SUSTAINABLE BUSINESS MODEL INNOVATION

TNO innovation for life

November 2020

PREFACE

What is a business model? If you ask 100 people, you may get 100 different answers. But most people will probably agree that the core of a business model is how a company delivers value to its customers and makes a profit. By creating a win-win for both the company and the customers, a successful business model thrives under the forces of the market. It scales, replicates and lasts.

That is why business models are so important for advancing sustainability. A sustainable business model should be able to not only bring customer value and company profit, but also benefits to the environment and society. As the business proliferates, it will simultaneously improve the well-being of people and the planet. If this works, it would be a most powerful, resilient and pleasant pathway for the much-needed transition towards a sustainable future.

But sustainable business models are not easy to create. Our conventional business models have been validated and perfected over decades and centuries to deliver customer value and company profit. Now suddenly adding the sustainability dimension into it, questions are arising everywhere. How to find the new magic formula to bring sustainability benefits, without sacrificing, or perhaps even enhancing customer value and company profit (remember, that is what makes a business model powerful in the first place!)? How to truly weave sustainability into every fabric of the company and change the way people have been working since as long as they can remember? How to bring our partners, suppliers, customers and other stakeholders on board, as sustainability often requires collaboration throughout the value chain? And wait a minute, how can we be sure that by going through all these efforts, we will be delivering actual benefits to people and the planet, instead of unintentionally shifting problems somewhere else?

These difficult questions have triggered strong interest in many innovative minds. A wealth of theories, methodologies, frameworks and tools have been created to answer such questions and help us to find way in these uncharted waters. In fact, sometimes finding the way among the multitude of innovation support options may have become a challenge by itself, creating the need for a guidebook like this one. This is a collection of the various sustainable business model innovation tools TNO has developed over the years, structured under a thoughtful framework covering a comprehensive set of key success factors: societal impact, value creation, internal decision making, and ecosystem collaboration. It is organized in a practical way, explaining the intended user and use of each tool.

As sustainable business models extend beyond the realm of conventional business knowledge, we look forward to seeing increasing collaborations between businesses and researchers, in environmental sciences, social sciences, technologies and many more disciplines, to create more and more success stories and accelerate real progress along this important pathway to the future.

Ke Wang
Knowledge Lead, PACE

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INTRODUCTION

Aligning our economies and societies with the carrying capacity of the planet is one of the greatest challenges of these days. Nevertheless, efforts to achieve this transition have not accelerated sufficiently; global greenhouse gas emissions have continued to rise with no sign of peak emissions in the near future[1]. Natural resource use is not decreasing but rapidly growing and is expected to double towards 2060 compared to 2011[2]. If the below-1,5 degrees Celsius limit is to be achieved, global emissions have to be cut 45% over the coming decade. Picking up the pace of the sustainability transition is crucial and the call for this has increased substantially as a result of the covid-19 pandemic, which brusquely revealed the vulnerability of our societies to natural disruptions. Of course political action is a key enabler of both post-covid recovery and the sustainability transition - ideally combined as a joint challenge. However, also businesses have a pivotal role to play in the success of the transition towards sustainability. Their large-scale influence on the economy and the natural environment makes them crucial actors in the transition at hand. Although the negative effects are not to be undervalued, the pandemic did show that change can be achieved, and that it can be achieved quickly. Many organisations proved able to adapt, innovate and change at a rate that was not perceived achievable before. We are now challenged to achieve similar innovation and change for the purpose of sustainability.

Directing businesses towards sustainability is not merely a matter of developing smart technical solutions. It requires company action and a shift to structurally responsible and sustainable operations, pursuing efforts beyond incremental and marginal change. Put differently, sustainability is to be embedded in the architecture of organizations and adopted within their business model. For most companies this means business model adaptation at the very least, ensuring that the impact logic becomes central to the structural fabric from which organizations operate. A logic in which the reduction of negative impact (as a starting point) and the creation of positive impact at various scales is the guiding principle. Resulting business models can lead to the creation of so-called multiple values, moving beyond only financial revenue generation as the sole focal point to environmental and social value creation as well. To achieve such change, more often than not companies are required to look beyond the borders of their own business, as concepts such as sustainability and impact are not limited to organisational boundaries. This means collective efforts are needed to achieve such change – a shift from individual organisational action to configurations of parties working together in co-created business models.

Achieving such multi-value and multi-actor business models is not a trivial process. How to determine which impact you can create as a company or network of companies? How to avoid merely squeezing in sustainability in the margins of existing business cases? How to organise the division of responsibilities, revenues and risks between various participants of a business model? And how to measure whether the innovation is actually doing good? These are all valid yet complex questions for which companies may not always know how to find an answer. To support companies with these kinds of challenges and to guide them in the process of business model

1 With the exception of a brief stabilization in 2016. UNEP (2019). Emissions Gap Report 2019. Executive summary. United Nations Environment Programme, Nairobi.
2 OECD (2019). Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences, OECD Publishing, Paris.

innovation towards sustainability TNO has (co-)developed a wide range of tools and methods, based on decade-long experience in both research and practice.

The aim of this publication is to assemble and explain the various tools that exist within the portfolio of TNO[3] and to show where and how in the process of sustainable business model innovation these tools can support organizations. The tools and methods relate to different parts of the business model innovation process and can show interdependencies and relations at various levels. To clarify these relations between the various methods and to explain the positioning of these tools in the process of business model innovation[4] itself, the TNO Sustainable Business Model Innovation (SBMI) Framework was developed. Sustainable Business Model Innovation is an iterative and non-linear process. The same goes for the framework itself as well as the positioning of the tools. The framework implements several unique characteristics, e.g. by integrated macro-economic and materials flow analysis – linking a monitoring and policy perspective- and approaches to organize the ecosystem for a coherent portfolio of sustainable innovations – linking open and mission oriented innovation.

These are not carved in stone and can and probably will develop as research and experience from practice progress. The publication can thus be seen as a reflection of the current status of knowledge development within an iterative process of support to the business community towards sustainability.

FOR WHOM?

This brochure is for everybody that aims to achieve sustainable businesses. This means companies, from people at the level of the boardroom striving to achieve ambitions to project leaders working on concrete ideas and innovations. This also means consultants, advising companies or networks of companies on business model innovation, as well as other research entities eager to expand their knowledge base and collaborations within the domain of sustainable business model innovations.

3 The collection of tools in this publication does not reflect the entirety of the work that TNO does on business modelling. However, these tools are among the most important ones when it comes to sustainable business modelling.

4 Geissdoerfer, Martin, Doroteya Vladimirova, and Steve Evans. “Sustainable business model innovation: A review.” Journal of cleaner production 198 (2018): 401-416.

TNO SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK

Conventional business model innovation has long existed and is a well-researched and applied domain. The focus of conventional business model innovation is generally on financial value creation and the quest to commercialize a new technology or other innovation[5]. Concepts of sustainability and impact beyond the monetary realm are often not included nor aimed at. The field of sustainable business model innovation has emerged in response to this narrow focus. Although less mature this research domain is growing rapidly. In the current literature base, Sustainable Business Model Innovation is defined as:

"The conceptualisation and implementation of sustainable business models. This can comprise the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another."[6]

But what does the process of sustainable business model innovation entail? The various components are shown in the Sustainable Business Model Innovation (SBMI) framework as constructed by TNO, which builds upon the available knowledge from literature and practice and combines this with TNO expertise and experience (see Figure 1). The TNO SBMI framework is a holistic approach which outlines the various elements of the business model innovation process and which can be used as a guide to the adaptation of existing and the construction of new business models. The framework is not about designing the innovation itself (for example, the process to valorise a residual stream or the measure to achieve energy reduction) – but is about implementing and scaling that innovation through the business model of the organisation or network of organisations.

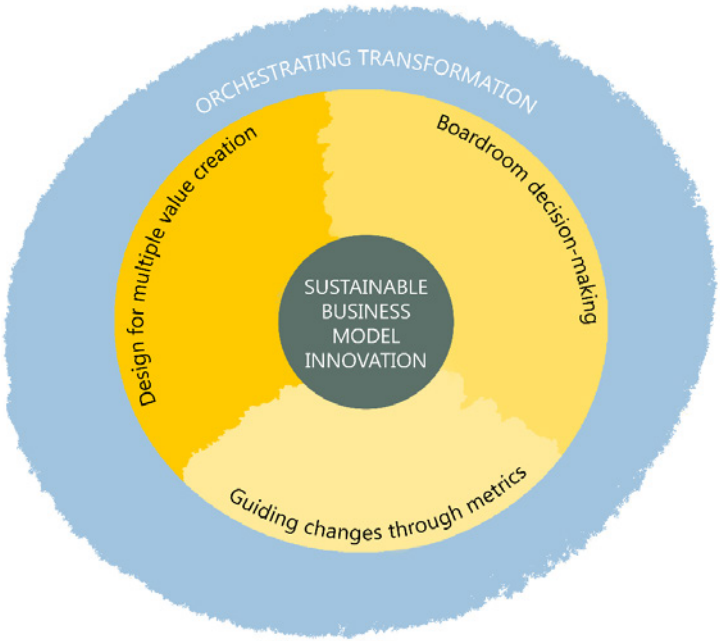

FIGURE 1. THE TNO SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK

5 See for example Chesbrough, H. (2010). Business model innovation: opportunities and barriers. Long range planning, 43(2-3), 354-363, and Amit, R., & Zott, C. (2012). Creating value through business model innovation. MIT Sloan Management Review.
6 Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. Journal of cleaner production, 198, 401-416.

The framework is non-linear and can be read and used at any point. Central to the TNO SBMI framework is the logic of impact and multiple value creation. Therefore the starting point maintained in this publication is the component ‘Guiding changes through metrics’.

GUIDING CHANGES THROUGH METRICS

The purpose of organizing sustainable business model innovation is of course to contribute to sustainability. However, how to set the right goals and determine how value can actually be created? Using tools to measure the impact of a product or even the whole portfolio of a company or network of companies provides such information and the basis on which business models can be grounded. In addition, moving beyond financial value creation to multiple value creation requires a means to determine what those other values are and how you as an organization or network are scoring on those values. The measuring of impact can be used again at later stages, as a means to check and monitor progress and determine whether and what impact is actually being achieved.

In this class of methods we can address the micro, meso and macro-economic levels. The micro level focuses at the lifecycle impacts of a specific product, linking concrete organisations; the meso level is about linking industry supply chains of a specific product class or materials flow; while the macro level assesses regional, national and international economic flows and material flows. This level can thus serve both as a characterisation of a region to identify specific points of improvement as well as to monitor the effects of a past policy measure.

BUSINESS MODEL DESIGN FOR MULTIPLE VALUE CREATION

To determine whether or not the implementation of an idea or innovation direction requires business model adaptation or the development of a fully new business model requires an analysis of the elements of the business model, as well as the interaction between those components. To do this effectively both qualitative and quantitative tools can be used to mould and shape the business model and determine the viability of various options. As this can cross organisational boundaries, networked approaches are dominant in this class.

BOARDROOM LEVEL DECISION-MAKING

Many very good ideas and innovations never take-off due to faltering or even lack of decision-making at boardroom level. To overcome this barrier, adequate information provisioning as well as support with the interpretation of this information to the relevant decision-making units is essential. A well-informed, convinced and supportive boardroom is of vital importance to the structural embedding and scaling of sustainability within the businesses. Particularly as innovations typically require investment decisions. In the context of multiple actor and consequently multiple and long term value creating innovations, the related cost-benefit analyses become even more complicated. Approaches to support this phase, for example through gradual adding of quantitative details and making trade-offs transparent, are critical.

ORCHESTRATING TRANSFORMATION

The previous three building blocks are all part of the process of constructing, committing to and evaluating a specific business model. Once a business model has been determined on and is pursued in practice it becomes important to understand how the ecosystem in which the model will be embedded needs to be altered and reorganised. In other words, what structures are needed to support the success and scaling of the business models underlying innovation? Particularly when a set of business models is the result of a multi-stakeholder collaboration, creating change at a more systemic level, the active orchestration of the intended transformation becomes crucial.

In our experience, societal challenges often require a range of innovations. These are interdependent and thus a coherent portfolio of innovations is required. Often these innovations require participation of a set of stakeholders, e.g. regional governments, knowledge institutes, large companies and a set of innovation specific stakeholders. To organise and manage such an open innovation portfolio and the corresponding ecosystem a specific organization can be set up. We refer to this as an innovation centre, but it is sometimes also called digital innovation hub, cluster, living lab et cetera. This component includes approaches to set up and manage such network forms.

CHARACTERISTICS OF THE SBMI FRAMEWORK

In summary, the SBMI framework is based on a set of key features, which can be seen as the foundational fabric of the structure. SBMI is:

- **Impact driven:** the core purpose of using SBMI is to create impact and contribute to sustainability. This is a long term objective and inherently deals with complexity and uncertainty.
- **Multi-value:** this means multiple values are pursued, being environmental, social and financial values.
- **Collaborative:** in many cases, collaborations between multiple parties are needed to achieve change and realize multiple values.
- **Action-driven:** these business models are created to achieve change. The purpose is not to do a theoretical exercise, but to aim for implementation in practice.

- **Multi-level interaction:** the framework operates at the micro-level of organizations, networks of organizations and their business models, the macro levels of achieving societal values which are always beyond the level of the business, and the systemic approach of organizing transformation by influencing the necessary innovation ecosystems and policy actors. The identification of the various levels as well as the focus on the interaction between them is key.
- **Non-linear:** although structured in a certain way for the purpose of understandability, the process of sustainable business model innovation is non-linear. There is no right or wrong starting point, no fixed direction in which the various components can or should be implemented and there certainly will be overlap between the various parts. This is even more so given the fact that sustainable business model innovation takes place in a transitional context, in which the economic playing field is not yet fully worked out and the environment is dynamic. Business model innovation will thus be cyclical and iterative, in which you travel back and forth through the various parts of the process.
- **Learning:** in order to deal with the complexity and uncertainty that long term societal goals inherently put forward, it is key to monitor and evaluate on the different levels.

The SBMI framework is unique in its integral approach towards sustainable business model innovation in which all these characteristics are identified and included. Although this does not mean that the SBMI framework and related tools provide a silver bullet approach towards business models for sustainability (it might be fair to say that nothing can), it provides a valuable addition to the domain of sustainable business model innovation support.

POSITIONING OF THE TOOLS WITHIN SBMI

Over the past years TNO together with partners has become more and more active in the field of sustainable business model innovation. Figure 2 shows the current portfolio of tools and approaches as (co-)developed by TNO and indicates where in the process of sustainable business model innovation these apply.

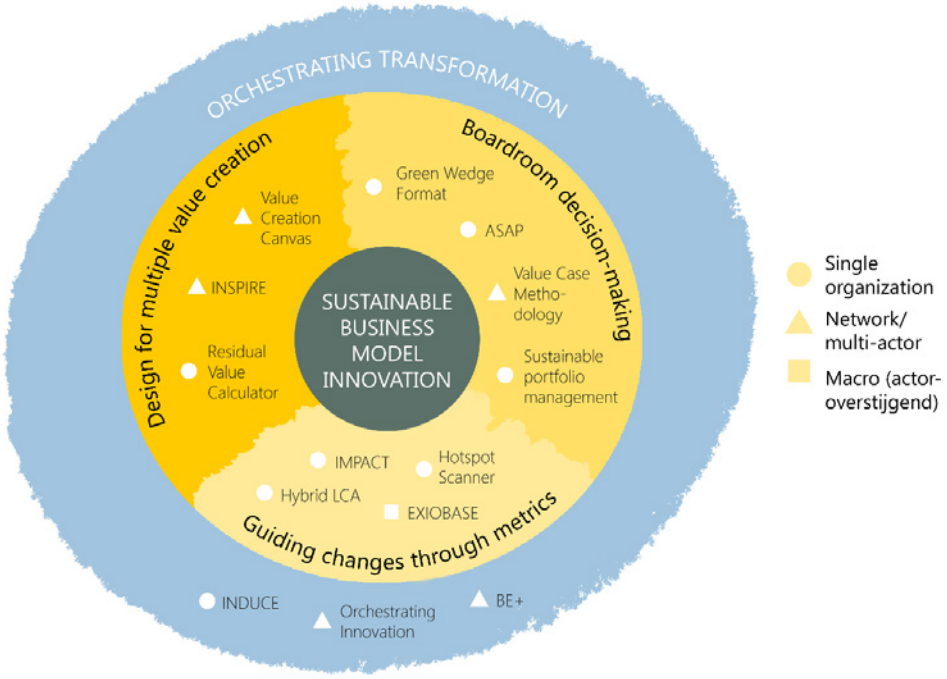

FIGURE 2. THE TOOLS AND METHODS OF TNO POSITIONED WITHIN THE SBMI FRAMEWORK[7]

The positioning of the tools in practice is less exact than visualised. Several of them apply to more than one domain and in some cases there can or will certainly be overlap between the activities and/ or outputs of the tools. Nevertheless, this structuring reflects most accurately what the current set of tools of TNO contributes to in relation to the SBMI process. In the following parts of this brochure each of these tools are elaborated on. Part I discusses the tools and methods in the component of 'Guiding changes through metrics'. Part II explains the set of methods that contribute to the 'Design of business models for multiple value creation'. Part III reveals which tools can provide support to the achievement of 'Boardroom-level support and decision-making' for business model innovation. Part IV Moves from the micro to the macro-level and highlights what approaches exist to 'Orchestrating Transformation' and the accomplishment of a supportive innovation ecosystem.

7 The collection of tools is market with three symbols: dot (single organizations) are methods focused on application with an individual organizations; pyramid (networks) are methods focused on application with multiple actors; square (macro) are methods that reflect the macro level of society (aggregated).

READING GUIDE:

We see this set of sustainable tools as very helpful in making steps towards more sustainable businesses. All tools have been developed by TNO or TNO in collaboration with parties in the field. The tools are tested in practice and experienced as helpful in making either steps in decision making or coming to fact based insights.

The toolbox consists of several parts dealing each with a specific aspect of business modelling, filled with tools. Each chapter describes a tool, how it is used, when it is applicable and for whom. The reader will also find further reading and contact information of our experts, ready for you to tell you more. We cordially invite you to contact them.

Part	Tool
Determining directions for change and measuring impact	EXIOMOD
	Sustainable Hotspot Scanner
	IMPACT
Business model design for multiple value creation	Value Creation Canvas
	INSPIRE
	Residual Value Calculator
Boardroom level decision-making	Value Case Methodology
	Green Wedge Workshop Format
	ASAP
	Sustainable Growth Metrics
Orchestrating transformation	Orchestrating Innovation
	BE+
	INDUCE

PART I - GUIDING CHANGES THROUGH METRICS

1 EXIOMOD

THE IDEA IN SHORT

It might appear curious to include a macroeconomic model in the list of tools and methods that support new business models. And yet: modelling global environmental and labour impacts, modelling legal and fiscal policy actions, indicating “waterbed” effects that spread out over the whole of the economy? Those are aspects that a macroeconomic model can assess. Combined with other models, EXIOMOD can support decisions making of start-up entrepreneurs, established multinationals, policy makers and equip many others with quantified arguments.

The basic model is not aimed at organisational aspects and business networks, although certain types of behaviours of economic agents can be made visible custom based in order to mimic certain phenomena, such as risk aversion or consumer awareness.

AUTHORS

EXIOMOD was first created as part of a FP6 program starting 2006 called EXIOPOL. Nowadays, several knowledge institutes have their own versions, some of which can be customized using supporting networks like GITHUB. Elmer Rietveld and Hettie Boonman (TNO) are currently responsible for the (continuous) development of the model.

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CONSTRUCTION DATE

2006 – present. Although operational since 2011, it will always be subject to finetuning and improvements.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

For the first time in human history, innovation can’t only lead to better products and services, but should also be applied in such a way that planetary boundaries are respected whilst maintaining a standard of living so that it enables a peaceful society. Put differently, we must make the energy transition and circular transition a reality, or we might be left with an unstable planet and society. The energy transition and the circular economy are expected to have a global impact on our economy, as is evidenced by shifts in employment. One example of this, is that coal mining jobs around the world are expected to disappear. On the other hand, there are likely to be additional jobs in the recycling industry. With proper estimates of the effects of these transitions, public authorities can determine whether adjustments in their policies need to be made during the process.

INTENDED USERS

In order to be able to analyse such impacts accurately, detailed data are required on the energy and circular technologies being used. The more detail in the data, the better we can measure the impact of transitions. The EXIOMOD model contains these data and is able to calculate the expected economic and environmental effects of intended measures.

It is very important that the calculations provide stable and transparent outcomes. Every change (such as tax increases, shifts in consumption behaviour or adapted production processes) can have an impact on the economy. All of this information needs to be clearly analysed. That's why we developed the EXIOMOD model, which can test and interpret a great deal of public and transparent data. With the model, we help national and European public authorities to make independent and well-founded predictions. TNO is therefore able to determine fact based the expected economic impact of the energy transition.

INPUT DESCRIPTION

EXIOMOD is a macro-economic model that predicts the effects of public authority measures and shifts in consumer behaviour (see infographic in Process section). These can be effects on the economy, such as employment and revenue growth per sector or environmental impact. This is an extraordinarily comprehensive model, covering 200 products and 163 sectors, among which several specifically aimed at the energy and circular transition. This allows the dependency between sectors to be included in an impact analysis. The model considers 44 individual countries into its measurements, other regions in the world are aggregated (e.g. "other Latin America") into seven rest-of-the-world regions. The model can also predict the impact of a measure on the competitiveness of a customized territory (e.g. the commonwealth).

The energy transition and the circular economy are undoubtedly having a global impact on our economy. For a thorough impact study, the quality and detail of the data used is very important. An impact analysis of the energy transition, for example, requires detailed data from the current production structure for as many energy technologies as possible. What is the 'list of ingredients' needed to generate one extra euro of revenue through wind energy technology?

With more detail on this 'ingredients list', we can also provide the user with greater detail when looking at the impact of the energy transition on dependent sectors. Of course, for the transition to a circular economy, it's important that enough information is available on the use of critical materials, scarce metals, waste, recycling and sectors that enable the optimal use of goods.

In addition to sufficient data, it is also important that calculations are carried out by a model that provides stable and transparent outcomes. A small change to the model – such as an increase in taxes, a shift in consumption behaviour or changes to the production process – should lead to explainable shifts in the economy. The information and data used by the model must be clearly analysable. In this way, a EXIOMOD modelling exercise performed with one of our users, forms a bridge between the knowledge of the individuals involved and the input.

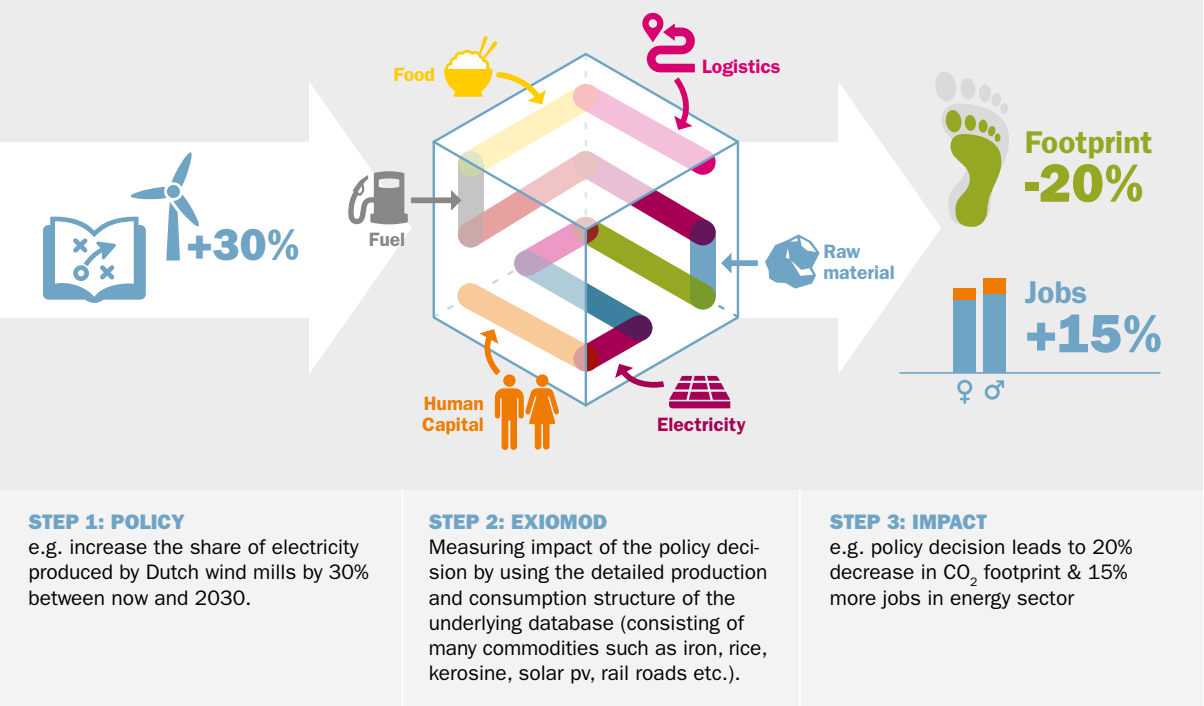

FIGURE 1.1: FLOWCHART OF EXIOMOD.

PROCESS

EXIOMOD is a macro-economic model that predicts the long-term effects of public authority measures and shifts in consumer behaviour. These can be effects on the economy, such as employment and growth of revenue per sector, but environmental impacts can also be calculated. The process is based on a system of National Accounts, a macroeconomic way of accounting first developed to assess major societal efforts in the 1930s and since then used to measure GDP amongst other things. The fact that 200 products and 163 sectors interact, requires ample calculation power. A strong desktop computer usually suffices.

The strength of this model lies partly in the underlying database: EXIOBASE. The data used in EXIOMOD is based on official and publicly verifiable statistics from public authorities and organisations around the world. Due to the high level of detail and the linked environmental data (emissions, water use, materials use, land use) for the many sectors, a broad impact study can be carried out. Another strength is the flexibility of the model. Depending on the case for which the impact is being calculated, modules of the model can be switched on or off. For example, should price effects be included or not?

OUTPUT DESCRIPTION

The EXIOMOD model has been used in advising European and national public authorities since 2007. One good example of this is the calculation of the effects of the Government-wide Programme for a Circular Economy and the five transition agendas on greenhouse gas emissions. Dutch climate objectives are based on a 49% reduction in greenhouse gases by 2030 and 85-90% by 2050, as compared to 1990. The central question of this project was: “To what extent do the quantitative objectives of the Government-wide Programme for a Circular Economy and the transition agendas contribute to the

achievement of the climate objectives?" An example of a quantitative objective from the programme is the complete recycling of asphalt in the Netherlands.

This study has shown that implementing the measures in the programme and the transition agendas could lead to a reduction of 7.7 Mt of emissions by 2030 and 13.3 Mt by 2050. These kinds of studies provide public authorities with insights into the expected contribution to the climate objectives, given the planned measures. It also enables EXIOMOD output, using other tools and methods, to percolate through decision making process within companies. For example, because the output provides immediate insights into whether current measures are sufficient or if additional interventions are needed in order to achieve the set objectives: this is relevant both on business (micro) as well as national (macro) level.

TIMESPAN

A regular EXIOMOD exercise typically takes between one and four weeks. This timespan excludes reporting and dissemination of results. This process can be expedited in case the resources (computing power, skilled people, swift interaction with non-experts) are present.

EXPERIENCE

Macroeconomic models using the EXIOMOD database (EXIOBASE) are ubiquitous in the Industrial Ecology research field and related consultancy. The number of studies using EXIOBASE since its inception around 2011 is expected to be well over a thousand. Model exercises specifically with a version of EXIOMOD are probably between 150 and 250, consisting of at least dozens of European Framework Projects (such as Horizon 2020) and related research programs (KIC EIT).

2 HOTSPOT SCANNER

THE IDEA IN SHORT

The Hotspot Scanner is a self-assessment tool to scan sustainability of products in the chemical industry. The tool gives a quick insight, with little time, data or knowledge needed, in social and environmental strengths and weaknesses of your product, not only in-company but also in the supply chain and at the end of the chain, the user. This scan provides a starting point for measures to improve sustainability.

AUTHORS

The Sustainability Hotspot Scan is developed for the International CSR Chemical Sector (IMVO Chemie) by TNO. Involved in the development of the tool were Toon van Harmelen and Elise Boukris (a.o.).

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Website to download the tool: Sustainability Hotspot Scan

CONSTRUCTION DATE

2016 - 2017

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

The Sustainability Hotspot Scan is a self-assessment tool to scan sustainability 'hot spots' (weaknesses and strengths) of products over their life cycles in the chemical industry, focusing on the environmental and social aspects of sustainability[8]. The result is a first consistent, qualitative sustainability profile of a product, as a basis for internal awareness creation, discussion and plans for improvement; it is not suited to make claims e.g. to consumers. For such actions, further detailed assessments are needed.

It is based upon state-of-the-art approaches to assess sustainability aspects such as: Life Cycle Assessment, WBCSD Social Metrics, People + Handbook Product Social Impact assessment and the MVO Risk Checker and uses different (global) public data sources to support the assessment of product specific product chains.

INTENDED USERS

This tool is especially usable for Small and Medium-size Enterprises that want to do a sustainability assessment of their product. For the tool can work with little data, time and knowledge. It can also be used by large companies on technologies and products for which little data are available, e.g. in early innovation stages. The results of the self-assessment can be used as a basis for discussion with suppliers or clients.

8 Economic aspects are considered as highly relevant but are not taken into account in this tool.

INPUT DESCRIPTION

Users are asked to fill in data that are relevant for their production processes, such as the ingredients used as well as the properties of those ingredients. In addition, the tool asks input on the relevance of certain hazard statements for the product or ingredients (available on Material Safety data sheets). Input on energy and water consumption and the location of production are used for estimating a number of social impacts.

A specification is required of the production processes that take place in the supply chain in order to make certain ingredients. The combination of type of process and volatility of the substance is used to estimate the size of emissions to air. The location of material suppliers or the origin of materials will be asked to assess the social indicators for the supply chain.

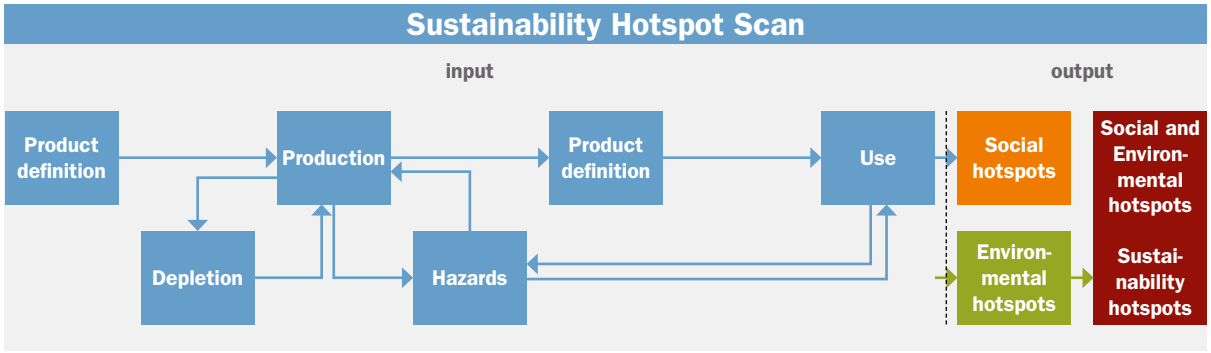

FIGURE 2.1: FLOWCHART OF THE SUSTAINABILITY HOTSPOT SCAN.

PROCESS

The hotspot assessment is conducted by answering (semi-)quantitative questions in a spreadsheet, receiving immediate feedback on the results of the specification. It starts after the product characterization and is structured along a simplified value chain of a product-market combination divided in Production (the production process of the organization deploying the tool), Supply chain (suppliers) and Use (by clients). The result for the relevant indicator(s) will be shown in colours, where yellow is the global average score, (light) red is (less) worse and (light) green is (less) better than the global average. It is a strength and weakness assessment of important aspects of social and environmental performance, a sustainability finger print as such, of a product.

OUTPUT DESCRIPTION

The Sustainability Hotspot Scan presents in a table (see table 2.1) for each stakeholder (consumer, producer, supplier) and for each environmental and social impact the total score of the underlying indicators. Social impacts considered are basic rights and needs, labour rights, health & safety, skills & knowledge and well-being. Environmental impacts included are resource depletion, climate change, environmental quality and toxicity.

The colour of a cell shows the impact from very low (dark green) to very high (dark orange). The Sustainability Hotspot Scan uses one type of scale that reflects the main objective of the scan, namely compare with average sustainability performance in the world. The scale indicates two steps better and two steps worse than the world average. Furthermore the different impacts are linked to the Sustainable Development Goals.

	SOCIAL					ENVIRONMENTAL			
	Basic rights & needs	Labour rights	Health & safety	Skills & knowledge	Well-being	Depletion of non-renewable resources	Climate change	Air, water and soil quality	Hazards
Use	Product impact on food & shelter	Product impact on labour quality	Product impact on health & safety	Product impact on education	Product function and expe - rience	Product impact on lifespan and reuse	product impact on energy & renew-able sources	Air, water and soil quality	SVHC & Hazards
Production	Forced labour, Child labour, corruption, discrimi-nation,	Worker rights, Fair wages, Social security, Working hours, Job creation	Fatal injuries at work, Non-fatal injuries at work			Energy, waste, water con-sumption	CO_2 from energy	Air quality	SVHC & Hazards
Supply chain	Forced labour, Child labour, corruption, discrimi-nation,	Worker rights, Fair wages, Social security, Working hours, Job creation	Fatal injuries at work, Nonfatal injuries at work			Energy, waste, water con-sumption	CO_2 from fossil energy	Air quality	

TABLE 2.1: EXAMPLE OF A RESULT OF THE SUSTAINABILITY HOTSPOT SCAN.

TIMESPAN

Conducting a self-assessment with the Sustainability Hotspot Scan will take approximately half a day, once one is familiar with the tool.

EXPERIENCE

The tool has been downloaded more than 200 times. See Sustainability Hotspot Scan.

3 IMPACT

THE IDEA IN SHORT

The IMPACT tool stands for Integrated Method of sustainable Product Assessment for Circular Transition. This tool assesses the social, economic and environmental impact of a product when circularity measures are taken.

AUTHORS

The tool was developed by Jacco Verstraeten-Jochemsen (TNO), Elisabeth Keijzer (TNO), Toon van Harmelen (TNO),

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CONSTRUCTION DATE

2018 - 2019

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

During design of a new product, designers need information on both the circularity and sustainability of their design and guidance on how to further improve the performance. With the IMPACT tool the Circular Economy is quantified on the basis of the latest scientific knowledge that is in line with current national and European policy, not only in the narrow sense of avoiding the destruction of raw materials, but it also explicitly includes the economy, people and the environment, hence valuing the actual sustainability impact of circular measures. IMPACT rates the circularity of various products independently of industry branches in a consistent and comparable way.

The underlying indicators within IMPACT are drawn from LCA, relying on accepted state of the art knowledge and methods, except for the economic indicators. The innovative aspect of the method is the translation towards circularity and sustainability progress on a generally understandable and applicable scale.

INTENDED USERS

The IMPACT valuation method is developed for producers and retailers in various manufacturing sectors to innovate their products in a circular and sustainable direction.

INPUT

Input is a standard Life Cycle Inventory for an existing product and its newly designed product variants. Also, prices are needed from resources and waste treatment. Next to data, interaction in a few meetings is needed between the designer and the IMPACT consultant in order to find in an iterative process the optimal circular design.

PROCESS

Applying the IMPACT methodology follows a “standard” process of Life Cycle data inventory and Life Cycle Assessment on a production innovation in an early design stage, progressing from a first life cycle scan (using proxies and limited data) to a full Life Cycle Assessment using specific data for different relevant product design variants. This process is conducted in close interaction with the client, exchanging information, gaining insight and developing designs.

OUTPUT

IMPACT makes the sustainability performance visible of a new, more circular product in relation to an existing product. It presents a few underlying indicators for the saving on resources, the reduction of the impact on people and the environment and the reduction of external economic losses in order to understand the effects of design measures.

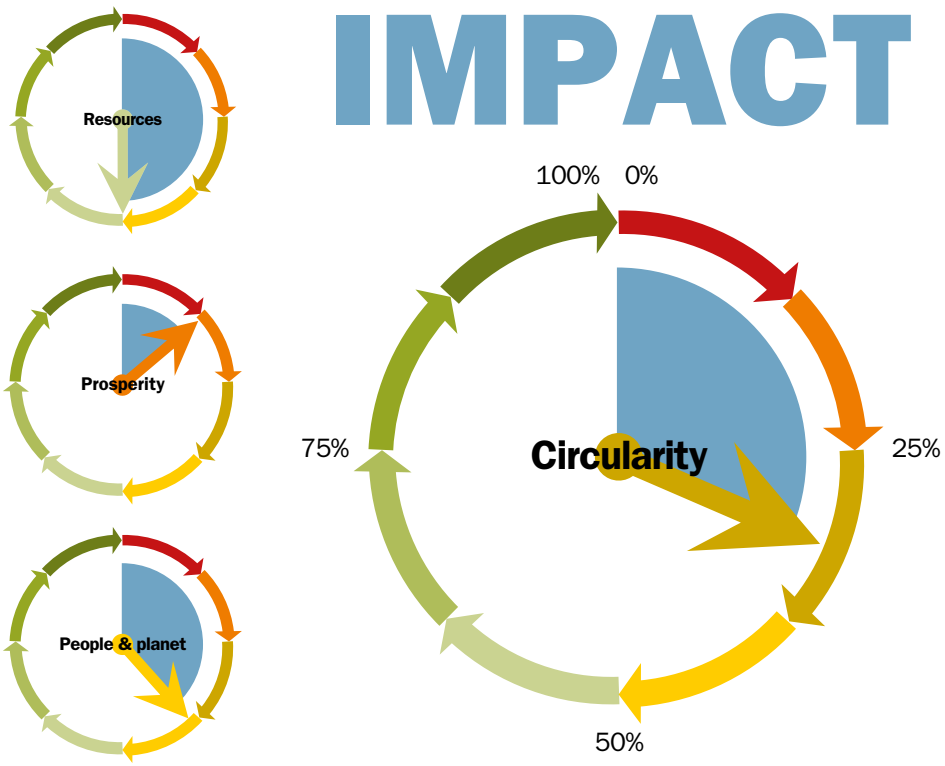

FIGURE 3.1: EXAMPLE OF AN IMPACT SCORING RESULT FOR AN OFFICE CHAIR.

The circularity percentage (100% = fully circular and sustainable; 0% = fully linear) is presented for each of the three aspects Resources, Economy and People & Environment (see figure 3.1), which makes it clear where results are achieved or not and where there is room for improvement. In addition, the various aspect scores add up to the IMPACT circularity score, with each aspect counting equally.

TIMESPAN

To apply the methodology for the improved design of a single product can take a few months, since the data collection and discussion process can be quite intensive.

EXPERIENCE

The methodology has been applied by BeterBed and Veldeman for the development of a new boxspring bed named Element. It is also being used by TNO for internal technology assessments, e.g. on plastic recycling technology which are being developed inhouse.

IMPACT offers the producer insight into achieved and possible further chain improvement with the help of underlying explanatory indicators. It also has been used in an app in communication with clients in the store on the sustainability impact of user choices on bed configurations.

PART II - BUSINESS MODEL DESIGN FOR MULTIPLE VALUE CREATION

4 VALUE CREATION CANVAS

FULL TITLE

Shared Value Creation Canvas
A quick method to (re-)design Value Networks for value creation

THE IDEA IN SHORT

This approach provides a methodology to design current and future value networks as well as current and future business models of the actors involved. By explicitly incorporating the individual actors' current and future perspective (scenario)), participation and adoption of the innovation and its intended shared values is expected to improve.

AUTHORS

Involved in the development of the Value Creation Canvas were: Mirjam Groote Schaarsberg, Wietske Koers, Wemke van der Weij, Marijn Rijken
Frank Berkers, Strategic Business Analysis Department

See for more information: STEM – Energietransitie van onderaf

contact: frank.berkers@tno.nl

CONSTRUCTION DATE

July 2015

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

The main challenge this tool addresses is the achievement of collective action; in practice a joint and coordinated decision to invest in an innovation with an aim for shared value. The focus of this tool is to design a future value network that is acceptable by all actors involved. This is achieved by the incorporation of the perspectives (i.e. current and future business models) of multiple actors involved in the value network that creates value. The following challenges apply:

- The innovation is intended to address a Grand Challenge, a societal value and you want to design the possible future actor network in context of an ecosystem in a sustainable way
- The innovation is useful for multiple sectors, and different stakeholders, e.g. both public and private parties
- If you want to understand coherence and risks associated with direct and indirect interdependencies between actors in your targeted ecosystem
- If you want to understand and manage the way value is created with your innovation
- This methodology can be applied as stand-alone or in concert with the 'Value Case Methodology' (see Chapter 7).

The output and goal of the tool is an agreed upon design of the collaborative business model that creates shared value, accompanied with an initial evaluation, identification of and commitment to clear next steps.

INTENDED USERS

The methodology is intended for use in context of multi-actor innovation projects. Consequently it is expected that it is facilitated by consultants and researchers guiding the consortium to an acceptable outcome. The facilitator requires neutrality and good understanding of stakeholder collaboration, innovation processes and business decisions.

INPUT DESCRIPTION

The methodology can be applied when there is some idea about the value creation of the innovation and the possible stakeholders that need to be involved.

PROCESS

In a Shared Value Workshop, in which representatives of all relevant stakeholders participate, we use the Value Creation Canvas to obtain insights in shared value creation. The goal of these workshops is to answer the following question: How can we collaboratively create shared value for the current (directly involved) stakeholders as well as for society?
The interrelation between resources, activities, values and actors is summarized in the Value Creation Canvas, which will be the main tool during the shared value workshop.

Activity	Format	Time needed	People to be involved	Result	Purpose
Step 1: Initialization	Desk research	Variable, depending on available knowledge and other interventions		List of activities, values, assets, stake-holders.	Preparation, activate domain knowledge of facilitator
Step 2: Preparation	Homework for stake-holders	Half a day per stake-holder	stake-holders workshop participants	Value canvas per stakeholder	Prepare individual perspectives
Step 3: Shared Value Workshop	Workshop	One day for the workshop	Facilitator, representa-tives of all stakeholders	Value network	A common view on the “Ist” situation
Step 4: Scenario Shared Value Workshop	Repeat step 2/3 Extra: desk research on scenario	Less than first round of step 2 and 3.	Extra: experts on future scenario	Future value network	A common view on the “Soll” situation
Extra: desk research on scenario	Less than first round of step 2 and 3.	Extra: experts on future scenario	Future value network	A common view on the “Soll” situation	

Activity	Format	Time needed	People to be involved	Result	Purpose
Step 5: Analysis and collective action	Desk research, interviews, plenary session (or mini workshop)	One day per value network/ case. One extra day for plenary sessions	Same participants and preferably some 'real' decision makers.	Realistic value networks and set of actions.	Evaluation and improve-ment of the innovation; commitment

TABLE 4.1: STEPWISE EXPLANATION OF THE VALUE CREATION CANVAS PROCESS.

In the workshops two types of resources are developed: 1. A value network, like below, for both the current and future situation (scenario), 2. For each stakeholder a filled out Value Creation Canvas for both the current and future situation (scenario). The confrontation of the current and future situation (scenario) helps to identify the impact of the innovation for individual stakeholders.

VALUE NETWORK

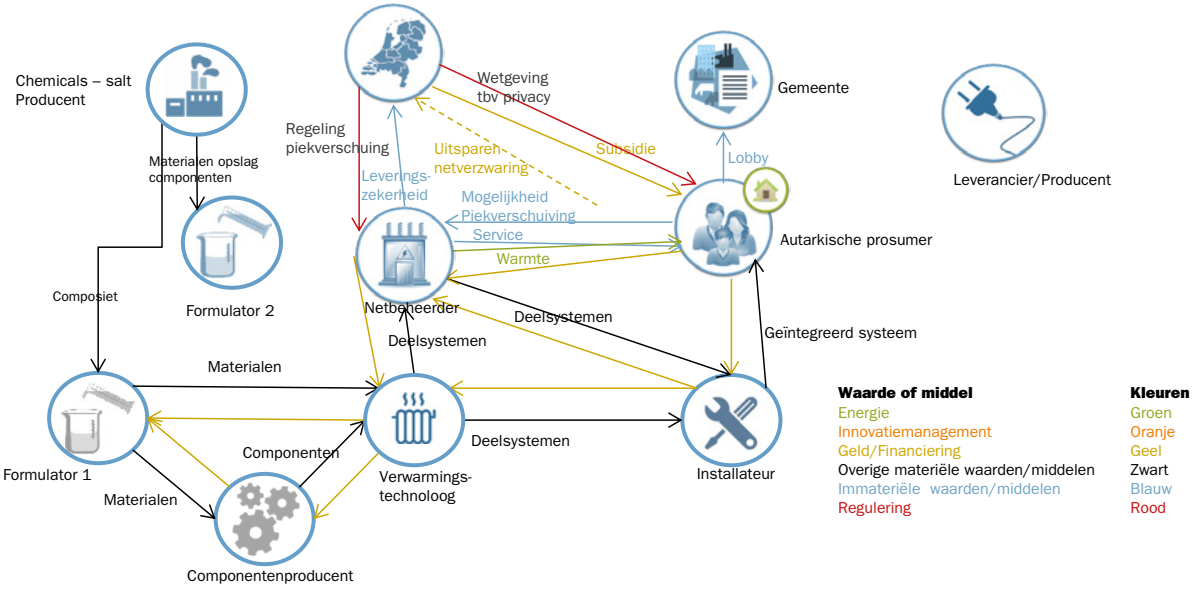

FIGURE 4.2: VALUE NETWORK OVERVIEW.

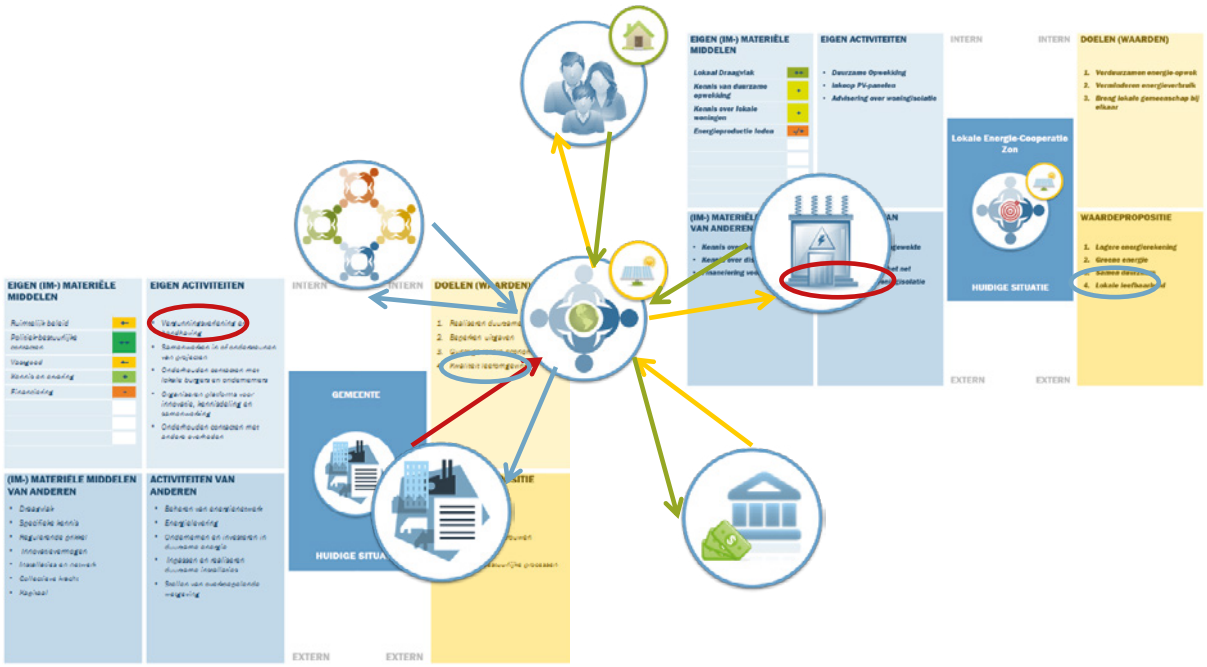

FIGURE 4.3: CURRENT AND FUTURE VALUE CREATION CANVAS.

VALUE CREATION CANVAS BASIC TEMPLATE

This canvas captures a simplified business model for the current and future situation for the specific actor. It captures activities and resources of both the focal actor as well as from network partners. It expresses the stakes of the focal actor and the value offered to its customers. By comparing what a stakeholder can offer (upper row) with what other stakeholders need (lower row of other stakeholders) and vice versa, a network of stakeholders appears in which different values are exchanged.

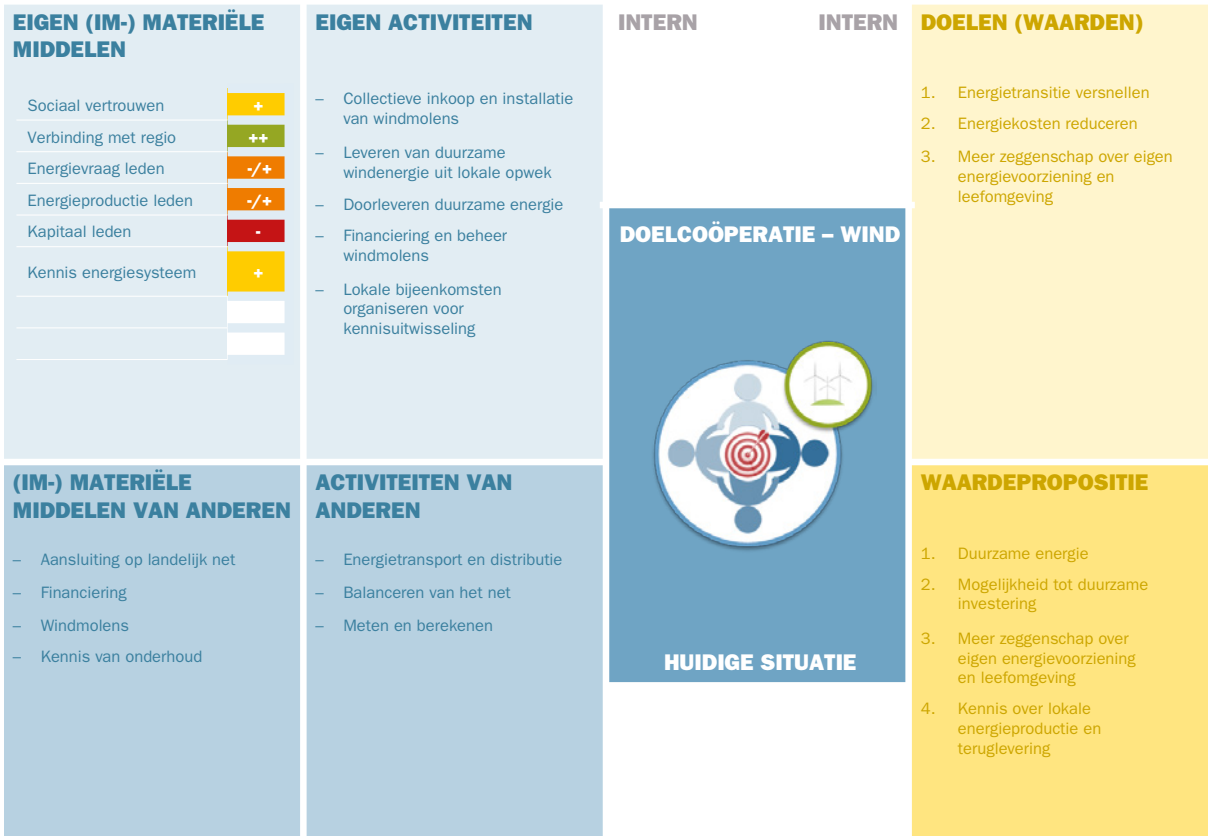

FIGURE 4.3: TEMPLATE: VALUE CREATION CANVAS SCENARIO TEMPLATE.

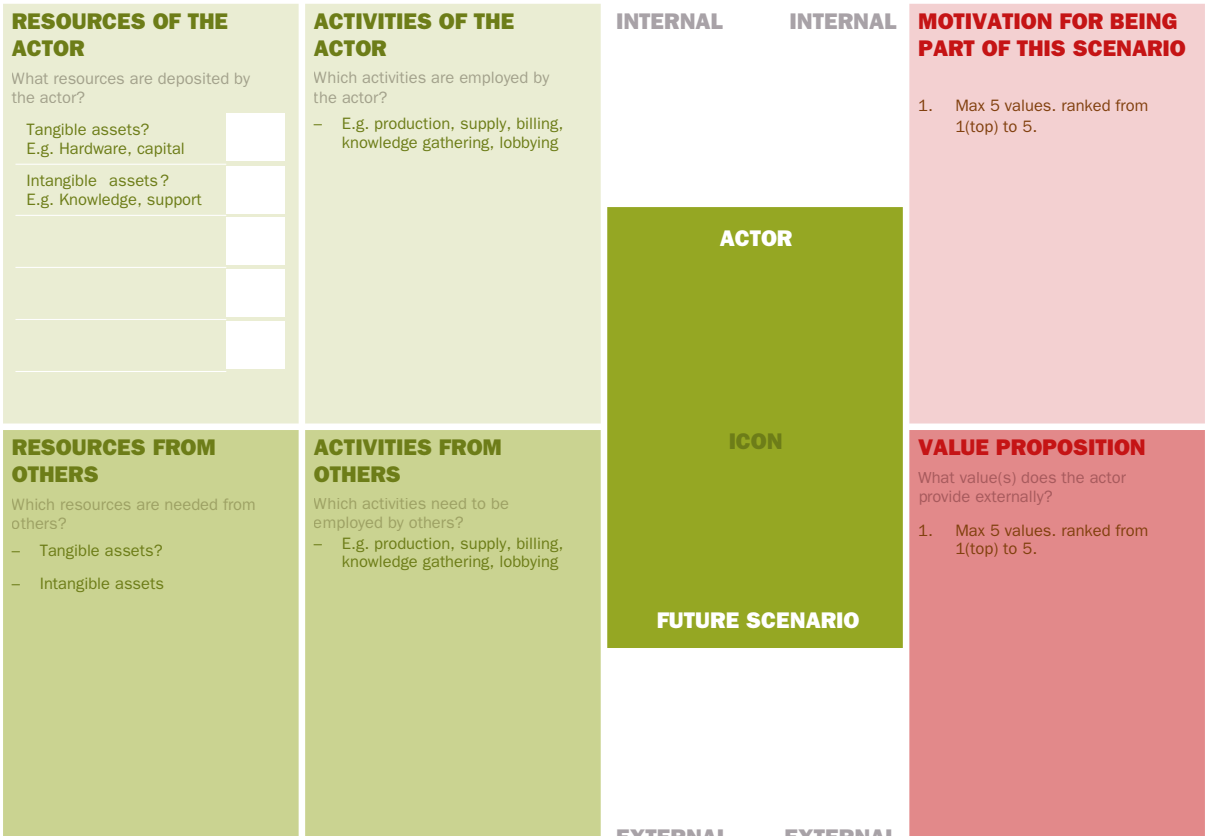

FIGURE 4.4: THE SCENARIO TEMPLATE CAPTURES THE SAME ELEMENTS BUT FOR A FUTURE SCENARIO.

OUTPUT DESCRIPTION

The output and goal of the tool is an agreed upon design of the collaborative business model that creates shared value, accompanied with an initial evaluation, identification of and commitment to clear next steps.

TIMESPAN

The timespan for completing the 5 steps requires, depending on availability of stakeholders, typically a few weeks.

EXPERIENCE

In the project “energy transition from the bottom-up” the research question how can local sustainable energy initiatives contribute to the transition towards a more energy sustainable Dutch ecosystem? was answered using (amongst others) the concept of Shared Value Creation.

Matching the canvasses with what stakeholders made themselves and what they need from others showed the potential for value exchange bilaterally. Combining all those bilaterial value exchanges resulted in the shared value web. This was done for a current and future shared value web in order to identify the main gaps between current and desired situation.

Stakeholder representatives could easily and cooperatively conclude that for example in the current situation the flow of capital did not match the flow of goods and services on the level of the local initiatives. The visualization, the common language and the ease of comparability were appreciated by the participants.

5 INSPIRE

FULL TITLE
INSPIRE Business Model Game

THE IDEA IN SHORT
The tool allows users to redesign and evaluate new supply chains incorporating new technologies and various types of flexibility, in order to increase sustainability and a better competitive outlook for Europe's industry. The format is a roleplay played by the participants and directed by the moderator. The play is the joint redesign of a specific case. The redesign is in line with one of the project's archetypes and the redesign is directed to reshoring.

AUTHORS
The tool is developed by: Niels Jansen, Frank Berkers, Research Team Strategic Business Analysis (TNO).

See for more information: INSPIRE Business Model Game

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CONSTRUCTION DATE
2018

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL
The challenges the (processing) industry faces are manifold. From a policy perspective there is the need for a more sustainable future and reshoring security of production and employment to Europe. From an individual business perspective, there is the necessity to deal with competitiveness, sustainability and dealing with the many different technological innovations. To explore new supply chains is of strategic importance to both Europe and individual companies. The goal of the tool is to redesign supply chains, using new technologies and using flexibility while achieving sustainability and reshoring. The approach is a multi-round design and evaluation game.

INTENDED USERS
The methodology is intended for use in contextual strategic exploration of new business models focusing on sustainability and flexibility of companies in the European processing industry. Consequently it is expected that the exploration process is facilitated by consultants and researchers guiding the participants to an acceptable outcome. The facilitator requires neutrality and good understanding of stakeholder collaboration, innovation processes, innovation policy and business decisions.

INPUT DESCRIPTION

The inputs required for this workshop are a to be redesigned case, printed tangible cards, a Moderator, a Case Owner and invited and selected stakeholders (around 10).

PROCESS

The approach is a roleplay with multiple rounds for input, contemplation and evaluation. The roleplay is guided by the Moderator. The Moderator asks questions, summarizes responses (for check) and keeps time. Ideally a Case Owner or case experts fulfills the role of client. This person is knowledgeable about the domain and can give feedback on the proposed design. Others are Participants. Participants can be so called 'Flexies', 'Techies' or 'Assessees'. Flexies consider the case from the perspective of a specific type of flexibility, for instance capacity flexibility. Techies consider the case each from the perspective of a specific technology cluster or technologies, for instance ICT. Assessees consider the case from a specific evaluation aspect, for instance reshoring or sustainability. Specific roles are assigned by handing out corresponding cards. The game lasts around 90 minutes. The format comprises of 3 phases: i) introduction, ii) the play and iii) the closing.

FLOW OF THE PLAY

The Case Owner introduces the current supply chain (business as usual) and explains the design challenges (including reshoring) using the canvas (see below). The Moderator invites the Flexies and Techies to think (5 min.) about the applicability of their card. The Moderator also invites the Assessees to keep their Assessment criterium in mind and evaluate the design on this aspect. Wildcards are available as well for technologies or flexibilities not considered yet. After 5 minutes, the Flexies and the Techies report each on the applicability of their card, placing the cards on the canvas (flex and tech spots). Reasons for not considering a specific flexibility or technology can be captured as well.

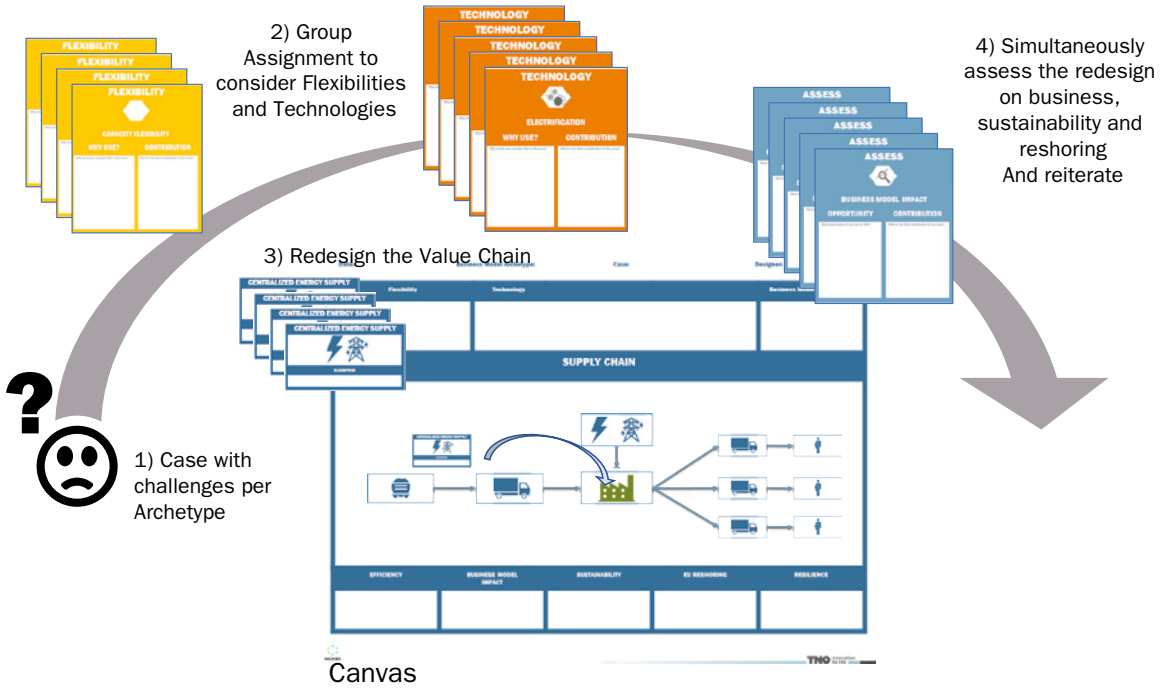

FIGURE 5.1: FLOWCHART INSPIRE BUSINESS MODEL CREATION.

Next, the Moderator invites the Case Owner to respond briefly with an encouraging comment. The Moderator invites the Flexies and Techies to redesign the 'Business As Usual' Value Chain. Using the existing cards and other Supply Chain function cards. The Flexies and Techies are encouraged to explain each modification. The Moderator may ask clarification or challenging questions. Implementations of flexibility and technology can be expressed by a (marker) line between the card and the value chain. After 15 minutes of redesign, the Moderator invites the Assessees to comment on the design from their perspective. Be sure to capture comments (e.g. by using post-its). Avoid lengthy explanations or discussions.

Next, the Moderator invites all to reiterate (both Assessees and Techies and Flexies), 10 minutes or as long as time permits.

Next, the Moderator invites all (active) Flexies and Techies and Assessees to reflect on the design from their perspective. To conclude, the Moderator invites all participants to briefly write an evaluation of the workshop with respect to its objectives and usability.

OUTPUT DESCRIPTION

The output is a redesign of the supply chain, as well as considerations to deploy new technologies and flexibilities. Also the redesigned supply chain is qualitatively evaluated on the following dimensions: Efficiency of the supply chain; Sustainability; Business Model Impact; Resilience; EU Reshoring.

TIMESPAN

The workshop can be executed in 90 minutes. Preparation (case elaboration, invitation of stakeholders) requires a timespan of weeks.

EXPERIENCE

The tool is developed and validated in four different use cases at the general assembly of the SPIRE PPP, the European partnership focused on a more sustainable processing industry.

1. Decentralised or modular production (DM): BC1- Small scale ammonia.
2. Mass- customization: BC2- Fashion sector in Europe.
3. Servitisation of the process industry: BC3- Chemical leasing.
4. Reuse and sustainability: BC4- Critical Raw Materials (CRM).

Afterwards the tool was applied in an industrial case, to make a business model for decentralized NH3 production, based on the INSPIRE business model archetype 'Decentralized and Modular production'. The validation with an industrial partner revealed that the insights gathered in a 90 minute workshop with industry and policy experts were similar to the experience of the company gathered over the course of two years. The current supply chain is depicted below (see Figure 4.2).

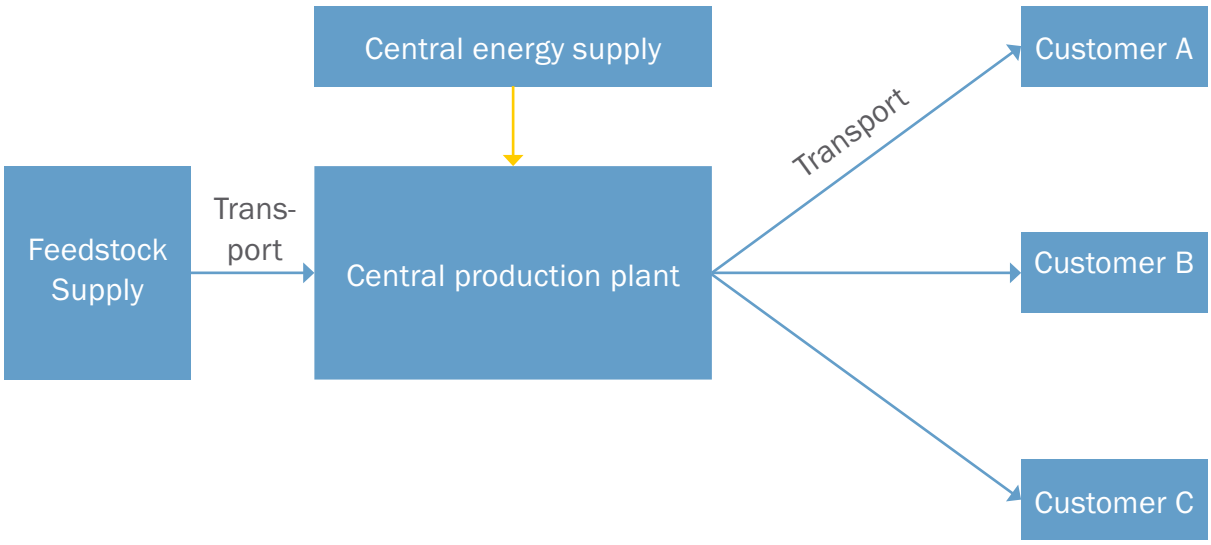

FIGURE 5.2: CURRENT SUPPLY CHAIN: CENTRAL PRODUCTION OF AMMONIA/FERTILIZERS.

Several challenges exist in this supply chain. Natural gas is used for production of ammonia. This induces a large CO_2 footprint for the process and introduces fluctuation in the ammonia price. In agriculture, especially certainty about the price of ammonia (used in fertilizers) is important. Furthermore, natural gas (in NL/EU) will be phased out on the long term which creates uncertainty about the feasibility of ammonia production from natural gas in the EU. Due to the dependency on natural gas, new sites are mainly built where this feedstock has a steady and cheap supply. Ammonia production is mainly produced by China. India, Russia and the US are the next major producers (USGS, 2017). A growth in demand for fertiliser is expected because of world population growth. Ammonia is of vital importance for world food supply. In the current supply chain, the transport costs of ammonia to distributed customers are significant as are the CO_2 emissions. Reducing both delivers considerable value.

FIGURE 5.3: AN INSPIRE BUSINESS MODEL GAME IN PRACTICE FOR THE REDESIGN OF THE AMMONIA PRODUCTION CHAIN.

6 RESIDUAL VALUE CALCULATOR

FULL TITLE

The Residual Value Calculator
Financial triggers for the reuse of building sector products

THE IDEA IN SHORT

The efficient use of materials is not only needed to reach a low-carbon economy, but also for a resilient building industry and as a means to achieve new ways of generating economic value sustainably. At this moment however, buildings are demolished at the end of their lifetime, leading to destruction of building products that not always have reached the end of their technical lifespan. This signifies a destruction in both functionality and economical value. To solve this issue, products should be given a second lifetime through e.g. refurbishment and repair. In order to do this, the value of the product should be known.

Knowing the value of a product at the end of its economic lifetime opens up new ways of creating revenue: for the product producer it opens up the possibility of e.g. a buy-back business model instead of a linear business model. For an investor it makes the risk of investing in a sustainable investment tangible.

The 'Residual Value Calculator' (RVC) was developed to calculate this value. This tool is a catalyst to enable new business models and sustainable investment in the building sector.

AUTHORS

This tool is developed by: Sara Wieclawska, Sanne van Leeuwen, Peter Kuindersma, Pieter Verstraten, Rens Nijman (TNO), Bas van der Westerlo (C2C ExpoLab).

The projects were developed with the collaboration of multiple partners/stakeholders in and outside of the building sector: Alkondor, Shuco, Blitta, Pilkington, Deloitte, Municipality of Venlo, Alba Concepts and IGG, amongst others.

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CONSTRUCTION DATE

2018 - 2020

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

The building sector is challenged to reduce its significant climate and material impact. The use of secondary materials could play an important role in addressing these challenges. Up until this point in time however no positive financial triggers are in place to widely reuse building materials and products.

The goal of the RVC is to supply both the manufacturers and their financers and investors in the built environment with information on what the financial and environmental effects are of using secondary building materials. This is directed at products such as inner walls, facades and other products.

The intended result is enabling the adoption of business models more catered towards reuse and recycling (e.g. via buy-back business models), the acknowledgement of these business models by the financing world and the incorporation of 'value of materials' into financial bookkeeping. Another long-term result would be that, if reuse of products was found to be financially attractive, manufacturers would be inclined to design their products in such a way that they could be used multiple times (design-for-recycling).

INTENDED USERS

Manufacturers of building materials and products, financers / banks of aforementioned manufacturers, real-estate investors and accountants.

INPUT

The tool can now give the Residual Value of a single product (e.g. an inner wall, a facade, an installation).

The inputs needed to do this, are:

- Composition of the building material or product (type of material, kilograms of materials)
- Business statistics such as cost of production, amount of production, etc.
- Expert guesses on the possibilities and costs of repair and maintenance, etc.

The tool will be further developed to include more single products as well as aggregate calculations (for example, for temporary homes or whole buildings). Moreover it is explored how the RVC could be developed to be used in other product sectors as well (e.g. manufacturing). Multiple parties have expressed interest in commercialization of the tool.

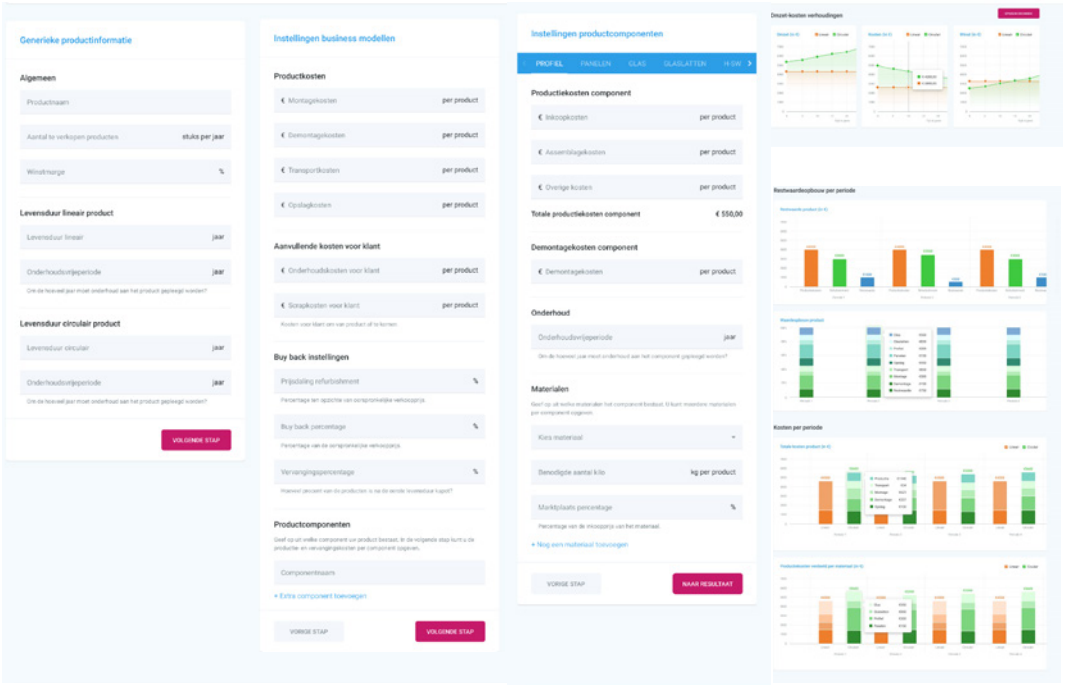

FIGURE 6.1: AN EXAMPLE OF STEPS TAKEN IN THE PROCESS TO COME TO RESIDUAL VALUE.

PROCESS

Calculating the Residual Value is a consultancy process in which in 2 or 3 sessions with the client are necessary, to acquire the data that has to be filled in the tool. At the end, the results will be reported and discussed with the client.

OUTPUT

The output consists of a ‘results’ sheet with:

- The residual value of the product
- A comparison of linear versus buy-back business case of the product
- A rough LCA estimation on the amount of materials avoided.

TIMESPAN

In total a residual value calculation can be done in approximately two to three months. To calculate the Residual Value of a single product 2-3 sessions with the client are required. Most time goes to preparation and data processing and analysis.

EXPERIENCE

The Residual Value Calculator has so far been used in three real-life cases. For three facade producers the Residual Value of their products was calculated.

Other parties have expressed their interest in a Residual Value calculation for products such as removable bridges, solar panels and temporary housing units.

PART III - BOARDROOM LEVEL DECISION-MAKING

7 VALUE CASE METHODOLOGY

THE IDEA IN SHORT

Sustainable ideas, technologies and innovations are plentiful, but how do organizations make the best joint decision together? When organizations are contributing to big social issues they are often dealing with large consortiums, where each party mainly promotes its own interests and trade-offs in the decision process. The value case methodology enables you to reach consensus.

AUTHORS

Frank Berkers, Mirjam Groote Schaarsberg, (TNO).

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CONSTRUCTION DATE

Development of the Value Case started in 2013, renewed development started in 2018.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

Many innovations that aim for multiple value creation require collaborations and investments from multiple parties. Transition trajectories where joint action needs to be taken and where prospects remain blurry are often threatened by a lack of investment. For example, the value that the investment in sustainability generates for each party remains unclear, the risk seems higher than the return, financial considerations predominate the discussion, or private negotiations make it difficult to come to an agreement.

The Value Case Methodology enables us to help you map all the values of the consortium members in a comprehensive, independent and objective manner, and use these to align their objectives. This allows them to reach a widely accepted investment decision in a joint project. The method has four steps. After each step, you can move forward and take a decision. If you are not yet ready to take a decision, you should proceed to the next step.

The objective of the VCM is to achieve ‘collective action’; to support a positive decision of the relevant actors to participate in the innovation. The approach of VCM is to provide clarity on the distribution of values over stakeholders, both qualitatively and quantitatively, and as such provide the basis for a process of further alignment on the stakeholders and improving the design of the innovation itself.

Prerequisites for applying the VCM are a clear view on the investment decision at hand[9], more than one decision maker and decision makers with objectives beyond financial returns.

9 “How to get to a natural gas free district?” is not clear enough for making a value case. “How to deploy and maintain a low temperature heat network, supplied by industrial residual heat, in this district?” is clear enough.

The VCM is designed for use by consultants, rooted in innovation and business, that facilitate consortia of organizations that engage in sustainable innovations.

INPUT/STARTING POINT

The process starts with a concrete idea for an innovation, the need to make an investment decision by multiple actors and objectives beyond financial returns. The overall system or societal cost and benefit trade off of this idea or innovation are already assessed as positive.

Participation of representative of all organizations that are part of this joint investment decision (stakeholders) is required during the process to reveal the objectives and select organization relevant indicators. Stakeholders and content are needed to construct or model the expected effect of the investment alternatives on the selected indicators.

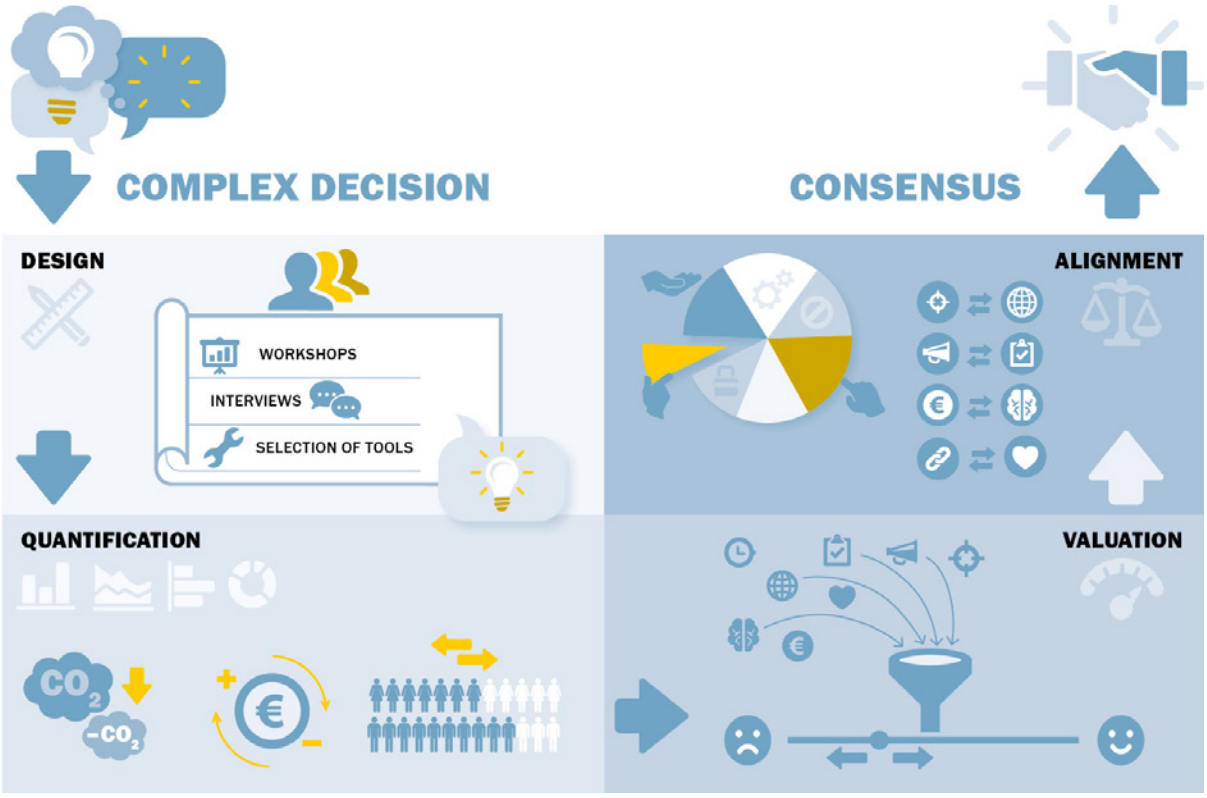

FIGURE 7.1: A FLOWCHART FOR THE VALUE CASE METHODOLOGY.

The VCM has four steps, ideally leading to positive commitment to the joint investment.

Step 1: Design

In the first step clarity is created in a structured qualitative way with respect to:

- The decision: what is the investment and from which options a choice or agreement is needed? The agreement terms or the decision variables.
- The roles: what is the engagement with respect to the investment and the aimed impacts for each of the stakeholders?
- The objectives: what are the individual objectives for each of the stakeholders?

This step can be facilitated by networked business modelling approaches, such as the Value Creation Canvas and Value Network construction and analysis, illustrated in graphic. A design of the current and future situation helps to elicit the implementation and effects of the innovation for multiple actors in coherence.

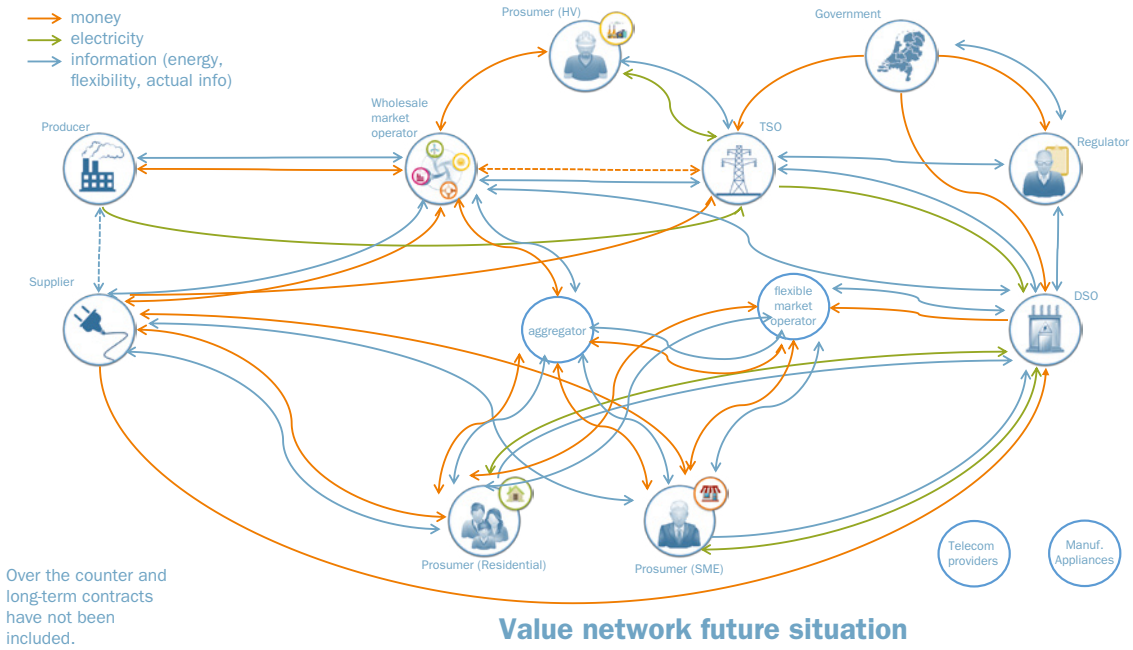

FIGURE 7.2: AN EXAMPLE OF A VALUE NETWORK.

Step 2: Quantification

In this step transparency is created quantitatively by

- Constructing a set of indicators that sufficiently reflect stakeholder objectives from step 1.
- Quantifying the agreement terms (decision variables) from step 1.
- Make an ex ante assessment of the effects of the investment: constructing a function for each objective based on indicators and decision variables. This function can be a general one (e.g. CO_2 emission reduction) or a stakeholder specific one (e.g. Return on Investment)

This can be visualized in a dashboard as illustrated in figure 7.3, this is a dashboard for a public sector stakeholder. Depending on stakeholder needs the set of indicators and type of visualization can be adapted.

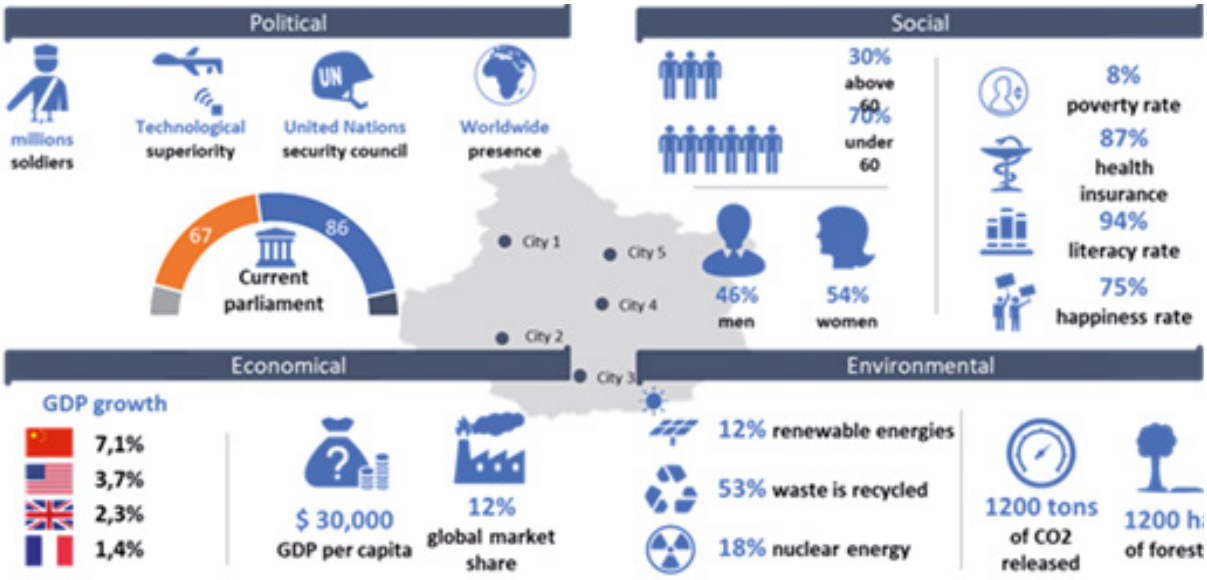

FIGURE 7.3: AN EXAMPLE OF THE POSSIBLE RESULTS OF A VALUE CASE METHODOLOGY PROCEDURE. THE DASHBOARD.

Step 3: Individual Valuation

In step 2, we objectively quantify effects of investment on stakeholder relevant indicators. In this step the stakeholders' individual perspectives and preferences are incorporated: individual valuation of effects from step 2. Several methods are readily available in literature.

In case of decision making where effects are nonlinear and uncertain we use the concept of economic utility.

Based on
- stakeholders' expectation and risk attitude;
- best and worst outcome for stakeholders per indicator and if possible, an acceptable range;
- individual weighing of indicators;

we simulate possible outcomes and stakeholders individual valuation of those outcomes per indicator. These are all expressed in terms of utility, which helps stakeholders compare alternatives.

In the graphic below, for four investment alternatives the probability density of the utility function of two different indicators are plotted (Net Present Value (NPV) and CO_2). One can also present the expected value only.

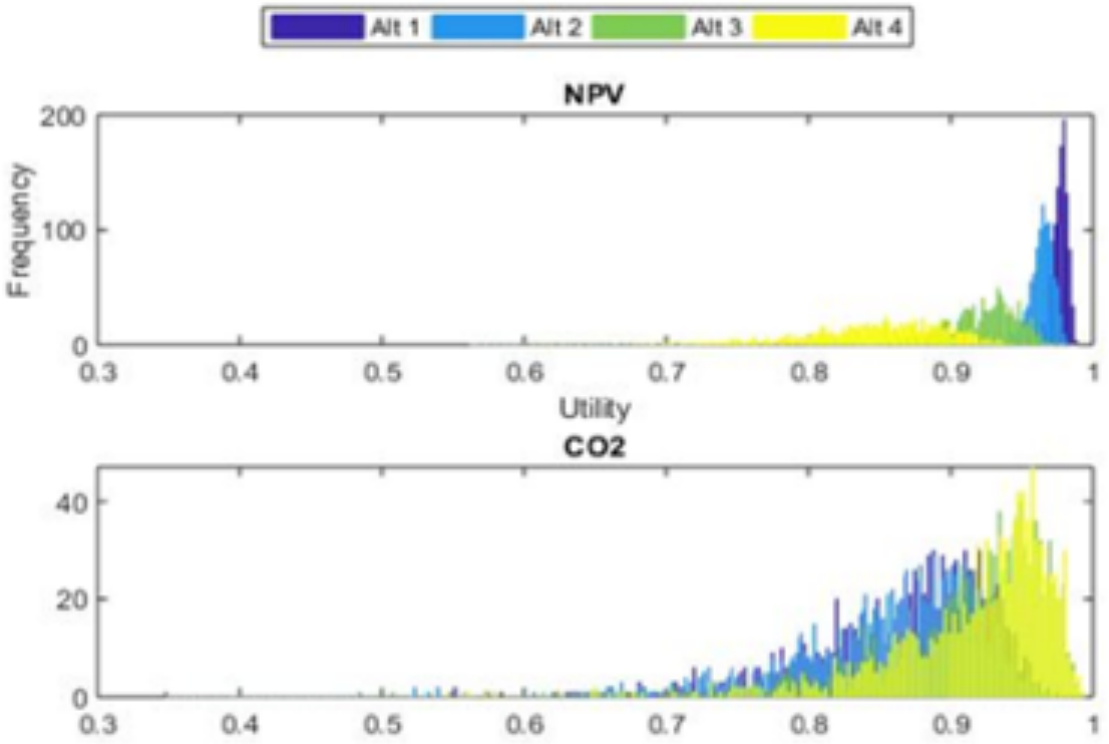

FIGURE 7.4: PROBABILITY DENSITY PLOTTED OF TWO DIFFERENT UTILITY INDICATOR FUNCTIONS (NET PRESENT VALUE (NPV) AND CO_2).

Step 4: Alignment

In this step decision makers go through an informed negotiation process on how to decide on the agreement terms (decision variables). The negotiation process depends on type of decision, political context and stakeholder needs.
We help them navigate through the solution space by

- Creating transparency in the effect of different agreements on both the indicators as well as individual valuation by the different stakeholders.
- Showing stable outcomes, i.e. sets of agreements for which all stakeholders are within an acceptable range.

The dashboard below[10] summarizes the options and their effects. It helps decision makers to agree.

FIGURE 7.5: SUMMARY OF THE OPTIONS AND THEIR EFFECTS IN A DASHBOARD.

10 This is a draft dashboard, we are still developing it.

OUTPUT DESCRIPTION

The Value Case Methodology is a decision support instrument. The output after going through all 4 steps is a refined decision design (e.g. a value network and set of networked business models), quantified solution space of agreement terms and its (modelled) effect on stakeholders objectives, and stakeholders individual valuation of those effects. The outcome of the method is a decision:

- yes, we invest under agreement terms x,y,z
- go back to step 1 and redesign the investment decision based on new insights in one of the steps.
- no, we cannot find an agreement

TIMESPAN

The indicative time to run the process is around 6 months, largely depending on stakeholder availability and the number of decision variables to explore.

EXPERIENCE

Smart Meters Geuzeveld – assessment of the effects for different stakeholders with respect to the deployment of smart meters in Amsterdam Geuzeveld

Smart City Almere – assessment of the effects of several smart city solution in city centre of Almere.

GreenElec – assessment of several options to 'green' consumer electronics.

Leiden University Social Sciences curriculum

Parking Garage as City Battery – assessment of both institutional and financial readiness of a city battery in parking garages with electrical vehicles

Bottom up Energy Transition

8 GREEN WEDGE WORKSHOP FORMAT

THE IDEA IN SHORT

A wedge is a tool to exert force in the right direction, for example to split an object. The Green Wedge Workshop Format is intended to break open the dialogue between buyer and supplier and steer towards sustainability.

AUTHORS

The tool was developed by: Lieke Dreijerink (TNO), Frans van den Akker, Eugen Popa, Meine Koeslag (ISPT), Michel Handgraaf (Wageningen University & Research (WUR))

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All materials are available for download at: GREENWEDGE

CONSTRUCTION DATE

Developed as part of the MVI Energy project Green Wedge, 2018-2019.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

Previous research has shown that suppliers of process technology are often hesitant to discuss energy efficiency as a potential benefit of their product. In their sales pitch they focus on technological specifications and price, regardless whether the customer is a new or existing client and regardless the client's sustainability ambitions. Clients who are open to more energy efficient options thus have to bring up the topic themselves, or they run great risk of not being served.

The Green Wedge workshop format focuses on supplier and buyer communication. It is aimed at capacity building among SME technology suppliers in order to stimulate the development of green propositions. The workshop format was a co-production of the researchers of the Green Wedge project and the target group. The target group was involved via interviews and through several pilots with the workshop format.

INTENDED USERS

Suppliers of process equipment with an improved performance on energy efficiency. Usually, these are SMEs. They can either be start-ups with a green innovation, or incumbents who have developed a greener option alongside their conventional 'grey' option.

INPUT

To participate in the Green Wedge workshop, no preparation is required. Examples of buyer-supplier dialogues are provided in the workshop, and suppliers will recognize these from their own practice. For those who wish to use the Green Wedge workshop format to teach others, knowledge of cognitive psychology and specifically about decision biases is mandatory.

PROCESS

In the workshop format, nine psychological principles are identified that play a role in buyer-supplier dialogues, inhibiting suppliers to make a convincing case for their 'green' technology. Four of these insights are part of a dialogue exercise in which the participants practice recognizing the principles in written buyer-supplier dialogues. In a subsequent role-playing game, the participants take turns in playing the role of buyer and supplier and practice with 'debiasing' the dialogue, while a watcher observes, makes notes, and provides feedback at the end. The workshop format incorporates each of the four learning styles identified by David Kolb (feeling, watching, thinking, doing)[11]. In practice, a selection from the nine psychological principles is discussed in the workshop, depending on the background and experience of the participants.

FIGURE 8.1: CONTEXTUAL ELEMENTS PLAYING A ROLE IN DECISION MAKING.

11 Kolb, D.A. (1984). Experiential Learning. Englewood Cliffs, NJ: Prentice-Hall.

OUTPUT DESCRIPTION

The intended effect is that technology suppliers learn to put a sustainable proposition in the spotlight with existing and potential customers, in such a way that this positively affects the buyer-supplier relationship. The workshop should enable SME technology suppliers to develop a more effective approach to actively market their sustainable technology.

TIMESPAN

The workshop takes one hour at the very least. The exact duration should be tailored to the type and number of participants and depends amongst others on the number of psychological principles that is relevant to discuss with the specific target group.

EXPERIENCE

During the project, a total of 100 participants was reached with the workshop. Feedback indicated that the final workshop format serves well to achieve the intended purpose. Several possibilities were identified to reach a larger audience, but these have yet to materialize.

9 ASAP

THE IDEA IN SHORT

The ASAP tool for Energy Efficiency stands for “Aligning Sustainability impact Assessment of Purchasing decisions.” The tool offers a limited, standardized set of criteria for assessing the potential contribution of capital expenditures to improving the energy efficiency of a company.

AUTHORS

The tool was developed by: Suzanne Brunsting (TNO), Bart Vos (Tilburg University (School of Economics and Management)), Frans van den Akker (ISPT), Fons Pennartz (KWA bedrijfsadviseurs).

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CONSTRUCTION DATE

Developed as part of the STEM project Green by Choice, Green by Design, 2014-2016.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

Previous research has shown that even companies that profile themselves as sustainable do not always make desirable choices from an energy efficiency (EE) perspective. The ASAP tool, which is relatively easy to apply, can improve the decision-making process in this area, leading to increased consideration of EE as part of the overall sustainability policy of enterprises. The tool is used to assess the role and the significance of EE in investment projects in the (process) industry, while preventing ‘biases’ (be it conscious or unconscious) in strategic decision-making.

The existence of a corporate strategic sustainability ambition is a prerequisite for using ASAP. The tool is not meant for awareness raising of sustainability per se, but rather an instrument to help identify and quantify challenges and barriers to sustainable conduct (particularly EE).

INTENDED USERS

The primary audience are high level managers (management team, Board of Directors) such as the CEO/director, COO/head of production and the CTO/R&D director. However, in companies where individual production locations can make their own investment decisions (up to a certain maximum amount), the tool can also be applied at production location/middle management level. Essentially, we are looking for the Decision Making Unit (DMU), which may differ between multinational and SME. Moreover, this tool can also be used in smaller companies. In this case, one person may have multiple roles. But the principle remains the same.

INPUT

Prior to using ASAP a compact fact sheet (1-2 A4) containing key information about the investment project has to be constructed. This could include information on project type (e.g. new equipment, major maintenance), investment timing (when), estimated budget, (global) technical specifications and previous experiences in similar projects. This is used as the primary information source based on which ASAP can be used.

PROCESS

Members from the DMU assess the information from the factsheet while using the ASAP tool (see below). After assessing the factsheet each manager fills in the ASAP format individually and scores a set of five criteria on a three-point scale.

Criterion	0 Points	1 Points	2 Points
Impact energy saving (internally)	Low	Average	High
Availability ee options (market)	Hardly	Fair	Good
Profitability (financial)	Low	Average	High
Organisational feasibility	Low	Average	High
Previous experience	Not/negative	Neutral	Good/positive

TABLE 9.1: ASAP FORMAT TO ASSESS INDIVIDUAL SCORES ON ASAP ITEMS WITH FICTITIOUS ANSWERS.

The criteria are the following:

1. Impact energy saving
   This primarily concerns an estimate of the contribution a specific investment can provide to the total energy consumption reduction of the organisation. A clear overview of relevant 'state of the art' references is of great importance in this. At this stage the focus is on estimated potential rather than on detailed figures on energy saving.

2. Availability EE options
   This criterion is intended to estimate whether there are EE variants available on the market. It is important that the investing company itself (and its advisors) has a clear view of this, since it has been established that suppliers do not always come up with their best EE options. However, the company could challenge the supplier to present a solution or to take away barriers.

3. Profitability
   Financial criteria (evidently) play a role in these kinds of decisions, where the main barriers for EE investments are internal requirements for relatively short payback times. Profitability, however, should not only be assessed as a reduction in energy costs. Other positive effects have been e.g. a contribution to product innovation, quality improvements, lower production and/or maintenance costs and safety. These are in fact the real drivers to arrive at a positive business case for an EE investment/project.

4. Organisational feasibility
   This term covers several obstacles that have emerged from previous research. This could include factors such as low status EE, time pressure (e.g. in situations where expansion of production capacity is urgently needed), complex decision-making and the lack of adequate internal control.

5. Previous experience
   Less positive or downright negative experiences with EE projects in the past can serve as 'ballast' (also called 'shadow of the past'). These could include clinchers such as "we have already sorted this out 8 years ago (and it didn't work then either)". Such bias has a paralyzing effect, however they do provide crucial information for future-oriented decisions. After all, new times bring along new opportunities.

After the individual scoring process the completed ASAP forms are discussed plenary within the management team. Exchanging thoughts based on a variety of positions and background (i.e. functions in an organisation) has a positive effect on the decision-making process.

It is important that the ASAP tool is deployed at an early stage in the decision-making process, to allow for steering the process in the strategically desired direction.

OUTPUT

Using ASAP, projects can receive a score from 0-10 points. Below is an interpretation of the scores.

Score 8-10
These are projects with high EE potential that, most importantly, will actually be used in the execution/implementation of the project. This can be achieved by making this an important evaluation criterion for the project leader (in addition to conventional criteria such as budget, quality and duration).

Score 4-7
For senior management this is actually the most interesting category, in which it is crucial to have a dialog to identify the main reasons for weak performance. Say, for example, that a score of 4 is achieved due to a maximal score on the criteria impact and availability. This can/should be a signal for senior management to review which measures are required to create the appropriate (internal) conditions for an EE investment. Suppose, however, that a score of 6 is achieved through maximal scores on the criteria profitability, organisational feasibility and previous experiences, then it will be less urgent for senior management to intervene. In that case it is especially important to re-evaluate whether the assessment of impact and availability was made properly and carefully.

Score 0-3
These are, from EE perspective, almost certainly less interesting projects and will therefore receive less priority when it comes to realizing energy savings.

In any case, the dialogue on scores and the underlying motivation is crucial. The primary objective of this dialogue is to determine whether additional measures are required to contribute to energy savings and achieve energy saving targets, by means of a specific investment project.

TIMESPAN

The tool was designed to take as little time as possible. Inspired by the APGAR scoring system for newborns, which marked the start of protocolizing patient care in hospitals[12], the idea behind the tool is that managers can quickly learn to use it as part of their normal routine to guarantee attention is given to energy efficiency as a decision criterion. The tool can be applied to a particular case, or even a shortlist of cases, in a single management meeting. Depending on the investment, a 2-4 hour session can suffice for a first impression. However, a conclusion may be that in some cases, additional information and a follow-up session is needed to fine-tune the scores. In a piloting session of the tool, participants remarked that managers may need to make use of the services of external advisors to complete the assessment. Particularly to quantify expected impacts/effects.

EXPERIENCE

Within the project, the tool has been demonstrated to a group of experts. They were positive about its applicability, not only for single-project assessment but also, for example, for project portfolio management.

ASAP has been tested in a production facility in the food sector, by higher/middle management to decide about EE investments for that particular location. ASAP was used as part of a training to help improve the company's energy management. Part of the training was hands-on experience with a case study of the company itself to see whether the ASAP tool was considered useful. In the training, the company used a current investment case. The status quo of the company is ad-hoc decision making with no solid structure in place for agreement between different professionals or departments. Even with large investments, there is no formal work-flow in place. Practice with the ASAP tool gave the company insight how energy efficiency decisions relate to multiple stakeholders in the company. The company welcomed greater deliberation amongst themselves. The main feedback on the ASAP tool itself focused on the type of questions. The participants found it hard to share their opinion with little detailed information. This is a point of attention for future application of the ASAP tool.

12 https://healthmatters.nyp.org/apgar-score/

10 SUSTAINABLE GROWTH METRICS

THE IDEA IN SHORT
A tool assisted methodology to assess the sustainability of a company's product portfolio to support strategic decision making on business and innovation.

AUTHORS
A first version called Sustainable Portfolio Management has been developed by TNO and AdL with and for Solvay. This has been modified and further developed into Sustainable Growth Metrics (SGM) by TNO.

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CONSTRUCTION DATE
2008 up to now

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL
A fact and expert based method to assess the sustainability of a company's product portfolio as a basis for longer term strategic decisions on business and innovation.

In order to create reliable results, it relies on a combination of:
- Widely accepted methodology (LCA),
- State of the art approaches (WBCSD guidelines on Sustainable Portfolio Assessment),
- TNO operationalisation and;
- Company specific tailor made fine tuning.

INTENDED USERS
Large (chemical) companies.

PROCESS
Applying SGM is an iterative learning process, shaping a common language and goal for different disciplines and departments (e.g. involvement of sales, technical, R&D, sustainability experts). Roughly, the following steps are taken:
- Market segmentation and selection of product(s),
- Collection of data,
- Tool supported SGM assessment,
- Interpretation and discussion of results within a team of experts and internal stakeholders.

When applying SGM to a company product portfolio, support from the corporate management and embedding in the organization is crucial.

INPUT DESCRIPTION

Quantitative and qualitative data are needed on production of a product (LCA and product prices) and product properties and markets (sustainability agenda for relevant markets, regulatory trends, chemical hazards, authoritative ecolabels and sustainability performance). These are based upon literature study, MSDS information, Life Cycle Inventories (preferably company specific), and other internal sources.

OUTPUT DESCRIPTION

All data are processed into tables with indicators on different environmental theme aspects in order to facilitate a discussion on the how's and why's of a product's sustainability performance. In addition, sustainability performance of (groups of) products can be graphically depicted in a product portfolio map (see Figure 1). The outputs together form the basis for a discussion with internal stakeholders and sometimes external sustainability reporting.

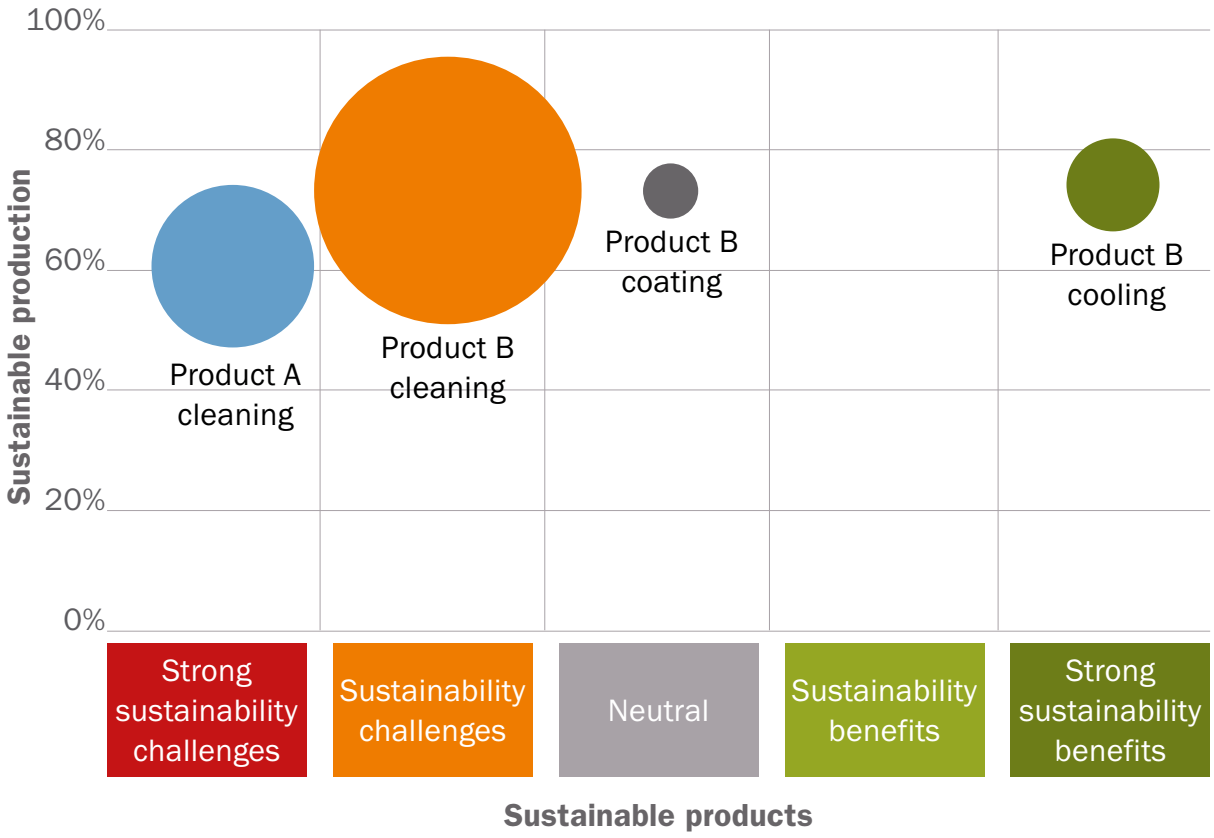

FIGURE 10.1 A FICTITIOUS EXAMPLE OF A SUSTAINABLE PRODUCT PORTFOLIO MAP.

TIMESPAN

To apply the methodology for a single product can take a few months, since the data collection and discussion process can be quite intensive.

EXPERIENCE

Next to co-developer Solvay, several other large companies have applied SGM. According them, results provide useful strategic insights in the sustainability of production and products, additional to current operational KPIs. Data on end-use applications and markets is valuable but more difficult to acquire. Applying SGM is an iterative learning process, shaping a common language and goal for different disciplines and departments (e.g. involvement of sales, technical, R&D, sustainability experts).

PART IV - ORCHESTRATING TRANSFORMATION

11 ORCHESTRATING INNOVATION

FULL TITLE

Orchestrating Innovation
The innovation centre business model

THE IDEA IN SHORT

Orchestrating Innovation is the setting-up and managing of a collaboration between different types of public and private organizations (knowledge institutes, companies, governments, non-governmental organizations) around a portfolio of innovations, aimed at a joint vision, a mission or a sustainable objective. The collaboration typically takes place in an “Innovation Center”. An innovation can take on many forms, e.g. field lab, joint innovation center, open innovation center, digital innovation hub, living lab, et cetera. The different forms typically have different accents. The innovation center business model serves as a blueprint for designing and operating an innovation center.

AUTHORS

Frank Berkers (TNO), Research team: Strategic Business Analysis (TNO).

See for more information: Orchestrating Innovation

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CONSTRUCTION DATE

2014 - 2018

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

The central challenge of an innovation centre is to achieve long term economic and societal objectives by means of innovation in collaboration. This requires capabilities to develop innovations, to market and implement innovations and to achieve scale and monitor and manage the desired impact, thus this requires participation and incentivization of different parties and a portfolio of short and longer term innovations (also referred to as a roadmap). An ecosystem perspective and stakeholder management alongside an innovation management perspective are crucial.
Who to involve, and when? Who should invest? Who benefits and who bears risks? Logical, but not easy to answer questions, due to uncertainty and unclarity.

The tool provides a blueprint of the topics that need to be specified when setting-up an innovation center.

INPUT DESCRIPTION

The process for setting-up an innovation center can start if there is at least one party with an ambition to address a societal challenge by means of innovation and the need to achieve this in (public-private) collaboration. The tool can be used to quickly develop a proposal or to monitor the development of an innovation center. Good knowledge of the ecosystem actors is required for the process. Use of ecosystem mapping tools to chart the relevant information is not sufficiently present.

PROCESS

The process revolves around a high-level design of an Innovation Center. The design of an Innovation Center is represented by the following figure. A full design requires to specify all elements presented in it.

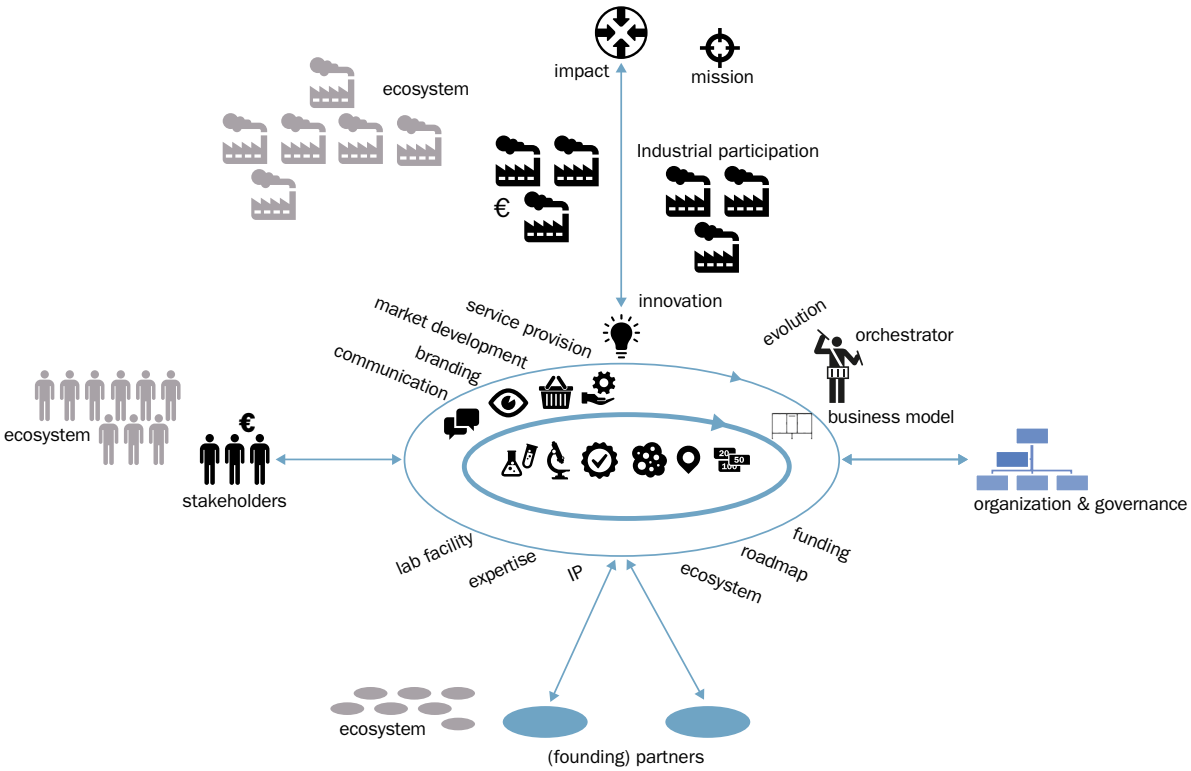

FIGURE 11.1: REPRESENTATION OF THE DESIGN ELEMENT OF AN INNOVATION CENTER BUSINESS MODEL.

The figure above illustrates all relevant elements of an Innovation Center design. In practice these will have different accents. In the table below the elements are briefly translated into questions.

Table 11.2: Questions for relevant elements of an Innovation Center Design.	
Impact	What is the Impact that the Innovation Center wants to achieve? This is typically related to a Grand Societal Challenge and should be as concrete as possible?
Mission	What is the desired position of the ecosystem in the longer term?
Industrial Participation	Which business are actually using the services provided by the Innovation Center? Which businesses are the targeted first customers?
Ecosystem	Which industry* segments are in focus to adopt the innovations that are expected to be generated by the Innovation Center?
Stakeholders	Which national or regional governmental or societal stakeholders are actively sponsoring or funding the Innovation Center in cash or in kind? Stakeholders are also complementing and sometimes competing Innovation Centers.
Ecosystem (2)	Which other actors are stakeholders (types), but are not directly related, currently?
(founding) Partners	Which organizations are the designated founding partners? The spokesman is typically an employee of one of these. These organizations will typically be represented in the governance.
Ecosystem (3)	Which organizations should or could become partner?
Orchestrator	Which person acts as the coordinator of the innovation center? Typically there is a difference in setting up and operating the center.
Business Model	What is the business model for the Innovation Center?
Innovation	What type of innovations does the Innovation Center intend to generate?
(Lab) Facility	What (lab) facilities does the Innovation Center have access to? This can be interpreted quite broad. It can include living labs, test beds, field labs, actual labs, software platforms. It can also be a physical meeting location or an office.
Expertise	What type of research and development capabilities are needed to generate the innovations?

IP	What and whose IP is needed to utilize the innovations (for the industry participants)? What IP is expected to be generated by whom?
Ecosystem (4)	What is the database of actual contacts and organizations does the Innovation Center have? This may include a network of innovation centers that complement each other.
Roadmap	What technology development roadmaps does the Innovation Center have? What is already under construction? Which organizations and stakeholders are affiliated with these projects? What does the project portfolio look like?
Funding	What funding can be directed by the Innovation Center?
Service Provision	Which Innovation Services does the Innovation Center provide? Currenty we distinguish: **Ecosystem services** – Community building: – Strategy development: – Ecosystem learning: – Representation, promotion: **Technology Services** – Strategic RDI: – Contract research – Provision of technology infrastructure – Testing and validation – Technical support on scale-up **Business services** – Incubator/accelerator support: – Access to finance: – Offering housing:
Market Development	Who will develop which markets?
Branding	What is the branding strategy for the Innovation Center? How do businesses see the difference between the Innovation Center and the founding partners?
Communication	What communication and community strategy is in place?
Evolution	How does the Innovation Center evolve over time? All the above can evolve over time. E.g. it can start as a virtual innovation center and then move into a physical location. It can also be multiple locations.

This process can be driven by one person familiar with the tool 'facilitator'. Typically the facilitator works with a team consisting of 'leader', 'experts' and 'stakeholders'. The leader is the spokesperson for the innovation center, experts have oversight knowledge of the innovation field and stakeholders represent organizations that have an interest in the innovation center. (This need not be all eventually relevant stakeholders.)

Table 11.3: Steps in the Innovation Center Design.

Initiation	1-2 hours	Discussion with Innovation Center leader about the idea, the tool and the informational needs.
Planning		Identification of stakeholders, planning of workshops and informational needs.
Data gathering and preparation	2 weeks	Gather of information like: Presentations, proposals, business plans, marketing plans, technology roadmaps. The facilitator request such information from the team an processes it to see what is already available. This is roughly mapped to the tool.
First exploration	½ day	Workshop. The facilitator presents the tool and the process and the planning. If available the gathered information will be briefly revisited in context of the tool. The major items of the tool are discussed: – Mission and ambition – Industry segments – Technology roadmaps and technical facilities – Stakes of the founding fathers An update for information gathering is set out and the agenda for the upcoming workshop is set.
Data gathering and processing	2 weeks	Additional data is sought. Discussion proposals are developed.
Second iteration	½ day	The previous workshop is recapped and the updates are discussed. The tool is filled out in more detail. An update for information gathering is set out and the agenda for the upcoming workshop is set.
Data gathering and processing	3-4 weeks	Additional data is sought. Discussion proposals are developed.
The facilitator may have bilateral discussions, updating the tool		

Finalisation and next steps	½ day	The complete Innovation Center design is presented. Priorities are set and actions are set to the team.
Aftercare		The team can update the Innovation Center design regularly.

OUTPUT DESCRIPTION

The output is a design specification of all the relevant aspects of an innovation center.

TIMESPAN

The design for an innovation center can be completed in an afternoon's workshop, if all information and stakeholders are available. Typically it takes a number of bi-weekly iterations to identify gaps, acquire informations and make 'design decisions'.

EXPERIENCE

The methodology has been developed and applied in VoltaChem and Fieldlab Industrial Electrification. See https://www.voltachem.com/

Furthermore the approach has been applied in a wide variety of other Orchestrating Innovation Cases. https://www.tno.nl/en/focus-areas/strategic-analysis-policy/expertise-groups/orchestrating-innovation/

TNO Report TNO-2015-R11239

TNO has developed a course for Innovation Orchestrators, who lead Innovation Centers. Currently 45 persons have concluded this course. TNO has decided to make this course available to external participant. Launch is expected in Q4 2020.

12 BE+

THE IDEA IN SHORT

Business parks harbor a great potential for CO_2 reduction. By enabling local entrepreneurial associations and park managers to initiate and carry out collective sustainable energy projects this potential can be achieved. Within two projects TNO has developed a Quick Start Guide and corresponding training to realize capacity building for these two target groups. In the Quick Start Guide a step by step process has been developed based upon the best practices and research done in three pilot business parks. The training transforms the Quick Start Guide in a two day course to be followed by participants from the two target groups: local entrepreneurial associations and park managers.

AUTHORS

Authors of the Quick Start Guide: Lieke Dreijerink (IVAM, presently TNO), Sophie Emmert (TNO), Gerard Fit (Energie Coöperatie West-Friesland), Roosmarijn Goldbach (TNO), Merle Gormley (ENGIE Business Development), Jankees Klapwijk (Klapwijk Parkmanagement), Nicole de Koning (TNO), Jaap Kortman (IVAM), Edwin Markus (Markus makelaardij), Guus Mulder (TNO), Caroline van der Weerdt (TNO) en Peter Wolbert (ENGIE Energy Solutions).

Authors of the training: Guus Mulder (TNO), Niels Jansen (TNO). Nicole de Koning (TNO), Renske Boswinkel (TNO). The project partners (TNO, OostNL, Green Business Club, CLOK, WM3 Energie) have all contributed to the content of the training.

The Quick Start Guide business parks can be downloaded (Dutch):
Sustainable business parks
Energy positive business park

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CONSTRUCTION DATE

STEM project Energy measures at business parks ran from October 1, 2014 to September 30, 2016, MVI Energy follow-up project Removing resistances at business parks ran from January 1, 2017 to December 31, 2018.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL

There are 3,500 business parks in the Netherlands. Making these industrial sites energy-positive would mean a huge reduction in CO_2 emissions. In the STEM project Energy measures at business parks, a quick start guide has been developed for park managers who want to develop collective energy initiatives on businessparks. A second result of the STEM project was the initiation of the BE+ foundation. Within this foundation, the insights from the Quick Start Guide and associated toolset are further shared and disseminated, and the partners work together with business parks to make them energy positive. There are now 35 business parks affiliated with the foundation.

Various innovation programs are under way from the foundation for the development of practical knowledge and tools to support the business parks in their process.
The aim of the BE + Foundation, initiated by TNO, is to make 250 industrial sites energy-positive. The idea behind BE + is that this can only be achieved with a collective approach, whereby individual entrepreneurs (often SMEs) are given maximum relief. The park manager plays a central role in this, as a point of contact for all companies on a business park. To support this park manager, a quick start guide has been developed for taking sustainable energy measures at business parks. A training course has also been developed for park managers to help them identify the drivers and barriers of SME entrepreneurs and to inspire them to take sustainable energy measures.
The aim of the Quick Start Guide and training is to make park managers (including the park managers on business parks in the BE + initiative) more effective in realizing sustainable energy projects with SME entrepreneurs on business parks. To be more effective, park managers must have the right knowledge and methods to interest SME entrepreneurs and to remove or reduce resistance.

INTENDED USERS

In addition to the park manager, the target group of this Quick Start Guide is the entrepreneurs' association or another local organization on the business park. Target group of the training are park managers (primary), business associations, environmental services, development companies, municipalities and energy consultancy firms.

FIGURE 12.1: THE EXPECTED USER, DUTCH BUSINESS PARKS.

INPUT

In order to gain insight into the drivers and barriers of entrepreneurs in business parks with regard to taking (collective) sustainable energy measures, a short survey was conducted in March 2015 on sustainable energy in various Dutch business parks. 115 entrepreneurs completed this questionnaire in the spring of 2015. 44 respondents have completed the entire questionnaire. Based on this research, the experiences of the project partners with entrepreneurs on business parks and a number of additional interviews with entrepreneurs, four types of entrepreneurs have been described; so-called "personas." The insights were then incorporated into the training in an MVI Energy project.

Parkmanagers who use the Quick start guide or participate in the training need to have the ambition to collectively – with the group of SME entrepreneurs on the business park – realize sustainable projects.

No further input is needed. The Quick start guide and the training will learn the park managers how to collect the necessary data, get insights into the needs of SME entrepreneurs and organize enough time and resources to realize their goals.

PROCESS

The Quick start guide is meant to support the park manager throughout the duration of their project. It provides typical business models, a standardized process and supporting tools (17). In the MVI Energy project Removing resistances on business parks, a training course was developed for park managers to provide them with knowledge and methods with which they can more effectively interest entrepreneurs in their business parks in taking energy measures. This training is given by Clok[13]. Interesting about the Quick Start Guide and training from a behavioural and communication perspective is a target group segmentation of entrepreneurs through 4 personas. This segmentation is used as a tool to teach park managers how to identify drivers of different entrepreneur types.

The training takes two days. Day 1 contains the following components:

- Sustainability: "why, what and how" : the participants learn more about the benefits of sustainable business parks. They get an overview of sustainable measurements and they get an initial introduction of the segmentation of four different types of entrepreneurs. They get started with a vision for their own business park.
- Collaboration: they get a step-by-step plan to collaborate with stakeholders. They apply this to their own business park.
- Program plan: the participants learn about the elements of a program plan.
- Process money management: the participants get an overview of different forms of financing. They apply this knowledge to their own business park.

13 https://clok.nl/training-energiepositief-bedrijventerrein/

Day 2 contains the following components:

- The business case: the participants learn among others about ESCO's (energy service companies). They start developing the business case for their own business park.
- Motivation and communication: the participants learn more about the step-by-step plan to collaborate with stakeholders. They get tips to motivate and communicate with entrepreneurs. They learn how to use insights about the drivers of entrepreneurs.
- Suppliers: they learn how to select a supplier.
- Collective financing: they learn more about different forms of financing.
- Monitoring: they learn how to monitor the progress of their collaboration with stakeholders.

FIGURE 12.2: CARD USED IN THE BE+-PROCESS TO COME TO A GREENER ENTERPRISE IN DUTCH BUSINESS PARKS.

OUTPUT DESCRIPTION

The Quick start guide and training provide park managers with the necessary insights and inspiration to manage their local energy initiative adequately.

TIMESPAN

The Quick start guide and training is meant to support the park manager throughout the duration of their project, which typically takes 2-5 years.

EXPERIENCE

It should be demonstrated in follow-up research whether the use of personas in dialogues with entrepreneurs actually increases the willingness of entrepreneurs to participate in (collective) energy-saving measures. In general, it is desirable to further investigate which communication and participation means best suit different types of entrepreneurs. This requires further motivation of research among SME entrepreneurs on business parks. The developed four personas are a first step, but relatively little is known about this target group, while at the same time many parties are interested in making industrial sites more sustainable. Without targeted application of knowledge about behavioural principles, based on knowledge of the target group, attempts by these parties to involve entrepreneurs in their initiative have shown not to have maximum effect. This emphasizes the necessity of a fact based approach.

The Quick start guide and training provide park managers with the necessary insights and inspiration to manage their local energy initiative adequately. 35 business parks are member within the BE+ foundations community. These business parks work according to the processes as described in the Quick start guide. Furthermore, 10 business parks have followed the training. These business parks value the inspiration they got from the Quick start guide and training and the hands on experience that is conveyed from the described pilots are invaluable in shaping their sustainable projects.

13 INDUCE

FULL TITLE
INDUCE Capacity Building Programma

THE IDEA IN SHORT
The INDUCE Capacity Building Programme in energy efficiency fosters the transition towards a sustainable agro-food industry. The programme offers a method for developing custom-made energy efficiency trainings for companies, using a Human-Centered Design approach. The INDUCE methodology for training development is supported by an online repository with training materials.

AUTHORS
The INDUCE Methodology follows from the European INDUCE project, conducted between 2018 and 2020 with a consortium of 10 partners from five countries.
The following overview only lists the Dutch partners:
Pim Piek and Suzanne Brunsting (TNO), Bas Oldenhof (KWA), Michelle Meijnders (FNLI).
For the full overview of partners and a broader description of the project please visit INDUCE2020.

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CONSTRUCTION DATE
Development of INDUCE Methodology commenced in 2018 and will be finished by July 2020.

CHALLENGE(S) ADDRESSED AND GOAL OF THE TOOL
The INDUCE project delivers a methodology for the implementation of capacity building programmes in energy efficiency, focusing on improving energy management and stimulating energy efficiency behaviour. The main target group is the agro-food sector, but the method is expected to be also useful for other sectors in helping them to organize their energy management.

A unique feature of the INDUCE Methodology is the application of a Human-Centered Design approach resulting in different, customized trainings for each of the 15 pilot companies involved in the project. Experiences from these pilots have been collected and fed into a train-the-trainer programme to enable others to work with the INDUCE Methodology. A large benefit for prospective users of the method is that it incorporates experiences and training materials from experienced training companies in four different countries: the Netherlands, France, Germany and Spain.

INTENDED USERS

The capacity building program targets all layers of an organization: higher management, middle management, and employees. The program has a modular design. Together with the company, the trainer will select the modules that the company needs.

INPUT

Before the capacity building program is developed, an assessment of company needs is made that consists of two or three components:

- Energy scan to assess the current development of the energy management system
- Interviews with key figures in the DMU (Decision Making Unit)
- Optional: Survey among employees to establish baseline for sustainable behaviour

PROCESS

In a subsequent co-creation session, the trainer proposes a training program to the company. Together with the DMU, the final training program is created and implemented. One training example that most pilot companies asked for, was a training for the plant workers to discuss the company's energy policy and let them discuss what they can contribute. This training format is very interactive, containing a quiz or, for example, an energy hunt through the factory where teams of plant workers identify potential energy efficiency improvements in their own working environment.

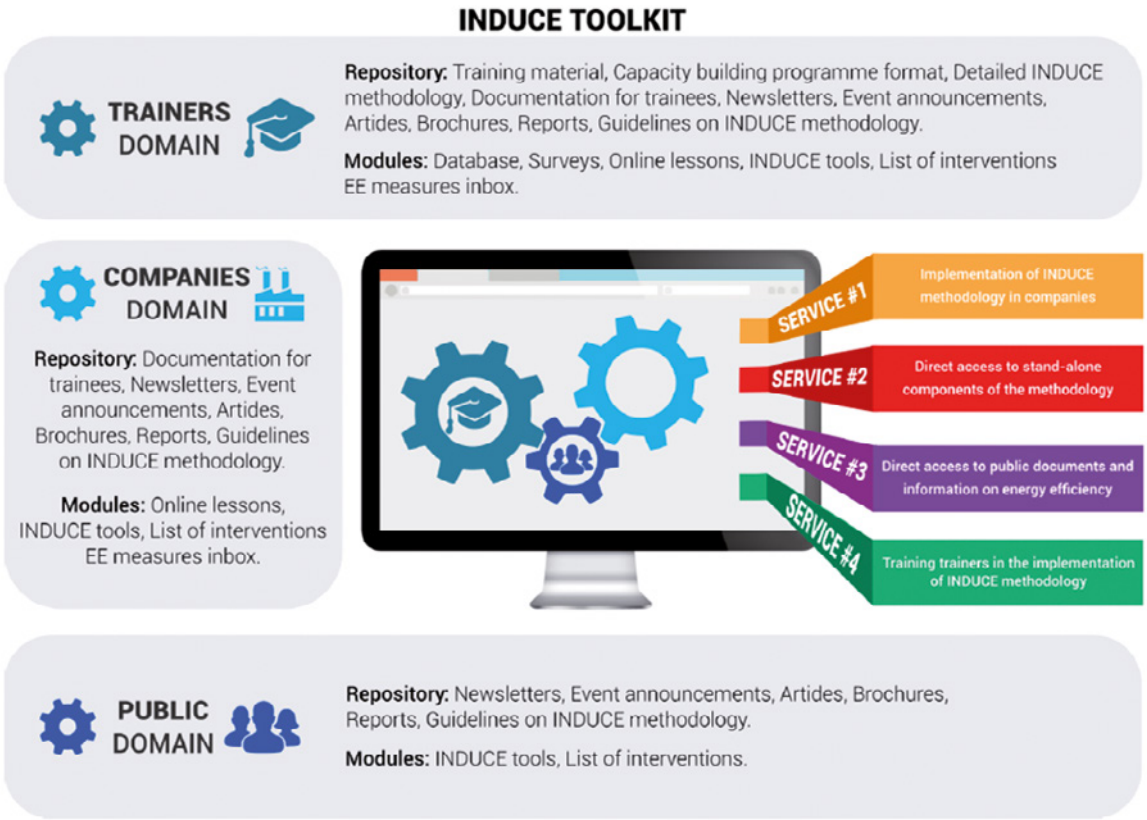

FIGURE 13.1: INDUCE TOOLKIT ITEMS.

OUTPUT DESCRIPTION

A customized training program for improving energy management and increasing actual energy efficiency.

The INDUCE project develops an open access platform (INDUCE toolkit) where training material, online lessons, guidelines and tools will be available for companies aiming to increase their energy efficiency (this toolkit will be available mid-2020). Trainers who have been trained in the INDUCE Methodology can use these materials to compose a tailored training program for their clients.

TIMESPAN

This strongly depends on the company agenda. The 15 pilot companies who participated in the project completed the trajectory in 1,5 – 2 years, from first contact to final training conducted.

EXPERIENCE

Training programmes have been conducted in 15 pilot companies. Based on these experiences, the INDUCE Methodology has been finalized. The final package is used as input for other trainers in train-the-trainer sessions, which have taken place in March and April 2020. These trainers will subsequently contribute to large-scale rollout of the INDUCE Methodology. Final results are available as from mid-2020. The ultimate aim is to have the INDUCE training method certified, so that trainers working with the method can obtain a formal qualification.

TESTIMONIALS

BUSINESS PARK HILVERSUM SOUTH WEST: SAVING ENERGY TOGETHER

The board of Enterprise club Hilversum South West has the ambition to support the members of their club with their change towards a sustainable business. The club strives for a Climate Neutral form of business parks. Taking part in the initiative 'Bedrijventerreinen Energie Positief (BE+)' was in this proces a logical step. Project coördinator Joost Bennekers where the project is right now, and what it is aiming for.

https://www.bepositief.nl/bedrijventerrein-hilversum-zuid-west-samen-energie-besparen/

INSPIRE

The INSPIRE business model innovation workshop held in Brussels on November, 23th, 2017. The participants were given the task of redesigning the value chain and discussing the required technologies and related flexibilities in four parallel sessions during the workshop. The business model innovation exercise in each parallel session was designed for a particular business case (real life problem) focusing on a business model archetype.

The validation with an industrial partner, revealed that the insights gathered in a 1.5 hr workshop with industry and policy experts were similar to the experience of the company gathered over the course of two years.

ORCHESTRATING INNOVATION

"Without the approach of TNO, Orchestrating Innovation, JoinData was never realized", according to Frido Hamoen from CRV. "TNO orchestrated that farmers and other parties involved understood the next step towards sustainability we needed to take and supported this next step".

COLOFON

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