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Chapter 4

Substantiating the rough consensus on concept of sustainable development as point of departure for indicator development

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Abstract.

In this chapter I maintain that, despite the endless condemnations of the vagueness of the concept and definition of sustainable development (SD), in practice we can see a rough consensus on what it includes. Claims about vagueness are the result of the on-going, open and divergent discourses on what is needed for sustainable development. This divergence has its roots in the shared tendency to disagree within and between academic disciplines; in the political arena; and the competitive framings of the concept in the market arena. However, despite this noisy cacophony, we see, in a few globally oriented communities of practice (of voluntary standards, GRI, LCA, LCSA, some of the well-developed sustainable development indicators), a rough consensus on the core elements of the concept of sustainable development, which is also well in line with the UN Sustainable Development Goals (SDGs). Some sub-elements still need some refining, while some other key elements may still be further refined with additional sub-elements, but a core structure exists and is being widely worked with. In this chapter I bring together widely shared views in diverse academic and practitioners' communities, which by smart combining can help to create an integrated view. I will reflect on the commonalities, some persistent confusion and show routes for further refinement.

Key words:

Sustainable development, SDGs, LCA, sLCA, LCC, LCSA, VSS, indicators, logic models

1. Introduction

Indicators and indices are useful metrics to assess progress in achieving goals. This is also true for the field of sustainable development, where the goals are complex and may be difficult to explain. With a history of academic discourses of more than three decades, the concept of 'sustainable development' is often referred to as being vague, unspecified or intuitive (Christen and Schmidt, 2012; Cobbinah et al., 2015; Daly, 1990; Lele, 1991; Mebratu, 1998; Pope et al., 2004; Redclift, 2005; Robinson, 2004; White, 2013). Some scholars even argue that the concept should be set aside and replaced (Dernbach and Cheever, 2015; Viñuales, 2013, p. 3). However, the number of scientists applying the concept continues to grow rapidly, with 9000-12000 articles published annually during the last decade in Scopus registered journals.

Simultaneously, industries are developing sustainability solutions at a vast rate and voluntary initiatives, in collaborations between producers and civil society, are rapidly expanding in number, scope and global uptake. Meanwhile, in the multilateral policy arena, growing concerns about the still on-going degradation of eco-systems and persistent poverty and inequality have leveraged the political process of formulation and acceptance of the UN Sustainable Development Goals (SDGs) in September 2015 (General Assembly UN, 2015).

The continuous criticisms on the concept versus the dynamic practices are in sharp contrast. While scientists are endlessly discussing the details, practitioners seem to be finding their way in the forest of opinions, at least the most advanced initiatives amongst them.
As I argued elsewhere, making sense of the concept is especially essential for well-motivated executives in the economy, who may previously have been fairly inactive on the scene of sustainability, but are willing to jump on the bandwagon (Vermeulen and Witjes, 2016). For them the first challenge is to find their way through the cacophony of opinions. These range from - on one side - aspiring to a reticent position of just complying with regulatory requirements (which, in itself, is confusing due to contradictions and diversity in and between regulatory regimes in our >200 nations), with - in the centre - a wide variety of opinions available in the scientific, political and market arenas (Du Pisani, 2006; Robinson, 2004) to - on the other side - eco-fundamentalists in civil society and academics taking extreme positions, which might even almost exclude the mere existence of businesses and modern mankind from the picture of Gaia (Callicott, 2005; Lovelock, 2003).

The so-called problem of vagueness of the concept is not so much the problem of that concept itself, but rather a symptom of the dominant tendency in contemporary open societies to disagree. This results in on-going, open and divergent discourses on what is needed for sustainable development. This divergence partly has its roots in endless debates about the "correct" meaning of the concept of sustainable development in and between *academic disciplines*. It also is partly rooted in the same tendency to disagree in the *political arena.* And we also see this common practice of competing by means of different framings of the concept in the *market arena*. These *three processes of divergence* are mutually reinforcing, and do not help companies in making substantial steps in the right direction, especially the smaller ones.

How can one still help companies and others find their way? There is a way out of this; despite this noisy cacophony, discourses on the supranational level have resulted in a fairly well supported ***rough consensus*** on the core elements of the concept of sustainable development. Some sub-elements may still need some refining, some other key elements may still be further complemented by additional sub-elements, but a core structure exists and is widely being worked with.
Pragmatic choices are needed. What is the contribution to be made; continue endlessly impeaching the concept, or work with the well-supported rough consensus and have it further fine-tuned by exposing it to communities of practice?

For the last purpose, I have had good experiences in presenting the concept of sustainable development in the context of discourses on vision and strategy development as a Rubik's Cube (see Figure 1), combining the issues dimension (people, planet, prosperity; or PPP), with the time dimension (past, now and then) and the place dimension (I, here and there) (Vermeulen and Witjes, 2016; Witjes, 2017). The time dimension includes the clearest point of consensus on the concept: that of intergenerational justice. The place dimension reflects the connectedness of mankind and ecosystems through global networks of value chains. In this chapter we focus mostly on the issues dimension.

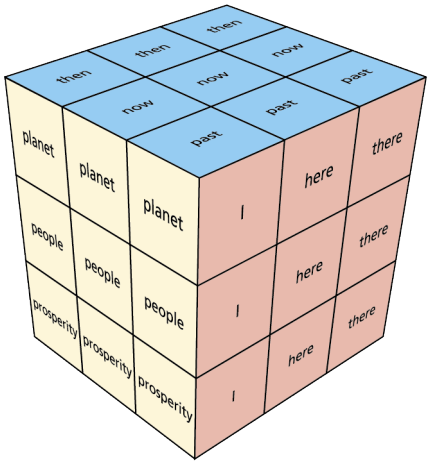

Figure 1
Three dimensions of the concept of sustainable development: issues (people, planet, prosperity; or PPP), time and place, containing 3x3x3 boxes.

The challenge is to further detail this by reviewing the *crucial choices* to be made and being made in practice in parcelling out the playing field of sustainable development. This requires a few steps:

- Apply sustainable development as a ***goal-oriented*** concept and not as a fixed end-state concept. It is oriented towards solving issues of unsustainability; in other words, minimizing the negative ecological and societal impacts that are covered by the concept, or even reversing them into positive impacts;
- We need a clear ***demarcation*** between ***causes and impacts***, with causal pathways from societal root causes, via interventions (what and how) to effects of interventions in terms of termination of the negative impacts;
- We need to ***separate*** the ***means*** from the ***ends***;
- We also need to ***distinguish*** the ***impacts*** from the ***fields of application***;
- We need to apply scientifically well-founded ***rules for categorisation*** of impacts, both at the level of the main elements (in practice mostly a three pillar approach is suggested, whereas others suggest four or more main categories…) and for the sub-elements.

During the last decade, the field of sustainability science and the practices of sustainability initiatives have delivered a wide range of approaches and elaborated instruments to assess sustainability more or less holistically[1]. This in itself is an encouraging progress. However, in many cases these initiatives have elaborated their approach without acknowledging work on the same topic in other forums, often for understandable reasons (limited resources and time). But recent efforts have been more helpful in creating overviews in the various fields. For our purpose of identifying the ***rough consensus,*** these aggregation activities are useful sources.

[1] See for an overview http://www.iisd.org/measure/compendium/

At least three fields of practice[2] related to economic activities by companies in the market are relevant:
- Voluntary sustainability initiatives in the international trade of products (supply chain perspective);
- Voluntary reporting on corporate sustainability (firm level perspective);
- Efforts to synthesize life cycle assessment on environmental and social aspects (eLCA, sLCA, LCSA).

In each of these fields either scientific scholars or collaborative knowledge institutes have recently produced reviews and developed aggregated reviews, often closely related to policy developments at the global level (UN, OECD, Worldbank) or global stakeholder representation organisations (ISEAL Alliance, WBCSD, GRI). Simultaneously, in the scientific arena clear ideas have been presented about proper and valid ways of developing indicators and formulating (policy) goals.

In this chapter I will link these various fields, identify commonly occurring confusions and suggest a way out. I will first discuss what sustainable development is about; then reflect on key principles for goal definition and indicator development, stressing the need to link *problems* with *practices,* and via *interventions* to *goals.* After that I will compare key demarcations in the concept of sustainable development as three issue fields and give a criticism of some of the commonly applied confusions and the way to go beyond them. I will then map the environmental issues (*planet)* and the societal issues (*people and prosperity*). By doing so I will be able to integrate the various separated discourses and link them to the SDGs.

2. What is sustainable development about?

After its first usage in the 1980s the concept of sustainable development has become commonplace, especially after the first global conference on sustainable development in 1992, but even more so after the second in 2002 and the third in 2012. More recently some fatigue seems to be occurring. In Figure 2 we see a sharp rise in scientific publications on sustainable development in the 1990s, up to some 127000 in total in 2016, with some 11000-12000 additional contributions per year the last decade.

[2] It would be interesting to also include a review of efforts framed as 'performance measurement' or 'key performance indicators', but due to limitations of space in this chapter I will do so elsewhere.

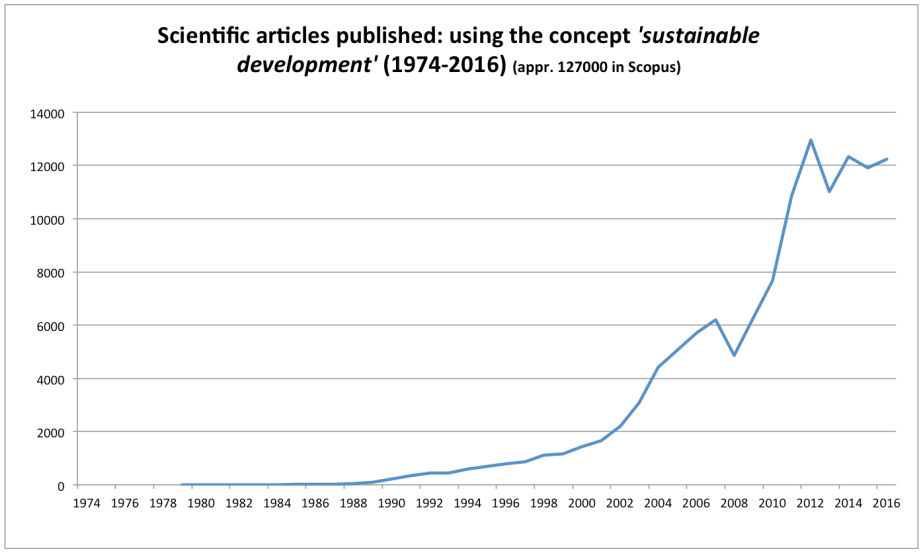

Figure 2
Scientific articles published using the concept 'sustainable development' (1974-2016) (source: Scopus)

The same trend can be seen with a more specified search for conceptual debates (Figure 3).

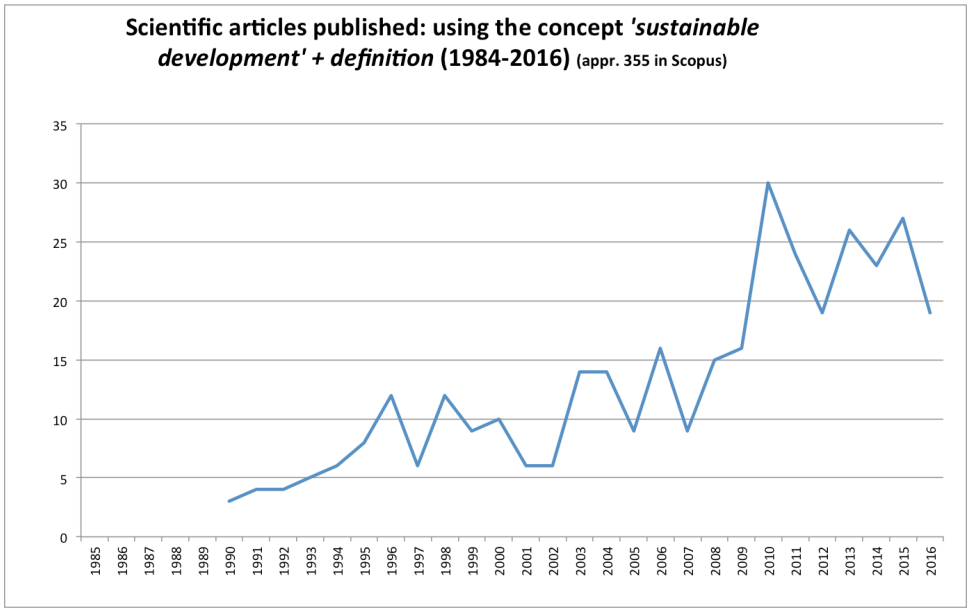

Figure 3
Scientific articles published: using the concept 'sustainable development' + definition (1984-2016) (source: Scopus)

Various authors have been mapping and aggregating the diverse perspectives in this debate. Some of the best recognised historical reviews are by Lele, Robinson, Pezzoli and Hopwood et al., who clearly show the diversity of conceptions with diverging views on the balance between two key elements: fair equitable development of the poor versus protection of our ecology against human impacts (Bolis et al., 2014; Hopwood et al., 2005; Lele, 1991; Pezzoli, 1997; Robinson, 2004; Sartori et al., 2011). Going back to the earliest publications, most

authors clearly stress the equal importance of this dual challenge (Clausen, 1982; Daly, 1990; Goodland and Ledec, 1987), which is generally seen as the original core message of the Brundtland Commission (World Commission on Environment and Development, 1987).
In this sense, sustainable development clearly combines two major ambitions: the ambition of ecological precaution and the ambition of fair and equitable societal development. The common elements in both are the *extractive practices of human societies*, both with respect to the ecological and the societal system. Many contributions have been made on the dual and mutually reinforcing relationship between these two elements. In the past scholars have stressed the threats of the rapid increase in poor populations to long term sustainability, often as a threat to nature or to the rest of mankind (Hardin, 1974, 1968, Meadows et al., 1972, 2004), while others were focussed more on ecology as a prerequisite for economic development (Pearce, 1988).

We can see a shift away from the original meaning of sustainable development as addressing fair and equitable development (intra and intergenerational justice), while simultaneously respecting planetary boundaries. Various authors observe this shift away from the fairness and equity component, towards stronger emphasis of the ecological agenda, partly because it allows business to create win-wins on the ecological element, rather than on the fair distribution element. Hadden and Seybert have clearly shown this original intention of the concept with their content analysis of speeches by heads of states in UN meetings. In the 1992 discourse the original focus was on the 'development gap', 'poverty', 'equity' and 'solidarity', which recently has shifted to the 'development gap' and 'green economy' in 2012 (Hadden and Seybert, 2016, p. 246). We observed a comparable trend in the academic teaching on sustainable development (Vermeulen et al., 2014). Others show the same trend in global business initiatives (Barkemeyer et al., 2014), while White illustrated this same point by analysing popular definitions of sustainable development by creating a word cloud, based on the count of words used in definitions. Remarkably, a clear reference to the poverty, equity and solidarity element only shows up in 24th place with the word 'equity' (White, 2013, p. 216).

However, despite these analyses, there is one convincing argument to state that we need to continue seeing the concept of sustainable development as an integral ecological and societal fairness agenda.
They are equally important, and mutually dependent and reinforcing: it is about 'planet' and about 'people and prosperity'. This has been well acknowledged in the supranational policy processes preparing for the 2012 summit on sustainable development[3], as well as finally in the accepted SDGs: having six goals addressing the societal fairness agenda at individual human level (goals 1, 2, 3, 4, 5, 11) and four goals at societal level (goals 8, 9, 10, 16), while five goals are linked to the ecological agenda (goals 6, 7, 13, 14, 15). I will later discuss this in more detail.

3. Key principles for goal definition and indicator development

[3] As a clear example, in the report presented to the UN General Assembly about the preparation for the SDGs it was stated: "moving towards a green economy in the context of sustainable development and poverty eradication is as much about structural change in the institutions governing economies at different levels as about technological change" (Preparatory Committee for the United Nations Conference on Sustainable Development, 2010, p. 2).

Before we proceed to detail the key elements, we need to look at what the scientific community sets as key principles for (sustainable development) indicator construction. Sustainability indicators are also developed at various levels: nations, regional/urban, projects, companies and products. Examples of nations' indicators are discussed in [chapter Hueting; chapter; chapter Hsu; chapter Conrad and Cessar; chapter Gallopin; chapter Rosenstrom], while [chapter Joss & Rydin] discuss examples of urban indicators. In this chapter, we focus on the discourse related to production and products, but our discussion on the core vision also applies to the other levels. Another complication is that many indicator approaches also limit themselves to specific issues under the wider flag of sustainability, such as only environmental issues or even one environmental issue, for example, climate change or biodiversity (see for example [chapter Wackernagel; chapter Bravo]). Therefore, anyone embarking on gauging sustainable development faces the challenge of measuring something that is not precisely defined. The possibility of finding an objective measure for a concept that is loaded with values and constrained by uncertainties and data availability is still, scientifically, an open challenge (Bell and Morse, 2008; Bradley Guy and Kibert, 1998, p. 40). Goal development and indicator construction are the contact points between policymaking and evaluating policy implementation. They are reflected upon both by practitioners in policy agencies and researchers in academic circles. Engaging in the multifaceted discourses in these circles will inevitably confuse scholars, due to the wide variety of languages used by the various 'communities of experts'.

In common sense usage, the word ***'goal'*** would be understood as the intended result of any effort aiming at achieving a specific point, just as in sports. In this sense, it could be anything. In the context of policies or governance a 'policy goal' would be the outcome of a political process accommodating diverse societal stakeholders' individual goals. Various theories of the policy process describe this process differently, but remarkably, most authors hardly try to define the concept of 'policy goals' (see for example Cairney and Heikkila, 2014; Mukherjee and Howlett, 2015; Sabatier and Weible, 2014). However, various authors, also in the field of sustainable development, explicitly call for more specific goal formulation and distinguish a pathway of *policy outputs* (regulation, instruments, projects, plans etc.), *intermediate outcomes* (behavioural response of target groups) and the ultimate intended *'end-outcome'* (as improved environmental or societal conditions). In their view policies will be more effective if the goals are specified as such *'end-outcomes'* (Biddle and Koontz, 2014). This is in line with the common approach in policy and program evaluation studies, to distinguish input, throughput, output and outcomes (also known as *'logic models'*) (see for more detail Cooksy et al., 2001; Kaplan and Garrett, 2005; McCawley, 2002; McLaughlin and Jordan, 1999; Millar et al., 2001; Morra Imas and Rist, 2009, p. 223). It stresses the need to distinguish between direct policy outputs affecting target group behaviours, and long-term outcomes in terms of the desired 'end-state'. This is the type of reasoning that we will need to clarify the concept of sustainable development.

In the scholarly discourse about sustainable development we see two distinct approaches towards 'end-states': sustainability seen as a fixed end-state or end-point versus a development or learning process towards a less fixed destination (Bell and Morse, 2007, 2001). In the first approach one would develop goals as very clear quantitative targets, whereas in the second approach one would rather describe problem areas, in terms of a desired 'end state', but in both cases one should avoid fixing the required solutions (these are inputs or outputs, but not the outcomes). Here the *means* and the *ends* do need to be clearly separated.

Goals need to be translated into indicators to measure progress. The concept of ***'indicator'*** is generally described as well-justified measurements, representing a wider complexity in reality, but based on a convincing reasoning assumed to be valid for describing that complex reality. As a specific subset 'indexes' are deliberate simplifications of a wider set of measurements, mainly to guide decisions and behaviour (Mayer, 2008, p. 278).

Both defining goals and related indicators and indexes are in themselves societal activities, either in the policymaking arena (serving policy formulation and planning, as well as evaluation), or in the policy implementation arena (serving collaborative policymaking (Bell and Morse, 2005)), or in academic circles (serving curiosity-driven or contract-driven research), or finally, in civil society circles (as a tool to push policymakers)(see also [chapter Rotz & Frazer; chapter Dahl; chapter Spangenberg]). Remarkably, here we see very different approaches, which can be understood from the specific positions these actors hold in the societal governance processes (either close to governments at national level or in supra-national agencies; or as consultants or facilitators to open policy processes; or merely within the academic circles; or as civil society actors in public discourses) (Parris and Kates, 2003, pp. 572–577). No wonder we get a cacophony.

However, looking at these diverging debates we can distinguish some consensual lines of reasoning. Goals and indicators are to be logically linked and to be used to guide action (at any level of governance). Regardless of whether the process of construction is intended as a 'top-down expert' or a 'bottom–up practitioner' activity (see also [chapter Bell& Morse; chapter Turcu; chapter Domingues e.a.]), there is a common pathway. In working with indicator systems, it will be very fruitful to combine the lines of thought in the policy evaluation community (logic models, focus on outcomes) with guidelines for creating indicators in the academic (mostly environmental) indicator community.
Various scholars have either critically reviewed the practices of sustainable development indicators or proposed systematic approaches for it. Table 1 combines the core massages of five well-recognized examples of such contributions (see also [chapter Pinter on BallogioSTAMP]). Each of them, starting from different intentions and foci, propose steps, factors, requirements, criteria and the more for creating and applying indicators systems. Table 1 suggests a synthesis, which includes partly methodological aspects and partly considerations for useful application.

Combining the articles, we can observe that they mostly entail comparable steps and related considerations: firstly with creation of a core structure of the indicator system (A and B). This needs to feed and justify choices made in the operationalization (C). Methodological rigour needs to be established in the steps of data manipulation (D) and in the process of final aggregation into a final composite result (E). In all these scholarly contributions, the link between each of these steps or elements is crucial: all choices need to be well founded in systemic core reasoning. In that sense steps A and B are to be seen as guidance.

	authors	Pintér et al., 2005 / Hardi and Zhan 1997	Böhringer and Jochem, 2007	Boulanger, 2008	Mayer, 2008	Bradley Guy and Kibert, 1998
Article	Relevance (as # citations; field weighed citation impact and percentile)[1]	45 3.38 96th percentile	241 40.77 percentile n.a.	12 0.43 65th percentile	138 2.74 88th percentile	59 6.69 90th percentile
	Description of considerations or purpose	Bellagio STAMP: "8 **principles** to promote common approach of developing / using measurement systems as integral part of how institutions and society function" *(based on expert meeting)*	"6 Key **requirements** for selecting appropriate SD indicators" *(referring to various other authors)*	"Successive **phases** of the construction of indicators" *(cf. work of the empirical sociologist Lazarfeld)*	"Prevent bias due to 4 **factors** influencing inappropriate index behaviour" *(scientific work)*	"12 **criteria** for indicators" *(position: selection of sustainability indicators as an inevitably human value-driven process)*
	Focus	Content & procedures Giving guidelines	Procedures Comparing existing indicator sets	Procedures Giving guidelines	Procedures Comparing existing indicator sets	Process Developing sector indicators
Methodological elements	**A.** Scope and core concept	1. **Guiding vision** *Includes well-being, within biosphere capacity, also for future generations*	1. Rigorous **connection to definitions** of sustainability	**1. Concept** *As: aggregate, multi-dimensional umbrella concept*		
	B. Key elements	2: **Essential considerations** *Includes holistic systems approach*	2. Selection of **meaningful** indicators representing **holistic** fields	**2. Dimensions** *As: logical main elements of concept, but still multifaceted, to be broken down in separate variables*		• Linkage environment, economic, and social issues; • Representative: cover important dimensions of focus area
	C. Data specification	3. **Adequate scope** *Time and geographical*	3. Reliability and availability (measurability) of **data** for quantification over **longer time horizons**	**3. Measure** *Measure theoretically relevant variables with appropriate indicators*	1. **Scale** of the available data	• Valid measurement of state of the system • Include focus on long-term • Act locally, think globally: prevent acting at the expense of others
		4. **Framework and indicators** *Define issues, priorities with targets, and proper baseline and benchmarks to compare*	4. Process orientated **indicator selection**		2. Choice of **system boundaries**	
	D. Data manipulation		6. **Adequate normalization, aggregation, and weighting** of the underlying variables ensuring **scientific quality**	**4. Aggregate** *Combine results in synthetic indicators: in a common unit, or by standardisation, well justified*	3. **Aggregation** method	
	E. Compilation of final result			**5. Weighing** *Major challenges in weighing the relative importance of the 3 dimensions (PPP)*	4. **Inclusion, transformation, and weighting** of indicator data	
Application aspects	**I.** Accountability	5. **Transparency** *Publicly accessible, choices justified and sources disclosed*				• Stable and reliable: a systematic and fair method
	II. Outreach	6. **Effective communications** *Broad public, avoid misuse*	5. Possibility of **deriving political** (sub)**objectives**			• Understandable for lay persons
		Application asp[ects7. **Broad participation** *Reflect public interests, engage users*				• Community involvement Relevant to public or corporate policy
	III. Long term impact	8. **Continuity and capacity** *Ensure long term capacity and adaptability*				• Available and timely data on annual basis • Responsive to changes • Flexible: include possible future available important data

[1]: using the metrics on the document details page in Scopus (22-2-2017)

Table 1
Descriptors of the sustainable development indicator formulation process, according to various authors

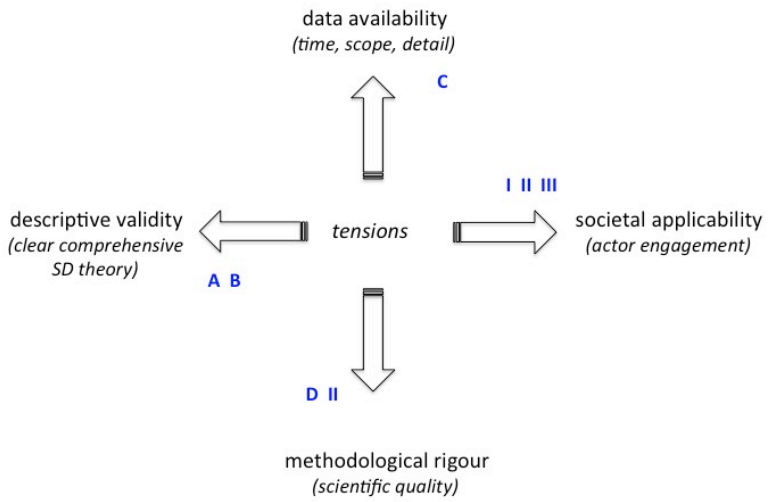

Figure 4
Tensions in the practice of indicator construction and application (and relation to elements A to D and aspects I to III described in Table 1)

In practice, cohesion between the five steps or elements is often challenged. Reviews such as the articles used here often observe that indicators systems either have a narrow focus on available data, an over-simple guiding vision, or inadequately apply steps C, D and/or E. This can be seen as the result of practices of indicator construction and application struggling with the conflicting expectations and needs on two conflicting lines: theoretical soundness versus applicability for engagement; and methodological rigour versus data availability (see also the discussion in [chapter Dahl; chapter Boulanger; chapter Esty]). The elements A to D and I to III identified in the review in Table 1 all relate to specific sides of these tensions (as shown on Figure 4). Limited resources and the position of the developers in society often determine the choices they can make in this field of tensions.

4. Linking problems with practices, and via interventions to goals

Apart from balancing these tensions, as indicated before and also stressed in [chapter Janouskova e.a.], it is crucial to work with a guiding core reasoning (elements A and B). For this, our discussion in section 2 is essential, framing sustainable development as a twin integral ecological and societal fairness agenda. End states need to be described as the final targets in both these domains. From those end points, logic models are required to specify the *pathways* from policy outputs (as regulations, projects, policy instruments, plans etc.) via intermediate outcomes (responses of target groups) to the end-outcomes. Such pathways then serve to improve the quality of choices made in elements C and D. The composition of the final outcome parameter should again be based on the SD vision (elements A and B).

Various models for describing such pathways or causal routes are popular, in both academic literature and policy practice, originally rooted in the field of environmental sciences. In most cases they do not (explicitly) link to the thinking in terms of logic models common in the field of policy evaluation. Popular pathway models are the *pressure-state-response* model (Kee and de Haan, 2007; Orians and Policansky, 2009; Pintér et al., 2005; Singh et al., 2009; Tanguay

et al., 2010), or (more extended) the *driver-pressure-state-impact-response* model (Ness et al., 2010; Smeets and Weterings, 1999); various *capital* approaches (like CRITINC) (Bebbington, 1999; Ekins et al., 2003; Joint UNECE et al., 2013; Worldbank, 1997), and causal models like *IPAT* or *ImPACT* or *STIRPAT* (Chertow, 2000; Fischer-Kowalski and Amann, 2001; Waggoner and Ausubel, 2002; York et al., 2003). Contributions about indicators from policy agencies and accounting or statistical bureaux tend to be strongly data-driven; presenting and discussing large numbers of indicators, stressing the technical issues which are shown in Table 1 under elements C and D. These reviews often have weak conceptual foundations, more or less bypassing methodological aspects A and B and presenting the work with categorisations of policy fields (Joint UNECE et al., 2013; Leadership Council of the Sustainable Development Solutions Network (SDSN), 2015; United Nations, 2007). In Table 2, I compare some of these logic pathway models. In the left column, in the lowest five rows, we show the elements in logic models. With their roots in evaluation studies, logic models tend to focus on the logic *after* policy formulation. So I have added four rows before it, describing the origins of SD issues in human activity, current problem states, its recognition and the take-up in any governance activity (as varied forms of multi-actor activity (see for a discussion Driessen et al., 2012), thus also describing the policy formulation phase. We need this to contextualize the sustainability pathways in this perspective.

In the nine columns to the right I show various popular pathway models and their academic context. It shows that these models mostly focus on the causation and to some extent make an (implicit) jump to end-outcomes.

In most cases the models do not clarify how societal (governance) responses to the issues result in achieving the goals, e.g. end-outcomes. The PSR and DPSIR approach implicitly aggregates inputs, throughputs, output and outcomes under an unspecified 'Response'. The IPAT model and related variations merely a causal model, not reflecting societal response, while the capital approaches assume that a balanced presence of the five or six capitals ensures achievement of sustainability more or less as a black box. As a result of these lines of reasoning the end-outcomes are not very explicitly identified.

The first six approaches, all focussing on a 'impact' category, are rooted in environmental sciences and describe impacts as environmental impacts, either using a 'receiver' categorisation (the nature component that receives the impacts: air, water, soil, human) or more sophisticated categorisation describing the problem-causation mechanism of the impacts (climate change, eutrophication, depletion etc.) which has become accepted as the proper way of working in the sub-discipline of environmental life cycle analysis (which I will discuss in section 6 and 7).

The various capital approaches tend to present the capitals as valid indicators for the concept of sustainable development, with many authors suggesting that these also represent the three elements of sustainable development: the environmental (natural capital), the social (human and social, or also intellectual capital) and the economic aspect (built, or physical and financial capital).

The fundamental shortcomings of such approaches are twofold: -1- they fail to display the causal pathway from problem, via governance response and its outputs, to the defined end-outcomes (goals) of sustainable development; and -2- the end-outcomes are not clear and instructive for actors in society.

Environmental sciences representations *(disciplines)* / Logic model elements[1]		**PSR** (OECD, 2003, p. 21) *(environmental sciences)*	**DPSIR** (Bell, 2012; Kim, 2010; Ness et al., 2010; OECD, 2003; Smeets and Weterings, 1999) *(environmental sciences)*	**CNC/ CRITINC** (Critical natural capital) (Ekins et al., 2003; Joint UNECE et al., 2013) *(environmental sciences)*	**IPAT** (Chertow, 2000; Daily and Ehrlich, 1992; Diesendorf, 2002; Roca, 2002; Schulze, 2002) *(environmental sciences)*	**ImPACT** (Waggoner and Ausubel, 2002) *(environmental sciences)*	**STIRPAT** (stochastic impacts by regression on population, affluence and technology) (York et al., 2003) *(ecological economics)*	**5 Capitals** (as prerequisites for development at national level) (Lehtonen, 2004; Pretty, 2008; Worldbank, 1997) *(ecological economics)*	**6 Capitals** (Deloitte and Deloitte Netherlands, 2016) *(business studies; accounting)*	**5 Capitals** (for rural livelihood development at local level) (Bebbington, 1999; DFID, 1999; Garnett et al., 2007) *(development studies, ecology, agro-economics)*
1	*(human activities causing SD issues (PPP))* ↓	Pressure	Driving forces Pressures	Influences	Population size Affluence Technology	Population size Consumption intensity Affluence Technology	Population size Affluence Technology	n.a.	n.a.	n.a.
2	*(current problematic states of environment and/or society)* ↓	State	State Impact	Natural Capital (elements & functions); Functions for people	(environmental) Impact (of a population)	(environmental) Impact (of a population)	(environmental) Impact (of a population)	Natural capital	Natural capital	Natural capital
3	*(knowledge and societal pressure)* ↓	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		(Intellectual capital)	
4	*(governance responses: formulation and decision making)* ↓			n.a.	n.a.	n.a.	n.a.	Social capital	Social capital	Social capital
5	**INPUTS** (resources: time, funds, people etc.) ↓			n.a.	n.a.	n.a.	n.a.	Physical capital Financial Capital	Physical capital Financial Capital	Built capital Financial Capital
6	**THROUGHPUTS** (processes, activities, implementation, …) ↓	Response	Response	n.a.	n.a.	n.a.	n.a.	Human capital	Human capital	Human capital
7	**OUTPUTS** (plans, projects, enforcement, ↓			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
8	(intermediate) **OUTCOMES** (behaviours, … ↓			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
9	**END OUTCOMES** ↓	(reduced) Pressure / (adjusted) State	(adjusted) Driving forces, Pressures and States	Human Welfare / Ecological Well-being	(goals not specified)	(goals not specified)	(goals not specified)	SD measured as maintenance of 5 capital 'stocks'	Sustainable business	Sustainable livelihood

[1]: using (Cooksy et al., 2001; Kaplan and Garrett, 2005; McCawley, 2002; McLaughlin and Jordan, 1999; Millar et al., 2001), being based in the discipline of policy evaluation it start after the initial policy making, expressing these prior steps here *(between brackets and in italics)*. / n.a. = not addressed

Table 2
Popular sustainability pathways represented in terms of logic model concepts

These various pathway approaches have a long history and are well-known and widely applied in the indicator communities. Earlier I argued that the inclusive scope and core concept and its key elements (section 2; elements A and B in Table 1) should be guiding. This implies that we need to frame both the problem identification (row -2-) and the goals (row -9-) as the twin SD-agenda of integral ecological and societal fairness. Assessing the popular pathway models in this way, we cannot but observe that most do not explicitly and clearly do so. In many cases the complexity of the issue is reduced by working towards one of the corners of the tension fields shown in Figure 4. Either using available data or generating a simple and attractive message towards user publics seems to motivate such simplification steps. The way the sustainability pathways approaches describe the end state does not link substantially to the twin SD-agenda. PSR and DPISR implicitly limit the intended end-outcome to environmental conditions; CNC and CRINTINC refer to combined ecological and human well-being, but do not detail it; the IPAT, ImPACT and STIRPAT approaches do not specify end-outcomes, while finally, the various capitals approaches propose the balanced and sustained availability of the various capitals as the end-outcome, but detail them in very different ways. The need for stronger focus on implementation and effectiveness is also stressed in [chapter Almassy & Pinter].

For the sake of maintaining a clear meaning for the concept of sustainable development I therefore argue that we need stronger focus on the first elements in the indicator formulation process approaches: the inclusive scope of the concept, well-linked to a holistic systems theory approach. This implies a stronger reasoning for subdividing sustainable development into a small number of key elements.
In literature, such subdivisions are framed with various different wordings ('aspects', 'domains', 'pillars', 'spheres', dimensions', 'circles', etc.). The number of elements also differs, often three, but we also find versions of two, four, or five more key elements. Mostly used are subdivisions into *social*, *environmental* (or *ecological*), and *economic* elements (SEE) and in *people*, *planet*, *profit* (PPP, or 3P), also referred to in business contexts as *triple bottom line*

(TBL). They may be seen as nearly identical, but once we look into the ways these three elements are further detailed, we get a chaotic picture, both in scientific literature and in policy- and practices-related literature. It may be useful to analyse the roots and history of such diverse operationalizations, but with the limited space here I only briefly reflect on this.

5. Commonly found confusions and the way to go beyond them

Many of the existing approaches are created in the context of production and consumption systems and business, to assess and decide upon productive activities, projects, plans, and product redesigns etc., in the context of corporate sustainability and the impacts of production throughout value chains. In these fields the assessment of *environmental* impacts has relatively the longest history. In this sub-field, a fairly clear consensus on showing the pathways of impacts has developed (which I will discuss in section 6). It uses a clear midpoint-endpoint pathway reasoning[4], as I described in section 4.

But working towards an integrated sustainability assessment in relation to production activities also has a long history. The *people*, *planet*, *profit* (PPP, or 3P) framing has become very popular after Elkington's critical book on firms' behaviour, called "Cannibals with forks" (Elkington, 1998), stressing that with unsustainable practices the business community is cutting up its own flesh. The key point here was the argument to extend economic decision-making beyond the single bottom line of profit and include environmental and social impact considerations. In this way 'profit' as a concept sneaked into the framing of sustainability. It makes perfect sense to assess improvement options in the context of the relative efficiency of various alternative solutions, and thus allow for identifying alternatives that can create win-win situations for both producers and customers. But with the concept becoming more and more attractive and enabling previously closed boardroom doors to open, practitioners and academics started to distort the clear framing of sustainable development (as the twin SD-agenda of integral environmental and societal fairness) by putting individual firms' *profit*-making at the same outcome level as *people* and *planet* related issues. Individual firms' profits can never serve as intended *end-outcomes* of the process towards sustainable development. For scholars who are not convinced by the argument, I suggest that they check the text of the UN decision on the SDGs. They will look for the word 'profit' in this document in vain (General Assembly UN, 2015).

A comparable development is seen where sustainable development is summarized as social, environmental and economic (SEE). Here the element 'economic' is often without clear theoretical reasoning filled at random with concepts or metrics related to economic growth. Examples are: summing up profit margins, total labour costs (Kruse et al., 2009); revenues (Ocampo, 2015); investments made (Joung et al., 2013); R&D expenditures (Krajnc and Glavič, 2005), just to name a few of the overwhelming number of examples. The crucial issue here is that in the development of indicators and indexes, steps A and B are ignored. *Any costs made in production, profits resulting from it and even the resulting economic growth in itself, are not elements of the concept of sustainable development.* Sustainable development is about

[4] Remarkably this is not recognized at the level of *national or regional projects* or *country* comparisons. In those fields of study the environmental aspects are often still subdivided as the receiving components of the earth's system: air, water, soil, etc., as indicated in section 1. In this chapter I focus on production-related approaches.

abating the *negative environmental and societal externalities* created in our production and consumption systems (Benoît and Mazijn, 2009, pp. 15–16; Sala et al., 2015, pp. 18–19). To include any element of the internalities (being: all costs and benefits that are intrinsically connected to goods and service brought on the market) is a major fallacy in using the concept of sustainability: it relates neither to creating societal fairness, nor to ecological protection. Here the problem is that the decision-making context (throughput in Table 2) is confused with the intended end-outcomes. In decision-making one needs to know the financial implications and the strategic business opportunities. It makes sense to identify and specify them. But they need to be used in clear separation from the sustainability end goals.

A comparable confusion is found in the literature about developing integrated sustainability life cycle assessment methodologies. In many proposals the solution suggested is to see this as the sum of eLCA + sLCA + LCC (Finkbeiner et al., 2010; Halog and Manik, 2011; Heijungs et al., 2013; Kloepffer, 2008; Swarr et al., 2011b; Zamagni, 2012). In the next section I will discuss the first two in more detail. But first we need to address the applicability of Life Cycle Costing as representation of one of the three key elements of sustainable development. At the current stage in most cases LCC does not address the fair economic development framing we identified as a core element of sustainable development. Historically LCC is about the production costs in the full supply chain, translated to the full costs for the user per unit of product or service (Cole and Sterner, 2000). Again, this is a very useful concept, but it analyses the *internalities*[5], not the externalities (Meester et al., 2013; Swarr et al., 2011a, 2011b) or it addresses the environmental and/or social externalities in monetary units, thus risking double counting. The micro-economic parameters can be used to assess the efficiency and feasibility of improvement options, which in simple terms can be presented as:

$$\frac{\text{'total sustainability improvement' (as planet, people, prosperity) per unit}}{\text{'total life cycle costs' per unit}}$$

But micro-economic parameters should be used properly. In the above-mentioned cases the numerator and the divisor in this equation are mixed up, using the 'total life cycle costs' in the place of 'prosperity'. The numerator needs to express only the twin SD-agenda of integral ecological and societal fairness.

In more recent approaches some scholars propose forms of LCC, which include models following a mid-point and end-point reasoning, and offer a pathway reasoning including the macro-economic 'areas of protection' as 'economic stability' and 'wealth generation' (Neugebauer et al., 2016). This is a step in the right direction, but these are not yet explicitly linked to the sustainable development discourse as described in section 2. The related mid-points are still profitability, productivity, and consumer satisfaction, which are neither connected to the twin SD-agenda, nor to be seen as externalities. Although in these new approaches the concept of prosperity is also embraced, the theoretical reasoning is still fairly weak, close to the neo-liberal economic agenda, of economic growth, capital investment, and export-stability. Some links are made to the issue of inequality, but it is not yet explicitly addressed in the framework they propose (Neugebauer et al., 2016, p. 6).

[5] Kloepffer gives a remarkable justification for this, clarifying my point here: *"to sum up, LCC is a useful complement to LCA (and SLCA), since sustainable products should be profitable and not unreasonably expensive, otherwise they will not be accepted in the market"* (Kloepffer, 2008, p. 91). Thus it is not about the SD end-outcomes, but about the direct customer/consumer interest.

At this point the LCA, LCSA and LCC community are weakly connected to wider discourses on sustainable development and the SDGs. Looking beyond their epistemological homeland could enrich the methodological development. Looking to the academic field of economic history and development economics could strengthen the theoretical thinking on the societal fairness side of the twin SD-agenda. In these disciplines the crucial question is to what extent core institutional features of societies matter for achieving prosperity, and which specific institutions are most relevant. This question has been extensively addressed with long-term historic cross-country comparative research in the last decade, backed up by empirical analysis of assumed causal mechanisms. Extensive empirical data is used to prove key assumptions, even going back to colonial periods (Acemoglu et al., 2000). With this approach the group around Acemoglu, Johnson and Robinson developed their *theory of political transitions* (Acemoglu and Robinson, 2001), which was illustrated in their extensive book "*Why nations fail - The origins of power, prosperity and poverty*" and many other publications (Acemoglu et al., 2014; Acemoglu and Robinson, 2013). Their main point is that continuous development toward prosperity can only be achieved by states organised around *inclusive political institutions* combined with *inclusive economic institutions*. History shows a long development of historical and contemporary elites building *extractive political and economic institutions*; where during crucial historical junctures (decolonisation, post-first world war and post-second world war and after collapse in Eastern Europe) new (more) extractive regimes were often created, recycling earlier institutions in new forms. With their approach they built on the earlier work of the Nobel prize-winning economic historian North, who argued that we should derive the key elements of what a state is from the '*exploitation or predatory theory of the state',* where the agency is a group, class or elite, which uses the state to extract income from the rest of the constituents in the interest of that group (North, 1989, 1979). The most fundamental institutions in the political and economic domain are closely linked. It includes *property* and *contract law*, *tax systems* and a *control system* for this: jurisdiction. Yet, as North argues, this builds in fundamentally inherent tensions which cause the continuous historical turmoil within and between states: rent maximizing for the rulers and safeguarding tax revenues via juridification of transaction costs creates tensions between groups close to the elite, as it builds in some diffusion of power and creates its own future failure. It is essential that societies are able to make the transition away from extractive political and economic institutions towards *pluralist and inclusive institutions*. Only with pluralist regimes can entrepreneurs engage in innovation, and new knowledge be used without the countervailing activities of incumbent interests and creative destruction, which are crucial elements for progress to take place. Based on this school of research the critical *political institutions* are identified, enabling an open political system; fair taxation; distributional systems; and rules for free association. Key e*conomic institutions* are related to property rights and land and resources ownership; price formation and open markets; and rights of workers and consumers.
Remarkably, these well-proven theories are hardly used in the SD indicator arenas, while they offer a good theoretical justification of the methodological choices to be made in our field of study. It allows us to better elaborate the prosperity element at the macro-level of society as a social system and thus link it also to the SGs that address this level (SDG 8, 9, 10, 16).

In this way, we can translate the twin SD-agenda of integral ecological and societal fairness into that of *planet* and of *people and prosperity,* where the 'people' element addresses (in the context of productive activities) the individuals and their communities directly related to value chain activities, and the 'prosperity' element relates to the macro-economic institutions that are essential for creating fair and equitable development.

With this in mind, we can now review the common approaches for mapping these elements by: a) voluntary sustainability initiatives in the international trade of products (supply chain perspective); b) voluntary reporting about corporate sustainability (firm level perspective); and c) efforts to synthesize life cycle assessment on environmental and social aspects (eLCA, sLCA, LCSA).

6. Mapping environmental issues: *planet*

The first pillar of 'planet'-related impacts has the longest history of scientific discourses on the most valid method for characterisation of the damage impacts. This discourse also includes a focus on integrating causal pathways from human activity to final impacts. This is the core activity of the field of environmental life cycle (impact) assessment (LCA, LCIA, e-LCA). First approaches were developed in the 1980s (Klöpffer, 1997), with methodologies elaborated in various parts of the world and a longer history of collaborative approaches to harmonizing the key principles (guided by UNEP/SETAC, EC-JRP, and others). Being one of the core applied methodologies in environmental sciences, from its first days it combined impacts both on ecosystems and on mankind, but related to the production of products and services, thus already focussing on planet and people, but with a limited perspective. Many publications are available describing the principles of environmental life cycle (impact) assessment (Guinée, 2002; Pennington et al., 2004; Rebitzer et al., 2004), and the methods are also standardised with various ISO standards (most recent ISO 14044:2006).

For our debate in this chapter, the question on the core categories of environmental damages is the most crucial. In LCA terminology, this relates to the 'characterisation' step of mapping the pathway of human impact on ecosystems and mankind in terms of midpoints, endpoints and areas of protection. Various slightly different approaches for this have been developed and are widely used. Some of the most important examples from various continents are the CML-method (Guinée et al., 1993; Udo De Haes et al., 2000; Udo de Haes, 1993), IMPACT 2002+ (Jolliet et al., 2003), LUCAS (Toffotetto et al., 2006), the EcoIndicator-method (Goedkoop and Spriensma, 2000), the LIME approach (Itsubo and Inaba, 2003), and ReCiPe (Goedkoop et al., 2009). Understandably this diversity of approaches has led to confusion and some loss of confidence in the field of science. The good thing is that this academic community has joined forces and worked towards a consensus on the best practices for characterisation, created by all lead researchers in the field (see Hauschild et al., 2013). In this key publication 156 characterization models were reviewed belonging to 12 different LCIA methods, and a best practice framework was proposed, as shown in Figure 5, synthesizing the discourse into 15 midpoints and three endpoints[6].
Remarkably, not all relevant environmental impacts have found their way into this apparent LCA consensus, such as various forms of nuisance (noise, odour, light), which are also seen as essential (Marchand et al., 2013; Müller-Wenk, 2004; Ongel, 2016).

[6] I have also added the categories for the planet issues used in the community of voluntary sustainability standards, which will be discussed in section 7.

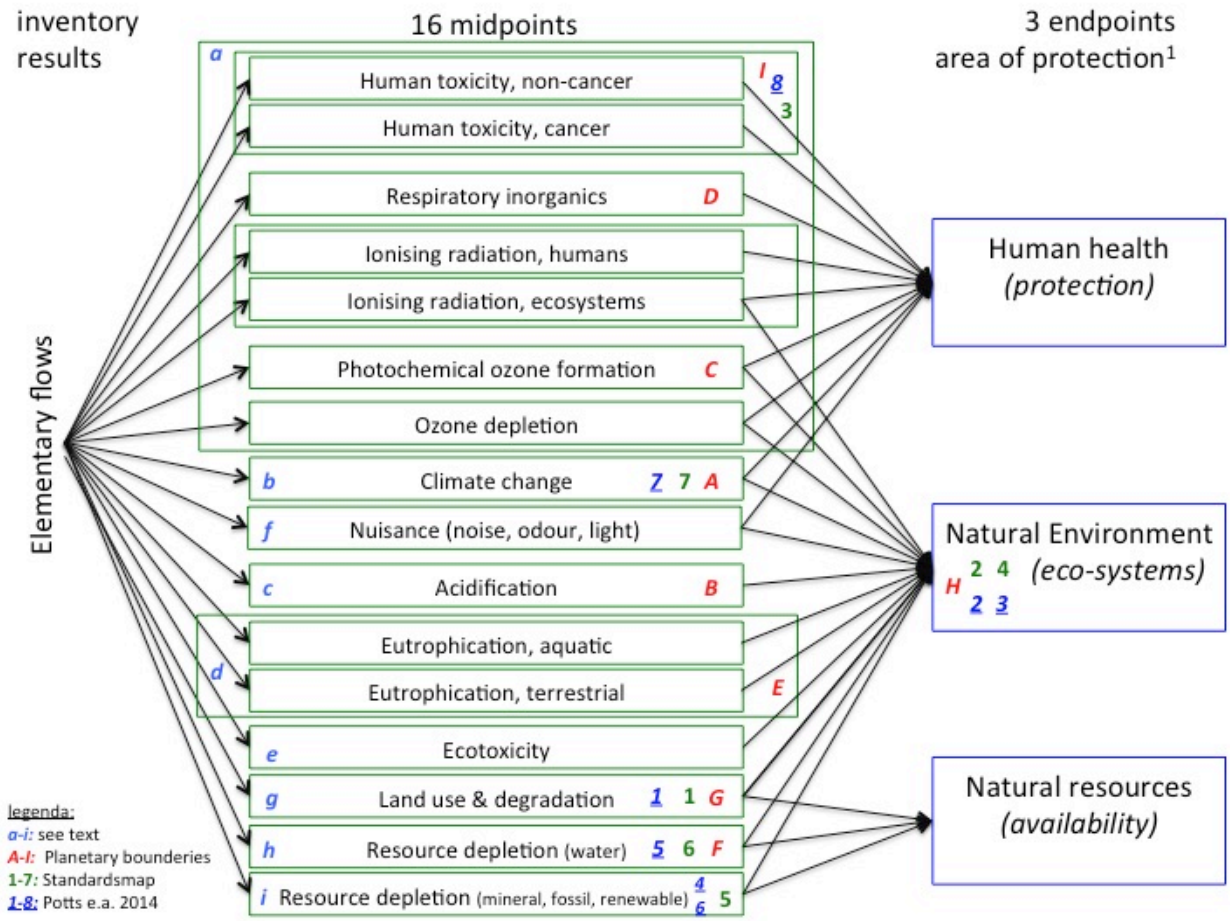

Figure 5
EC-JRC Framework for best practices of impact characterisation (based on Hauschild et al., 2013) *compared with Planetary Boundaries concept elements* (Rockström et al., 2009) *and others.*
*Legend: Planetary boundaries **A - I**: A: Climate Change; – B: Ocean Acidification; C: Stratospheric ozone depletion; D: Atmospheric aerosol loading; E: Biogeo-chemical flows: interference with P and N cycles; F: Global freshwater use; G: Land-system change; H: Rate of biodiversity loss; I: Chemical pollution;*
[1]: end point descriptions also based on (Huijbregts et al., 2017)*;*
***a- b**: simplifications explained in text;*
1-7: *categories in Standardsmap* (WTO-ITC, 2017) **1**: *soil;* **2**: *forests;* **3**: *chemicals, organic inputs;* **4**: *biodiversity;* **5**: *waste;* **6**: *water;* **7**: *energy / **1-8**: categories In review of voluntary standards* (Potts et al., 2014, p. 70) **1**: *soil;* **2**: *biodiversity;* **3**: *GMO prohibition;* **4**: *waste;* **5**: *water;* **6**: *energy;* **7**: *greenhouse gas;* **8**: *synthetic inputs.*

The field of life cycle (impact) assessment is strongly matured, but is not the only subfield of sustainable development research. In this context, I want to briefly refer to the growing field of resilience research, which takes a planetary system's approach and defines the crucial thresholds to be guarded, described as nine boundaries. These are also depicted in Figure 5. We see a strong overlap of the two approaches, but the planetary boundaries approach mixes midpoint and endpoint reasoning and ignores some issues, such as depletion of mineral resources. Combining these approaches is fertile, as the resilience community adds knowledge about specific threshold values to be respected, which is weak in the LCA community.

With a stronger collaboration between these various research communities, a clearer consensus would be possible. However, scientists would not be scientists if some of them would not, after this consensus, jump like frogs out of the wheelbarrow again. After this joint publication some new adjustments to the framework have been published, such as the ReCiPe2016 approach (Huijbregts et al., 2017). In this new version, some of the 15 midpoints

are again detailed into separate midpoints, adding up to a total of 17 midpoints, and, more importantly, more details have been added on pathway categories.

However, for our purpose I would rather move in the other direction, that of aggregation, which I also illustrate in Figure 5, with the blue 'a' to 'h'. Indeed, looking through one's lashes, a rough consensus on the short-list of midpoints and the reasoning in midpoints and three endpoints is strongly vested[7]. We could even further summarize this synthesis into a shorter list of nine general midpoint categories: (a) human health-related pollution, (b) climate change, (c) acidification, (d) eutrophication, (e) eco-toxicity, (f) nuisance (of noise, smell, light), (g) land use and (h) water depletion and (i) resource depletion (mineral, fossil, renewable).

7. Mapping social issues and societal issues: *people and prosperity*

The development of a comparable methodology for the social and societal issues is far more recent; it has mostly taken off in the 21st century. I will briefly compare the approaches in the fields of social-LCA, product standards and corporate reporting.

As approaches for social-LCA grew in the womb of the e-LCA community, right from the start scholars have tried to continue applying the logic of causal pathways, midpoints and endpoints (Parent et al., 2010; Russo Garrido et al., 2016) and have tried to link to other relevant research communities and communities of practice. Now, in the middle of the second decade of the 21st century, various efforts of reviewing and integration have already been accomplished (Benoît-Norris et al., 2011; Benoît et al., 2010; Benoît and Mazijn, 2009; Benoît and Vickery-Niederman, 2011; Fontes, 2016; Russo Garrido et al., 2016; Sala et al., 2015). However, various scholars argue that the theoretical foundations are weak and a stronger justification of social goals is needed (Parent et al., 2013; Sala et al., 2015). Some sustainability pathway approaches have been suggested, including a stakeholder approach (Benoît and Vickery-Niederman, 2011, p. 14), an impact categories approach (such as human rights, working conditions, health and safety, cultural heritage, etc. see Benoît-Norris et al., 2011, p. 683) and also the capabilities or capitals approach (Reitinger et al., 2011; Sala et al., 2015, p. 82). However, looking at the commonly used approaches, the stakeholder categorisation appears to be the dominant one (Benoît and Mazijn, 2009; Eisfeldt, 2016; Fontes, 2016), sometimes applied in combination with the other two. It focuses on five general stakeholder groups: *workers*, (local) *communities*, *consumers*, and *suppliers* (or 'value chain actors') and as last '*society*'. In this way life cycle thinking is applied for the first four stakeholder groups, combining it with a societal network approach, implicitly referring to what is also called the netchain approach (Omta et al., 2001).

However, it is not yet fully mature. The last category is especially problematic. Using *'society'* as a main stakeholder group is a regularly repeated conceptual blunder. In social sciences 'society' stands for the total collection of actors and their encounters, embedded within meso-structures of organisational units and macro-structures of institutions, stratifications, and cultures (Turner, 2014, 2012a, 2012b, 2010). In that way 'society' cannot be a stakeholder. The roots of this confusion are the common practices in the field of business studies, where 'society' is more or less used as everything outside the firm. However, also in stakeholder theory a stakeholder is commonly defined as 'any *group* or *individual* who can affect or is

[7] A recent example of such a simplified aggregation is to be found in (Sala et al., 2015, p. 56)

affected by the achievement of the organization's objectives' (Freeman, 1984; Mitchell et al., 1997). As a result of this conceptual inaccuracy we see a problematic diversity in the application of this category in practice. We see very diverse notions under the heading of 'society', as in the UNEP/SETC Guidelines 'public commitment'; 'economic development'; 'prevention of armed conflicts'; 'technology development' and 'corruption' (Benoît and Mazijn, 2009, p. 49; also applied in PSILCA, see Ciroth and Franze, 2011, p. 80), but in the same report it also refers to: government, banks, media and more financial institutions (p. 26). Other approaches replaced 'society' by 'governance', like the SHDB, using it to contain 'legal system' and 'corruption' (Sala et al., 2015, p. 40) combining it with an impacts categories approach (using labour rights, human rights etc.). In these ways 'society' functions as a trash bin category.

This choice of five key categories has also been endorsed by the initiative of a large group of industry stakeholders in their Roundtable for Product Social Metrics, which published their Handbook for Product Social Impact Assessment 3.0 (Fontes, 2016). This report makes a valuable contribution with the review of 19 comparable global initiatives in its Appendix 9 (including GRI, ISO 26000, OECD Guidelines), mapping the social impacts and illustrating the level of consensus on most of the topics categorised under the same five stakeholder groups (see Fontes, 2016, pp. 127–133). However, it also implicitly makes an interest-biased choice in shortlisting, thus reducing the methods they propose to only three of the five stakeholder categories (workers, consumers and communities), not elaborating the categories of value chain actors' and 'society', only justified as allowing more focus and presenting it as an initial shortlist (Fontes, 2016, pp. 28, 127).

Further evidence for a rough consensus in the field of 'people'-related impacts can be found in two comprehensive reviews of the state-of-the art in the field of voluntary sustainability standards, by the International Institute of Sustainable Development (IISD) and by WTO-ITC. The vastly growing number of product-oriented standards (see for a discussion Vermeulen, 2015) have specified requirements for many categories of internationally traded products. These requirements have been determined in open stakeholder processes. The IISD and WTO-ITC review reports provide a good overview of which issues are seen as being relevant for sustainable products. In these reports a bottom-up process of aggregation resulted in a categorisation which is described above as the *impact categories* approach: using eight categories: human rights; labour rights; gender; health and safety; employment conditions; employment benefits; community involvement; and humane treatment of animals (Potts et al., 2014, p. 69).
The second knowledge hub in this field, the WTO-International Trade Centre, in describing voluntary sustainability standards in the social dimension, distinguishes three main categories: social aspects, management aspects and ethical aspects (ITC, 2016, 2015; ITC and EUI, 2016), which however again cover the same issues as the approaches discussed above, while the category 'management aspects' describes the means rather than the intended end-outcome (in terms of applying management system practices: plan-do-check-act activities, such as having proper chemicals storage facilities and warnings, and anti-erosion plans etc.).

A third community of practice addressing (in addition to environmental issues also) the social and societal issues are the organisations that provide the current global guidelines for corporate sustainability and reporting about it: ISO 26000 and GRI:G4. In these cases, the focal point is not the product but the organisation, which results in a mixture of end-outcome oriented metrics and throughput and output metrics. It also includes an explicit life cycle perspective. Both guidelines do use different categorisations, but also provide guidance in

how these relate to each other (ISO and GRI, 2014). If we focus on the end-outcomes, we see the same categories as applied in the sLCA and voluntary standards community. This like-mindedness is the strongest on the issues concerning *workers*. For the *community* stakeholder group, the ISO 26000 and GRI:G4 include more detail than the LCA and the product standard communities, also looking at rights of communities not directly working for companies, and issues like protecting cultural heritage and informal property rights. For the consumer, it also includes protection against misleading marketing.
These guidelines also more extensively address issues related to the macro-economic institutions that are essential for creating fair and equitable development. They include anti-corruption, fair competition, fair value chain contracting, and responsible political involvement.

There are still a few key elements of the *theory of political transitions* (section 5) that these three communities have hardly adopted, but that have been increasingly addressed in the last few years: the crucial quest for fair taxation systems and reduction of inequality. This translates to tax evasion and tax avoidance as corporate behaviours, which deprives developing countries from substantial incomes, which are needed for their development (Hollingshead, 2010; Makunike, 2015; Verstappen et al., 2016). The issue of inequality is also only sometimes addressed in measurements of corporate or product sustainability, but practical methods have recently been proposed (Croes and Vermeulen, 2016).

If we now combine the approaches discussed in this section, taking the strong elements of the various approaches, we can map the societal pathways in a way that enables them to be integrated with the commonly accepted approach for the 'planet' element. Figure 6 combines the 'people' element, addressing the individuals and their communities directly related to value chain activities (stakeholder groups workers, communities and consumers), and the 'prosperity' element relates to the macro-economic institutions that are essential for creating fair development, such as the transactional institutions in value-chain exchanges and corporate activity related to political and economic institutions at the macro-societal level.

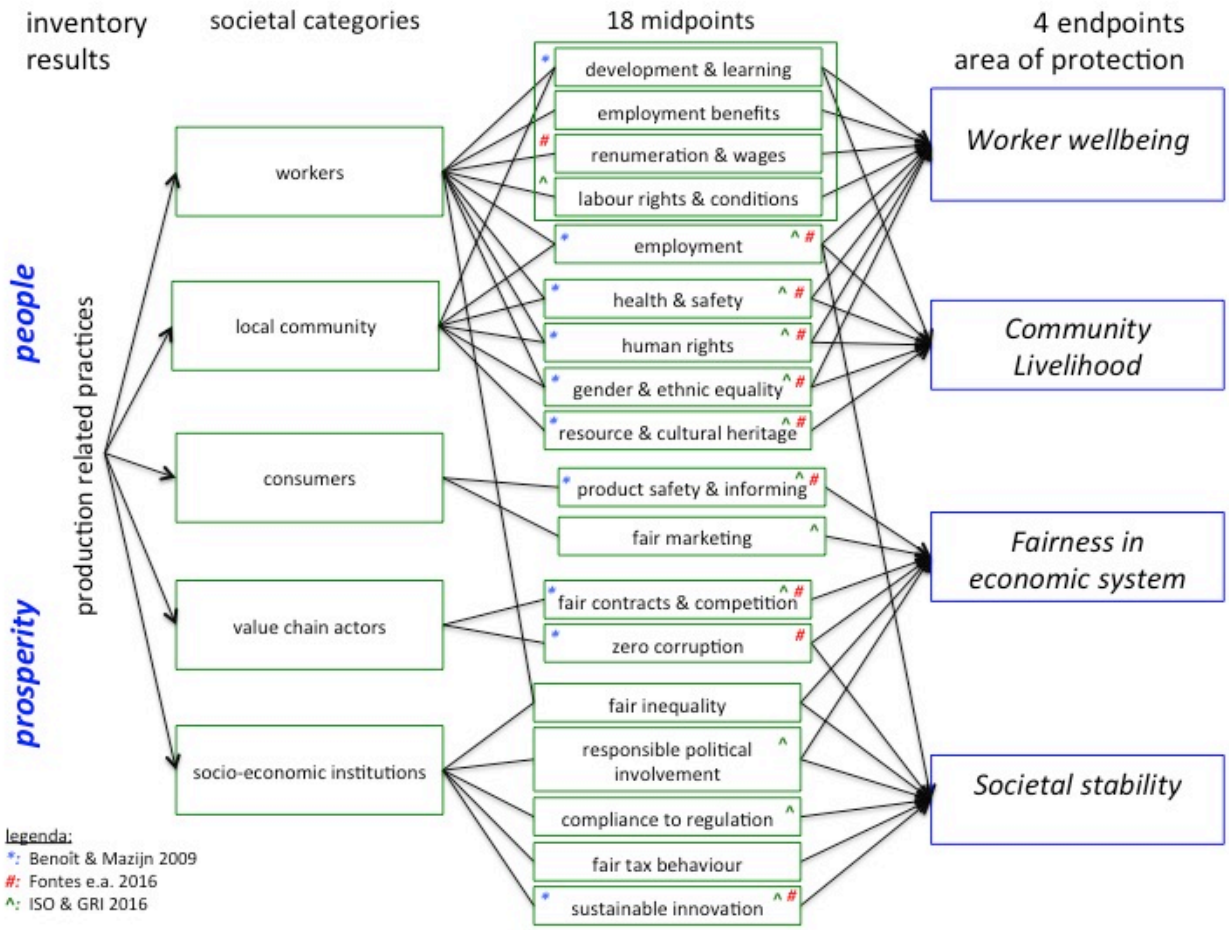

Figure 6
Combining global initiatives for societal impact characterisation in a societal category – activity midpoint – endpoint frameworks (Benoît and Mazijn, 2009, pp. 45, 49; Fontes, 2016, pp. 29, 127–133; ISO and GRI, 2014)

8. Synthesizing and reconnecting to the SDGs.

Every time we review specific sub-fields in the academic study and communities of practice of sustainable development, we may be tempted to dive deeper and deeper with further detailing. Working in this very complex field (from any of the many possible positions in relation to the full (value chain) production and consumption system), when we choose to narrow down to what may seem a feasible way forward, we tend to reduce our scope and build in biases (like the example of the Roundtable for Product Social Metrics discussed above). This understandable tendency partly accounts for the alleged vagueness of the concept of sustainable development, which I addressed in the introduction. For the purpose of this chapter I focus on the common ground and attempt to strengthen the argument that in general we know what we are looking for and that this is actually validated by high level UN decision-making.

Following the argument in this chapter,
- we need to build indicators and index systems based on a clear guiding vision and key elements;
- there is a clear systemic vision of sustainable development as the twin SD-agenda of integral ecological and societal fairness;

- which can be described as PPP with prosperity as the third P, explicitly separating profits of firms as internalities from the externalities addressed in this twin SD-agenda;
- the goal setting should apply the reasoning of logic models, clarifying the logic causal pathways from inputs, policy outputs via intermediate outcomes to the end-outcomes;
- this is applied in the field of environmental impacts and can also very well be applied in the field of societal impacts;
- and thus allows us to present the twin SD-agenda as addressing the planet, people and prosperity issues in terms of end-outcomes, or as it is called in the (s)LC(S)A community: as the intended 'areas of protection';
- but in the area of 'prosperity' a stronger theoretical foundations is still required.

This line of reasoning can strengthen both the governance agenda and the (academic) impact assessment practices. For this we need to have a closer look at the 17 SDGs, politically validated in the UN General Assembly on September 25th, 2015 (General Assembly UN, 2015). These 17 goals[8] are formulated in very different forms and further detailed in 169 sub-goals, with between five and 19 sub-goals per SDG (a detailed explanation is available in Osborn et al., 2015). Figure 7 shows our analysis of these sub-goals in terms of the logic model discussed in section 3 and Table 2. We see that only 25% of these goals have the nature of a 'end-outcome' goal, formulated in terms of a reduced impact, or in other words: as an achieved level of either planetary or societal wellbeing. Most of the sub-goals (39%) are formulated as policy outputs (plans, projects, regulations), and as policymaking (inputs or throughputs) (15%). A small part (12%) is formulated as intermediate outcome (behaviour response of target groups). Others stress in a comparable analysis that the SDGs focus mostly on government roles, ignoring the role of businesses and other actors (Spangenberg, 2016).

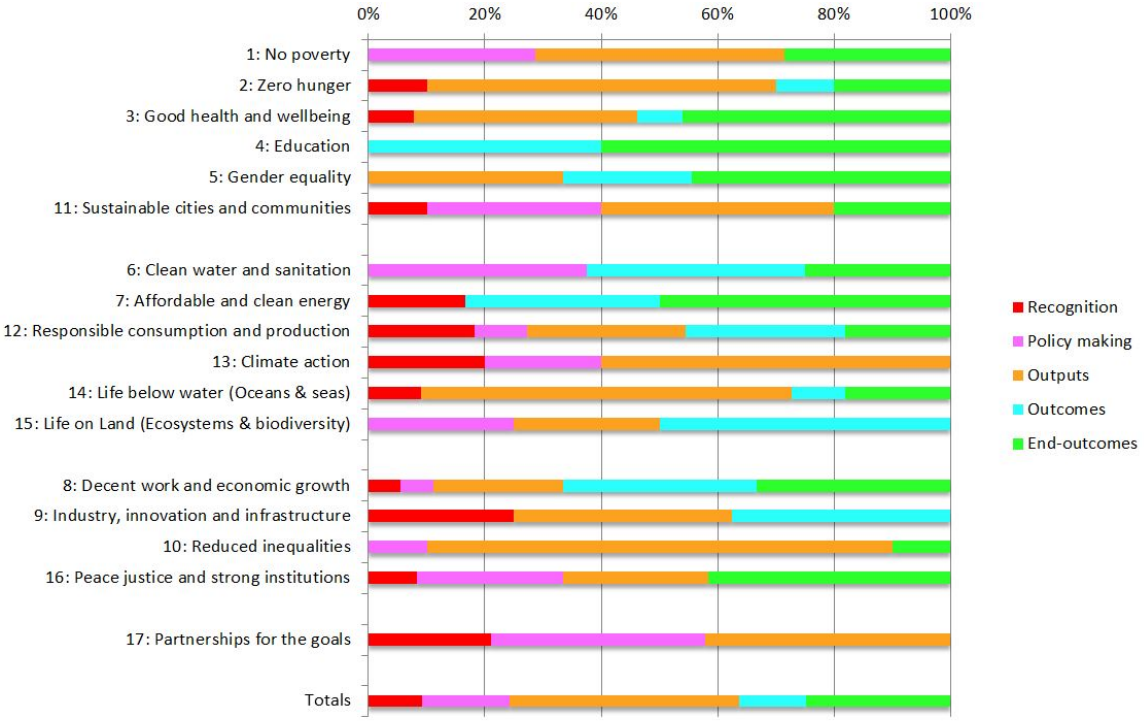

Figure 7

[8] When clarifying the concept of sustainable development as intended end outcomes, we could better talk in terms of only 16 SDGs, as SDG 17 only refers to collaborative policy activities.

17 SDGs characterized as steps in the logic model (for more details see Appendix I)

But regardless of the weakness in this political result of 17 SDGs in clarifying pathways of creating the necessary end outcomes, they turn out to be very valuable, as they are far more inclusive in describing the twin SD-agenda of integral ecological and societal fairness. The SDGs are very explicit, especially in the area of socio-economic institutions and the endpoint of fairness in the economic system and societal stability: such as SDG 8.5 (achieve full and decent employment by 2030); SDG 10.1 (income growth of the bottom 40% of the population at a rate higher than the national average); SDG 16.4 (significantly reduce illicit financial and arms flows, strengthen recovery and return of stolen assets) and SDG 16.5 (substantially reduce corruption and bribery). These 'prosperity' goals have not yet properly found their way into the sustainability assessment practices of products and companies, which I discussed in section 5 to 7.

As a result of the extensive literature review in this chapter, aiming at finding common ground, which is also validated by the various synthesising activities in global communities of practice, I suggest an integrated representation of the rough consensus on the key components of the concept of sustainable development as the intended end-outcomes.

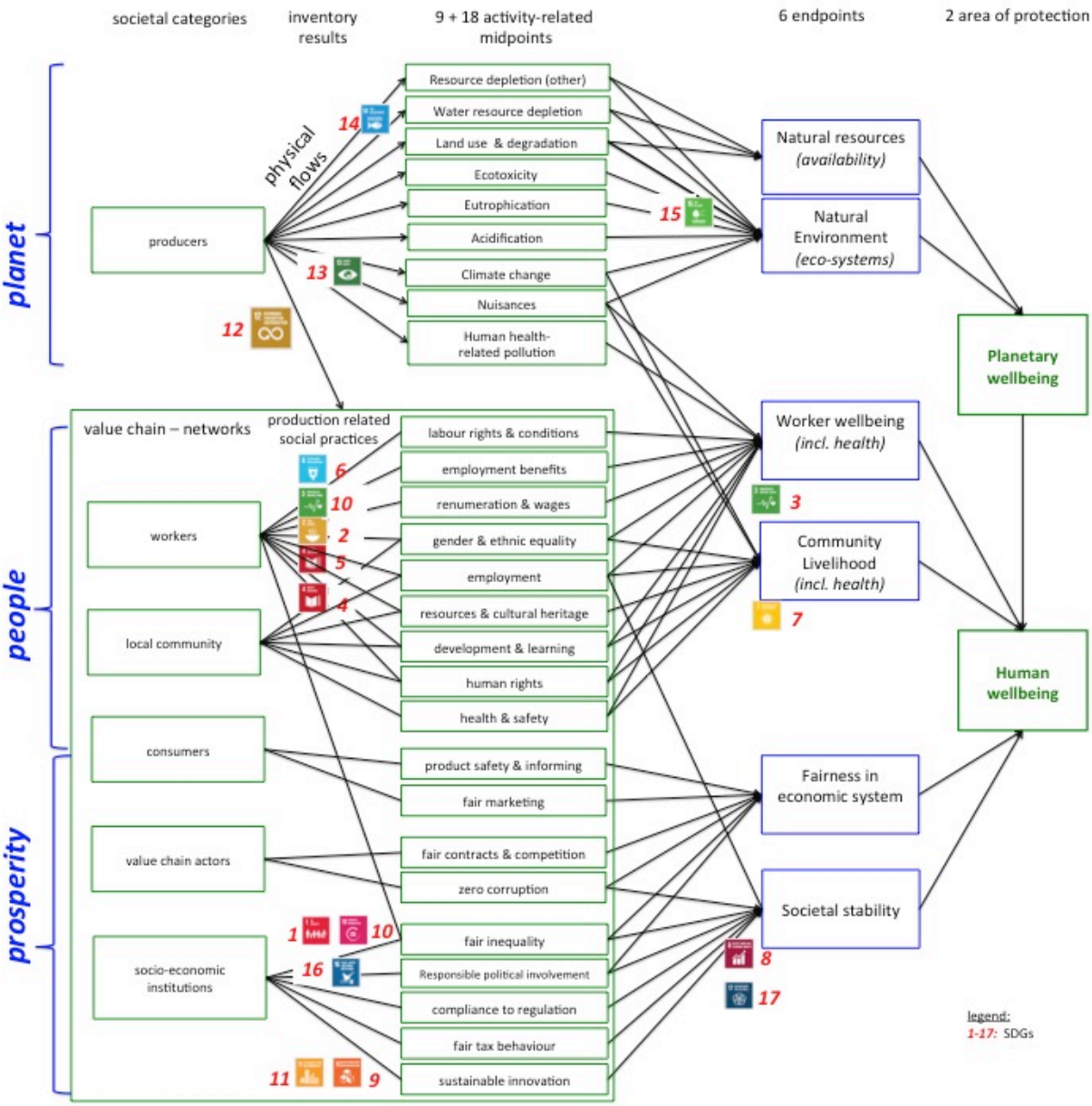

Figure 8
Integrating the rough consensus in global scholarly practices of sustainability assessment and the 17 United Nations Sustainable development goals in a logic model representing the dual SD-agenda. Legend: 1-17 = SDGs.

Figure 8 combines the results of section 5 to 7 and uses the logic model approach to display the main pathways, while avoiding the abundance of detailing that most communities of practice tend to present, especially when they make the steps from goal formulation (which should be in terms of end-outcomes) towards indicators for measurement of progress. The goals are to be the two final areas of protection, which are well agreed upon: planetary and human wellbeing. The six endpoints also each have their own strong foundations in various academic fields, even though they are often not yet sufficiently connected.
Further detailing the 9+18 midpoints is the actual minefield. We have seen that both the academic community and the communities of practices have made strong efforts to come to a widely shared view on various parts of this. The presentation in Figure 8 intends to balance

the elements of PPP in a way that respects the twin SD-agenda of integral ecological and societal fairness.
With this argumentation, I stress the need to describe sustainable development as the intended end-outcome and not to mix up SD-indicators with parameters describing means or policy inputs, throughputs and outputs. This is one of the sources of confusion about the concept. A second source of confusion is the incorrect and obscuring use of all kinds of economic parameters, and using profit, production costs and investment costs as data in assessing the level of sustainability. Instead I stressed and elaborated the use of 'prosperity' as the third element of the triple P, referring to macro-economic system elements as key pathways. This is also better in line with the UN SDGs. The micro-economic parameters can be used to assess the efficiency and feasibility of improvement options, but in section 5 we saw that in many cases the numerator and the divisor in this equation is being mixed up, using the 'total life cycle costs' in the place of 'prosperity'.

With this extensive review, the concept of sustainable development has been recalibrated as aiming for the *'planet, people, prosperity'* triple-P, as shown in the Rubik's cube (Figure 1) instead of the obscuring triple bottom line (TBL). The 'time' and 'place' dimension were not discussed in detail, but 'place' refers to applying the full value chain system approach, while the 'time' dimension refers to translating the long-term challenges for each of the triple-P issues as input for defining the planetary boundaries, which serve as reference points for outcome evaluations. In this way the 'time' dimension addresses to most clear point of consensus on the concept: that of intergenerational justice.
Our joint challenge as assessment and indicator communities is to link our diverse practices in further detailing the parameters and maintaining the suggested focus on the common ground presented here. This needs to enable application in the many decision making contexts on any human activity in such a way that it acknowledges the full spectrum of potential impacts on the three issues domains, and avoids successes for some issues at the expense of increased impacts for other issues and at other places, while simultaneously respecting the needs of future generations.

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Logic model element cf. Table 2 / SDG	# 1 … x + a … d	Recognition and activation				Stages in logic model				
		causes	states	knowledge	Governance response	INPUT	THROUGHPUT	OUTPUT	OUTCOME	END OUTCOME
1 End poverty	5 + 2						1a – 1b	1.3 – 1.4 – 1.5		1.1 – 1.2
2 End hunger & good food	5 + 3			2a				2.1 – 2.2 – 2.3 – 2.5 – 2b – 2c	2.4	2.1 – 2.2
3 Health & well-being	9 + 4			3b				3.5 – 3.7 – 3.8 – 3a – 3d	3c	3.1 – 3.2 – 3.3 -3.4 – 3.6 – 3.9
4 Education	7 + 3								4.7 - 4a – 4b – 4c	4.1 – 4.2 – 4.3 – 4.4 – 4.5 – 4.6
5 Gender equality	6 + 3							5a – 5b – 5c	5.4 – 5.6	5.1 – 5.2 – 5.3 – 5.7
6 Water & sanitation	6 + 2					6b	6.5 – 6a		6.3 – 6.4 – 6.6	6.1 – 6.2
7 Affordable & clean Energy	3 + 2			7a					7a - 7b	7.1 – 7.2 – 7.3
8 Growth and employment	10 + 2			8a		8.10		8.3 – 8.8 – 8.9 – 8b		8.1 – 8.2 – 8.4 – 8.5 – 8.6 – 8.7
9 Infrastructure & innovation	5 + 3			9.5 – 9b				9.3 – 9.6 – 9c	9.1 – 9.2 – 9.4	
10 Reduce inequality	7 + 3					10.6		10.2 – 10.3 – 10.4 – 10.5 – 10.7 – 10a – 10b – 10c		10.1
11 Cities & settlements	7 + 3			11c			11.3 – 11.4 – 11a	11.1 – 11.2 – 11.7 – 11b		11.5 – 11.6
12 Consumption and production	8 + 3			12.8 – 12b		12a		12.1 – 12.7 – 12c	12.2 – 12.4 – 12.6	12.3 – 12.5
13 Climate change	3 + 2			13.3		13b		13.1 – 13.2 -13a		
14 Oceans & seas	7 + 3			14a				14.2 – 14.3 – 14.4 14.5 – 14.6 – 14b – 14c	14.7	14.1 – 14.4
15 Ecosystems & biodiversity	9 + 3					15a -15b	15.9 – 15c	15.1 – 15.2 -15.3 – 15.4 - 15.5 – 15.6 – 15. 7 – 15.8		
16 Peaceful & inclusive societies	10 + 2			16.10		16a	16.7 – 16.8	16.3 – 16.6 – 16b		16.1 – 16.2 – 16.4 – 16.5 – 16.9
17 Global Partnership	19			17.6 – 17.8 – 17.18 – 17.19		17.1 – 17.9 – 17.16 – 17.17	17.13 – 17.14 – 17.15	17.2 – 17.2 – 17.3 – 17.4 – 17.7 – 17.10 – 17.11 – 17.12		
Totals	126 + 43 = 169	-	-	8 + 8 = 16	-	6 + 6 = 12	9 + 5 = 14	50 + 17 = 67	14 + 6 = 20	43
%[1]				9,3%		6,9%	8,1%	38,9%	11,6%	25%

[1] = column total divided by 172 as some goals are mentioned in 2 columns

Appendix 1: Content analysis of UN-SDGs on elements in logic model addressed per sub-goal

Appendix 1: Content analysis of UN-SDGs on elements in logic model addressed per sub-goal