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TNO report

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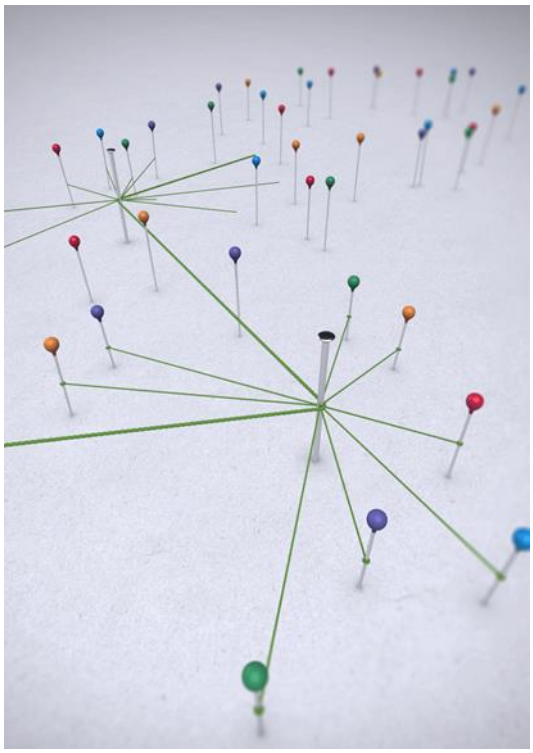
Collaborative Business Models for Transition



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Summary

Collaborative business models for transition
TNO initiated a study to innovatively combine sustainable and collaborative business models and the field of transition studies. This connection is relevant due to a growing number of societal, ecological, economically complex and interdependent challenges. These challenges call for a workable and practical approach to creating a sustainable transition in multiple sectors (e.g. energy, mobility, resources). Transitions are often blocked by a combination of factors such as technological uncertainties, static organisational models, institutionalised stakeholder behaviour, fluctuating policies and changing circumstances. This study focuses on developing a solid theoretical and practical basis for a research agenda at the intersection of fundamental and applied research, intending to provide tools to make transition processes more practical and effective and thus increasing the chances of success.

Transition Studies (TS) is a relatively young and evolving field of research, aimed at generating (useful) knowledge of social transitions for a sustainable and circular economy. Various approaches can be distinguished in TS. Often a collaborative and participatory process of observing, learning and experimenting is part of the central approach. Nevertheless, it remains a challenge to realise the intended large-scale system changes. Experiments are often stuck in their so-called 'niche development' and cannot bring about permanent changes in the sector. Established individual companies are often unable to achieve fundamental changes because they follow the current market, where revenue is usually generated based on sub-optimisation and unsustainable behaviour.

This project focuses on the idea that the system change, which is needed for the realisation of transitions, can be better designed when conscious and purposeful use is made of the collaborative business model concept. Business models are (action) concepts for organisations to create values based on a specific logic. The conventional business model is focused on one company (organisation-centric approach). In this paper, this idea is replaced by a collaborative business model with different parties such as companies, organisations and governments. The goal is to achieve collective value creation between and for all parties involved. This requires a collaborative process of organising a business model for the involved parties in which the competencies and capacities of the actors involved can be utilised in designing and realising a transition.

The main conclusions of the research to substantiate this Working Paper are as follows:

1. Over the last two decades, systematic research has been carried out to develop a 'body of knowledge' about creating collective business models and transition thinking
2. These two domains are hardly connected in literature and practice, although promising approaches can be found
3. The existing literature is characterised by a high degree of theoretical and conceptual content, which hinders the practical application of a combination between the two domains.

4. Both domains share as a central principle that the essence of the design and instrumentation of a process requires a different way of working together.
5. By effectively combining these two processes, designing transitions while working on collective business models, a valuable perspective on increasing the chances of success of these transitions is given.

Structure of the report

The existing literature and organisational practices offer only limited insight into which strategic and practical steps organisations need to take in their specific context to work together towards a collaborative business model. This Working Paper is written to make a connection between the concepts 'collaborative business models', 'value creation' and 'transition'. This is done based on a summary of the current knowledge on collaborative business models and by linking this to the various schools of thought in transition studies. The focus is on identifying the phases and steps that lead to the design of a process of value creation and transition. In addition, a focus on scale and scalability is added as a prerequisite for the deployment of collaborative business models for transition.

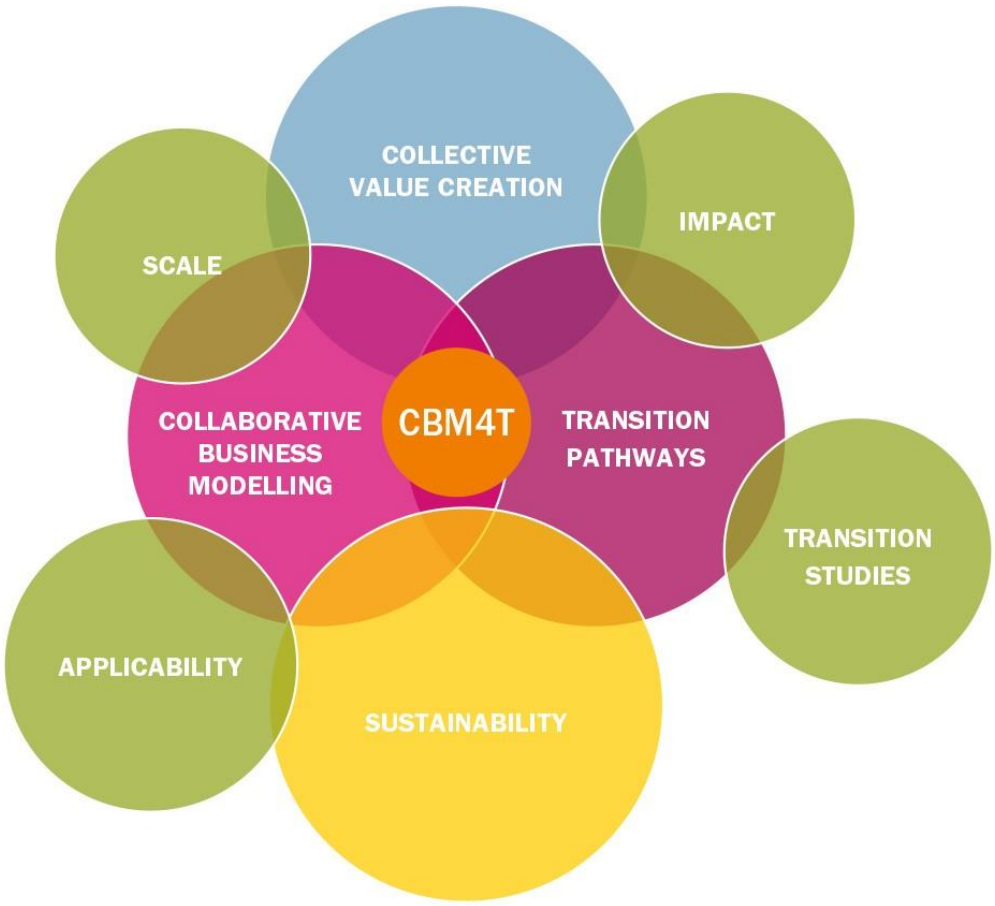


Figure 1: Interdisciplinary nature field of research

Additionally, an inventory of several case studies in the Netherlands and Europe was made in which we looked for cases that combine collaborative business models and transition studies. Furthermore, an inventory of current research- and

PhD projects of universities and colleges in the Netherlands has been made to create an overview of the focus of the research practice. These knowledge and insights combined form the basis for identifying different transition paths. Together, these different forms of input form the basis for creating a research agenda leading to a four-year research programme from 2021 onwards.

Colophon

Acknowledgements
We are very grateful to everyone who contributed directly or indirectly to the development of this publication. The authors owe TNO much gratitude for making a development grant available to realise this programme.

Origin of sources
In recent years, the authors of this publication, alone or with others, have written a large number of publications, working papers, research reports and White Papers on the two topics central to this publication: sustainable and collaborative business models and transition. In addition to formal academic publications, texts have been published on the digital platforms of the periodicals SIGMA, Management Impact, DuurzaamNieuws, TGTHR, Management Executive and websites such as LinkedIn, Twitter and New Business Models. During the compilation and editing of this text, both conscious and unconscious use was made of these earlier texts and the insights expressed in them, both directly and indirectly. Parts of the text are therefore 'recycled' (so-called 'autoplagiarism'). This means that some readers may come across text that they have seen before.

Language discrimination
In no way is the intention of using male and/or female referrals (her, his, she, he) intended to be discriminatory. Wherever we use 'she' in this publication, 'he' can and may be read, and wherever we use 'he', 'she' can and may also be read. By using these gender binary references, we do not want to exclude non-binary persons in any way. The choice for the use of 'he' and 'she' as reference words as demonstrative pronouns is only meant to guarantee the readability of the text.

Feedback
Although this publication has been prepared with the greatest possible care, it may still contain unintentional errors. Should this be the case, please contact the authors.

Contact
We would be happy for you to get in touch with us if you would like to know more about this research project, the people involved or what TNO can do for you in transition processes. You will find our contact details in chapter 7 of this Working Paper.

The contents of this report were primarily created by a strong collaboration between TNO Unit Circular Economy & Environment and TNO Unit Strategy, Analysis & Policy.

Contents

1 Transition as challenge

Our collaborative thinking about (organisational) change dates back to the middle of the last century. The origin of this thinking can be found in dealing with organisational-technical changes in wartime, and therefore under pressure. The approach was to make small adjustments to the routines, which largely remained the same. The essence was to improve the existing conditions in the short term; not doing one thing anymore by starting to do something else. ‘Transition thinking' is partly based on this historical thinking about organisational change. It is a concept that attracts a growing amount of political, social and scientific interest. It is about fundamental, lasting change of social systems that leads to (among other things) new structures, working methods and relationships. Transition processes can only be designed to a limited extent since they change over time and are therefore unpredictable when it comes to the timeframe and the outcome of the transition. Think, for example, of the historical transition from small-scale to mechanised, large-scale agriculture, or the current transition from fossil to green energy. The essence is the redesign and restructuring of a relevant social (sub)system by maintaining the function of the (sub)system. These processes can be described as an ongoing activity of discovery and co-creation by the involved parties. Entering into a transition process together means that the actors collectively design the transition process and have to take on different roles. These roles can also change over time, which indicates that the actors need to deal with a lot of uncertainty together. This can mean that parties have to work together differently, that rules and regulations have to be changed, but also that citizens, employees and leaders have to change their mindset. A central rule of thumb in transition thinking is therefore not entirely surprising: designing a transition is a 25% technical and 75% socio-organisational and institutional task. Furthermore, success is not guaranteed beforehand. Only after some time will it become clear whether the desired transition will take shape or not.

1.1 Why transition?

In the coming years (but actually from now on, preferably even yesterday) the need for knowledge, competencies and skills around the functional addressing of transitions will increase urgently. The present societal challenges, such as the climate crisis, the biodiversity crisis and the discussion about fossil fuels, call for targeted and coordinated action to realise sustainability transitions. Currently, there is a policy basis for this in the form of the Climate Agreement, the Knowledge and Innovation Agendas (KIAs) and the Mission-driven Innovation Programmes (MMIPs, which all articulate the same message. However, realising sustainable transition in practice is proving to be very difficult. The question is whether the existing 'Body of Knowledge' is still appropriate and sufficient for the issues raised by the current transitions. It is difficult to give a positive answer to this question. Over the past decades, theoretical knowledge has certainly increased the understanding of the nature of and possible approaches to designing and managing transitions. But translation into practice in the form of concrete (process) tools remains insubstantial. An ongoing survey among people in knowledge institutions and consultancies shows that the knowledge, competencies and skills needed to effectively deal with transitions are thin on the ground. Against this background, the

justified task is to develop knowledge and expertise on how to focus, organise and carry out transitions.

1.2 What are transitions?

Transitions are large-scale, complex, multi-actor and trans-institutional change processes that take place between organisations, institutions and (individual) parties. These are fundamental changes that take place simultaneously at multiple levels and locations. They can relate to a variety of issues and do not necessarily have to result in a more sustainable situation (i.e. there are also unsustainable transitions). Although a more sustainable situation is usually explicitly aspired by the stakeholders involved.

Achieving a transition requires the dismantling of existing systems to create room for the construction of new ones. This takes time. Not surprisingly, transitions take at least ten years, but it is more realistic to assume that they will take several decades. Moreover, these are processes that often provoke fierce open and hidden resistance — after all, it is about redesigning the existing order with all its interests and interdependencies. In addition, there is often uncertainty and a lack of clarity about the pros and cons of the different directions in which a transition can go.

A central aspect of transitions is that it is about more than individual (organisational) interests. There is always value creation in multiple areas, based on the social interest of achieving the transition goal. Nevertheless, it appears time and again that our institutional environment (legislation and regulation in all possible areas) is capable of slowing down transitions considerably. At the same time, there are increasing calls for transitions — certainly if they have the ambition to contribute to sustainability. Currently, the Netherlands has a number of transition agendas that are in progress and have been placed under the responsibility of various ministries (e.g. EZK, I&W, LNV). All these agendas focus on sustainability (e.g. food, mobility, energy, raw materials) over a longer period of time, with 2030 and 2050 as 'reference dates'.

Background of transition studies

Our thinking about transitions has different foundations. It is grounded upon a technical-industrial foundation around the intentional realisation of changes in small steps. The central concepts of these intentional changes were developed before and during WWII and are highly technical and incremental. The key approach is to create incremental improvements on existing conditions. The scientific thought on large-scale social change dates back to the 1960s (with thinkers such as Etzioni, Giddens and Ostrom). These perspectives are often highly theoretical and abstract. The underlying systems thinking (with various representatives such as Meadows, Perez or Bar-Yam) finds a strong — and also recent — interest, but often lives its own academic life and is not or is only very abstractly connected to concrete transition issues. Over the past two decades, the study of transitions has been further developed by a group of mainly Dutch scientists (including Geels, Van Gils, Hekkert, Rotmans and Loorbach).

1.3 What is the central task of a transition?

Realising a transition requires the development and design of another functional (sub)system while at the same time developing a new system. After all, it is impossible to switch off one system from one day to the next (say an industry based on fossil resources) and 'switch on' the system that replaces it (say electrification, renewable energy or bio-based raw materials). The realisation of a new system is designed by a complex process comprising of different levels. It is common to refer to these as (a) the landscape (institutional and legal frameworks), (b) the regime (to be seen as the various sectors of society) and (c) the niche. The latter is mainly understood to represent individual companies and organisations that work together practically on the intended large-scale change.

The complexity and the different perspectives of transitions creates a gap between the academic literature on transitions and the practical design of these transitions in real life. The central task is to create purposeful transitions that lead to a change in sustainable direction. Hence, practice-oriented research into collective and participatory transition designs is required to bridge the gap between science and practice. This can contribute to the development of a toolkit for policymakers and transition managers to offer practical methods and tools to manage purposive transitions. The emphasis is on involving key stakeholders, developing a collective vision, creating a joint transition agenda and developing collaborative business models to shape the transition (Sondeijker et al., 2006). In this way, best practices in transition management can be collected and transitions can be designed and developed more effectively.

A participatory design can help to design the transition in such a way that it can be executed more successfully since the different stakeholders are involved. In addition, it should be possible to speed up a transition that has been initiated and to avoid lock-in of regime parties. This means involving both the parties already established in the regime (the sector) and the companies or organisations in the niche in the process of setting up the transition. Think of collaborative experiments in combination with knowledge and expertise exchange to achieve a common goal (Rotmans & Loorbach, 2009; Nevens et al., 2013). Creating a transition from a collective perspective leads to the disruption of obsolete techniques and is accelerated by successful niche developments. Through a joint transition agenda, old techniques can be phased out and replaced by more sustainable techniques that are more in line with societal demands (Loorbach, 2018). By involving the government, market, communities and non-governmental organisations in forming a shared vision, support is created for sustainable change. This offers opportunities for a transition with less resistance from the old system to the new, leading to a more sustainable system in which synergies between niche developments and regime technologies can be achieved.

1.4 Transition thinking on different levels

In transition studies, the so-called multi-level perspective is the common analysis tool for mapping the relevant levels of a transition project (see Figure 2). By observing the different levels at the same time, stabilising and destabilising forces and the dynamics between the different levels can be visualised. The three levels are those already introduced: (1) Landscape, (2) Regime and (3) Niches.

1. The landscape (macro-level) is a representation of major social systems and the associated long-term changes, such as macroeconomics, culture, macropolitical developments and natural changes. These macro-trends change slowly and are therefore outside the direct influence of the incumbents of a regime. Landscape developments are the result of the ideas and actions of a large number of players. These changes create tension with the incumbents of the regime since they are forced to adapt to these macro-trends (Geels & Schot, 2007). Examples of landscape changes are climate change, population growth or long-term political policy.

2. The regime or sector (meso-level) represents a set of rules, institutions and technological developments that are common practice within a given area (e.g. food, mobility or housing). This leads to dominant rules, culture, knowledge, routines, power relations between the involved actors, technological developments and infrastructure that perpetuate a particular practice (Geels & Schot, 2007). These factors influence the actions of the incumbents and reflect the common practice in which social needs are met (de Haan & Rotmans, 2011).

3. The niches (micro-level) are the small and often ‘protected’ places where radical innovation often originates. Niches are companies, organisations or small networks of dedicated actors that develop innovative social, economic, technological or policy practices. Successful niche innovations — provided they have sufficient scale — put pressure on the regime (and ultimately on the landscape) to change. Competitive innovations ensure that a regime is replaced, while symbiotic innovations improve the regime's performance (Geels & Schot, 2007). Successful niche innovations can lead to disruption or technological adaptation of the regime.

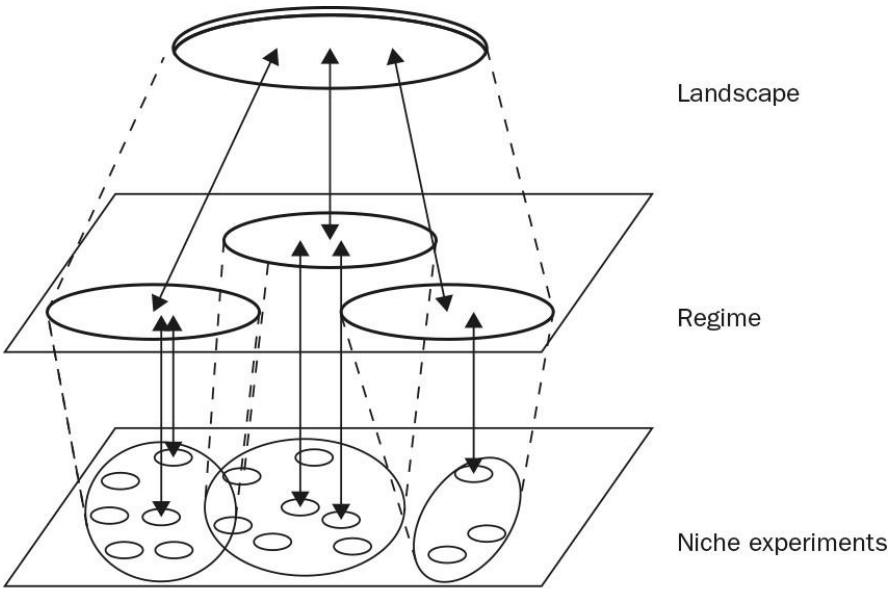


Figure 2: Levels of transition thinking
Source: Geels (2017)

What these three levels have in common is that there are observable, ongoing processes that take place at each level. These processes are referred to as transition pathways. These pathways are partly predictable, self-organising, path-dependent processes. In this sense, a transition path represents a strategy, a route towards a direction that can be chosen, which can be designed and developed in very different ways to achieve a certain transition goal. The table below gives an overview of the scientific thinking on transition paths and how this has developed over the past 15 years.

Berkhout et al. (2004)	Geels (2005)	Geels et al. (2007)	De Haan & Rotmans (2011)	Loorbach (2014)	PATHWAYS project (2015)
Endogenous renewal	Technological substitution	De-alignment and re-alignment	Reconstellation	Ideal typical transition	Pathway 0
Reorientation of trajectories	Broad transformation	Technological substitution	Empowerment	Disruptive transition	Pathway A
Emergent transformation		Transformation	Adaptation	Destructive transition	Pathway B
Purposive transition		Reconfiguration	Squeezed	Sustainable transition	
		Reproduction		Managed transition	

Table 1: Overview transition pathways

The overview shows that there are different perspectives on the nature of transition paths. But, the not-always-present explanation of the various terms does not create clarity on the definitions of transition paths. There is no clear typology, let alone a typology that can be made operational. In addition, the meaning given to terms by the various authors also differs. All this together means that there is no clarity about the design and structure of transition paths.

1.5 Transition management

In any case, the main message is that transitions are complex processes of change. The assumption here is that it is partly possible to design, stimulate and steer the direction of transitions. In purposive transitions, an extensive planning process takes place in which stakeholders jointly develop a vision and try to achieve this by using a transition agenda. Both planning and policy instruments are used in this purposive transition. On the contrary, an emergent transition consists of niche developments in which the government takes a reactive role and tries to steer the direction of the transition. In this case, the government only uses policy instruments to accelerate or slow down transitions.

1. Participatory tools	Sector-level roundtables Horizon scanning Delphi-method Participatory backcasting Participatory scenario construction
2. Design tools	Socio-technical scenario planning
3. Analytical tools and methods	Trend audits Scenario assessments Forecasting Policy stress testing Technological roadmapping
4. Stakeholder management tools	Stakeholder identification analysis Expert workshops

Table 2: Planning tools for transition management

For a purposive transition, the first step consists of planning the transition by creating a transition arena. By using a stakeholder identification tool, the most relevant stakeholders should be selected and invited for a stakeholder roundtable discussion to formulate the central societal problem. This is followed by the second step: developing a shared vision to develop support among stakeholders. Based on the vision, a transition agenda will be designed and tested using techniques such as backcasting, roadmapping and stress testing.

After planning the transition, the transition agenda can be executed into practice. The agenda will be used to design niche experiments of new technologies and business models, which will result in, among other things, icon projects and incubators. After this, successful niche developments can be selected and scaled up by means of structural projects supported by a consortium of business partners, knowledge institutes, the government and non-governmental organisations. In this phase, the current regime will also be destabilised to create a 'window of opportunity' for niche innovations. The niche challenges the regime, and depending on the diffusion of the niche innovation, the technological improvements with respect to regime technology, and changes in the landscape level, this leads to regime disruption or technological adaptation. The government can steer the transition by facilitating fiscal, economic and regulatory incentives for new sustainable technologies and reducing subsidies to regime technologies. There is a whole range of instruments available to shape this transition. Finally, this leads to stabilisation of the new regime, in which the government must try to adapt legislation and bring it into line with the public, sustainable interest, and evaluate whether the collective vision has been realised.

1. Investment tools	• Subsidies • Investments • State guarantees
2. Partnership tools	• Icon projects • Structural projects

3. Policy tools	• Fiscal incentives • Economic incentives • Regulatory incentives
4. Market development tools	• Enabling campaigns • Encouraging campaigns • Engagement campaigns • Exemplification campaigns
5. Knowledge tools	• Expertise centres • Information centres • Education centres

Table 3: Policy instruments for transition management

In emergent transitions, the transition management strategy mainly consists of steering the direction of the transition. The first step is to use policy instruments such as legislation and economic incentives so that the government can influence which niche developments will be successful. The second step for the government is to create momentum for niche technologies through investments, subsidies and market development. After this, the government can use campaigns, incentives and sharing best practices to influence whether there will be regime disruption or adaptation. These adjustments can lead to a different outcome of the transition, which can either be in favour of or a disadvantage to the existing regime.

1.6 What is the current situation?

It is difficult to identify where and when current thinking about transitions started. But what is certain is that we can now look back on two decades of research and related projects (mainly within the EU) and publications. Together, these reflect that the core of a transition is the planning and design of a complex process based on phases in which the building up and breaking down of structures go hand in hand. This process can be set up in various ways using a range of tools, which can be chosen depending on the transition challenge. The planning and execution is driven by a dominant vision that is shared by the various parties involved. The execution of the process often shows a capricious and certainly not tightly 'controllable' pattern. Furthermore, publications on transitions show that, from a retrospective perspective, not all transitions turn out to be sustainable. It also turns out that quite a few transitions 'fade out' over time, get stuck or fail completely.

The inevitable conclusion is that there is an urgent 'gap' between 'desire and reality'. Existing systems no longer meet the standards, get stuck based on new rules, and receive sharp and growing social and political criticism. Current examples are now widely available (including agriculture, aviation, raw materials, energy, and construction) and their number is growing. Throughout all this, there is a clear call for sustainability (even if it is sometimes difficult to get a clear definition of what exactly is meant by sustainability).

1.7 Current demand for transition knowledge

At the national level, both purposive and emergent transitions are taking place. The Dutch government, in collaboration with the business community, has drawn up five transition agendas for the construction sector, agriculture, plastics, consumer goods and manufacturing industry. With the goal of fully circular production by 2050, the Netherlands wants to play a pioneering role in Europe. Another purposive transition is taking place in the 'Netherlands' adaption strategy to climate change. The Delta Plan for Spatial Adaptation (Deltaplan Ruimtelijke Adaptatie) and the National Adaptation Strategy (Nationale Adaptatie Strategie), among others, will provide targeted guidance for the adaptation process to the consequences of climate change. A more emergent transition is taking place in mobility. After years of experimenting with shared cars, green mobility and alternative means of transport, the mobility transition is gaining momentum. New partnerships such as the coalition Travelling Differently (Anders Reizen) and the Mobility Alliance (Mobiliteitsalliantie) reinforce the call for disruption of the regime. Also, the court decision on the Nitrogen Action Programme (Programma Aanpak Stikstof) will only accelerate the mobility transition (Bode et al., 2019). In the coming decades, knowledge and expertise on planning, managing and adjusting transitions will be needed to ensure that both purposive and emergent transitions contribute to a sustainable, circular and inclusive society.

In addition, a major movement is taking place at the European level, stimulated by the Green Deal and the Circular Economy Action Plan (CEAP). Its objective is to achieve a climate-neutral Europe by 2050. A total package of at least 100 billion euros in investment has been created to shape the green transition (European Commission, 2020). The Green Deal has a multi-sectoral approach and includes the energy, industrial, mobility and agriculture sectors. A targeted transition on this scale is unique in history, and represents one of the greatest European-level challenges for the coming decades.

TNO and transitions

TNO, as a public, not-for-profit organisation and in line with its statutory mission, wants to connect people and knowledge to create innovations that sustainably strengthen the competitiveness of companies and the welfare of society. To achieve this, together with industry and 'top sectors', TNO is developing new services and products that tap into new markets by, for example, being healthier, emitting less CO2, using fewer materials or producing clean energy. Other major challenges that TNO aims to tackle are the cost and quality of healthcare, the creation of a safe, liveable, sustainable and resilient society and high-quality employment. TNO is organised in nine units, each with its own and common societal challenges that often require system changes. Together, the various units focus on a broadly supported energy transition including a significant increase in solar power, large-scale wind power generation, an energy-producing built environment and a green chemical industry. By way of illustration, four routes to a CO2-neutral industry have been worked out by TNO:

1. Electrification of production processes (energy supply and feedstock), which is inevitable to make industry CO2 neutral.

2. Increasing the sustainability of heat management. Multiple value is created if the industrial heat pump is powered by sustainably-generated electricity.

3. Capture, storage and reuse of CO2.

4. By making industrial processes efficient and circular, they require less energy and fewer raw materials and release fewer emissions and waste materials.

In addition, TNO also wants to move towards a smart and sustainable logistics and mobility system, and ensure that data can be used to facilitate circular agriculture. For the climate, TNO is developing models to monitor the Paris agreements and tackle climate change.By developing not only (technical) in-depth knowledge, but also the ability to connect different knowledge domains, systems and societal sectors by integrating technical, social and policy innovations, TNO can contribute to realising both public and private impacts and thus contribute to the realisation of sustainable transitions.

2 Collaborative Business Models

2.1 Developments in the knowledge of business models

The central assumption in this paper is that the chances of a successful transition can greatly increase if the parties involved not only participate in the design and organisation of a transition from their own perspective, but actively and intentionally collaborate in a collaborative business model of sufficient scale, or what is assumed to be scalability. However, to reinforce this proposition, it is important to first explain the concepts of 'business model' and 'collaborative business model'. The term 'business model' has been used more and more often over the past two decades. In essence, a business model describes how an organisation creates value. It shows how an organisation is structured and shows what value is realised (described in the value proposition) and how this is achieved. In conventional theory, business models are in principle organisation-centric. Central is a single organisation and how this organisation creates value. Environmental and institutional factors influence how the specific business model can be structured. Also, the definition of value often involves a fairly narrow interpretation, namely financial value. Sustainability is not usually included in the traditional business model.

Analysis of the use of the term 'business model' reveals three different forms (Massa, Tucci and Afuah, 2017). The first is the business model as a descriptive archetype of how businesses operate in practice. Examples are 'razor & blade' (cheap core product, more expensive additional products), 'freemium' (product or service is offered free of charge, advanced functionalities are priced) or 'pay-per-use' (a fee per moment of use). The second form of use involves understanding the images of business logic that managers hold, as opposed to describing reality. The third form of use, which could be positioned between the two preceding ones, is that of a formal model that consists of elements and relationships. A well-known model is the Business Model Canvas, which was developed specifically from an organisation-centric perspective, but there are many other forms and examples.

In practice, the business model is used for various purposes (Al-Debei, Mutaz & Avison, 2010). The first is that of a means to create a shared perception between multiple people (or companies). For example: what activities are needed to deliver a service to a specific target group? The second purpose is that of operationalising a strategy. By specifying the elements of a business model, a clear picture is created of how the company intends to realise the strategy. The third purpose is to capture and use knowledge on business models. This enables users to compare business models and observe performance.

These forms find their origin in strategy, management and information systems. In this sense, it is not surprising that in these business models a central place is created for the financial-economic revenue capacity of a single organisation. In the light of sustainability and climate objectives, various elaborations and counter-movements have emerged in response to this purely financial economic perspective (Bocken et al., 2014; Geissdoerfer, Vladimirova & Evans, 2018). The aim here is to integrally incorporate sustainability objectives into the business model by applying a broader concept of value. The 'triple bottom line' (people, planet, profit) and 'multiple value creation' are well-known, but hard to operationalise concepts. This

school of thought is also known as 'Sustainable Business Models' (SBM). In this movement, the concept of servitisation (Product-Service System, PSS) is prominent (Tukker & Tischner, 2006).

2.2 Multiple value creation by collaboration

The responsibilities of a company towards the environment have been debated for decades. Supporters of a 'narrow vision' of value creation such as Friedman (1970) and Rappaport (1986) describe how the ultimate responsibility of a company is to create shareholder value. A 'broader vision' of value creation is given by Elkington (1997), Emerson (2000) and Visser & Kymal (2015), with the notion that companies should proactively create value for society by finding profitable solutions to social and environmental challenges.

The perspective on value creation makes a fundamental difference in designing a business model. Conventional business models are designed from the perspective of single, financial value creation within a company's value chains (Osterwalder & Pigneur, 2009). Conversely, new business models have an inter-organisational design with the aim of creating more than one value at a time. It is common to refer to this with the (abstract) trilogy of economic, environmental and social value (also known as people, planet and profit). As a result, the design of the business model takes a different approach and becomes community-centric, where value creation takes place through collaborations in hubs, networks and chains (Jonker & Faber, 2019). Stakeholders collectively identify complex, multidimensional problems to business and economic challenges. By looking at these (complex) problems from a collective perspective, stakeholders can take action and allocate the necessary resources (Kais & Islam, 2016).

In essence, the multiple value that is created in this way means that the participating organisations take greater responsibility towards society and nature. Companies proactively design the business model in such a way that it creates environmental, economic and social value for the community and network partners. The aim of the organisations is thus to solve problems within the domains of sustainability, circularity and inclusiveness. Because of the nature and complexity of these problems, close cooperation with other companies, stakeholders, communities and governments is required. New collaborative business models can help to achieve this collaboration and thus create multiple, collective and shared values.

2.3 Why collaborative business models?

Cooperation is essential in both the context of sustainability issues and in the light of increasing competition and market turbulence. This is further reinforced by globalisation, which increases the risks of not only individual companies, but also whole industries or regions (recently highlighted by the Covid-19 crisis). By explicitly focusing on cooperation, a company can strengthen its own competitive position, but also improve the position of the entire business ecosystem of which it is part. To safeguard the cooperation between different constituents, collaborative business models can ensure a shared interest between partners. These are business models in which multiple organisations that sometimes differ in type (industry, government, research and non-profit), and differ in position in the value chain (production,

service, regulation), work together to create value. It requires a shift from organisation-centric thinking to thinking in networks (the business ecosystem). In this way, the business models of individual parties are better connected, thus avoiding sub-optimal revenue models. Costs and risks are shared between parties and dependency on third parties decreases, while the innovation capacity and market position increases. By working on collaborative business models, risks are spread and the positions of the individual company and the other companies within the business ecosystem are improved. But perhaps most importantly, companies can collaborate on sustainability issues.

How do you organise a collaborative business model?

There are various methods for collaboration within the business ecosystem to create a collaborative business model. These methods differ greatly in applicability and focus. Nevertheless, six core steps can be distilled from these methods to arrive at a collaborative business model:

1. **Initiation**: Identify and characterise the parties (and their relations in the network) that want to work towards a collaborative business model.
2. **Idea creation**: Generate creative and innovative ideas for creating the collaborative business model together through win-win value propositions.
3. **Innovation**: Exchange knowledge, develop business model concepts and define both actor roles and technical solutions.
4. **Evaluation**: Evaluate to ensure that the business model adds value to all actors.
5. **Implementation**: Create transition paths to achieve a marketable and profitable product or service that adds value to the whole ecosystem.
6. **Adaptation**: Make adaptations to the existing business models of the individual parties to meet the requirements of the collaborative business model.

By following these steps, a focus on involving the different actors in the ecosystem is essential to making a successful collaborative business model work.

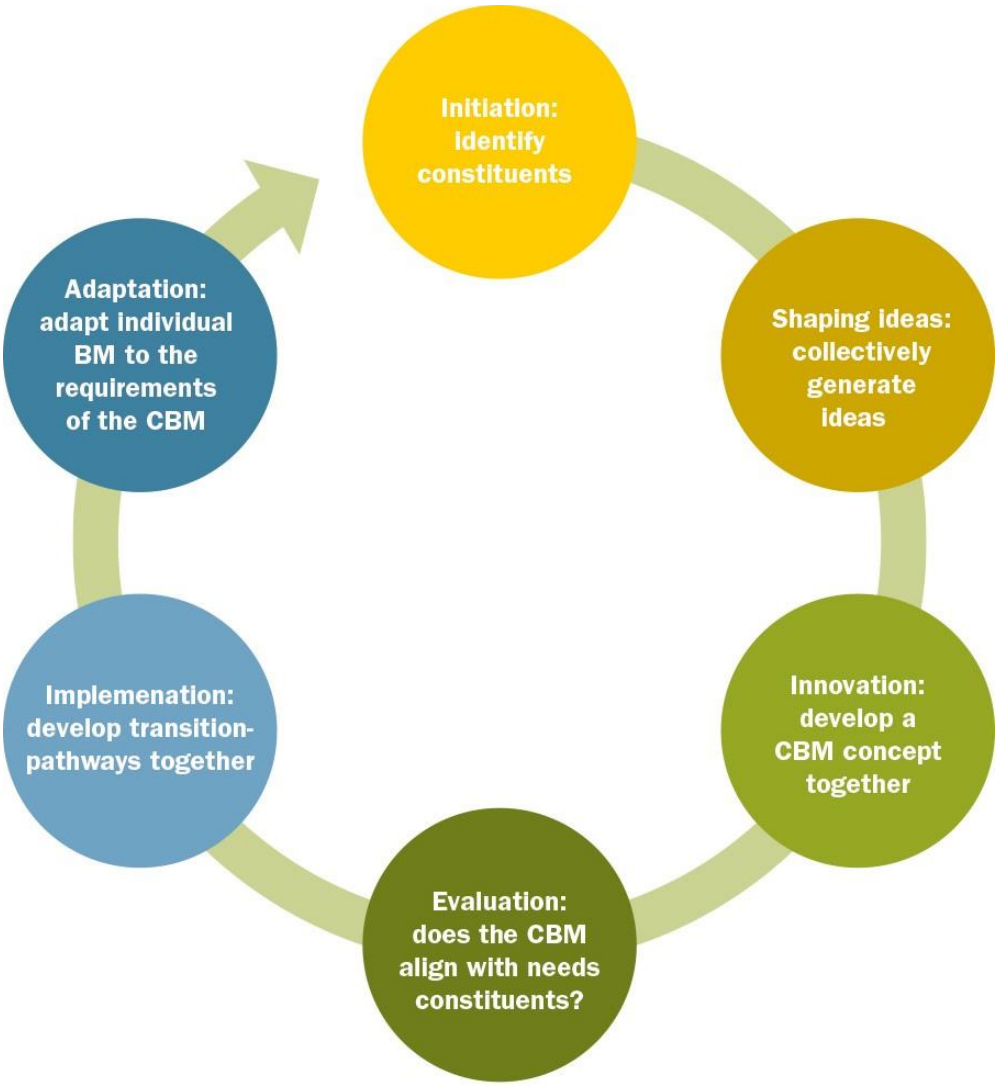


Figure 3: The process of collaborative business modelling
Source: Oukes et al. (2020)

2.4 Scale as a critical condition

In the various approaches that exist regarding collaborative business models, it is striking that upscaling is underexposed. In more conventional business administration, there is quite some attention for scaling up. Usually, organic growth (from the existing organisation), strategic growth and growth through acquisitions are distinguished. However, these insights are less applicable when it comes to scaling up collaborative business models. In transition neither growth of individual organisations nor acquisition of small innovators by the larger players is the aim. Focus is intentional collaboration aimed at achieving shared (valuable) goals in line with the intended transition. However, it is expected that the direct inclusion of a scaling strategy in collaborative business model thinking increases the chances of creating a business ecosystem of sufficient mass to make the implementation a success. The further development of knowledge on scalability for specific collaborative business models therefore seems to be an important condition.

2.5 Collective value creation as the driving force of a transition

In traditional business model thinking, developments outside the value chain are often seen as external factors that cannot be influenced. These developments are only included in the business modelling process as an opportunity or threat, although they can have an enormous effect on both individual companies and the entire value chain. We are increasingly confronted with developments that have a significant impact on our existence and therefore also on business models. Not only do globalisation and digitisation continue to have a major impact on business, but new developments such as climate change, the depletion of natural resources and pandemics (with Covid-19 as an extreme example) also bring change. What these developments have in common, besides being volatile, uncertain and complex, is that they are major catalysts for transitions. This makes it risky to include these factors as only opportunities or threats in the business modelling process and thus gives even more weight to the need for cooperation in collaborative business models.

By using collaborative business models of sufficient scale or scalability and by working together with different parties within and outside of the value chain, it is possible to actively respond to the major challenges of our time. This not only strengthens the position of the individual company, but also that of the business ecosystem and accelerates the transition. Transition often starts with a new technology being developed in a niche, after which the new technology gets stuck more than once in the 'niche development' and fails to scale up to 'mainstream', regime level. This requires parties from different sectors (e.g. industry, government, research) to orchestrate and simultaneously take steps to change and innovate in order to achieve the scale necessary to contribute to transition. Given the legal, organisational and institutional challenges posed by international chains, an approach at the regional level seems most likely to succeed, preferably within a single institutional setting. If parties in a particular region can collaborate from the beginning with sufficient scale, and if this collaboration has an ideal-typical integral character, then the scale of transition and collective value creation will coincide.

In the scientific and professional literature, first steps have been taken in linking transition studies with (collaborative) business model thinking. It outlines the contours of how these business model processes can be linked to transition processes. The approach advocated in this paper aims to ensure that parties within a business ecosystem arrive at a collaborative business model of sufficient scale (preferably one that already has scale or is explicitly scalable from the beginning onwards), in such a way that it actively contributes to both shaping and catalysing the transition. A clear and concrete approach on how to develop such a collaborative business model for transition has not yet received sufficient attention in the current literature. In light of the question of giving concrete and practical shape to transitions, it is important to develop an approach that combines collaborative business model thinking with elements from transition studies, taking scale as a central focus.

3 The field

The previous chapter showed that the knowledge on collaborative business model design to facilitate transition is insufficiently developed. In an initial contribution to this knowledge base, a brief overview was made of recent cases in the Netherlands and Europe in which collaborative business models and transition studies could go hand in hand. These case studies were based on actual transitions. The ultimate goal is to use this preliminary knowledge base as a whole and to develop it into a set of instruments that can be used in new cases and thus catalyse transitions. In this chapter, by way of illustration, some transition cases are highlighted and described, followed by a brief analysis. Two cases in particular are highlighted as potential 'revealing cases': they are seen as examples of transitions that go hand in hand with business model developments. This can be used to illustrate the knowledge needed to develop a practical approach to collaborative business models for transition.

3.1 Overview of NL and EU cases

To arrive at an overview of cases, a set of criteria was used, as described below. These criteria are important to arrive at a certain uniformity of transition cases. Practice shows that what is meant by such a case can vary considerably by country, region and case:

1. **Multi-actor environment**: The change involves more than one type of actor: several parties are involved, such as the private sector, the government and citizens or 'customers/consumers' of the aforementioned. This criterion is essential because it makes it possible to distinguish between transitions from regular trajectories between two private parties.
2. **An urban/regional/national sphere of influence**: The transition has at least an urban 'scope'. This criterion creates a separation between smaller changes and larger, scalable transitions. It also ensures that the created collective value is 'distributed' in the same environment.
3. **Duration of 5-10 years**: The transition has a reasonable maturity and therefore consists not only of planning, but has also reached an implementation phase. This criterion, like the sphere of influence, also has to do with the scalability of the change taking place.
4. **A sector-specific focus**: The transition focuses on a particular sector (e.g. energy, logistics or chemicals) or a combination of these. This criterion is based on how in today's world, things are organised in domains (e.g. the 'logistics domain' or 'the care domain'). If a transition extends across one or more domains, this is a signal for a certain scale.
5. **Effectiveness**: The transition has a goal or endpoint that the actors collectively work towards. Often, but not always, this is a more comprehensive social goal in which sustainability plays a role. A distinction can be made between process- and purpose-driven transition. In this inventory, we assume that purposive transitions are easier to identify and monitor.
6. **Multiple value creation**: The various actors create more than just financial value. This may involve an implicit or explicit shift towards using collaborative business models. In this inventory, this criterion is important

because it assumes that collective value creation is essential for a successful transition. This is in contrast to a transition where no collective values are created.

7. **Significant change**: There is a fundamental change in a (sub)system. This criterion explicitly excludes optimisation and improvement processes that preserve the current system.

In addition to the above-mentioned points, various cases were examined to see whether there was a transition path. Because we worked with available literature and case studies (so no new research was set up to find cases and turn them into case studies), this last criterion was treated with care.

Based on these criteria, two inventories have been carried out to identify several current examples. The first inventory focused on European projects. This resulted in a long-list of 34 cases. On the basis of an in-depth analysis, this has been narrowed down to five appealing cases. The second inventory focuses on current transition cases within TNO. To this end, interviews were held with people within the various TNO fields of work (Energy, Logistics, Defence & Safety, ICT, Construction and Circular Economy, and Sustainability). This resulted in a long-list of 14 cases. Moreover, in a second term, a more in-depth analysis was made which also resulted in five cases.

These five selected European and five TNO cases are briefly presented below in the form of a table (see Table 4). The collection of cases as identified so far (possibly complemented with new information or sources) will be used in a separate and concise analysis. This analysis is made to clarify the role of business models in these transitions, and to assess whether and to what extent specific transition paths are being followed consciously or unconsciously.

3.2 Overview of EU-cases

In various parts of Europe, there are long-term and sometimes large-scale projects which can be typified as 'transitions in action' based on the above criteria. This sounds more self-evident than it is in reality. In some countries and regions, it is culturally easier to work on and experiment with (social, institutional, economic) change than in others. Moreover, the original list that formed the basis for the summary below only looked at projects that provide (up-to-date) information in English.

Name	**Transition**	**Sector**	**Sphere of influence**	**Duration**
Samsø Island (DK)	Energy autarky	Energy	Island	20 years
Project Zero (DK)	Completely CO_2-neutral community	Energy	Region	10 years
Bio-energy village Jühnde (DE)	Sustainable living environment	CO_2-reduction	Village	4 years

Biomass Energy (FI and SE)	Sustainable bio-energy	Energy	City/region	2 years
Eccentric, Civitas (EU)	Sustainable mobility	Mobility	City	6 years

Table 4: Overview of transition cases in the EU

Analysis shows that two of these five projects have been running for a decade and are ongoing. It is striking that in this collection of cases, a relatively large number are stimulated within the framework of EU programmes. It is almost self-evident for the cases that a multi-actor approach is taken in which the actors consciously adopt different roles over time. Furthermore, the first two selected projects have a clear, explicit purpose: CO2 neutrality or energy autarky. These are truly 'revealing cases', in which collaborative business models and a sustainable transition intentionally come together. An example of a close call to being a revealing case is the Samsø trajectory. In this example, a series of interconnected phases of change over time are visible, which contribute to the transition to an energy-autonomous island. This case is briefly explained below.

Project Samsø (DK)

Samsø is possibly the longest-running integral sustainability project in Europe. It is an island and municipality in the Danish region of Midtjylland and has a population of 3,724 (reference date 2017). The island thrives on tourism, agriculture and the supply of green electricity. Samsø is also known in Denmark for its potatoes. By working intensively together as a population and government, and by working towards a common goal, the island, led by a few creative, enterprising and green spirits, was ready to be completely self-sufficient in energy in just a few years. In the 20th century, Samsø faced a steady decline in population. The islanders left for other regions and saw no future on the island. The deliberately chosen sustainable approach was created to turn that tide, and with success: since 2019, Samsø has been able to call itself the most sustainable municipality in the world.

This success is based on local wind energy and other renewable energy sources, making Samsø the largest CO2-neutral residential community in the world. The sustainable movement started in the 1990s when a number of inhabitants decided to generate their own energy to become autarkic. For the first time, they raised money to have windmills built for green electricity which they would consume themselves. Now, 20 years later, 100% of the necessary energy on the island is generated by renewable sources and the surpluses are sold to nearby Jutland. About 75% of the heat demand is generated with biomass and solar heat. Furthermore, a quarter of the mobility fleet is now electric. In most cases, it turns out that people can save 40–50% on their energy costs. Most of the investments are recouped in5-10 years, which allows for substantial savings for the inhabitants in the following years. This is made possible by the goodwill of the banks, which have been involved since the beginning of the project, to lend money to the inhabitants for them to make green investments. These investments also applied to people with lower incomes. These investments also applied to people with lower

incomes whose applications for financial support from the bank in order to purchase (for example) part of a windmill, were generally approved.

Since 2011, a new plan has been developed stating that the island has the goal of becoming completely free of fossil fuels. This master plan is based on seven new objectives. The ferries will run on biogas, which means that biogas plants are needed to become self-sufficient. Large vehicles for transport such as tractors and trucks will also run on biogas. Furthermore, public transport (buses) will run on electricity. Also, new imported cars will be electric as much as possible, starting with the vans and homecare providers. In addition, there are several major energy renovation projects in which, among other things, the electricity consumption of farmers is examined. Finally, a system of two electricity tariffs will be set up. Energy use at night then becomes much cheaper than during the day, which contributes to the stability of the network. This is also advantageous for the electric cars that charge at night. Samsø is now working on the third version of its transition plan. To support citizens and businesses, a transition academy has been set up (Energieakademiet) which provides advice, research and communication (see: https://energiakademiet.dk) (text compiled from various public sources).

3.3 Overview of TNO cases

TNO also contributes to various projects to transitions that bring a sustainable society closer. In its broad field of work, several cases can be identified in which collaborative business models implicitly play a role in shaping these transitions. Table 5 below lists five of these cases that have been identified based on an internal qualitative review.

Name	Transition	Sector	Sphere of influence	Duration
CILOLAB	Zero-emission urban logistics	Logistics	City	6 years
Porthos/H-Vision	Hydrogen and CCS in a new energy system	Energy	City/region	3 years (previous projects started in 2011)
Lifestyle4Health	From curative to preventive healthcare	Healthcare	Region and nationwide	4 years
Chemelot	A climate-neutral integrated chemistry site	Industry	Site and region	2 years
VoltaChem	Electrification of the chemical industry	Chemistry	Region	6 years

Table 5: Overview of TNO transition cases

The analysis shows that all five projects mentioned above use a multi-actor approach, usually in a triple helix context. All projects also have a certain explicit or implicit purpose. Multiple value creation and striving for a significant rotation of the existing system is visible in all cases. However, there is as yet no real 'revealing case' in which collaborative business models and a sustainable transition intentionally come together. The example within TNO that comes closest to a revealing case is the Porthos Project. In this example, we see changing collaborative business models that contribute to the transition to a CO2 free Rotterdam port area. This case is briefly explained below; Appendix A gives a more detailed description of the other cases mentioned above.

Project Porthos/H-Vision

In the Porthos Project, preparations are being made for a project to transport and store CO2, coming from the industry in the Port of Rotterdam in empty gas fields under the North Sea (Carbon Capture Utilisation and Storage, or CCUS). The aim is to reduce greenhouse gas emissions. H-Vision focuses on the production of blue hydrogen, which is made from natural gas and residual gases from the refinery in the Port of Rotterdam. These two projects in the crossover between the process industry and energy sectors are seen as a project in which the Porthos organisation creates the infrastructure and the organisation H-Vision makes use of it. In these projects various parties, mainly from the Rotterdam port area and from the gas and hydrogen chain, cooperate intensively with (semi-)government bodies and knowledge institutes. Both projects have been running for several years now, but have several precursors. The common goal is to contribute to a substantial CO2 reduction by 2030.

The precursor of Porthos called ROAD, ailed, partly due to excessive costs. One of the lessons learnt was that the project should construct a public infrastructure that other companies can make use of. At H-Vision, blue hydrogen is produced as a transfer to green hydrogen (which does not release CO2). The success of H-Vision requires the large-scale use of hydrogen by industry. This requires substantial process adjustments for the industry. If the transition is to succeed, H-Vision cannot be seen in isolation from Porthos, since the CO2 generated in the production of blue hydrogen can, thanks to Porthos, be transported and stored sustainably. In addition to the ecological and financial value creation of this transition, it will also increase the self-sufficiency of the Port of Rotterdam and, in time, the Dutch industry. The infrastructure that is being built and the installations that are being converted will soon also be used for green hydrogen and thus reduce CO2 emissions even further.

3.4 Short reflection on the cases

On the basis of the inventory study, several European and TNO cases have been found that meet the criteria for transition mentioned in this chapter to a greater or lesser extent, and work (not always intentional) on collective business models. Two short overviews were made of the cases found and two illustrative cases were explained, namely the cases of the island of Samsø (Denmark) and the Porthos Project (Port of Rotterdam).

The fact that so many potential cases were found in a relatively short period of time — both external and internal — is an indication that working on transitions is a hot topic. However, in most cases, there is no conscious use of (collaborative) business model development as a process (or instrument) to achieve fundamental changes — with the possible exception of Samsø. After analysis of the cases, there is reason to assume that changes are implicitly being made involving other business models, but this has not been deliberately designed or implemented in this way. The 'revealing cases' do show that changes are taking place in the way in which (collective) value creation is handled. A future, more in-depth case study should clarify how this has developed over time. Nevertheless, these cases give a nice indication that practical knowledge about setting up collaborative business models is scarce, but does exist. This probably means that in projects that have been labelled 'transitions', valuable energy and time is lost because of a lack of input from previous experiences and the help of already-available useful instruments. Or as the Dutch saying goes, 'The wheel is constantly being reinvented'. Precisely at this intersection is the approach chosen here: to work on transition processes and to merge these one by one with working on collective value creation, which takes the form of collaborative business models.

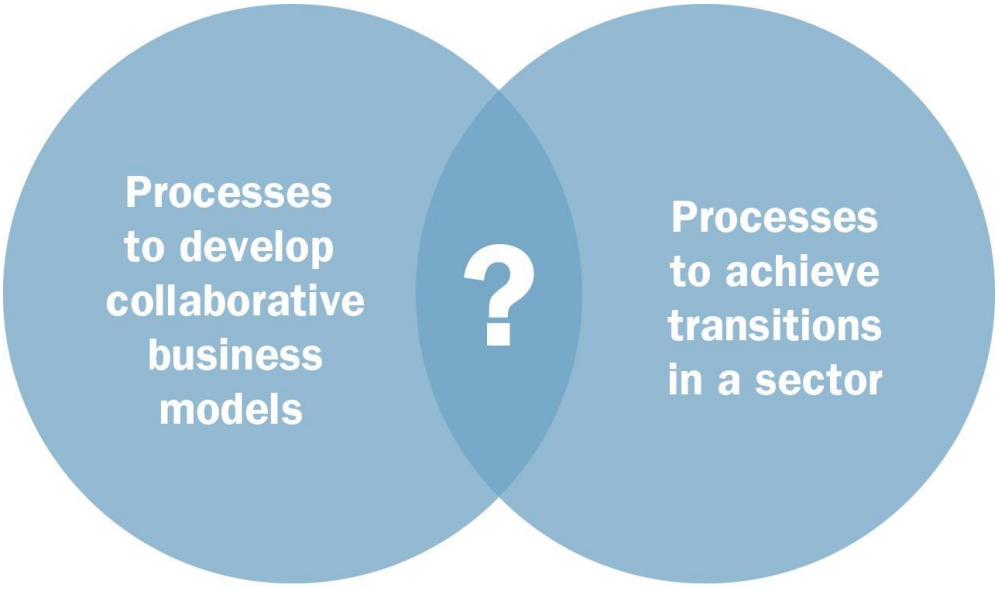


Figure 4: Focus of the research

4 Working together on transition by using collective value creation

Now that the current knowledge on transitions, business models and collaborative business models has been set out in the previous chapters, and a brief outline has been made of the activities in practice in the field of transition (using collaborative business models to a greater or lesser extent), it is now important to link the two domains and to initiate a process approach to transitions based on collaborative business models.

4.1 Different approaches to transition

Studies on transitions can be divided into two main approaches. The first is typified as top-down, the second as bottom-up. In a top-down transition, a normative, collective vision is created and transition management techniques are applied as a guiding process to achieve the collective goal. There are several phases in transition management, but how they are realised in practice often remains unclear. This is why transition management focuses primarily on guiding purposive transitions to steer them in a sustainable direction that serves the public interest. Bottom-up, emergent transitions, often involve reactive anticipation on external developments. The role of the government is to set out frameworks and conditions for the transition. Studies into emergent transitions often focus on how existing or new companies can search for scale and scalability from niche developments.

	Purposive transition	**Emergent transition**
Approach	Top-down	Bottom-up
Driving factor	Vision-driven transition	Technology-facilitated transition
Role of the government	Proactive	Reactive
Goals	Normative goals such as sustainability, circularity and inclusivity	Technological improvement of the regime to create a better fit with societal demands
Examples	Energy transition, circular economy	Mobility transition, digitalisation, platform economy

Table 6: Top-down and bottom-up transition approaches

Not entirely surprisingly, many transitions get stuck over time. Problems such as vested interests, a risk-averse institutional context and poorly accommodating financial infrastructure play a role. After all, it is about critically examining existing positions and practices and, where necessary, replacing them in the light of a collaborative task to arrive at different forms of value creation. Timing plays an important role in this process. Parties lose interest if it takes too long to achieve

results. The disruption, the complexity, but also the unpredictability of the economy and society make it difficult to maintain a single course for ten years or more, even if it is 'only' by following a broad outline. Consistency is a crucial factor in the effective realisation of a transition. But perhaps the most important thing is that collective value creation is the core starting and implementation point for the intended transitions.

Last but not least, there remains the critical question of whether the dual approach of top-down or bottom-up developed so far should be replaced by another, possibly more successful, approach. After all, working from a governance-perspective (institutional frameworks) or upscaling from the niche (business-perspective) sometimes seems to get in each other's way. After all, there must always be simultaneous work on transition at different levels (multi-level approach) and it should be executed by different parties that take on different roles. This happens over time, in a process in which dismantling and building-up take shape.

4.2 Towards a process approach to transitions

The above leads to the observation that an approach is needed that not only looks at the transition from the perspective of either the landscape (top-down) or the niche (bottom-up), but also explicitly seeks a connection between niche, regime and landscape in a multi-level, multi-stakeholder approach. A collaborative business model approach is especially suitable for this and can be used in three different ways to facilitate the transition.

The Collaborative Business Model as an instrument in the technical niche: Many technical niche developments get stuck in their search for scale. The technical niche development itself can be very valuable, but due to the lack of a feasible and innovative business model, the technical niche development does not succeed in achieving sufficient scale to break down the present regime. By adopting a collaborative business model approach focused on scaling up, the necessary partners for successfully developing a technical niche in the business ecosystem are explicitly included. This increases the competitive position of both the niche and the entire value chain, which increases the chance of achieving sufficient scale to break down and replace the current regime. This, however, does not apply to all technical niche developments. In the case of radical and disruptive innovations, it is sometimes better to exclude regime incumbents to be more successful in disrupting the regime.

The Collaborative Business Model as a non-technical niche innovation: Some non-technical niche developments are based on a new service model, not a technical innovation. Think, for example, of 'mobility-as-a-service' providers, which offer services to move between locations instead of offering a means of transport. Technological developments serve as enablers rather than drivers. Non-technical niche developments do not always succeed in achieving sufficient scale to break the regime. A collaborative business model approach ensures that the necessary partners join at an early stage, participate in the development and share in the success of the new business model. This increases the chance of success in achieving sufficient scale. Again, this is not necessary or feasible for all non-technical niche developments, such as disruptive business models that can in themselves initiate a considerable transition.

The Collaborative Business Model as a challenge of the socio-technical regime: By defining a project within a certain sector that has scale from the outset, the current regime can be challenged immediately since the niche development and upscaling phases can be skipped. Fictitious but realistic examples are the organisation of closed plastic cycles for provinces, or the creation of a sand and concrete cycle based on demolition waste within a large municipality to construct 30,000 new houses over a period of ten years. As a result, a process of transition begins with a search for the scale appropriate to the transition task and the parties involved at the start. This takes time and investment in human (organisational) energy and, where necessary, relevant technology. Last but not least, process funding or in-kind contributions are required. All this argues in favour of defining projects in sectors that can give transitions a 'boost' because they have been scaled up from the outset. A collaborative business model makes such collaboration possible.

On all three levels, a collaborative business model approach can shape transitions, partly based on a collectively-chosen direction. However, integrating collaborative business models in a transition process requires a much more practical, instrumental approach to transition management to be effective. This creates an approach that can tentatively be referred to as 'collaborative transition management'.

4.3 Making transition and collaboration business models concrete

Collaborative transition management seeks the balance between purposive and emergent transitions, in which a formulation of long-term strategic goals is combined with scaled regional and/or local initiatives in specific sectors (e.g. mobility, energy, construction or food) from the outset. Both processes contribute to the reduction and redesign of structures, cultures, institutions and related practices in a specific sector. The approach advocated here should result in the selection and design of so-called 'icon projects'. This is understood to mean projects that set an example in terms of design, layout and implementation.

In collaborative transition management, the three levels — landscape, regime and niche — work together to achieve a shared vision. Using a discovery and co-creation process, the parties try to design the transition from different roles. Working with each other on this requires long-term involvement of the participating parties. Together, different parties therefore try to arrive at a collaborative business model at different levels to increase sustainability in society. By combining the six steps of collaborative business models the steps from the transition literature a first proposal towards a new roadmap for collaborative transition management is developed:

1. **Initiation phase**: Relevant stakeholders concerning a transition issue are brought together by means of roundtable discussions. This forms an innovation network in which, on the basis of a collective social problem setting, new solutions are sought that solve these complex problems.
2. **Vision development phase**: Stakeholders develop a collective vision of collective value creation for the transition issue through one or more meetings and flanking activities (e.g. workshops, working visits, brainstorming).

3. **Exploratory phase**: In this phase, the consequences of the various transition paths for achieving the collective vision are explored. Ideas are formed for niche experiments and proposals are made for icon projects. Objectives and ideas are translated into a transition agenda, whether or not supported by a research, investment and education agenda.
4. **Experimentation phase**: Experiments with collaborative business models can be developed on a smaller scale to test the viability and scalability of niche developments. By exchanging knowledge in incubators and knowledge centres, best practices are shared between actors. Intermediate evaluations take place to check whether the implementation creates the promised value for the different parties involved.
5. **Acceleration phase**: Successful collaborative business models and related tools are scaled up in this phase and marketed into a profitable product or service. In addition, institutional pressures are initiated where necessary to create new windows of opportunity in the regime, in order to successfully introduce new technology, systems and collaborative business models.
6. **Regime adaptation or disruption phase**: The new collaborative business models and sustainable technologies challenge the regime, which could lead to a regime change. On the one hand, the new technology or business models can lead to regime adaptation, by improving existing business models of incumbents to meet societal demands. This leads to technological adaptation and collaboration with the regime. Conversely, collaborative business models that have a disruptive nature could disrupt the regime, leading to a new regime.
7. **Stabilisation phase**: A new or adapted regime has come into place. New rules, structures, cultures and attitudes are needed to create alignment of the regime with its environment. The transition process is evaluated (again) with the parties involved and, where necessary, plans are made for changing the regime or starting a new transition.

The essence of this seven-step approach is that, based on a collective vision, an agenda of niche experiments (preferably directly to scale) are developed. In time, this should result in incubators and icon projects. After this, these successful niche developments (which do not yet have a scale) can be selected and scaled up by a consortium of industry, knowledge institutes, governmental- and non-governmental organisations. The government can steer this transition process by creating fiscal, economic and regulatory incentives for sustainable technologies and reducing subsidies to regime technologies. Ultimately, this will lead to a new regime, on condition that the government has revised the legislation and brought it in line with the public, sustainable interest.

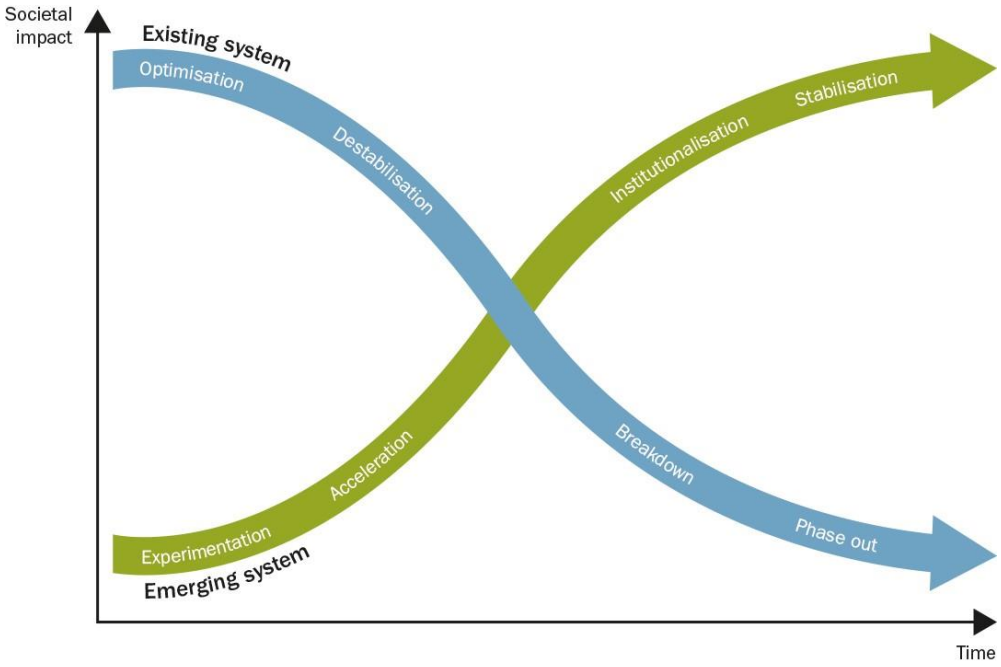


Figure 5: Phase model of transitions
Source: Loorbach (2018)

5 Outline of a research agenda

The recent literature review, carried out as part of this publication, shows that many transition studies are abstract, historicising, and above all descriptive in nature. This means that a transition process is often analysed in retrospect. Such a description might nicely show how a process actually went. However, designing a future transition process with different parties and implementing that transition is a different story. There is currently a lack of practical building blocks to make the design and implementation of a transition process in a particular domain as concrete as possible, with the associated concepts, instruments and roles.

Within the framework of this Working Paper — in addition to a literature study — a consultation of actors (teachers, professors, PhD students) working at Dutch educational and research institutions was conducted. Unfortunately, the time was not available to make such an inventory in Europe. Using a snowball method, more than thirty lecturers, researchers and PhD students (who made up the majority) were identified who are to some extent involved in business models in the light of transition. This method continued until it no longer yielded any new names. It can be concluded from this that it is a relatively small research community. Publications and/or research involving a combination of transitions and business models are scarce. The idea was that the identified members of the community-of-science would meet at a workshop and share knowledge and experience. However, because of the Covid-19 pandemic, this could not take place. Instead, there was a half-day virtual working conference with about 15 participants. Unfortunately, this resulted in less concrete output than originally planned. But it was clear that the willingness to participate in a community-of-science on this subject is great. Bringing together researchers from different disciplines with different research questions was seen as very valuable to the participants and researchers.

5.1 Balancing between fundamental and applied research

The societal challenges that are central to transitions by definition require adjustments to a socio-technical system. This means that the ball is not only in the court of the business community, but also of governments, politicians, research and educational institutions, and citizens in society, and that requires innovation and integration in both the technical and societal fields. The overview of the field of transition studies and collaborative business models presented in previous chapters shows that a number of fundamental and applied issues remain unanswered. At the same time, the overview of cases in the field (chapter 3) shows that in practice there is a great need for applicable knowledge.

This practical knowledge will also have to be developed into practice. By definition, working on transition, and thus on solving complex problems, requires cooperation between multiple actors across different projects (whether or not scaled up from the outset). The problems addressed in these projects are by definition complex and urgent. Solutions cannot be developed and tested in a lab closed off from the outside world, but will largely have to be tried out and adapted in practice. An important characteristic of solutions is that they create value in different areas for all actors involved.

Developing a research agenda requires a hybrid strategy in which fundamental knowledge is distilled 'from' current practice, and in which simultaneously applicable knowledge is developed and tested in — and used for — the same practice. This can be done by building up a portfolio of transition cases that are 'more mature' and transition cases that are a bit younger. By studying these, insight can be gained into issues such as roles, phases, instruments and other tools. This creates a solid basis for knowledge exchange between supply and demand. This can also be done by combining the research with interventions and evaluations. In addition, this can also be done by programming immediately usable knowledge applications and knowledge development in parallel with each other. This can be done by learning from each other and embracing the development of transitions as a collective challenge.

5.2 The research challenge: operationalisation of collaborative business models as transition paths

Transitions are seen, in the context of this publication, as search-and-development processes in evolving complex socio-technical systems. It takes a long-term commitment to realise these processes, and success is not guaranteed. There is a 'Valley of Death' threat, not only due to the inability to obtain funding or demand, but also due to a lack of support and coordination with the necessary parties, unchangeable regulations, unfitting culture, resistance to change by parties with vested interests, and so on. Nevertheless, we believe that a transition process can to a certain extent be designed and, albeit in moderation, can be steered.

In chapter 4.2 we presented the collaborative business model as (1) a niche transition instrument, (2) a non-technical niche innovation and (3) a challenger to the socio-technical regime. Each of these three forms has its own characteristics, challenges and approach. In (1), the uncertainty regarding the operation of the technological innovation (and thus a dominant linear philosophy from idea, to lab, to pilot, to market), the business model and scaling up to regime scale are central. This means that the phasing out of the current regime is part of the challenge. In (2) the same challenges apply, with the exception that availability of technology does not apply. For this reason, this strategy could be a solution that can be implemented in a shorter period of time. In (3), innovation is shaped by the regime. This means that scale is part of the focus from the outset, and that actors have more control over the dismantling of the dominant logic. At the same time, this also implies that different types of stakeholders that want to participate have by definition an interest in the status quo. This ranges from shareholders to regional authorities (employment). The research assignments are as follows: How can you support and realise the development of these collective business models? When do you choose one of these three types and can this change over time? What is the contribution of each of these to the transition and how can you maximise their impact?

In chapter 4.1 it was argued that transition paths require moderation and require the taking on of different roles by involved parties. Here, such 'paths' are seen as partially predictable, self-organising, path-dependent processes that shape a transition.

The research task is to develop, apply and evaluate a set of approaches that help to develop, implement and effectuate collaborative business models for the various transition paths.

In order to give direction to this dual strategy, which must produce both fundamental and applied knowledge at the same time, several research tasks are identified:

1. Which collaborative business models exist and which are most suitable for different transition paths?
2. What methodical and instrumental support does the development and realisation of these collaborative business models require?
3. How can a clearer classification (typology) be made of different transition paths and their underlying building blocks and phases?
4. How do the different transition paths relate to each other? To what extent can synergy be achieved to make their contribution to the transition as effective as possible?
5. What tools are available to shape different transition paths, what is the relationship between them, and what are possible gaps that should be filled?
6. How can a transition-following system be developed in which transitions are followed and compared over the years across countries and sectors?
7. How can the possible theoretical impact of the proposed systematic practical knowledge be used to contribute at a more fundamental level to transition studies and the underlying systems-thinking?

This is certainly not an exhaustive list of research questions, but rather a list that provides an adequate indication of the nature and scope of the questions that need to be answered as effectively as possible in the research agenda.

5.3 Developing a practical and methodical TNO-approach

Above what we want to accomplish is described: a practice-oriented methodical approach that can be used by various actors for the development and realisation of collaborative business models embedded in transition paths that effectively promote a transition. How to do this concretely and systematically is based on so-called progressive insights and knowledge. This knowledge would indicate how people can take concrete steps within a particular transition path in practice and what instruments they can use to do so. To achieve this, various other types of knowledge are required. A distinction is made here between a number of building blocks in a systems-based approach.

1. What are good, and less good, practical examples in the context of the different transition paths? Clear, accessible and recognisable practical examples help to study and understand collaborative business models.
2. What is a suitable framework of elements and relationships that connect transition paths with collaborative business models, in such a way that practical cases can be described and analysed?
3. Can certain archetypes of collaborative business models be distinguished? Archetypes typify common practical situations and can contribute to better 'framing' and the development of transition cases.

4. Which factors in a certain domain or sector influence the choices for a collaborative business model? Understanding how choices are made helps in making deliberate choices in ongoing transitions.
5. What contribution(s) do collaborative business models make to the transition? Which performance indicators can be used to provide insight into this contribution? Insight into this contribution helps to make the right choices.

It is clear that these questions concerning transition paths are complex, dynamic and long-term in nature. Achieving transitions is challenging for a reason. In order to achieve a transition as effectively as possible, fundamental and practice-oriented research is also required. This can be achieved in ongoing cases, by linking transition cases with research and implementation capacity. This will create a focused research community that — supported by a back office — is embedded in an education and dissemination structure, ensuring the development of a unique body of knowledge around transitions. It goes without saying that this can only be achieved by collaborating with existing educational and research institutions in the Netherlands and abroad.

TNO has now built up a collection of several dozen relevant transition cases and an informal network of PhD students, university lecturers and researchers at relevant intersections of research topics in the Netherlands. This may be a good basis for looking at ongoing research together, but it is not yet sufficient to realise the above ambition. We therefore propose to go a step further and to develop a TNO Transition Academy (working title) in which education and research in this field will be accommodated for a number of years.

5.4 Towards a development plan

This Working Paper has briefly outlined a number of concepts around collaborative business models and developed an approach on how these can be used in the design of transitions. The core task is to focus, organise, search and develop instruments for sector-specific processes to arrive at collective business models in that sector. The essence is and remains the joint search for new (inter-organisational and institutional) forms of value creation. To do this collectively could be considered a transition in itself. The proposed further development will, by means of a methodology (step-by-step plan), provide a range of suitable instruments that can be used to better analyse and organise the process of designing sector-specific transitions.

The aim is to develop a research project over a period of four years. The approach is to develop a methodology, on the basis of five important building blocks, including the tools and instruments. These are briefly described:

1. The search for and design of a number of multi-year projects (two to three) and the associated stakeholders and sponsors, supported by a back-office that takes care of, among other things, organisation, coordination, research, education and information diffusion.
2. The creation and organisation of a competent interdisciplinary support team (staffing) and a scientific and practice-oriented advisory board (the latter can be separate or jointly — this is to be debated).

3. The creation and operationalisation of a short- and long-term research agenda that is filled on the basis of concrete experiences and actual questions.
4. The systematic collection of experiences with creating and designing project specific transitions (in a positive and negative sense). This can take the form of Policy Briefs, White Papers, working documents, animations, scientific articles and dissertations.
5. On the basis of research and practical experience, designing various project-/sector-specific transition paths, which instruments are required and what role collaborative business models can play in this. This results in a comprehensive 'toolkit' and forms the core of the proposed research project.
6. Setting up (curriculum development and staffing) and operationalising (looking for participants with different approaches and ambitions) of a TNO Transition Academy from the outset (see below: unique TNO approach).
7. Bringing all parties together at least once a year in an (international) 'work conference' in which experiences, instruments and progress of projects are discussed.

5.5 The unique TNO approach: effectively realising transitions together

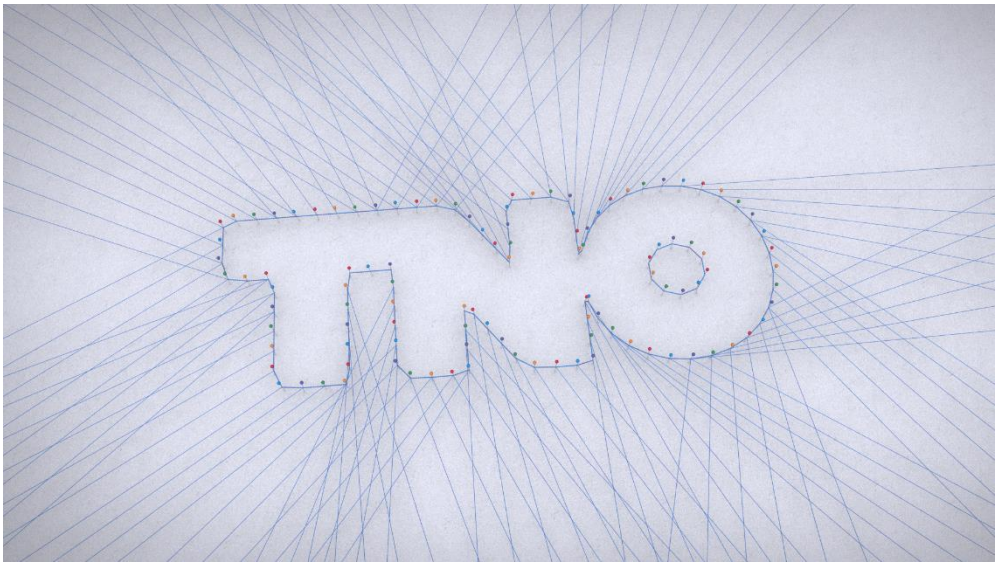
Against the background of this memorandum and the research agenda it contains, it is advisable to strengthen knowledge and competencies within TNO on socio-organisational transition and to systematically link them to the existing technologically-oriented knowledge. This could result in a 'TNO Transition Academy'. The design and organisation of such an academy can be set up from three perspectives that are not mutually exclusive:

1. Improving the 'general' level of managing transitions among TNO employees. This involves equipping them with practically-oriented concepts, approaches and skills.
2. In consultation with a number of relevant institutes for higher education, the creation of say 15 to 18 PhD positions (with a duration of four to five years) for TNO employees who can work part-time (three days a week) but linked to concrete projects on a dissertation at the intersection of fundamental and applied research.
3. Selecting a number of transition projects/objects to work with the parties involved (including but certainly not limited to companies, ministries, NGOs, TO2 institutions) to address, organise and direct these transitions. This can already be seen in practice under headings such as 'Living Labs' or 'Transition Areas'.

The idea is to work on a structural long-term approach with a group of stakeholders on a project that is scaled right from the start. Working on collaborative business models in order to give shape to transition is central to this idea. Together, the stakeholders set up action-oriented research in which learning, and applying what they have learned in practice, go hand in hand. Short- and long-term feedback loops are a recurring element, both in the educational situation and in practice.

5.6 Call to Action

Given TNO's ambition to be a 'Thought Leader', it is right for TNO to take the lead when it comes to 'tough' social issues. As an organisation, TNO houses an overwhelming arsenal of technical knowledge on raw resources, materials and systems. That knowledge alone is not sufficient to arrive at other system designs. In addition to technical knowledge, this also requires institutional, organisational and legal knowledge, brought together from an integral perspective. Taking the initiative is the role that suits TNO especially in this day and age.



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7 Contact

Would you like to know more about how TNO deals with sectoral transitions?

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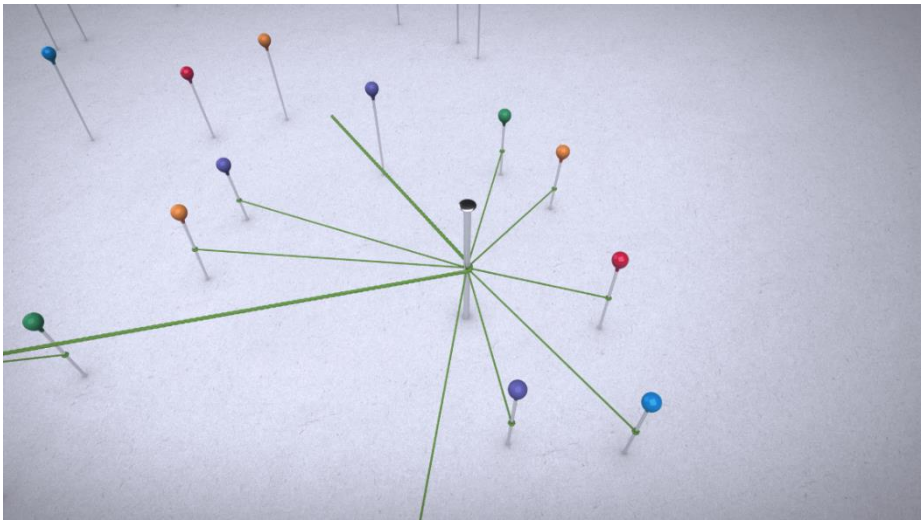

A More detailed description of TNO cases

CILOLAB
CILOLAB is a living lab for sustainable urban logistics. Parties work together in a five-year programme to develop and implement urban logistical solutions in order to offer zero-emission alternatives for all stakeholders in 2025. In this living lab, (competing) logistical service providers, hub operators, municipalities and knowledge institutes work together and share data. However, receiving parties (such as retail) are not yet involved. The project has been running in Rotterdam since 2014 and other municipalities have also been involved since then. The living lab's starting point is to accelerate existing initiatives, not to start new ones. For zero-emission city logistics to succeed, competing logistical service providers must work together. This requires a different organisational form with new business models.

Lifestyle4Health
Lifestyle4Health looks at curing chronic diseases in a new way; from curative care (e.g. medication) to preventive care (e.g. lifestyle change). The goal of this programme is to halve (the impact of) the disease burden of lifestyle-related diseases in the next ten years. This programme — a collaboration between Leiden University Medical Centre and TNO together with several network partners — was established in 2018, but the transition itself began two years earlier. The transition from 'cure' to prevention not only requires a change of perspective ('prevention is better than cure') in the industry and among people as citizens, but it also requires a change in the entire chain. This applies not only to the dominant pharmaceutical industry, but also to pharmacists and drugstores, including general practitioners. Therefore, the way that medical research is set up needs to be changed as well. The crux lies in simultaneously changing a 'complete' set of actors.

Chemelot - Brightsite
Chemelot is a complex, integrated chemical site on the former DSM site in Geleen, of which various parts are owned by multiple parties with different interests (from local startups to multinationals with limited ties to the site). Brightsite is the initiative that aims to make the Chemelot site more sustainable and a climate-neutral chemical site by 2050. The opportunity and speed of making production processes 'greener' is closely related to the changes that the partners on the site can and want to implement. Green chemical products also require sales in other channels, which means that a new business model is required. However, the chemical industry is organised along international commodity markets, as a result of which global competition and price pressure strongly influence the playing field and thus the 'costs' of change. The partners within Brightsite are Sitech Services, TNO, Maastricht University and Brightlands Chemelot Campus. The project has only been running since last year and is a long-term project (up to 2050), which means that many concrete goals will be further defined in the future. During the process, new business models will have to be realised for the chemical companies on the site. Many of these models will be started from the bottom up, in cooperation with the existing parties.

Voltachem

VoltaChem is an industry-driven Shared Innovation Programme for the electrification of the chemical industry, focusing on the use of renewable energy for the production of heat, hydrogen and chemicals. This research programme aims to reduce the CO2 impact of chemistry through electrification. The collaboration between TNO, the Dutch 'Top Sector Chemicals' (Chemie), chemical companies and energy companies started in 2015 and the first results will become visible in the upcoming period.

B The seven phases of a transition process

By linking the seven phases to the various planning and policy instruments as described in chapter 1.5, a practical roadmap and toolkit for transition managers is starting to take shape.

Phase	**Goal**	**Steps**	**Tools**
1. Initiation phase	Collective problem definition	1. Design the transition arena	• Stakeholder identification analysis
		2. Define the collective societal problem	• Roundtable conversations with stakeholders
2. Vision development phase	Collective vision development	3. Collect data on the situation in the future	• Horizon scanning • Delphi-method • Trend audits
		4. Develop a collective vision	• Strategic Foresight workshop • Visioning alternative system futures
3. Exploratory phase	Create a transition agenda	5. Explore transition paths to reach the collective goals	• Participatory backcasting • Socio-technical scenario planning • Scenario assessments
		6. Develop a transition agenda	• Stakeholder workshops on roadmapping
		7. Test the transition agenda	• Policy stress testing
4. Experimentation phase	Experiment with collaborative business models and niche technologies	8. Support collaborative niche experiments	• Subsidies • Investments
		9. Promote collaborative business models and sustainable technologies	• Collaborative icon and structural projects • Promotion campaigns for sustainable technologies
		10. Share knowledge and build social networks	• Education programmes for niche and regime actors • Incubators for collaborative niche innovations
5. Acceleration phase	Scale-up successful collaborative	11. Accelerate successful niche developments	• Investments • State guarantees for upscaling investments

	business models and technologies	12. Develop new functionalities in the technology and business models	• Collaborative structural projects to scale up technology and business models • Campaigns for acceptance of niche innovations
		13. Share best practices	• Expertise centres • Innovation centres
		14. Destabilise the regime	• Reduce support for regime technologies • Change regulations to enforce the regime transformation
6. Regime adaptation-/disruption phase	Breakthrough of sustainable technologies and new social rules	15. Increase institutional support for new technologies and business models	• Investments • Fiscal, economic and regulative incentives for sustainable technologies and collaborative business models
		16. Phase out institutional support for (old) regime technologies and business models	• Create economic and regulative incentives to support adaptation of niche technologies and business models and phase out old business • Phase out support to conventional technologies and business models
7. Stabilisation phase	Alignment of the new regime and preparations for a new transition	17. Create new rules and regulations for the new regime	• Existing rules and regulations are aligned with the new regime
		18. Phase out the old regime	• Fiscal, economic and legislative incentives are created to phase out conventional technologies and business models

Table 7: The seven phases of a transition process