassical economics. See also Marx K., *Capital, Vol. 1: A Critique of Political Economy*, published by Ernest Mandel, translated by Ben Fowkes, London, Penguin, 1992 [1867], chap. 15, esp. 617-8.

[3] Schumpeter J.A., *Capitalism, Socialism, and Democracy, op. cit.*, chap. 7.

mic co-dependencies disappear. To ensure decentralised decision-making does not result in chaos and malcoordination, its information infrastructure must be carefully constructed and maintained[4]. In particular, prices—the infrastructure's central element—must be collected, verified, aggregated, analysed, communicated, and (surprisingly often) regulated. This does not happen automatically. A non-trivial part of any market economy is the network of public and private institutions and rules that perform this function: from state statistical offices to Bloomberg and Thomson Reuters, from stock exchanges to the SEC and the European Securities and Markets Authority, from laws regulating price discrimination to the regulation of accounting frameworks and financial reporting. Without this infrastructure, the links between prices, profitability, and productivity easily break: Enron and Wirecard, to pick but two examples, demonstrate how easily investors can be misled into shifting resources to fraudulent and unproductive uses, if the price-based information infrastructure is not carefully maintained and policed.

It goes without saying that this mechanism of coordinating investment has a plethora of shortcomings: its definition of what is productive is dubious, in particular where high levels of wealth and income inequality greatly over-weigh the views of what rich people view as productive, and greatly under-weigh the views of everyone else; its decentralisation is always precarious, since the accumulation of monopoly power, unless blocked by a competition authority, is a sure road to riches, and feedback loops from rising inequality to politics erode anti-trust enforcement[5]; depending on financial regulation, investment may concentrate on unpro-

[4] In addition, a whole host of other institutions and limits are required to maintain decentralised investment decision-making over time, besides those necessary to sustain its information infrastructure. Market-based coordination could not function without, for example, the public production of a trained, healthy, and ready-to-hire workforce; the funding of basic research and development; aggregate demand management, via fiscal policy, automatic stabilisers, and monetary policy; public efforts at preventing the erosion of competition through cartelisation and monopolies; or backstops for the financial system and public management of the overall price level.

[5] Indeed, a striking concentration of investment management has taken place in recent years: Braun B., "American Asset Manager Capitalism", *Working paper*, 2020. See also Philippon T., *The Great Reversal: How America Gave Up on Free Markets*, Cambridge, MA, Harvard University Press, 2019, for evidence of rising concentration specifically in the US; Hacker J.S., Pierson P., *Winner-Take-All Politics: How Washington Made the Rich Richer-and Turned Its Back on the Middle Class*, New York, Simon and Schuster, 2010; Gilens M., Page B.I., "Testing Theories of American Politics: Elites, Interest Groups, and Average Citizens", *Perspectives on Politics* 12, n° 3, 2014; Gilens M., *Affluence and Influence*, Princeton, Princeton University Press, 2012; and Bartels L., *Unequal Democracy: The Political Economy of the New Gilded Age*, Princeton, N.J.,

ductive asset classes, e.g. real estate speculation; and, most obviously, it leads to deeply unsustainable relations between the economy, nature, and humanity.

Nevertheless, it is a tolerably effective solution for identifying which particular investment projects are productive in the context of a complex economic system. As such, it is a decent starting point for identifying which particular investments projects are sustainable in the context of complex economic, social, and natural systems.

Princeton University Press, 2008, for feedback loops between inequality and politics in the US; and Elsässer L., Hense S., Schäfer A., "Government of the people, by the elite, for the rich: Unequal responsiveness in an unlikely case", *MPIfG Discussion Paper* 18, n° 5, 2018, for similar data for Germany.

CHAPTER 5

FROM SYSTEMS TO INVESTMENTS (B): SUSTAINABILITY ACCOUNTING

Starting from the model of how merely productive investment is coordinated, one way to approach the identification of sustainable investments would be to rely on a similarly decentralised decision-making mechanism, but to modify the information infrastructure underpinning it. In brief: the same algorithm, but applied to different data.

In practice, this means leaving investment decisions up to individual firms and investors, but to change accounting frameworks so as to include sustainability information in them. This is variously known as Full Cost-[1], True Cost-[2], Natural Capital-[3], or New Accounting[4], Integrated Reporting[5], or triple bottom line accounting[6]. For the purpose of this report, I will group this family of proposals under the label of **sustainability accounting**.

Although details differ, the basics of sustainability accounting are simple: firms and other economic agents are mandated to track outcomes that are sustainability-relevant, such as GHG emissions, nitrate runoff, land use, water use, or air pollution for environmental sustainability; or wage differentials (e.g. along gender,

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1 Bebbington J., Gray R., Hibbitt C., et al., *Full Cost Accounting: An Agenda for Action*, London, Certified Accountants Educational Trust, 2001.

2 e.g. TEEB, "The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture & Food: Concept Note", 2014.

3 Wackernagel M., Onisto L., Bello P., et al., "National natural capital accounting with the ecological footprint concept", *Ecological Economics* 29, n° 3, 1999.

4 van der Lugt C., *Blueprint 2: The Blueprint for New Accounting: Laying the foundations for Future-Ready Reporting*, Reporting 3.0, 2018.

5 IIRC, *The International <IR> Framework*, International Integrated Reporting Council, 2013.

6 Thomas M., McElroy M.W., *The MultiCapital Scorecard: Rethinking Organisational Performance*, Chelsea, VT, Chelsea Green Publishing, 2016.

race, and religious lines, as well as simply between high- and low-paying jobs), workforce attrition rates, trade union policy, codetermination and other governance processes, as well as data on trust and legitimacy for social sustainability. Prices are fixed for each variable[7], with prices potentially varying by geography or other co-variates, allowing disparate impacts to be translated into a single metric. Combining prices with quantities, a single figure can then be calculated to proxy a firm's environmental and social sustainability impact. Combining this figure with a firm's balance sheet and P&L statement, as proxies for a firm's economic sustainability, an overall sustainability account can be produced. Only firms that show a profit on this overall sustainability account, while not running down any capital[8], would then qualify as sustainable.

In this scheme, the task of investors would remain unchanged: search for and invest in profitable investments. The SFPI's contribution to sustainable development would then mainly occur through optimising its portfolio for overall profitability, subject to the other aspects of its mission (strategic anchoring, a focus on seed, start-up, and scale-up investments, etc.). Politically, the SFPI could boost this approach by, one, asking portfolio firms to pioneer various elements of sustainability accounting, thereby demonstrating to legislators and the public the viability of this approach; and, two, by using 'shadow prices'[9] in its investment

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[7] A number of different pricing methodologies exist, each with advantages and disadvantages. Since no objective answer is possible—counterfactuals are once again required for any of the allegedly precise methods—I believe a democratic approach to pricing to be superior to a technocratic one. This issue is explored further below. Note also that some proposals do not use monetary prices to aggregate physical quantities, e.g. the Thomas and McElroy (*The MultiCapital Scorecard: Rethinking Organisational Performance*, *op. cit.*, 2016) operationalisation of a triple bottom line. Mathematically, however, this is irrelevant: as long as the different quantities are aggregated into one number, whatever weights are used are the equivalent of a price vector.

[8] Under these accounting standards, the concept of capital is extended to include various other stocks (e.g. CO_2 in the atmosphere, but potentially also various forms of social capital)—hence the name of one operationalisation is *MultiCapital Scorecard* (Thomas M., McElroy M.W., *The MultiCapital Scorecard: Rethinking Organisational Performance*, *op. cit.*) —so that the "do not run down your capital stock" constraint becomes more binding.

[9] Shadow prices consist in pricing certain accounting entries in investment analyses (e.g. NPV calculations), even though these entries do not (yet) have a market price. The practice of shadow pricing CO_2 emissions has become wide-spread in the oil and gas sector, for example. Shell, to take one firm, prices CO_2 emissions at \$40/tCO_2 (Ahluwalia M.B., "The business of price carbon", *Center for Climate and Energy Solutions*, 2017, p. 13), and only projects that meet its profitability goal after this "shadow cost of carbon" has been deducted receive the green light. This helps the company avoid making long-term investments that become loss-making when legal carbon prices (whether carbon taxes or emission trading schemes) rise.

decisions, thereby adjusting its portfolio to externality pricing even before the relevant taxes and charges have been legislated. Taken together, these two steps might increase the odds of sustainability accounting being rolled out at scale, which would help to move the Belgian economy towards sustainability[10].

Both of the latter contributions would involve risks, however: the first involves the risk of placing a double burden on portfolio companies, in case the particular version of sustainability accounting that portfolio firms introduced early differs from the form that is later imposed through legislation. The second involves the risk of financial losses for SFPI, since the use of shadow prices may lead to an overall less profitable investment portfolio, particularly if legislation fails to price the externalities that SFPI shadow-priced in advance.

A very simple version of sustainability accounting, in the sense just defined, is a carbon tax. Under a carbon tax, firms are mandated to track one particular sustainability outcome, CO_2 emissions. They then have to pay a certain tax, say €50 per tonne of CO_2. Only firms that would still be profitable after this tax would be considered to be sustainable—those that went out of business, it becomes clear ex-post, were only profitable because they could impose the costs of their emissions on society at large.

Similarly, the various dimensions of social sustainability could be quantified and priced: firms could be mandated to track the size of their gender pay gap, for example, and then charged in proportion to their departure from gender equality. Only firms that remain profitable after this charge would then be considered to be sustainable—those that went out of business, it becomes clear ex-post, relied on the exploitation of women.

This method has the advantage of preserving the Hayekian information efficiencies outlined above: if market prices are adjusted to include the environmental and social sustainability impacts associated with the relevant product, firms only need to measure and monetise *their own* sustainability behaviour, instead of having to monitor that of their suppliers and customers as well. Equally, consumers could infer that cheaper products (of the same quality) will have a better sustainability impact than more expensive products. In contrast to other ways of

[10] There remains a separate question over whether rolling out sustainability accounting in Belgium only would be feasible, or whether this would so adversely affect the competitiveness of Belgian firms as to only be viable on a European scale. This is an open question, the answer to which requires further investigation lying outside the scope of this report.

communicating sustainability information—in particular sustainability labels[11]—while firms' internal accounting practices would change greatly, it would not complicate firm-to-firm or consumer-to-firm interaction. Nor, perhaps most importantly, would it change the kinds of analyses that investors would have to conduct in order to choose between different investments.

In practice, and assuming that the prices fixed for social and environmental variables accurately reflect social priorities—an assumption questioned further below—this information infrastructure would help firms and investors prioritise areas and business units for change. The French luxury conglomerate Kering, for example, produces an environmental P&L account each year. Its 2019 account shows, given the particular prices it used, that its environmental impacts from land use (largely biodiversity loss impacts), monetised as around €170 million, are almost as important as its greenhouse gas emissions, monetised as approximately €190 million, and that its water-pollution and water-use cause environmental impacts of roughly half that size, at €100 million[12] (Figure 2).

[11] Sustainability labels were intended to help with precisely this information problem: how to identify a sustainable supplier or product without having to study them in great detail. However, a proliferation of standards means that consumers and firms must now study various competing labels to know which one best conforms to their interpretation of sustainability. In the case of coffee, for example, there are at least 9 different standards: Fair Trade, Bird Friendly, USDA Organic, Rainforest Alliance, Utz Kapeh, 4C, Starbucks' C.A.F.E. standard, Nespresso's AAA Sustainable Quality Standard, and Indonesia's ISCoffee standard. For biofuel, the European Commission recognises 17 different standards (Lambin E.F., Thorlakson T., "Sustainability Standards: Interactions Between Private Actors, Civil Society, and Governments", *Annual Review of Environment and Resources* 43, n° 1, 2018). In total, one article identified more than "400 ways to certify various goods and services—and much confusion for those consumers who want to choose responsibly" (Madhusoodanan J., "A blizzard of "sustainability" labels", *Knowable Magazine*, 2019).

[12] Kering S.A., "Environmental Profit & Loss 2019 Group Results", Paris, 2020.

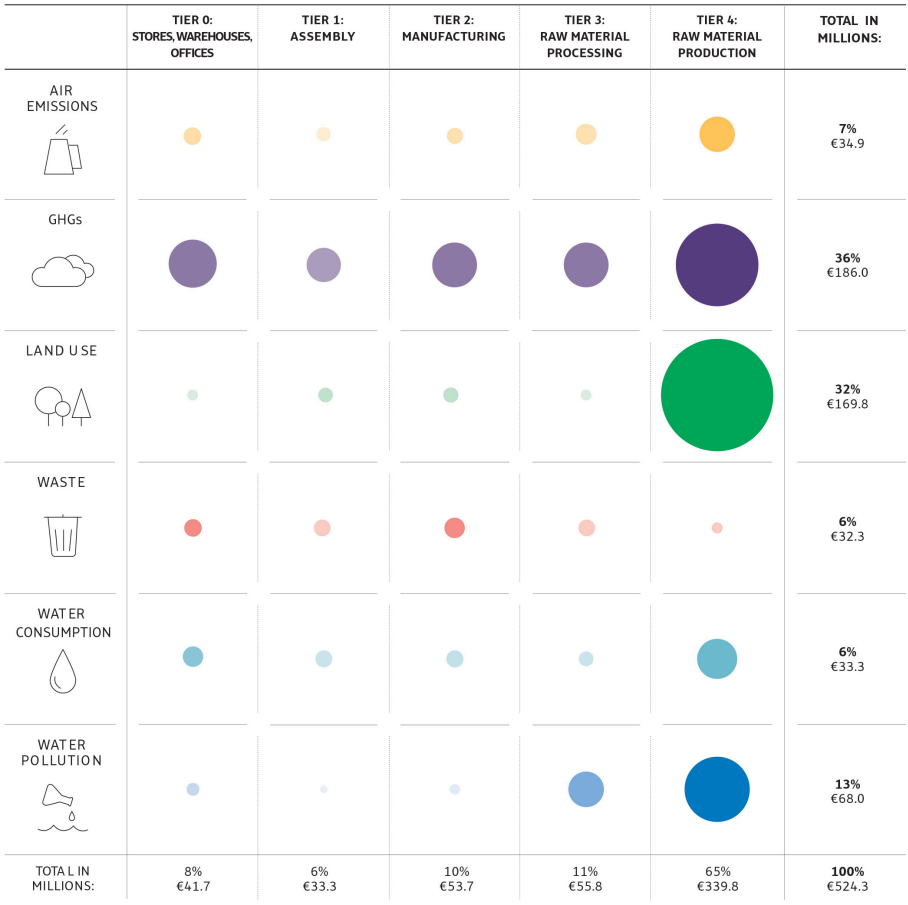

Fig. 2 — Environmental profit and loss impacts across Kering's supply chain, split by impact area
Source: Kering 2020, p. 6

Seen against the environmental P&L, a pure focus on reducing GHG emissions would ignore well over half of Kering's environmental impact—a non-trivial insight that is helpful both for policy makers and Kering's management.

One central point bears repeating: to be effective, *both* as an information infrastructure *and* as a tool for sustainable development, sustainability accounting must be fully reflected in prices, for example via imposing a tax equal to the social and environmental costs of a business's activity[13]. Only where prices reflect these costs will businesses change their behaviour *en masse*, so that it becomes

[13] In this context, it is worth noting that Kering has been accused of massive tax fraud, in the order of 2 to 3 billion Euros (Philippin Y., « La justice enquête sur l'évasion fiscale massive de

an effective tool for sustainable development. Only when prices have changed accordingly will an investor be able to tell which firms are *sustainably* profitable, i.e. profitable once all the relevant externalities—up and down the supply chain—have been priced. Where prices fail to reflect these costs, on the other hand, its usefulness as information infrastructure and investment guidance is severely limited: social and environmental costs that are remote in a firm's supply chain, hence difficult to spot for management and external investors, would then fail to appear in the final product price, and in current and future profitability.

PROBLEMS WITH ACCOUNTING-BASED SUSTAINABLE INVESTMENT IDENTIFICATION STRATEGIES

Accounting-based strategies for identifying investments as (non) sustainable are controversial, for a number of reasons[14]. Many of these reasons are not specific to accounting approaches, and hence do relatively little to discredit them vis-à-vis other approaches facing similar issues. One major difficulty, however, is intrinsically and inevitably linked to the approach, since it attaches to the Hayekian mechanism at its heart. This section covers the first class of problems, while the next section zooms into the second.

To begin with, there is the political difficulty of forcing sustainability accounting frameworks into the prices at which firms and consumers interact. As argued above, this is pivotal: on it depend both its effectiveness as a tool for change, and its effectiveness as an information infrastructure and investment guidance tool. In theory, taxes can force firms to roll the externalities revealed by sustainability accounting into their market prices. The accountancy framework, *eo ipso* constituting quantity and price information, would define both tax base and tax rates, so that no additional tax assessment infrastructure would be required. But in practice, legally designing the appropriate taxes, politically legislating them, administratively collecting them, and—most importantly—ex post verifying that firms are not cheating in their accounting would be challenging indeed. Much willpower and an extensive tax collection capacity would no doubt be required.

Kering », *Mediapart*, December 15th, 2020). As this shows, sustainability accounting without strict enforcement is insufficient.

[14] See e.g. Radermacher W.J., Steurer A., "Do we need natural capital accounts for measuring the performance of societies towards sustainable development, and if so, which ones?", *Eurostat Review on National Accounts and Macroeconomic Indicators*, n° 1, 2015; Hache F., "50 Shades of Green Part II: The Fallacy of Environmental Markets", Brussels, 2019.

Nevertheless, similar problems affect "classic" environmental and social regulation, too. Automobile emission or fuel economy standards, for example, "are beset by problems such as the discrepancy between lab and on-the-road emissions tests[15]"; any building- or land-use-code is only as good as the enforcement capacity behind it; the same goes for minimum wage standards[16]. While the granularity of accounting-based approaches may require more enforcement capacity than simple regulatory bans or restrictions, this extra enforcement cost may well be compensated for by the more granular adjustment of economic activity it allows, and the additional information it generates.

Further, there is the difficulty of identifying and quantifying the environmental and social elements of any system of sustainability accounting. How, for example, should biodiversity be rolled into an accounting framework? Which variable or variables best capture the concept, and how can they be measured? Concerning social sustainability, moving within the definition outlined above, how should individual firms' impact on social trust be quantified? What are the right wage and wage inequality metrics to consider? How can the effect of a firm or economic activity on the overall legitimacy of a social, economic and political system be captured in numbers? "Quantification only works by reducing complexity[17]", and sustainability is an inherently complex subject matter.

Some elements of sustainability will no doubt resist quantification, so that numerical inclusion in an accounting framework will be crude, and in some cases impossible or undesirable[18]. Where these elements are important, for example in the case of human rights, qualitative rules can be drawn up, and compliance can be made a prerequisite (in addition to a positive sustainability accounting bottom line) for classification as sustainable investment, or indeed for permission to operate as a business at all.

For elements that are difficult but not impossible to quantify, the difficulty is once again not specific to accounting approaches: as with enforcement, the

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[15] VAN RENSSEN S., "The inconvenient truth of failed climate policies", *Nature Climate Change* 8, n° 5, 2018, p. 358.

[16] In the UK, for example, only 13% of firms paying below the minimum wage get detected, despite an increase in enforcement (from very low levels) in recent years. As a result, an estimated 350,000 of the 1.4 million adult UK-based workers at or close to the minimum wage were underpaid (JUDGE L., STANSBURY A., "Under the wage floor: Exploring firms' incentives to comply with the minimum wage", London, 2020, p. 4-6).

[17] HACHE F., "50 Shades of Green Part II: The Fallacy of Environmental Markets", *op. cit.*, p. 50.

[18] RADERMACHER W.J., STEURER A., "Do we need natural capital accounts for measuring the performance of societies towards sustainable development, and if so, which ones?", *op. cit.*

question is rather whether the additional granularity and information produced via counting is worth the additional cost, for public administrations and for firms, compared to bans, prescriptions, or other forms of direct regulation. As James Scott might say, *all* state action works by reducing complexity[19]: counting reduces complexity with respect to information; bans or prescriptions reduce complexity with respect to *reacting* to information[20]. Whether or not to use state action with respect to a particular sustainability goal, and if so, whether to act via inclusion in an accounting framework or via traditional regulation—these are inherently political questions, and no answers can be given in the abstract.

Similar points apply to setting prices. Just like agreeing on which quantities to measure and how, agreeing on the price vector by which these quantities are to be aggregated is difficult and inherently political. To highlight but one difficulty: environmental or social ecosystems often have non-linearities. A wetland, a local animal population, or the local economy of a particular region might survive and adapt reasonably well to a certain amount of pressure, but then collapse rapidly if a threshold is crossed. The same holds for climate change, for which a number of potential tipping points have been identified[21], and for financial markets, which tend to tip from exuberance to despair[22], often with devastating consequences for particular places, people, or firms.

Market prices, actual or hypothetical, do poorly at accounting for such non-linearities, often shooting up or dropping off only *after* a threshold has been crossed, at which point—from the view of environmental or social sustainability—it is too late. The implicit assumption, for those who argue that Hayekian, decentralised coordination can deal with such non-linearities, is that choices are reversible. This assumption, however, is frequently false: important social or ecological features may be both critical and irreplaceable[23], which is difficult to capture in actual or

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[19] Scott J., *Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed*, New Haven, Yale University Press, 1999.

[20] With a ban, a uniform action is imposed on everyone, but not necessarily a uniform way of counting the good that is done or the bad that is prevented. With quantification, a uniform way of counting the good or bad is imposed, but not necessarily a uniform way of responding to it.

[21] Lenton T.M., Held H., Kriegler E., et al. "Tipping elements in the Earth's climate system", *Proceedings of the National Academy of Sciences of the United States of America*, National Academy of Sciences, 2008.

[22] Minsky H., *Stabilizing an Unstable Economy*, New Haven, Yale University Press, 1986.

[23] For environmental features, this is often called "critical natural capital" (Brand F., "Critical natural capital revisited: Ecological resilience and sustainable development", in *Ecological Economics* 68, n°3, Elsevier, 2009).

hypothetical market pricing methods.

To convey accurate and useful information, sustainability accounting pricing must therefore take a systems perspective[24], for example via Context-Based Sustainability or Science-Based[25] methods, rather than seeking to mimic market price behaviour. In the case of ecosystems and biodiversity, for example, this method would have to define a carrying capacity for a regional ecosystem, compare how close total use is to this threshold, and have steeply rising pricing structures if carrying capacities are approached or exceeded. This way, if a new company enters into an ecosystem and pushes it close to (or beyond) its limit, all firms that have an impact on that ecosystem will face a steep tax, and only those with the highest value-add relative to their impact will survive, while the others will go out of business, reducing pressure on the ecosystem. A similar systems-perspective is more challenging to develop in the case of social sustainability: it is not obvious which price schedules[26], if any, would have the desired effects on social outcomes of interest, such as local wage levels or (gender-)wage differentials or levels of trust. In certain cases, difficulties with pricing may be so large that, as with difficult-to-quantify concepts, qualitative rules are to be preferred.

The key point is that externality pricing must be understood as a political choice, rather than the mimicking of market-price formation. As the case of non-linearities shows, complex issues can—in many, though not all cases—be accounted for through well-designed price schedules and vectors, as long as price design is liberated from the model of market price formation, and is understood as a genuinely political act.

Summing up the problems so far, sustainability accounting suffers from issues related to implementation, quantification, and price-setting. All of these problems are legitimate, indeed serious: when it comes to biodiversity, for example, some argue that "measuring biodiversity is almost impossible to do accurately[27]"; ecosystems "are dynamic, constantly changing, and full of hierarchies and levels of organisation that are extraordinarily difficult to quantify, let alone put a price on[28]". However, these are by and large the same problems faced by all attempts

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[24] Holling C.S., "Understanding the complexity of economic, ecological, and social systems", *op. cit.*

[25] Science Based Targets, "Methods | Science Based Targets", 2020.

[26] Meaning both which accounting entries are being priced, and the prices that are applied to them.

[27] FERN, "Briefing note 3: Biodiversity offsetting in practice", Brussels, 2014, p. 2.

[28] FERN, "Briefing note 2: What is biodiversity offsetting and why is it problematic?", Brussels, 2014, p. 6.

at state action in support of sustainability: if biodiversity truly could not be measured, for example, there would be no basis on which to single out particular activities to ban, and no data on which to evaluate whether a particular suite of regulatory measures was effective, or required further adjustment. These critiques are therefore well taken, highlighting the many pitfalls and challenges that must be overcome in this area; but they do not speak against building an accounting-based information infrastructure to identify sustainable investments.

DECENTRALISED COORDINATION STRUGGLES WITH REMOTE COUNTERFACTUALS

The situation is different for a final critique. This critique aims not at the quantification or pricing of sustainability, i.e. the information infrastructure, but at issues of aggregation and coordination, i.e. at problems with decision-making that builds on it. As such, this critique gets at the heart of all accounting approaches for identifying sustainable investments, and shows why they cannot suffice, on their own, to successfully identify sustainable investments and mobilise funds in their direction.

Major economic changes are discontinuous. Consider, for example, the historical process of industrialisation. While its causes are difficult to pin down, few would deny that there are clear and obvious differences between industrial and pre-industrial economies; and that there are equally clear differences between economies on the path to industrialisation (the "take-off stage") and those that are not. In large part, these differences are explained by numerous co-dependencies that create multiple equilibria[29]: industrial-scale factories required railroads[30], railroads required coal mines and (later) a well-functioning electricity grid, coal mines and electricity required large amounts of industrial equipment, which in turn required factories, which however required railroads, and so on (Figure 3).

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[29] Gerschenkron A., *Economic Backwardness in Historical Perspective*, Cambridge, MA, Belknap Press of Harvard University Press, 1962.

[30] A graphic reminder of this is Gerschenkron's description of "a huge boiler being dragged by teams of oxen through the deep mud of the Ukrainian steppes on its way to the construction site of the first blast furnace in the Donbas"—a striking example of why "some railroad building had to antedate the period of rapid industrialization" (*Idem*, p. 124-25).

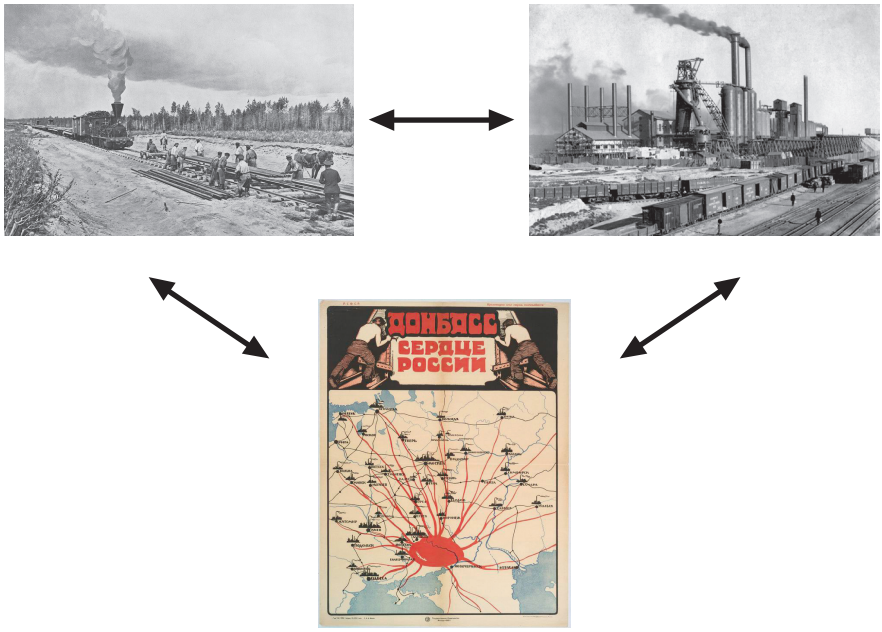

Fig. 3 — An illustration of the inter-linkages of industrialisation
Source: Public domain pictures showing (top left) construction of the Trans-Siberian Railroad, (top right) the Colorado Fuel and Iron Steel Mill in Pueblo, Colorado, and a Soviet propaganda poster describing the Donbass coal mining region as 'the heart of Russia'

Moreover, co-dependencies also apply in the social realm[31]: rapid industrialization required a mobile, literate, and disciplined workforce. But "creating" such a workforce was a highly risky endeavour without industry already flourishing. Enclosures or evictions from the land were prone to cause to severe social instability, unless there were relatively well-paying jobs available in industry to absorb this workforce[32]. In 1830s England, for example, "labor-saving technology was associated with more riots … Where alternative employment opportunities softened the blow of new technology, there was less rioting. Conversely, where enclosures had impoverished workers, the effect of threshing machines on rioting was amplified[33]".

As a result of these economic and social co-dependencies, many market economies have remained pre-industrial for extended periods of time, often centu-

[31] Meiksins Wood E., *The Origin of Capitalism: A Longer View*, London, Verso, 2002.

[32] Polanyi K., *The Great Transformation: The Political and Economic Origins of Our Time*, New York, Rinehart & Co., 1944.

[33] Caprettini B., Voth H.-J., "Rage against the Machines: Labor-Saving Technology and Unrest in Industrializing England", in *American Economic Review: Insights* 2, n° 3, 2021, p. 305.

ries or more[34]. Only when a particular set of policies or circumstances conspired to resolve various collective action- and coordination problems did industrial take-offs occur[35]. Only then did an economy leap from one equilibrium to another, or, more accurately, from one developmental path to another.

Much the same is true for the shift from an unsustainable to a sustainable economy today. Rich countries so massively exceed their share of planetary boundaries that small, marginal changes cannot bring them to sustainability[36]. European Union member states, for example, exceed sustainable limits for nitrogen and phosphorus discharge by a factor of 3.3 and 2, limits for land use by 1.8[37]. Concerning GHG emissions, to reach the EU's 2050 target of net zero, the annual speed of decarbonisation would have to increase by a factor of four to ten[38]. During the hardest COVID lockdowns, e.g. Italy in March and April 2020, emissions fell by approximately 20% relative to the same periods in 2018 or 2019[39]; but this is *less than halfway* to the EU's goal of 44-50% emission reductions between 2020 and 2030. In other words, even if the hardest of lockdowns were to be made permanent, greatly reducing traveling activity and many forms of consumption, the emission reductions would not get us to our 2030 goals—let alone the 2050 goal of net zero emissions.

Moreover, time is of the essence. In order to have a 50-66% chance of keeping global warming to 1.5 C or less, humanity can emit no more than 420-580 Gt CO_2[40]. However, the existing energy infrastructure alone, i.e. the power plants, refineries, pipelines etc. in operation today, if operated according to historical norms, would exhaust this budget, emitting around 660 Gt CO_2 over their regular economic life-

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[34] e.g. Temin P., "The Cambridge History of 'Capitalism'", *Journal of Economic Literature* 53, n° 4, 2015, p. 1002-7; Kocka J., *Capitalism: A Short History*, Princeton, Princeton University Press, 2016; Banaji J., *A Brief History of Commercial Capitalism*, Chicago, Haymarket Books, 2020.

[35] Gerschenkron A., *Economic Backwardness in Historical Perspective*, *op. cit*.

[36] Zaccai E., *Deux degrés : Les sociétés face au changement climatique*, Paris, Presses de Sciences Po, 2019.

[37] European Environmental Agency, Swiss Federal Office for the Environment, *Is Europe living within the limits of our planet? An assessment of Europe's environmental footprints in relation to planetary boundaries*, Luxembourg, Publications Office of the European Union, 2020, p. 10.

[38] European Environmental Agency, *Trends and projections in Europe 2019: Tracking progress towards Europe's climate and energy targets*, Luxembourg, Publications Office of the European Union, 2019, p. 13.

[39] Rugani B., Caro D., "Impact of COVID-19 outbreak measures of lockdown on the Italian Carbon Footprint", *Science of the Total Environment* 737, 2020.

[40] The remaining carbon budget for 2 C is larger, but quite uncertain, at 1170-1500 gigatonnes of CO_2.

time[41]. This implies two things: first, every new major power plant, installation or factory, every new car, plane or ship, every new house or building that is being built today should already be built carbon-neutral. Second, if this is not achieved, it will become necessary to retire significant amounts of power plants, factories, and transport equipment before the end of their economic lifetime. This will be highly disruptive, since much industrial infrastructure is debt-financed, and since expected profits over the expected economic lifespan of an asset are budgeted as the basis from which to repay this debt. Shut down plants early, and unexpected losses will ripple through the financial system. This financial disruption will be further amplified by the deflation of the carbon bubble that is likely to take place once investors are convinced of the seriousness of climate change mitigation[42].

In other words, the kind of systemic change that is required for a successful transition towards sustainability is rapid, likely to be disruptive and, though this is less certain, appears to exhibit co-dependencies comparable to those of industrialisation. This creates two closely related problems, both driven by the deeper problem of directing investment in the context of uncertainty: first, where uncertainty is high, sustainability accounting may fail at identifying the 'right' investments. Since this is a question of information and knowledge, this could be called the '**epistemological problem**'. Second, even where externality-adjusted prices *do* identify the right investments as profitable, in a context of high uncertainty, sustainability accounting may fail to direct large investment volumes in their direction. Since this is a question of changes in behaviour, this could be called the '**effectiveness problem**'. Let us take these two problems in turn.

As one proponent of this approach puts it, the "real deal" in sustainability accounting is "disclosing when a company can call itself a sustainable company[43]". Information-wise, this is a verification question at the micro level: Is this company, *as it currently operates* and *given the existing economic, social, and environmental ecosystem it is embedded in,* sustainable (i.e. profitable) or not?

In an ideal case, sustainability accounting does produce this information. But, once again, investment is about the future: what matters for investment choices

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41 Tong D., Zhang Q., Zheng Y., et al. "Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target", *Nature* 572, n° 7769, 2019, p. 373.

42 The carbon bubble refers to the idea that fossil fuel companies are overvalued, because if and when the world gets serious about dealing with climate change, these companies will be prevented from extracting the carbon reserves on which their economic value (in stock market valuations and elsewhere) is based.

43 Thurm R., *Blueprint 1. A principles-based approach to reporting serving a green, inclusive & open economy*, Reporting 3.0, 2017, p. 39.

today is who will be profitable *tomorrow*. In calm times, profitability today may be a reasonable proxy for profitability tomorrow. But given the magnitude and the speed at which the sustainability transition must take place, once it begins great uncertainty will emerge about future prices, the shape of future supply chains, the nature of tomorrow's market demand, and hence tomorrow's profitability landscape. In such a context, there simply is no objective way to evaluate future profitability. Profits today become a poor proxy for profits tomorrow. *Expectations* rather than current profitability start to drive asset valuations, creating ample space for herd behaviour, self-fulfilling prophecies, and the possibility of investments being attracted into rather dubious schemes[44]. In a low uncertainty context, the financial details of hare-brained or fraudulent schemes would be transparently implausible, and so a diligent investor could easily screen them out. In a high uncertainty context, however, this kind of screening is difficult: when entire industries, such as coal mining, may disappear within a decade or two, new ones, like mega-scale battery production, rise within a few years, or hundreds of firms change their behaviour all at once, switching to home office (and back?) over night, all sorts of projections may become credible. Moreover, even if an individual analyst or investment firm correctly identifies an investment as fraudulent, as long as a sufficient number of *other* investors believe it to be profitable, the price of this asset may rise for a long time, making it a financially attractive investment all the same.

Externality pricing (i.e. sustainability accounting) does not address this problem. If anything, it may even exacerbate it: by introducing major relative price changes into a complex system of interlocking global markets and value chains, whose reactions to these price movements is difficult, perhaps impossible, to predict, it increases uncertainty, at least in the short run.

There is no guarantee, then, that ambitious sustainability accounting will drive up the stock prices or asset valuations of 'good' investments, i.e. of truly sustainable firms, and drive down the prices of 'bad' investments, e.g. socially and economically unsustainable firms like WorldCom, Enron, Bear Sterns, Theranos or, most recently, Wirecard. In a context of high uncertainty, future expectations take over, current prices matter less for valuations, and the wrong firms can

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[44] See esp. the work of Robert Shiller and George Akerlof on this (Akerlof G.A., Shiller R.J., *Animal Spirits, op. cit.*; Akerlof G.A., Shiller R.J., *Phishing for Phools: The Economics of Manipulation and Deception*. Princeton, Princeton University Press, 2015); Shiller R.J., *Irrational Exuberance*, 3rd ed., Princeton, N.J., Princeton University Press, 2016; Shiller R.J., *Narrative Economics: How Stories Go Viral and Drive Major Economic Events*, Princeton, Princeton University Press, 2019.

easily appear as great investments. When the future is uncertain, the coordination mechanism on which sustainability accounting relies becomes epistemologically unreliable.

Second, in addition to the epistemological problem, sustainability accounting suffers from a problem of effectiveness. Put simply, uncertainty kills investment[45]. Consider the following linkages:

- Moving to a fully renewable electricity supply necessitates large R&D- and infrastructure investments in energy storage. But those investments only make sense if electricity production will rely on intermittent renewables. A (re-) commitment to stable nuclear power may render much of it wasted. Conversely, if electricity storage is mastered, investments in the next generation of nuclear power may become worthless.
- Developing carbon capture and storage (CCS) technologies to the point where they become cost-competitive—an expensive and uncertain undertaking—would allow steel and chemical production to decarbonise while continuing to rely on combustion processes. But CCS investments may be wasted if other large-scale investments make green hydrogen available as a GHG-free combustion fuel at scale.
- Whether certain materials (e.g. steel, aluminium, or copper) can sustainably be used in manufacturing will depend on whether there is a reuse, repair, and recycling infrastructure in place for them. But building such an infrastructure only makes sense if these materials will indeed continue to be used at scale, instead of being replaced by more organic or alternative materials.

From the perspective of an individual investor, these inter-linkages make it difficult to evaluate whether or not to invest in energy storage or nuclear power, hydrogen or CCS, a recycling infrastructure for steel or the development of alternative materials. It would be reasonable, in response, to hold funds in liquid assets for the time being, e.g. government bonds or ETFs, and to wait and see what happens. The higher the uncertainty, the larger the temptation to remain invested in liquid, low-risk assets, and to eschew long-term, high-risk investment in real assets or technologies.

But what if *many, even most*, investors do this? Even if, under the influence of

[45] Robinson J., *The Accumulation of Capital, op. cit.*; Robinson J., *Essays in the Theory of Economic Growth*, *op. cit.*

sustainability accounting, the 'right' firms are then profitable today, they might not receive large investments[46]. As a result, the uncertainty continues, since no (or few) bets are placed in any of these areas, the existing industrial and economic structure remains in place, and the transition fails to pick up pace. This is the problem of effectiveness: in a context of high uncertainty, profit-oriented investors may flee to liquidity and safety, depriving riskier but potentially productive investments of funding. Here, too, externality pricing does little to address the issue.

Where the identification of sustainable investments is left to the combination of sustainability accounting and decentralised, profit-oriented investing, the likely result is hence the following pattern. Faced with high uncertainty, investors prefer to trade existing assets and to buy liquid, low-risk financial products; depending on expectations, narratives, and crowd dynamics, periodically a bubble may emerge around a particular company, technology, or sector. These bubbles can be effective mechanisms for building out systemic infrastructure[47]; but they can also be a tremendous waste of capital, with little to show for after the fact[48]. Importantly, the direction and unfolding of bubbles is only weakly influenced by contemporary product market prices—the variable that sustainability account approaches influence most directly—instead following the whims of expectations, narratives and other, difficult-to-predict, dynamics. In the context of climate change, this is not good enough: infrequent and sentiment-driven waves of large-scale investment[49] will not suffice to master the transition.

Once again, these reflections are not purely theoretical. Discontinuity, and hence high levels of uncertainty, are just as visible in the *deterioration* of an econo-

[46] A lot of Keynes' *General Theory* boils down to exploring the macroeconomic consequences of precisely this scenario.

[47] Examples include the construction of railways in the 19th century, with multiple railway manias resulting in the rapid construction of extensive networks in Britain (1840s) and the US (1880s), or more recently the dot-com bubble, which greatly boosted the construction of internet infrastructure particularly in the US.

[48] Examples of this type of bubble include the South Sea Bubble of 1720, the Japanese real estate bubble of the 1980s, and the US subprime mortgage crisis at the heart of the Great Financial Crisis of 2007-2008.

[49] Tesla's share price, valuing the firm at around 7 to 8 times the value of Volkswagen, or 17 times the value of Ford, is an example of this. At the time of writing (December 2020), Tesla's market capitalisation was around 590 billion dollars, VW's ca. 80 billion, Ford's 35 billion. As of now, it is unclear if this is a case of a 'productive bubble', building out useful infrastructure and production technologies, or one in which a great volume of capital is wasted.

mic, environmental, or social system[50], as they are in positive transformations like the industrial revolution or the sustainability transition[51]. One clear, real-world example of the insufficiency of the price mechanism in the context of high uncertainty is the restructuring of Eastern Europe and the former USSR after 1990/1991. Whereas the Chinese government carefully managed the transition from central planning to market economy[52], and thereby avoided major drops in prosperity and productivity along the way, Eastern Europe and the former USSR opted for "shock therapy", with negative results for productivity, health, inequality, regional development, and other variables.

Summing up, the fundamental problem of accounting-based approaches for identifying sustainable investments is that, while useful as a method for guiding incremental change in a context of low uncertainty, it fails as a guide for rapid, discontinuous change. Faced with a world in which entire sectors can disappear, new ones emerge just as quickly, firms rapidly reconfigure value chains, and markets turn upside down, it runs into problems of both epistemology and effectiveness.

Epistemologically, the relative prices that sustainability accounting acts upon can easily be overwhelmed, in a context of high uncertainty, by the effects of expectations, narratives, and herd behaviour. Sustainability accounting, speaking through the voices of expected profitability, may therefore fail (in investment markets more so than in product markets) to identify actually sustainable investments.

In terms of effectiveness, in a context of high uncertainty, and depending on their 'animal spirits', investors often prefer liquidity over risk. As a result, even profitable, 'good' ventures may fail to get funding, so that even where price signals do identify the right ventures as profitable, it is not assured that these will receive large investment inflows. Since discontinuous change is precisely what is needed—time is of the essence, and the road to sustainability long—and since this is the context in which these problems are most likely to occur, we cannot rely solely on sustainability accounting to achieve the necessary transition.

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[50] Diamond J., *Collapse: How Societies Choose to Fail or Succeed*, New York, Viking, 2011.

[51] This was touched upon above, in relation to the pricing and quantification difficulties inherent in accounting approaches, but it bears repeating here: relying on Hayekian decentralised coordination, even when modified by sustainability accounting, assumes that choices are by and large reversible, so that gradual change in the wrong direction could be corrected via gradual change back in the opposite direction.

[52] Weber I., *How China Escaped Shock Therapy: The Market Reform Debate*, Milton Park (Oxfordshire), Routledge, 2021.

CHAPTER 6

FROM SYSTEMS TO INVESTMENTS (C): A TAXONOMY OF SUSTAINABLE INVESTMENTS

As the previous chapter showed, sustainability accounting struggles under conditions of uncertainty. Both epistemologically and in terms of effectiveness, it is far from guaranteed to deliver the goods. When it comes to identifying sustainable investments, a government would hence be negligent if it legislated sustainability accounting standards and taxes and then left the rest up to market interplay.

What does this mean for an investor like the SFPI? If it cannot count on using profitability, even if modified by sustainability accounting, as the measure of sustainability, and if macro-frameworks like the SDGs cannot provide investment-level answers either, on what grounds can investment choices be made?

SFPI could of course develop its own method of assessing the sustainability of different investments, drawing on market prices, sustainability accounting and shadow prices, and any other inputs that it might consider relevant, such as the internal governance structures of possible investment targets. However, if this method is only adopted by the SFPI, it might lead to investment losses, as a critical mass of other investors could reach different judgements concerning which firms and assets are worth investing into. Even in the unlikely case where this methodology is later widely adopted by other investors, so that losses from contrarian trades become less likely, such an approach is no more likely to move the Belgian economy towards sustainable development than the sustainability accounting approach would be: neither the epistemological problem, nor the problem of effectiveness identified in the previous section would be solved.

To see what might be a promising way forward, consider another analogy. Sustainability accounting, as well as the use of other, bottom-up, decentralised

methods for identifying the sustainability of individual investments, is structurally analogous to banking regulation prior to 2008. Prior to the Great Financial Crisis, regulators took individual bank balance sheets and applied regulatory criteria, but refrained from considering systemic interaction or the state of the financial system as a whole. Both investment decisions *and* the informational assessment of what constitutes appropriate and inappropriate risk-taking and other behaviour were largely left up to individual firms. When the crisis hit in 2007-8, it was only swift action by governments and central banks that prevented a collapse of the financial system[1]. After 2008, banking regulation moved towards **macroprudential regulation**, which deliberately takes a systemic perspective, including judgements on what risks are appropriate both for the sector as a whole and for individual banks. While investment decisions are still left, by and large, to individual investors, the assessment of what constitutes appropriate and inappropriate risk-taking and other behaviour has now been centralised to a far greater degree, and its orientation has changed from an "analysing one bank at a time" approach to a "considering the system as a whole" approach.

To identify truly sustainable investment, **the environmental and social equivalent of macroprudential regulation** may thus be a promising way forward: a systematic approach that looks at the economy as a whole, and on this basis develops criteria for what counts as sustainable or not. Such an approach, by giving a centralised verdict on the kinds of economic activities that count as sustainable, would greatly reduce uncertainty. While centralised sustainability verdicts may of course also be mistaken, epistemologically speaking (this will be explored further below), and while their effectiveness at mobilising investments is not guaranteed (hence the crucial role of public investment, also explored below), they would provide a coordination device, helping to address the uncertainty that was identified as a central problem above.

What would such an approach look like in practice? Perhaps the clearest and simplest example is the EU taxonomy of sustainable economic activities[2]. This taxonomy, currently being finalised by the European Commission, is a list that specifies for each major kind of economic activity which criteria the activity must

[1] Tooze A., *Crashed: How a Decade of Financial Crises Changed the World*, New York, Viking, 2018.

[2] EU Technical Expert Group on Sustainable Finance, "Taxonomy: Final report of the Technical Expert Group on Sustainable Finance", Brussels, 2020.

meet to be considered sustainable[3].

While the taxonomy has obvious flaws as it stands[4], what matters for this report is its logical structure, and the extent to which it can overcome the pro-

[3] For example, in the draft taxonomy, the activity of generating electricity is considered to be sustainable if it emits less than 100g CO_2e / kWh, and meets five "Do No Significant Harm" criteria (EU Technical Expert Group on Sustainable Finance, "Taxonomy Report: Technical Annex", *op. cit.*, p. 205). For the activity of constructing new buildings, the criterion is a primary energy demand at least 20% lower than the level mandated by national regulation (*Idem*, p. 369). This criterion will be tightened over time "with the aim of setting the whole sector on convergence towards net-zero energy and carbon targets by 2030" (*Ibidem*). Similar tightening intentions are signalled for the taxonomy as a whole (EU Technical Expert Group on Sustainable Finance, "Taxonomy: Final report of the Technical Expert Group on Sustainable Finance", *op. cit.*, p. 54).

[4] As it stands, the most obvious flaws are: all economic activity could be taxonomy-conforming, and yet system-level sustainability indicators could still be in the red. This is possible because "transitional activities" can be taxonomy-conforming as long as "there is no technologically and economically feasible low-carbon alternative", and as long as their "greenhouse gas emission levels … correspond to the best performance in the sector or industry" (European Union, *Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088*, 2020, Article 10.2 and 10.2.a). For example, best-in-class cement plants could thus be taxonomy-compliant, even though their *absolute* emissions may still be far in excess of what would be consistent with a 1.5 °C warming trajectory.
Further, there are certain activities for which criteria are weak, or not yet drawn up at all. For example, for agriculture "[t]he lack of deep GHG reporting datasets from which to establish best performance benchmarks, coupled with the lack of emissions budgets or sequestration targets … at either the EU or global level, meant it was not possible to set robust absolute GHG thresholds" (EU Technical Expert Group on Sustainable Finance, "Taxonomy Report: Technical Annex", *op. cit.*, p. 103). Maritime shipping and aviation are still missing and "The TEG [technical expert group] acknowledges that many manufacturing activities are still not currently covered in the Taxonomy, and this must be addressed." (*Idem*, p. 155).
In addition, the taxonomy does not distinguish between activities that merely fail to advance sustainability, i.e. are broadly neutral, and activities that do serious harm. From a macroprudential perspective, it would be highly desirable to have a "dirty" category, so as to accelerate a timely exit from activities that impose systemic risks on ecosystems, the climate, or other components of sustainability.
However, these flaws are not inherent in the structure of the taxonomy: Article 10.2 could be removed and the criteria can be tightened. And indeed, the taxonomy regulation itself mandates regular updates, suggesting that tightening will happen over time: Article 19.5 states that "To ensure that economic activities as referred to in Article 10(2) [i.e. "transitional activities"] remain on a credible transition pathway consistent with a climate-neutral economy, the Commission shall review the technical screening criteria for those activities at least every three years." Articles 26 requires the Commission to publish a report (by 31.12.2021) that lays out criteria for identifying environmentally-neutral activities and activities that significantly harm environmental sustainability—in other words, draft "grey" and "dirty" taxonomies.

blems identified with the other approaches covered above.

Compared to sustainability accounting, it changes the terms of the conversation: the former is bound to focus on decentralised quantification and pricing. The latter allows discussion to start from a systemic perspective, deliberately and systemically considering the economy as a whole and then working backwards toward criteria for individual activities[5]. Crucially, it provides an output that gives clear judgements on the sustainability (or not) of individual firms, *independently of market sentiment or future expectations*. This prevents the destabilising and self-reinforcing dynamics that occur with sustainability accounting (or other decentralised sustainability assessments) under conditions of uncertainty, where a company like Tesla may suddenly appear like a highly profitable investment (and hence, under the epistemological lens of sustainability accounting, like a sustainable investment).

For investors, both public ones, like the SFPI, and private ones, this radically simplifies the process for identifying sustainable investments: all that is needed to identify an investment as sustainable is to compare the investment in question to the applicable screening criteria. Indeed, since large firms will be required to report the percentage of their turnover, operating expenditure, and capital expenditure associated with economic activities that qualify as environmentally sustainable[6], an investor can in future read off at a granular level how taxonomy-compliant its major portfolio positions are. For smaller firms exempt from this reporting requirement, ESG data providers like MSCI, Sustainalytics, or ISS will no doubt offer taxonomy verification, so that investors can easily acquire taxonomy-compliance information when choosing between different investment options.

This is a promising avenue to reduce uncertainty. But does it suffice, on its own, to solve the epistemological and the effectiveness problems identified above? Not necessarily. Like the other approaches analysed above, a taxonomy approach suffers from the difficulty of identifying counterfactuals. Take a technology that, if implemented, reduces emissions in the steel industry by 20%. The actual impact of the technology depends on what would have happened, had it *not* been developed and implemented. If emissions would have fallen by 10% anyway,

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[5] Indeed, the Technical Expert Group that elaborated the draft taxonomy has explicitly highlighted the need for such a systemic perspective, pointing out "An economic activity cannot truly be considered sustainable independently from the wider system in which it operates." (EU Technical Expert Group on Sustainable Finance, "Taxonomy Technical Report", Brussels, 2019, p. 24).

[6] Article 8, European Union, *Regulation (EU) 2020/852*, *op. cit.*

for example because higher steel prices would have reduced demand, then the impact was only a 10% reduction, not the observed 20%. Since it is impossible to run experiments at the macroeconomic scale, assessments of the system-level results of major investments will always be more or less educated guesswork.

Moreover, the future development of key technologies cannot be known with certainty, nor can future world market prices for key materials be predicted with accuracy. Even the systematic study of observed changes, e.g. past emission reductions from investments in renewable energy, would not allow for the construction of a 100% reliable taxonomy. To identify the actual impact of an investment a counterfactual is always required. What *would have happened* in the absence of the investment whose impact is being estimated? It is only in comparison to that scenario that impact can be deduced from observed results[7].

Nevertheless, a taxonomy has a significant advantage over decentralised approaches, including sustainability accounting: it can accelerate the social learning process. In particular, it can identify promising avenues for systemic transformation—e.g. the combination of electrifying all energy use and switching electricity production to 100% renewables[8]—and then trigger a systematic investment drive to move in this direction. While this may not be the optimal investment pattern straight away, through an inclusive, democratic process of social learning and through fast iteration, this can generate robust knowledge at the system-level, accelerating the learning process and thereby speeding up the transition.

Concerning iteration, it is important to realise, however, that a taxonomy approach produces relatively little information about the actual sustainability performance of an economy or an investment. The only numbers that policy makers can easily read off from a taxonomy information infrastructure are the financial volumes in compliance with it. Since the criteria for compliance often consist of thresholds and are extremely diverse between different sectors, this information is of limited use: for policy makers, it carries little to no information about actual

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[7] Counterfactuals can be extrapolated from the past, as is dominant practice, of course. But this relies on the assumption that everything else remains more or less constant (Udo de Haes H., "How to approach land use in LCIA or, how to avoid the Cinderella effect? Comments on key elements in a framework for land use impact assessment within LCA1", *International Journal of Life Cycle Assessment* 11, n° 4, 2006, p. 220), i.e. it serves to identify the impact of a process, product, or investment embedded in an otherwise unchanging system. Given that sustainable investment is all about *transitioning* our economies from one state to another, the conclusion is clear: for want of counterfactuals, it is impossible to predict the sustainability impacts of individual investments in the context of a changing economy.

[8] Griffith S., Calisch S., Fraser L., *Rewiring America*, *op. cit*.

emissions, land use, species loss, waste and recycling volumes, and so on. Equally, for firms and investors, it does little to reveal what goes on in supply chains or portfolios: portfolio companies and upstream and downstream activities can be classified as "sustainable or not", but what precisely this means in terms of behaviour, emissions, land use, labour practices, and so on will not be clear.

In other words, a taxonomy is primarily a *steering tool* that, unlike sustainability accounting, reduces uncertainty and allows systemic considerations to be considered. By taking in diverse inputs and translating them into a simple list of criteria, it is well suited for translating between complex, system-level analysis and individual investors' choices. It is not, however, a useful ex-post *measurement* or verification tool. This implies significant complementarities between a taxonomy, which operates as a steering tool, and macro-frameworks like the SDGs or the Planetary Boundaries framework, which track the outcomes that this steering produces, and thereby provide vital input for the iteration of a taxonomy.

Finally, turning to the question of effectiveness, while a taxonomy will reduce uncertainty, and hence may mobilise more investment than sustainability accounting would on its own, it will not necessarily move funds into all projects that are desirable for the sustainability transition to go ahead. Put simply, projects that count as sustainable but whose financial outcomes are highly uncertain will not receive much private investment. As Mariana Mazzucato has shown, risk-taking capacity is highest in the *public*, not the private sector[9]. The pursuit of challenging missions, like the sustainability transition, thus requires an ambitious, confident public investment policy[10]. It is here that a body like the SFPI comes into play: by being able to take a longer view than most private investors, it can shoulder certain risks that would otherwise not be taken on by anyone.

Of course, a distinction still needs to be made between investments that are predictably loss-making, from a narrowly financial point of view, like investments in basic R&D or certain kinds of social investments, and investments that are risky but hold the potential of producing a future stream of profits. The former should be funded from the government budget, the latter are appropriately taken on by a public fund like the SFPI.

Summing up, a taxonomy can be an effective steering tool to reduce uncertainty in the sustainability transition. It does not, of its own, fully solve the epis-

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[9] Mazzucato, M., *The Entrepreneurial State: Debunking Public vs Private Sector Myths*, London, Anthem Press, 2013.

[10] Mazzucato, M., *Mission Economy: A Moonshot Guide to Changing Capitalism*, London, Penguin, 2021.

temological or the effectiveness problem identified above: to address the former, frequent iteration and the regular input of a wide variety of stakeholders is required; to address the latter, targeted public investment is needed.

In both cases, however, a taxonomy is useful. Concerning public investment, a taxonomy is useful to make sure that it does not proceed haphazardly. Both the actual list that constitutes the core of a taxonomy, and the process of drawing it up encourage systematic thinking and prioritization, thereby helping to identify the particular investments that would most profit from public investment (because they would not proceed otherwise), and those that are most effective in advancing the sustainability transition (because they deliver large environmental or social gains, and/or have beneficial spill-over effects on other sectors). Concerning iteration and the collection of input from a wide variety of stake-holders, a taxonomy provides a clear focal point around which an iterative, inclusive process can be structured. It renders discussion more concrete—should this activity be included or excluded, or what should the specific threshold be for inclusion?—and thereby facilitates transparency and accountability.

Concerning the role of the SFPI relative to a taxonomy, at least two possibilities emerge. First, the SFPI could contribute its expertise to the process of drawing up and then iterating a sustainability taxonomy for Belgium. This could be based on the European taxonomy, modified and adapted for the Belgian context. Second, it could readjust its portfolio to be taxonomy-compliant, thereby both signalling to other investors that such a readjustment is possible (as well as perhaps learning lessons about such a readjustment that could then be shared with other investors), and moving capital towards activities that have been identified as parts of a sustainable future for Belgium.

CONCLUSION
A framework for policy-makers and investors

Having discussed the advantages and disadvantages of three approaches—macro-frameworks, sustainability accounting, and planning—what, then, is the best method for moving from a general definition of sustainability to the identification of particular sustainable investments?

The preceding discussion has shown: none of the three methodologies is perfect on its own. A taxonomy is a useful steering tool for policy makers that allows systemic planning considerations to be translated into easy-to-use, investment-level criteria. However, it does not and cannot offer a perfect solution to the epistemological problem: hampered, like all of the approaches analysed here, by the inability to observe counterfactuals, it requires constant iteration in order to correct for misjudgements and unexpected outcomes. This is where macro-tracking frameworks, like the SDGs or the Planetary Boundaries framework, come in. As verification- rather than steering-tools, these reveal whether the system as a whole is becoming more sustainable or not over time, whether investment choices in aggregate are moving in the right direction or not, and thereby allow the evaluation and iteration of a guiding taxonomy.

Moreover, a taxonomy, taken by itself, does not resolve the effectiveness problem either: merely identifying certain investments as sustainable will not necessarily make them profitable, even if it reduces uncertainty about the future development of the economy. Public investment will be one answer to this challenge, taking on certain risks that the private sector is not equipped or willing to handle; but another part of the answer must lie in sustainability accounting frameworks. By translating externalities into quantified and priced accounting entries, these shift relative prices so as to make sustainable activities profitable, unsustainable activities unprofitable. In combination with a taxonomy, this will guide the decentralised, private, profit-oriented portion of investment in the direction of sustainable development.

Instead of prioritising one of the three, a combination of all three approaches thus appears most promising: a taxonomy, offering a guide to systemic change and thereby reducing uncertainty as well as helping to steer public investment; sustainability accounting, to enable precision steering and the price-guidance of private investments; and macro-frameworks for system-monitoring, verifying the sustainability status of the economy as a whole, and hence guiding iterations and revisions of the overall policy framework.

Of course, three approaches may look more complicated than focusing on just one. But the groundwork is already laid for all three. With the SDGs and the Planetary Boundary framework, suitable macro-frameworks are already designed, and the information infrastructure required to implement them is by and large already in place (e.g. the UNFCCC Greenhouse Gas Inventory and Eurostat's SDG Indicator Set). Concerning a taxonomy approach, the EU is currently finalising the climate change parts of its taxonomy[1], and will add the remaining environmental dimensions over the course of 2021. Moreover, a permanent expert group, the "Platform on Sustainable Finance", is being convened to facilitate updating and revising the taxonomy over time, representing the seed of iterated planning for the sustainability transition. Concerning environmental accounting, lastly, a plethora of approaches are currently being piloted, and much of the ESG data collection infrastructure that has already been put in place by the private sector will be useful for firm-level sustainability accounting once a dominant accounting framework has emerged. All three of these provide blueprints or exemplars on which a Belgian triple framework could be based.

Regarding implementation synergies, to assess compliance with taxonomy criteria, much of the same information is needed that mandatory sustainability accounting would force firms to collect anyway: e.g. emissions per kWh, energy use of a new building, or the land and water use required in agricultural production. Once the taxonomy is extended to include social criteria, wage structures, gender ratios, labour disputes, and other similar data may be required as data inputs for both. Further, by having two measurement infrastructures, a bottom-up one for sustainability accounting and a top-down for the SDGs and the Planetary Boundaries, data can be cross-checked and its quality improved. Finally, to account for inevitable shortcomings, the policy set-up as a whole must in any case be evaluated and revised every few years. This in turn is best done in light of how the macro-indicators evolve.

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[1] A draft text was presented for public consultation on 20th November 2020. The consultation period closed on 18th December 2020, but as of 4th January 2021, no final text had been published yet.

Each of the three components thus adds something essential which the other two could not deliver on their own. Profitability and sustainability can be brought in line through sustainability accounting; systemic change can be guided through a more centralised epistemology, like the EU taxonomy; and the aggregate impact of all investment decisions (and the policy framework that guides them) can be verified through macro-frameworks, like the SDGs or the Planetary Boundaries.

SPECULATIONS ON IMPLEMENTATION

This description remained at an abstract level, in order to give a systemic overview. But what would such a triple framework approach look like in practice? And what would be the role of the SFPI in it? Evidently, the design and implementation of a sustainable finance framework, with which to guide investment so as to achieve the sustainability transition, will be a highly political question. Since the transition will involve deep, structural changes, producing both winners and losers, the interests of many firms, workers, households, and levels of governments will be touched, and not just peripherally. Each firm, workforce, agency—every person—will have views of their own on what an effective transition would look like, and what a just transition should look like; these views will partially overlap, but partially clash, so that careful negotiations will be necessary to achieve a framework with wide majority support. Needless to say, then, that my remarks on the practical implementation of the theoretical framework just laid out are highly speculative; they should be taken as a proposal for discussion.

Given the high stakes and the likely amount of disagreement, perhaps the most important implementation aspect is the overall process through which the framework is drawn up, legislated, and implemented. Once a taxonomy, a system of sustainability accounting (and taxation), and a macro-indicator framework have been agreed upon and legislated, their impacts on investment patterns will be profound. Of course, in order for the transition to be *environmentally* sustainable, definitions must be strict enough, taxes (and subsidies) high enough, indicators accurate enough; in this regard, it is primarily the *outcome* of the process that matters, i.e. the actual taxonomy agreed upon, the taxes legislated, etc. From the perspective of *social* sustainability, however, it is the *process* that matters the most. As I argued above, the best understanding of social sustainability focuses on trust and legitimacy[2]. Whatever supports trust and legitimacy counts as socially

[2] Catalogues of rights and obligations, in particular, should be seen as means to the preservation of this trust, not as the definition of social sustainability itself.

sustainable; whatever undermines them, does not. This implies, for example, that a technocratic process for drawing up a Belgian taxonomy, a system of sustainability accounting, and a macro-indicator framework would be radically insufficient. Even if it issues in the 'right' legislative outcomes, such a process is likely to produce mistrust among those adversely affected by it, since they had no or little input into it. A relevant example is the legislative process that issued in the French fuel tax- and other policies that sparked the *Gilets jaunes* protests of 2018. Conversely, an example of an inclusive, transparent, and democratic process might be the *Convention citoyenne pour le climat* held in 2019-20.

Drawing on this example, one promising process for drawing up a Belgian sustainable finance framework would be to convoke a citizens' assembly on the French model[3]. This assembly could be randomly selected, with quotas ensuring an even representation of women and men, French-, Flemish-, and German-speakers, and ethnic and religious minorities. It could receive counsel from a staff of scientific advisors, as well as receive input from representatives of important social interest groups, particularly from trade unions and employers, but also from major civil society organisations. Its proposals could then be put to a referendum, either as a package or individually, or be submitted to parliament. In this process, one of the key roles of the SFPI could be to provide expertise and advice to the citizens' assembly, informing its members about the practical aspects of managing an investment portfolio.

Besides drawing up this framework, a process must also be found for iterating it over time. As discussed above, it is almost certain that initial versions of the taxonomy, the sustainability accounting framework, and the macro-indicators will be imperfect. Here, too, a process built around inclusive, open, randomly selected assemblies could be imagined, with new assemblies convened periodically. These could then initiate revisions, either on the basis of internally generated ideas, or on the basis of proposals and complaints being put forward by trade unions, employers, the federal or regional governments, or carefully selected civil society groups. As with the initial framework, these revisions could then either be adopted or rejected by referendum, or via the ordinary legislative process in parliament.

Given that the Belgian economy is highly integrated into European and global value chains, and that the sustainability transition will inevitably affect Belgium's competitive position in these structures, the Belgian government may wish to

[3] For extended reflections on the meaning and operationalisation of open, inclusive democracy, see LANDEMORE H., *Open Democracy: Reinventing Popular Rule for the Twenty-First Century*, Princeton, Princeton University Press, 2020.

push for parallel initial and iterative processes at the European level. This presents a number of political challenges, to put it lightly, but as with the Euro or Schengen, it may be possible to proceed with a subset of willing countries at first[4], in the hope that other member states will join later.

Finally, at the level of individual firms, too, the process and structures of governance through which firm-level transitions to sustainability are implemented matter. Where workers enjoy a collective voice via a significant say in the government of firms (e.g. along the principle of economic bicameralism, see footnote 18 on page 32), they can trust that major (firm-level) restructurings do in fact serve the sustainability transition, and are not used as cover to extract additional surplus value from them. This will increase the legitimacy of the necessary changes, and will help preserve trust and cooperation through what will no doubt be a challenging transition for many firms. Specific examples of inclusive, trust-building decision-making can be found in the cooperative structure of firms like Mondragon or, albeit in a weaker form, in the German system of co-determination[5]. In both cases, involving workers in firm-level decisions allows for profound restructuring without losing the trust of workers, which in turn preserves workforce commitment and productivity and boosts the chances of success throughout the transition. There is hence a strong case, when it comes to specifying which firms count as sustainable in the taxonomy, to prioritise or to give "extra points" to firms with democratic corporate governance. To accelerate progress in this area, the SFPI could pioneer this principle by conditioning all or a part of its investment on the adoption of democratic corporate governance structures.

Second, besides the process through which a sustainable finance triple framework is drawn up and implemented—crucial for its social sustainability—its *substance* is key: What activities are actually identified as sustainable by the taxonomy? Which externalities are taxed, which ones subsidised? Which indicators are tracked? Here, existing frameworks and past work provide much guidance already. The SDG indicator set is an excellent blueprint on which a Belgian or European macro-indicator framework could be based, and the EU taxonomy can fulfil the same role for a Belgian taxonomy. An important shortfall of the EU taxonomy—its lack of a "dirty list" of unsustainable activities, such as coal mining or fracking—could be remedied at the Belgian level, in the hope of prompting a

[4] A citizens' convention with the backing from the Nordics, France, Germany, Spain, Italy and BeNeLux, for example, could exercise decisive influence in all-EU deliberations.

[5] Landemore H., « Démocratiser l'entreprise », in Ferreras I., Battilana J., Méda D., *Le Manifeste Travail : Démocratiser, Démarchandiser, Dépolluer*, Paris, Seuil, 2020, p. 73-74.

future extension of the European taxonomy in this direction. Concerning sustainability accounting systems, here too a plethora of proposals exist (see p. 47 above), which could then be adopted for Belgian use via agreeing on tax and subsidy rates for the various accounting entries of importance.

An overall picture emerges: implementing a triple framework for sustainable finance in Belgium is less about drawing up new systems from scratch, and more about adapting and adopting ideas and blueprints already in circulation. To facilitate and guide this process of adapting and adopting, it will be useful to develop an overall strategy or vision for the Belgian economy's transition to sustainability. Such a plan should include visions for five key sectors—energy, housing, transport, industry, and food—charting realistic transition paths and goals. It should also identify areas where Belgium could become a leader and an exporter, as well as other areas where relying on trade partners and imports may be more advantageous. Examples of similar plans exist, for example for the US[6] or Germany[7], which could provide inspiration. Here, too, the SFPI could play a role: in collaboration with the *Bureau fédéral du plan*, the *Banque nationale de Belgique*, and the relevant federal and regional ministries, it could help to design and later iterate such a plan.

Third and finally, what about the financial sector in the context of implementing a sustainable finance framework along these lines? A variety of measures could be imagined: on the basis of a finalised taxonomy, investments in taxonomy-conforming activity could be provided with cheaper credit, for example by providing banks with cheap, long-term central bank refinancing for the relevant loans[8]. Equally, a penalising factor could be imposed on "dirty list"- or all non-taxonomy-conforming investments, requiring banks to hold more capital against them in order to reflect their higher risks. Where there is macroeconomic space, indicated by low inflation, low interest rates, and spare labour force capacity, this could be taken as an opportunity for debt- or monetarily-financed public sector investment. The former measures, being an element of monetary policy and banking regulation, would need to be undertaken at the European level. The latter, being an element of fiscal policy, could be undertaken at the national level, although central bank backing would be essential in order to keep interest rates on public debt low.

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6 Griffith S., Calisch S., Fraser L., *Rewiring America*, *op. cit*.

7 GermanZero, *Der 1,5-Grad-Klimaplan für Deutschland: Gemeinsamer Aufbruch gegen die Klimakrise*, *op. cit*.

8 Van 't Klooster J., Van Tilburg R., "Targeting a sustainable recovery with Green TLTROs", 2020.

In their sum, these measures and the political resolve that would be signalled by rolling out an ambitious sustainable finance framework would likely start to deflate the carbon bubble. Firms whose stock market valuation is based on unburnable oil, gas, or coal reserves would quickly devalue, other firms with stranded assets would do the same. At present, it is unclear how significant a problem this is: as of 2014-5, fossil fuel companies constituted around 7% of world stock market capitalization, or 2% of all financial assets[9]. Assuming that around 80% of their reserves may go unburnt, much of this value is likely illusory. Whether or not a price drop in fossil fuel shares and bonds will lead to a financial crisis, however, will depend primarily on two things: first, who the ultimate owners of these financial assets are, and two, how deeply integrated these financial assets are into wider financial markets. In an optimistic scenario, fossil shares and bonds turn out to be overwhelmingly and directly held by private, affluent households. In this case, little to no systemic risk emanates from them. A price drop would reduce the net wealth of the relevant households, which would reduce consumption, with a small reduction for very rich households (who generally consume but a small portion of their income and wealth), larger reductions for less wealthy households. Other than a minor macroeconomic stimulus, which could be delivered via increased green investment, no further action would be necessary to manage the deflation of the carbon bubble.

In a pessimistic scenario, fossil shares and bonds turn out to be owned by systemically important banks and insurers, other highly leveraged investors, or popular pension funds. Alternatively, they might form the basis of derivatives, asset-backed securities, extensive networks of swaps, or other forms of financial engineering. In such a scenario, a sudden price drop could lead to a cascading financial crisis similar to 2008: unsure who is directly or indirectly exposed to these assets, financial firms might curtail lending and transacting with each other. This could cause banks or other players to default or enter bankruptcy, i.e. become unable to meet contractual payment obligations, despite being solvent, i.e. owning assets that exceed their liabilities. In such a case, standing aside is not a realistic policy option. Instead, rescue operations would become necessary, in which large bailouts would be needed to stabilise the financial sector.

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[9] "Fossil fuel companies constitute about $5 trillion out of world stock market capitalization in excess of $70 trillion and total financial assets of roughly $300 trillion" (VAN DER PLOEG F., REZAI A., "Stranded Assets in the Transition to a Carbon-Free Economy", *Annual Review of Resource Economics* 12, 2020, p. 293).

While financial regulation has improved in the wake of 2008[10], and while fossil fuel assets tend to be too volatile to permit the same kind of leverage and financial engineering that could be based on mortgages (pre-2008; today, similar activity is largely based on government bonds), it may therefore be prudent to adjust financial regulation to protect the financial system as a whole against the 'popping' of the carbon bubble. Penalising factors on fossil fuel investments, as mentioned above, could require banks to hold more capital and more liquid assets against fossil fuel investments, to allow for major write-offs (when the bubble deflates) without rendering banks insolvent or illiquid. Equally, regulators could phase out the use of fossil fuel stocks and bonds as collateral for swaps or as underlying assets for derivatives or other structured financial products, to reduce linkages and hence spill-over effects from carbon stocks and bonds towards other parts of the financial sector.

Summing up, the implementation of the theoretical framework outlined above involves three main tasks:

1. Designing an inclusive, transparent and democratic process to hash out the details of a taxonomy, a system of sustainability accounting (and taxes and subsidies), and a macro-indicator framework. This process will be crucial for ensuring the social sustainability of the changes to come. Drawing on the French example, it could be based on randomly selected citizens' assemblies, with input from the major stakeholders affected by the transition.
2. The substance of a Belgian framework could be based on already existing examples: the EU taxonomy of sustainable economic activities, one of the various sustainability accounting proposals (see p. 47 above), and the SDGs. To make sure that their adaptation to the Belgian context proceeds systematically and rigorously, this should be guided by an overall vision for Belgium's sustainability transition, with inspiration provided by similar plans already developed for the American and German economies.
3. Financial regulation could be used both to speed up the redeployment of capital (through providing cheaper funding for taxonomy-conforming investments and through penalising non-conforming or dirty investments), and to cushion the likely deflation of the carbon bubble, through introducing higher capital- and liquidity requirements for fossil fuel assets, and through phasing out the use of fossil assets in derivatives and swaps.

[10] Tooze A., *Crashed: How a Decade of Financial Crises Changed the World*, *op. cit.*

THE ROLE OF INDIVIDUAL INVESTORS AND THE SFPI

This leaves a final question open: What precisely is the role of individual investors in all this, and particularly that of the SFPI?

Although this may be a somewhat deflationary conclusion, the general answer is: the role of individual investors, particularly private ones, is to continue investing profitably. To the extent that an investor wishes to contribute to the sustainability transition, they can restrict their investment universe to taxonomy-conforming investments. However, it is important to recall that identifying the sustainability impacts of individual investments is impossible. **In other words, individual investors cannot and will not be able reliably to distinguish between sustainable and unsustainable investments through bottom-up methodologies of their own[11].** Since sustainability impacts depend on what happens far away in supply chains; on how customers use the relevant product(s); on how the actions of one firm influence those of competitors and partners; on how all of this interacts with the complex ecosystems of nature and society; and what the no-investment counterfactual with regards to all of these would have been, it is not possible to separate sustainable from unsustainable investments through project-by-project analysis. Instead, the role of individual investors is to continue searching for profitable investments. It is the task of the state to ensure, via the introduction of a sustainable finance framework, such as the one outlined above, that the sum of all such investment decisions transitions the economy towards a sustainable future over time.

The role of the SFPI in all this may be a hybrid one: on the one hand, to contribute its experience in the process of drawing up a sustainable finance framework; on the other hand, and within a mission-oriented perspective that continues to value (long-term) profitability, to take on certain risks and prioritise certain investments, such as funding democratised firms, that private sector firms are likely to eschew. Within the latter task, however, it is important to recall: it is only in the context of an overall framework, an overall plan for the evolution of the Belgian economy, that a public investment strategy can be developed. Here, too, bottom-up analysis will not provide answers of its own.

The road between system- and investment-level sustainability, therefore, is a one-way street. Starting from system-level sustainability concerns, it is possible

[11] Other than identifying particular investments as taxonomy-conforming, of course, and screening out egregiously unsustainable investments such as coal mining, tar sands, or aggressive deforestation.

to develop a framework—inevitably imperfect and in need of iterative improvement—that gives investment-level guidance. It is impossible, in contrast, to start from individual investment projects and determine their system-level sustainability impacts. The trick, then, is to travel in the right direction.

BIBLIOGRAPHY

Ahluwalia M.B., "The business of price carbon", *Center for Climate and Energy Solutions*, 2017, p. 1-40. https://www.c2es.org/site/assets/uploads/2017/09/business-pricing-carbon.pdf.

Akerlof G.A., Shiller R.J., *Animal Spirits*. Princeton, Princeton University Press, 2009.

— *Phishing for Phools: The Economics of Manipulation and Deception*. Princeton, Princeton University Press, 2015.

Anderson E., *Private Government: How Employers Rule Our Lives (and Why We Don't Talk about It)*. Published by Stephen Macedo, Princeton, Princeton University Press, 2017.

Banaji J., *A Brief History of Commercial Capitalism*, Chicago, Haymarket Books, 2020.

Bartels L., *Unequal Democracy: The Political Economy of the New Gilded Age*, Princeton, N.J., Princeton University Press, 2008.

Bebbington J., Gray R., Hibbitt C., et al. *Full Cost Accounting: An Agenda for Action*, London, Certified Accountants Educational Trust, 2001.

Berg F., Kölbel J., Rigobon R., "Aggregate Confusion: The Divergence of ESG Ratings", *Working paper*, 2020. https://doi.org/10.2139/ssrn.3438533.

Blanchard O., "Public Debt and Low Interest Rates", in *American Economic Review* 109, n° 4, 2019, p. 1197-1229. http://www.nber.org/papers/w25621.pdf.

Blanchard O., Leigh D., "Forecast Errors and Fiscal Multipliers", in *American Economic Review* 103, n° 3, 2013, p. 117-20.

— "Learning about Fiscal Multipliers from Growth Forecast Errors", in *IMF Economic Review* 62, n° 2, 2014, p. 179-212. https://doi.org/10.1057/imfer.2014.17.

Bourdeau P., Moreau R., Zaccai E., *Le développement non durable*, Brussels, Académie royale de Belgique, 2018.

Brand F., "Critical natural capital revisited: Ecological resilience and sustainable development", in *Ecological Economics* 68, n°3, Elsevier, 2009, p. 605-612. https://doi.org/10.1016/j.ecolecon.2008.09.013.

Braun B., "American Asset Manager Capitalism", *Working paper*, 2020. https://osf.io/preprints/socarxiv/v6gue.

Caprettini B., Voth H.-J., "Rage against the Machines: Labor-Saving Technology and Unrest in Industrializing England", in *American Economic Review: Insights* 2, n° 3, 2021, p. 305-20. https://doi.org/10.1257/aeri.20190385.

Coleman J., *Foundations of Social Theory*, Cambridge, MA, Harvard University Press, 1990.

Diamond J., *Collapse: How Societies Choose to Fail or Succeed*, New York, Viking, 2011.

Elsässer L., Hense S., Schäfer A., "Government of the people, by the elite, for the rich: Unequal responsiveness in an unlikely case", *MPIfG Discussion Paper* 18, n° 5, 2018, p. 1-16.

Engie, "2020 Integrated Report", Paris, 2020. https://www.engie.com/sites/default/files/assets/documents/2020-04/RI-Engie2020-ENG-vdef_0.pdf.

EU Technical Expert Group on Sustainable Financ, "Taxonomy: Final report of the Technical Expert Group on Sustainable Finance", Brussels, 2020. https://ec.europa.eu/knowledge4policy/publication/sustainable-finance-teg-final-report-eu-taxonomy_en.

— "Taxonomy Report: Technical Annex", Brussels, 2020. https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf.

— "Taxonomy Technical Report", Brussels, 2019. https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-taxonomy_en.pdf.

European Environmental Agency, *Trends and projections in Europe 2019: Tracking progress towards Europe's climate and energy targets*, Luxembourg, Publications Office of the European Union, 2019. https://doi.org/10.2800/51114.

European Environmental Agency, Swiss Federal Office for the Environment, *Is Europe living within the limits of our planet? An assessment of Europe's environmental footprints in relation to planetary boundaries*, Luxembourg, Publications Office of the European Union, 2020. https://www.eea.europa.eu/publications/is-europe-living-within-the-planets-limits.

European Union, *Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088*, 2020. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2020:198:TOC.

Eurostat, *Sustainable Development in the European Union: Monitoring report on progress towards the SDGs in an EU context, 2020 edition*. *Greener Management International*, vol. 2001, Luxembourg, Publications Office of the European Union, 2020. https://doi.org/10.9774/gleaf.3062.2001.wi.00007.

FERN, "Briefing note 2: What is biodiversity offsetting and why is it problematic?", Brussels, 2014. https://www.fern.org/fileadmin/uploads/fern/Documents/Biodiversity2_EN.pdf.

— "Briefing note 3: Biodiversity offsetting in practice", Brussels, 2014. https://www.fern.org/fileadmin/uploads/fern/Documents/Biodiversity3_EN.pdf.

Ferreras I., *Firms as Political Entities: Saving Democracy through Economic Bicameralism*, Cambridge, Cambridge University Press, 2017.

GermanZero, *Der 1,5-Grad-Klimaplan für Deutschland: Gemeinsamer Aufbruch gegen die Klimakrise*, Berlin, 2020.

Gerschenkron A., *Economic Backwardness in Historical Perspective*, Cambridge, MA, Belknap Harvard University Press, 1962.

Gilens M., *Affluence and Influence*, Princeton, Princeton University Press, 2012.

Gilens M., Page B.I., "Testing Theories of American Politics: Elites, Interest Groups, and Average Citizens", *Perspectives on Politics* 12, n° 3, 2014, p. 564-81. http://www.journals.cambridge.org/abstract_S1537592714001595.

Government of Norway, "Management mandate for the Government Pension Fund Global", Oslo, 2019. https://www.regjeringen.no/contentassets/9d68c55c272c41e99f0bf45d24397d8c/gpfg_mandate_20122016.pdf.

Griffith S., Calisch S., Fraser L., *Rewiring America*, 2020. https://www.rewiringamerica.org/handbook.

Hache F., "50 Shades of Green Part II: The Fallacy of Environmental Markets", Brussels, 2019. https://doi.org/10.2139/ssrn.3547414.

Hacker J.S., Pierson P., *Winner-Take-All Politics: How Washington Made the Rich Richer-and Turned Its Back on the Middle Class*, New York, Simon and Schuster, 2010.

Hayek F.A, "The Use of Knowledge in Society", in *American Economic Review* 35, n° 4, 1945, p. 519-30.

Hirschman A.O., *Exit, Voice, and Loyalty*, Cambridge, MA, Harvard University Press, 1970.

Holling C.S., "Understanding the complexity of economic, ecological, and social systems", *Ecosystems* 4, n° 5, 2001, p. 390-405. https://doi.org/10.1007/s10021-001-0101-5.

Iberdrola, "Integrated Report 2020", Bilbao, 2020. https://www.iberdrola.com/wcorp/gc/prod/en_US/corporativos/docs/gsm20_IA_IntegratedReport20.pdf.

IEA, "Power carbon intensity in key regions in the Stated Policies Scenario, 2000-2040", *International Energy Agency*, 2020. https://www.iea.org/data-and-statistics/charts/power-carbon-intensity-in-key-regions-in-the-stated-policies-scenario-2000-2040.

IIRC, *The International <IR> Framework*, International Integrated Reporting Council, 2013. https://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf.

Judge L., Stansbury A., "Under the wage floor: Exploring firms' incentives to comply with the minimum wage", London, 2020. https://www.resolutionfoundation.org/app/uploads/2020/01/Under-the-wage-floor.pdf.

Kering S.A., "Environmental Profit & Loss 2019 Group Results", Paris, 2020. https://keringcorporate.dam.kering.com/m/788c4d5588730055/original/Kering-EP-L-report-2019-.pdf.

Keynes J.M., *The General Theory of Employment, Interest, and Money*, London, Macmillan, 1936.

Kocka J., *Capitalism: A Short History*, Princeton, Princeton University Press, 2016.

Lambin E.F., Thorlakson T., "Sustainability Standards: Interactions Between Private Actors, Civil Society, and Governments", *Annual Review of Environment and Resources* 43, n° 1, 2018, p. 369-93. https://doi.org/10.1146/annurev-environ-102017-025931.

Landemore H., « Démocratiser l'entreprise », in Ferreras I., Battilana J., Méda D., *Le Manifeste Travail : Démocratiser, Démarchandiser, Dépolluer*, Paris, Seuil, 2020, p. 67-77.

— *Open Democracy: Reinventing Popular Rule for the Twenty-First Century*, Princeton, Princeton University Press, 2020.

Landemore H., Ferreras I., "In defense of workplace democracy: Towards a justification of the firm–state analogy", *Political Theory* 44, n° 1, 2016, p. 53-81. https://doi.org/10.1177/0090591715600035.

Lenton T.M., Held H., Kriegler E., et al. "Tipping elements in the Earth's climate system", *Proceedings of the National Academy of Sciences of the United States of America*, National Academy of Sciences, 2008. https://doi.org/10.1073/pnas.0705414105.

Li F., Polychronopoulos A., "What a Difference an ESG Ratings Provider Makes!", Newport Beach, CA, 2020. https://doi.org/10.1016/S0016-5085(82)80303-X.

Madhusoodanan J., "A blizzard of "sustainability" labels", *Knowable Magazine*, 2019. https://doi.org/10.1146/knowable-050619-1.

Marx K., *Capital, Vol. 1: A Critique of Political Economy*, published by Ernest Mandel, translated by Ben Fowkes, London, Penguin, 1992.

Mazzucato M., *Mission Economy: A Moonshot Guide to Changing Capitalism*, London, Penguin, 2021

— *The Entrepreneurial State: Debunking Public vs Private Sector Myths*, London, Anthem Press, 2013

Meiksins Wood E., *The Origin of Capitalism: A Longer View*, London, Verso, 2002.

Minsky H., *Stabilizing an Unstable Economy*, New Haven, Yale University Press, 1986.

Moyn S, *Not Enough. Human Rights in an Unequal World*, Cambridge, MA, Harvard University Press, 2018.

NBIM, "Responsible Investment 2019", Oslo, 2020. https://www.nbim.no/en/publications/reports/2019/responsible-investment-2019/.

Philippin Y., « La justice enquête sur l'évasion fiscale massive de Kering », *Mediapart*, December 15th, 2020.

Philippon T., *The Great Reversal: How America Gave Up on Free Markets*, Cambridge, MA, Harvard University Press, 2019.

Piketty T., *Capital and Ideology*, translated by Arthur Goldhammer, Cambridge, Massachusetts, Harvard University Press, 2020.

Polanyi K., *The Great Transformation: The Political and Economic Origins of Our Time*, New York, Rinehart & Co., 1944.

Putnam R., *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton, Princeton University Press, 1993.

Radermacher W.J., Steurer A., "Do we need natural capital accounts for measuring the performance of societies towards sustainable development, and if so, which ones?", *Eurostat Review on National Accounts and Macroeconomic Indicators*, n° 1, 2015.

Raworth K., *Doughnut economics: seven ways to think like a 21st-century economist*, London, Random House, 2017.

Robinson J., *Essays in the Theory of Economic Growth*, London, Macmillan, 1962.

— *The Accumulation of Capital*, London, Macmillan, 1956.

Rodrik D., "New Firms for a New Era", *Project Syndicate*, 2020.

Rugani B., Caro D., "Impact of COVID-19 outbreak measures of lockdown on the Italian Carbon Footprint", *Science of the Total Environment* 737, 2020, p. 1-13. https://doi.org/10.1016/j.scitotenv.2020.139806.

Schneeweiss A., *Menschenrechte sind Investorenpflichten: Vorschlag für eine soziale Taxonomie des nachhaltigen Investierens*, Bonn, SÜDWIND e.V., 2020. https://suedwind-institut.de/files/Suedwind/Publikationen/2020/2020-12 Menschenrechte sind Investorenpflichten.pdf.

Schumpeter J.A., *Capitalism, Socialism, and Democracy*, New York, HarperCollins, 1942.

Science Based Targets, "Methods | Science Based Targets", 2020. https://sciencebasedtargets.org/methods/.

Scott J., *Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed*, New Haven, Yale University Press, 1999.

Shiller R.J., *Irrational Exuberance*, 3rd ed., Princeton, N.J., Princeton University Press, 2016.

— *Narrative Economics: How Stories Go Viral and Drive Major Economic Events*, Princeton, Princeton University Press, 2019.

Sovereign Wealth Fund Institute, "Top 91 Largest Sovereign Wealth Funds Ranking by Total Assets", 2020. https://www.swfinstitute.org/fund-rankings/sovereign-wealth-fund.

TEEB, "The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture & Food: Concept Note", 2014.

Temin P., "The Cambridge History of 'Capitalism'", *Journal of Economic Literature* 53, n° 4, 2015, p. 996-1016.

The Wall Street Journal, "WSJ Markets", December 21st, 2020.

Thomas A.L., *The Allocation Problem, Part Two*, Evanston, IL, American Accounting Association, 1974.

— *The Allocation Problem in Financial Accounting Theory*, Evanston, IL, American Accounting Association, 1969.

Thomas M., McElroy M.W., *The MultiCapital Scorecard: Rethinking Organisational Performance*, Chelsea, VT, Chelsea Green Publishing, 2016.

Thurm R., *Blueprint 1. A principles-based approach to reporting serving a green, inclusive & open economy*, Reporting 3.0, 2017.

Tong D., Zhang Q., Zheng Y., et al. "Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target", *Nature* 572, n° 7769, 2019, p. 373-77. https://doi.org/10.1038/s41586-019-1364-3.

Tooze A., *Crashed: How a Decade of Financial Crises Changed the World*, New York, Viking, 2018.

Tukker A., Bulavskaya T., Giljum S., et al. *The Global Resource Footprint of Nations. Carbon,*

water, land and materials embodied in trade and final consumption calculated with EXIOBASE 2.1, Leiden/Delft/Vienna/Trondheim, The Netherlands Organisation for Applied Scientific Research, 2014. http://www.researchgate.net/profile/Stefan_Giljum/publication/264080789_The_Global_Resource_Footprint_of_Nations._Carbon_water_land_and_materials_embodied_in_trade_and_final_consumption/links/02e7e53cd0969e6723000000.pdf.

Udo de Haes H., "How to approach land use in LCIA or, how to avoid the Cinderella effect? Comments on 'key elements in a framework for land use impact assessment within LCA1", *International Journal of Life Cycle Assessment* 11, n° 4, 2006, p. 219-21. https://doi.org/10.1065/lca2006.07.257.

Van 't Klooster J., Van Tilburg R., "Targeting a sustainable recovery with Green TLTROs", 2020. http://www.positivemoney.eu/wp-content/uploads/2020/09/Green-TLTROs.pdf.

van der Lugt C., *Blueprint 2: The Blueprint for New Accounting: Laying the foundations for Future-Ready Reporting*, Reporting 3.0, 2018.

van der Ploeg F., Rezai A., "Stranded Assets in the Transition to a Carbon-Free Economy", *Annual Review of Resource Economics* 12, 2020, p. 281-98. https://doi.org/10.1146/annurev-resource-110519-040938.

van Renssen S., "The inconvenient truth of failed climate policies", *Nature Climate Change* 8, n° 5, 2018, p. 355-58. https://doi.org/10.1038/s41558-018-0155-4.

Wackernagel M., Onisto L., Bello P., et al. "National natural capital accounting with the ecological footprint concept", *Ecological Economics* 29, n° 3, 1999, p. 375-90. https://doi.org/10.1016/S0921-8009(98)90063-5.

Weber I., *How China Escaped Shock Therapy: The Market Reform Debate*, Milton Park (Oxfordshire), Routledge, 2021

Wolff R.P., "The Future of Socialism, Part Three", The Philosopher's Stone, 2019. https://robertpaulwolff.blogspot.com/2019/04/the-future-of-socialism-part-three.html.

— "The Future of Socialism, Part Two", The Philosopher's Stone, 2019. https://robertpaulwolff.blogspot.com/2019/04/the-future-of-socialism-part-two.html.

World Commission on Environment and Development, *Our Common Future,* Oxford, Oxford University Press, 1987. https://doi.org/10.1017/CBO9781107415324.004.

Wuppertal Institut, *CO2-neutral bis 2035: Eckpunkte eines deutschen Beitrags zur Einhaltung der 1,5°C-Grenze*, Wuppertal, Bericht, 2020.

Zaccai E., *Deux degrés : Les sociétés face au changement climatique*, Paris, Presses de Sciences Po, 2019.