vito
vision on technology

Transition in research
Research in transition

When technology meets sustainability

"Vision on transition"-series #1

We have a conviction and an ambition ...

... we are part of the generation we've been waiting for ...

... let's make this time different from all the rest, the future isn't what it used to be ...

Let's take responsibility
and show leadership!

Some context

This document contains the essence of a strategic orientation plan of the research unit 'Transitions Energy and Environment' (TEM), anchored in VITO (the Flemish Institute for Technological Research). In that strategic outline we embraced 'transitions' and 'transition management' as guiding concepts for the effective co-creation of sustainable development and for (technologically inspired) research that aims at contributing to this objective.

The basic objective of this brochure is to inform that in the years to come VITO (and its research unit TEM in particular) engages to elaborate the concepts of transitions and transition management in its research projects. We share our current general understanding and interpretation of the concepts and we sketch the consequences that we envisage for our 'typical' research topics and activities in the near future.

More information on the VITO transition strategy and the related activities can be obtained from:

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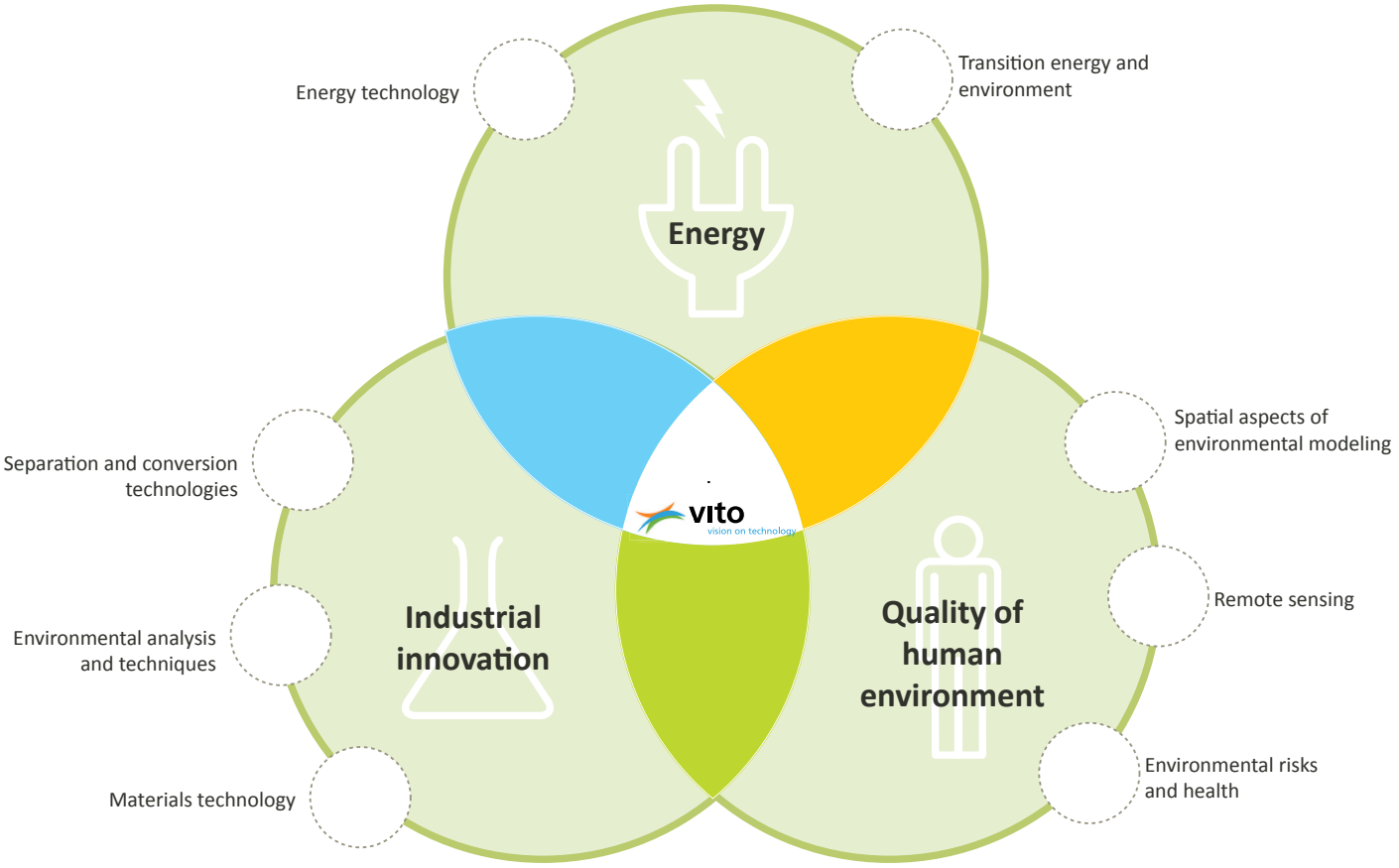
Energy technology
Transition energy and environment
Energy
Separation and conversion technologies
Spatial aspects of environmental modeling
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Industrial innovation
Quality of human environment
Environmental analysis and techniques
Remote sensing
Materials technology
Environmental risks and health

VITO in a nutshell

VITO is one of the Flemish Strategic Research Centres: larger 'pools' of knowledge and competence in strategic areas for the Flemish region of Belgium. Open innovation, outstanding scientific quality, valorisation potential and valorisation activities belong to the corporate assignment of such centres.

> "As an independent and customer-oriented research organisation, VITO provides innovative technological solutions as well as scientifically-based advice and support in order to stimulate sustainable development and to reinforce the economic and social fabric of Flanders".

This mission statement emphasizes technological innovation at the service of sustainable development. It reflects the organization's ambition to be "a leading independent European research and consulting centre developing sustainable technologies in the area of energy, environment, materials and remote sensing".

Organised in three research domains and eight research units, VITO's scientific work covers a wide scope of specific and specialistic domains.

> The Research unit Transition Energy and Environment (TEM) is the VITO niche in which 'transitions' and 'transition management' – the core topics of this brochure - will be integrated and elaborated in the years to come.

In 2011, VITO employed more than 600 people, mainly researchers. The typical VITO-researcher has a high academic education and an explicit technology-oriented profile.

Sustainable development, the ultimate goal

The ultimate goal

> "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
> (Our Common Future, 1987)

This well-known 'definition' contains two key concepts that should be balanced: (1) 'needs' of people, in particular the essential needs of the world's poor, to which overriding priority should be given; and (2) the idea of limitations imposed by the finite character of planet Earth's resources and carrying capacity and by the state of technology as well as social organisation.

Some may regard the Brundtland definition as 'too vague' as a basis for action. A vagueness that might have led to the occasional misuse of the definition as an excuse to continue 'business as usual'. VITO nevertheless finds enough strength and clearness in the expression as a basis for its envisaged activities. And although the world may have changed significantly in many ways since 1987, the symptoms of unsustainability have not been toned down, often to the contrary. The appeal still stands strongly, perhaps even stronger than ever before. Many even believe that we are the last generation that can effectively initiate the necessary changes to avoid incalculable and irreversible consequences of ongoing unsustainable trends.

An ever growing number of people therefore consider sustainable development, no matter how (well) it may be 'defined', as the next major change that our contemporary world is undoubtedly facing. As a moral civil duty, sustainable development is or will become a perhaps inconvenient, but inevitable truth. Thereby, the challenge is to embrace sustainable development as a discourse with enormous potential/opportunities, also from an economic point of view.

And although the 'revolution' in front of us may well be technologically supported, it will essentially be a trajectory of social change for a growing population on an finite planet.

Be the change you want to see in the world.

Mahatma Gandhi

VITO goes sustainable

In an organisation-wide strategic exercise in 2005-2006, VITO embraced sustainable development as a leading principle for its future activities. Since then the concept comprises an explicit and dominant part of the organisation's mission statement and it has been used as a guide in structurally redesigning the organisation as well as the research programmes and activities it undertakes.

An internal participative process in autumn 2009 resulted in the following VITO elevator pitch on sustainable development:

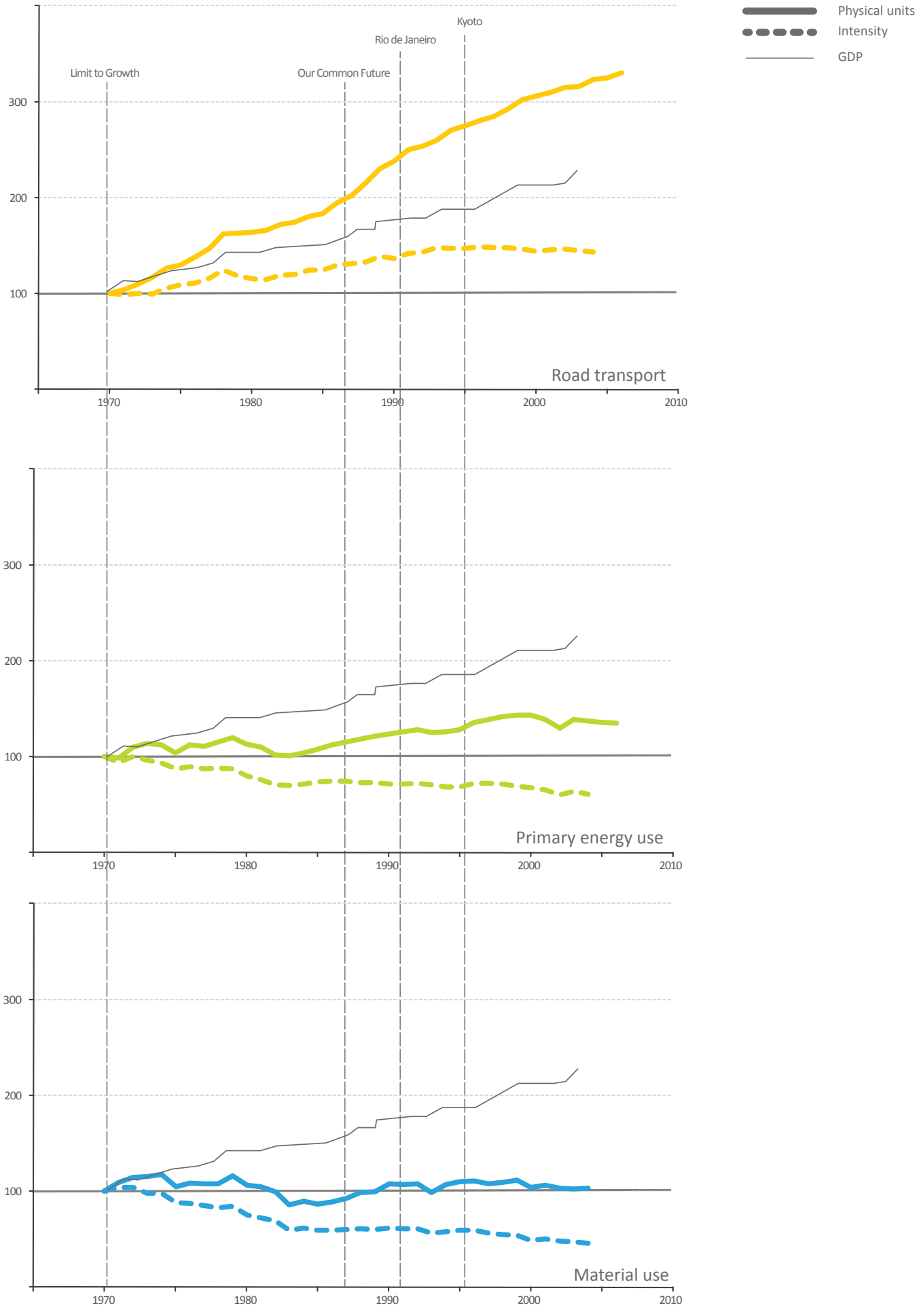
> VITO develops and introduces technological solutions that accelerate the transition to a world in which the needs of people are reconciled with the carrying capacity of the earth.

> VITO inspires, demonstrates and implements integrated solutions that contribute to smart processes and responsible use of materials and energy.

> A VITO employee chooses for and works at a sustainable society.

From these statements, it is clear that VITO not only embraces sustainable development as a guiding principle for its (technological) research activities, but also for its own organisational culture. It even calls on a personal engagement of its employees to consciously choose for a sustainable lifestyle.

We humbly admit that the realisation of this commitment is 'work in progress'; including successes but also resistance and failure.


Physical units
Intensity
GDP
Limit to Growth
Our Common Future
Rio de Janeiro
Kyoto
300
200
100
1970
1980
1990
2000
2010
Road transport
Primary energy use
Material use

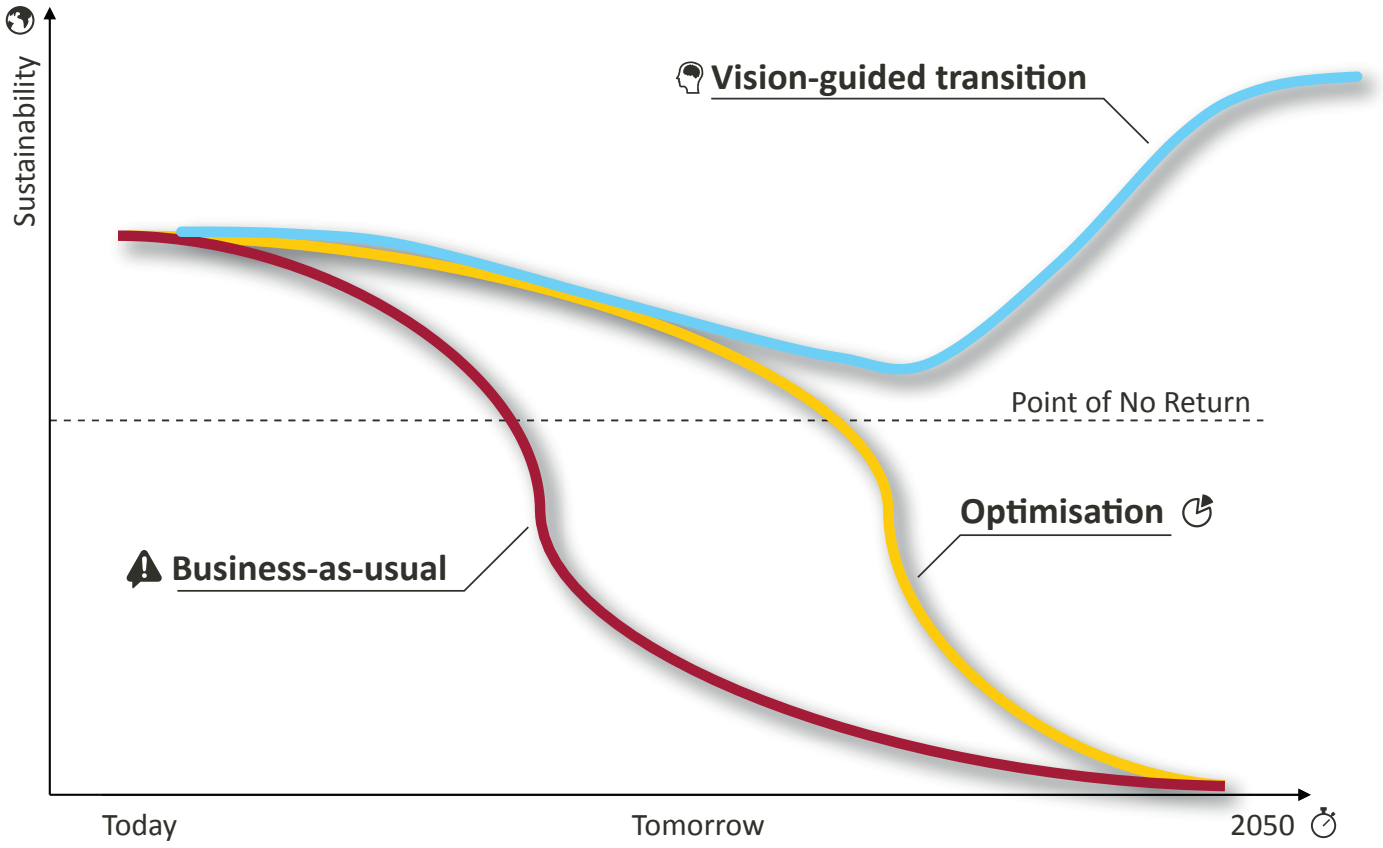
Symptoms of unsustainable systems

Many observations point out that processes like resource depletion, climate change, unequal spread of wealth, financial crises, endangered biodiversity, traffic congestion, persisting greediness and a never ending pursuit of 'growth' can be considered as symptoms of the unsustainability of (world) systems. And the challenges which these symptoms evoke seem to stay without effective answers. A general perception of progress towards sustainable systems is that incremental steps or short term solutions might not suffice. They may optimise but do not resolve.

Exemplary evidence, also drawn from VITO related studies shows that during the past decades significant 'efficiency' progress has been realised in Belgium (see Figure). This can be expressed as declining 'intensities': the gradual decoupling of economic growth (Gross National Product, GNP) from materials use and energy use (e.g.). Nevertheless, the absolute numbers for energy and materials use do not show any significant downward movement, which can be considered to be unwanted evolutions in the context of systems that continue to be dominated by the use of fossil energy sources and scarce/depletable materials. Road transport even shows a still increasing trend, in absolute as well as in GNP related terms. Undoubtedly, other examples are illustrative ...

Such local observations with regard to sustainability issues are mere reflections of parallel, even stronger trends and evolutions on a global scale, closely related to emerging economies, a growing world population, understandable quests for western-world prosperity levels. They illustrate that – in spite of multiple whistle-blowing events (Club of Rome, Rio Conference, Kyoto Protocol …) - changing societal and/or socio-technical trends is not an evident task and hence takes time. The systems undergoing the change have specific dynamics and typically suffer from inertia. In that realm, observable changes will occur slowly, resulting from incremental steps forward in the decades to come.

At the same time, questions arise whether current efforts in favour of sustainability are profound and innovative enough to actually contribute to the obviously needed processes of drastic and systemic change.



Note:
Do we suggest that technological innovation is not (sufficiently) contributing to sustainable development? That technological optimisation is wrong? That even 'Cleantech' is merely 'window dressing'? By no means! Substantial changes in technology always have the potential to imply substantial changes in society (including its economic structure) and vice versa. However, where technological optimisation only reaps the 'low hanging fruit", only real socio-technical transitions can deliver long-term solutions for a sustainable society. Bearing in mind Einstein's "We cannot solve problems by using the same kind of thinking we used when we created them", it is clear that more is needed than technological optimisation. New paradigms for socio-technological progress will contribute to adequate roadmaps towards sustainable futures, provided that they include economic, organisational, legal and other societal aspects.

From extrapolation to vision-guided transitions

How far are we from points of no return? In such a discourse, doomsday scenarios and warning messages for 'Age of Stupid'-like outcomes circulate and strengthen a sense of urgency. They stir up the burning platform for drastic change. The odds grow in favour of the opinion that business as usual (extrapolating) is no longer an option: it will inevitably lead humanity to catastrophe and collapse.

Even if we (think we) are able to successfully address and solve a number of the occurring persistent problems and negative impacts, the impression is that very often the deployed efforts merely deal with the observed acute problems/symptoms of failing systems. And although the actions may appear to be reassuringly effective in the short run, such optimisations of the existing systems often can be considered as 'solutions as usual', essentially deployed to buy time and creating an artificial optimism (e.g. 'end-of-pipe technology fix'). The negative impacts of the considered activities/systems are slowed down but not stopped or turned around; the eventual system's long term prospect on sustainability remains low. Another drawback aspect of an optimisation approach is the risk of 'rebound effects': more efficient processes and products may even reinforce an increase in production/consumption volumes and hence cause even larger total (unwanted) impacts.

What we believe -together with many others- is needed for creating a flourishing and sustainable world is a firm switch from 'business/solutions as usual'-tactics to really transformative strategies, or in the conceptual terms we embrace: vision-guided transitions. These will require quite fundamental changes in the way we live, work, move, think, learn ... It's all about rethinking, remaking and redoing our complex society, which deals with persistent problems that are deeply rooted in our cultures, structures and institutions. In such a realm, no tailor-made solutions are readily available. Finding the right solutions requires a strong orientation towards system thinking and system innovation. Moreover, genuine solutions should emerge from creative, inspirational and positive future perspectives, rather than from reactive, defensive and problem oriented approaches. We believe that a conceptual framework which can initiate and guide such a drastically new innovation/change paradigm is that of 'transitions' and 'transition management'.

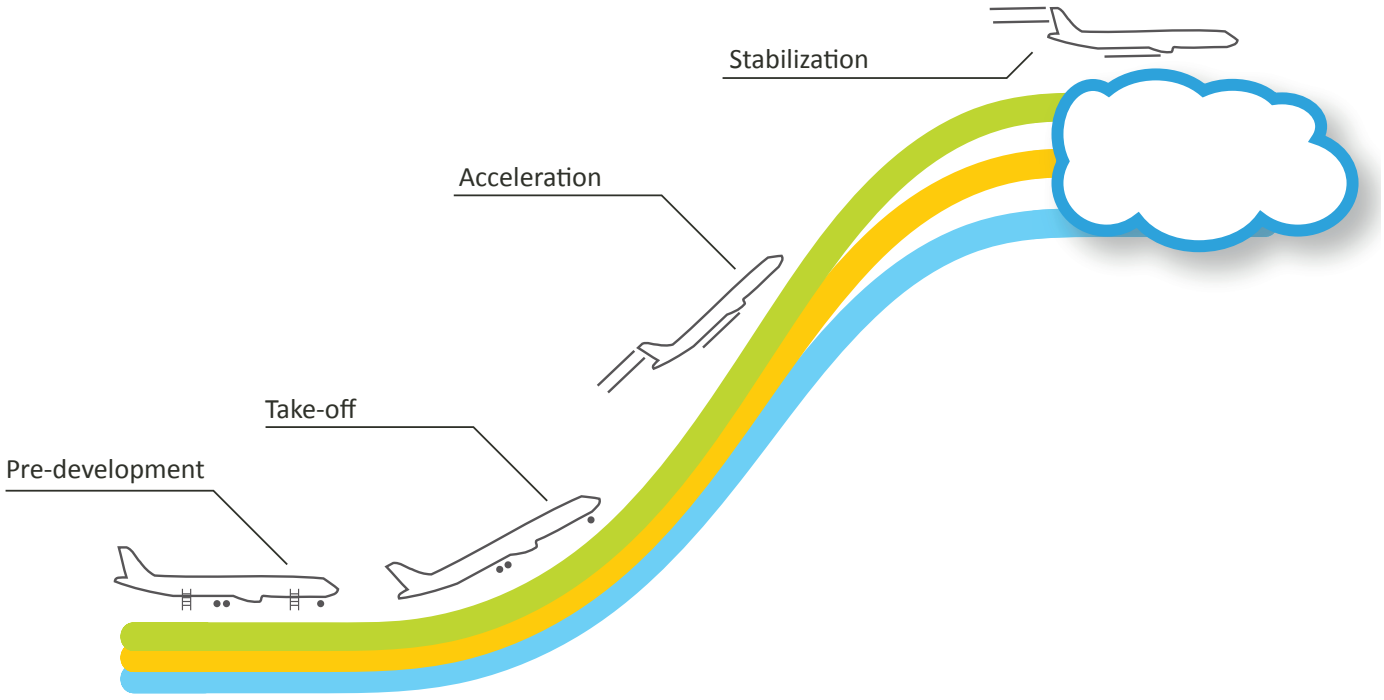
Transition management, a supporting framework

Gratefully inspired by René Kemp, Frank Geels, Derk Loorback, John Grin, Leo Jansen, Johan Schot, Jan Rotmans, Adrian Smith, Geert Verbong, Marina Fischer-Kowalski, and many others ...

Transitions, the concept

In essence transitions are processes of radical, structural change of society and its composing socio-technical systems. They encompass fundamental turns in the established structures, cultures and modes of action. As a consequence, transitions are long-term processes (transition practice thinks in 'generations'), trying to tackle complexity and insecurity in societal systems.

While examples of historical transitions (for instance from transport by horse-and-carriage to automobiles, or from sailing ships to steam ships) often boil down to radical and structural change processes without a well-defined and pre-set objective, the present concepts of 'transition' and 'transition management' as working frames are clearly linked with the explicit goal of sustainable development.


Stabilization
Acceleration
Take-off
Pre-development

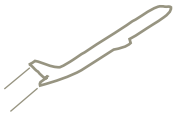

Pre-development
Take-off
Acceleration
Stabilisation

‘Phases’ in a typical transition S-curve

A first ordering frame to describe and clarify transition processes is a sequence of four phases, shaping a characteristic S-curve.

Pre-development The system status quo remains, but small-scale initiatives arise in which completely new working and thinking paradigms are employed. Early experiments fitting in innovative system structures are established.

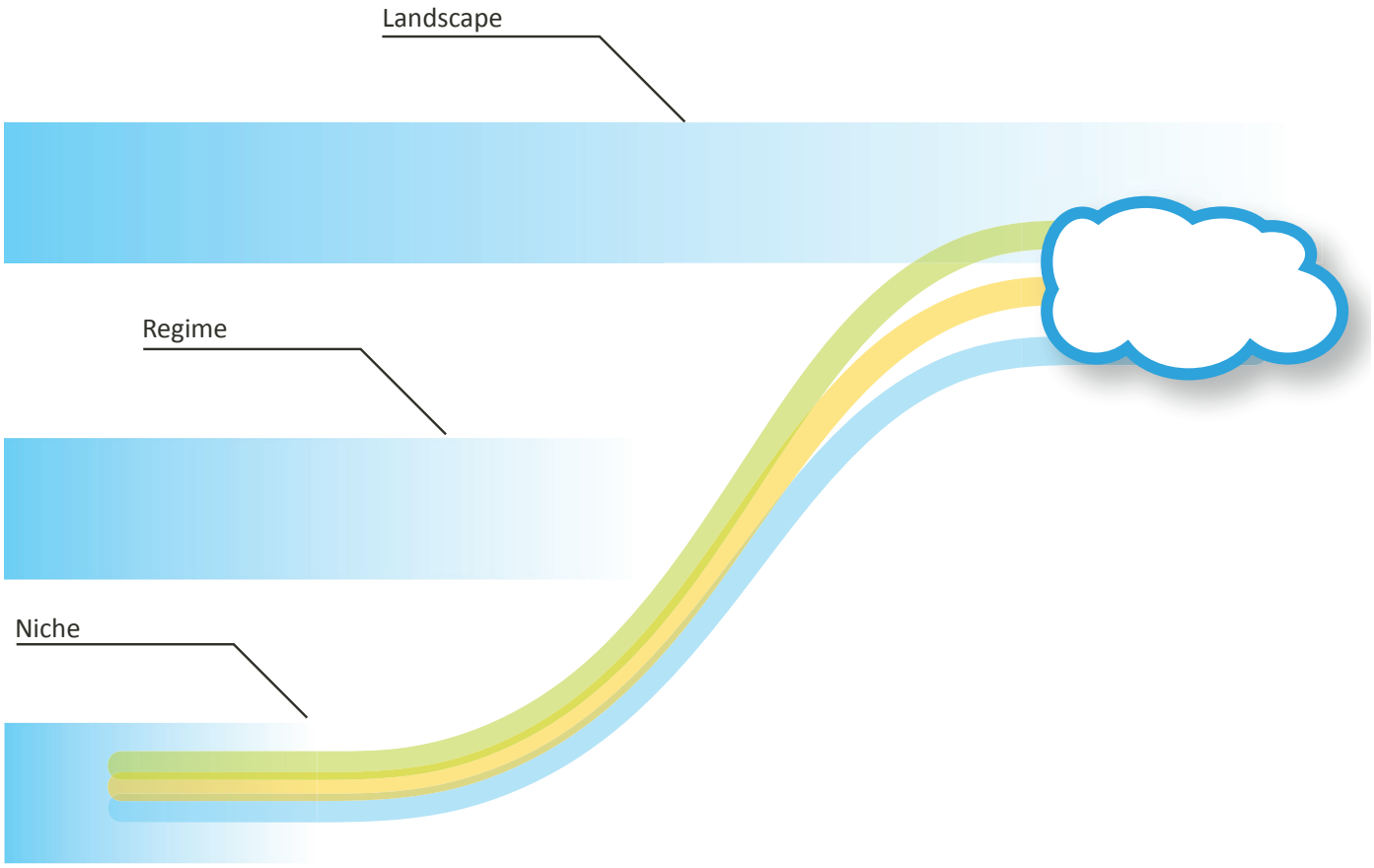
Take-off The system in place starts to absorb the transition impulses and shows a visible - be it cautious - start of a change process.



Acceleration Structural changes occur and are translated into mainstream practice of many actors; caused by an accumulation of mutually reinforcing socio-cultural, institutional, technological, economical ... moves. The new ways of working, thinking, learning ... get ‘anchored’ or ‘embedded’.

Stabilisation The speed of change decreases, a new system in a dynamic equilibrium is established (in which new niches develop, marking a new cycle …).

The distinct phases of an archetypical transition have no clear-cut demarcation. One of the big challenges left in the further development of transition management is a better understanding/recognition of the different phases, for instance by finding or developing indicators for monitoring ongoing transition processes.


Landscape
Regime
Niche

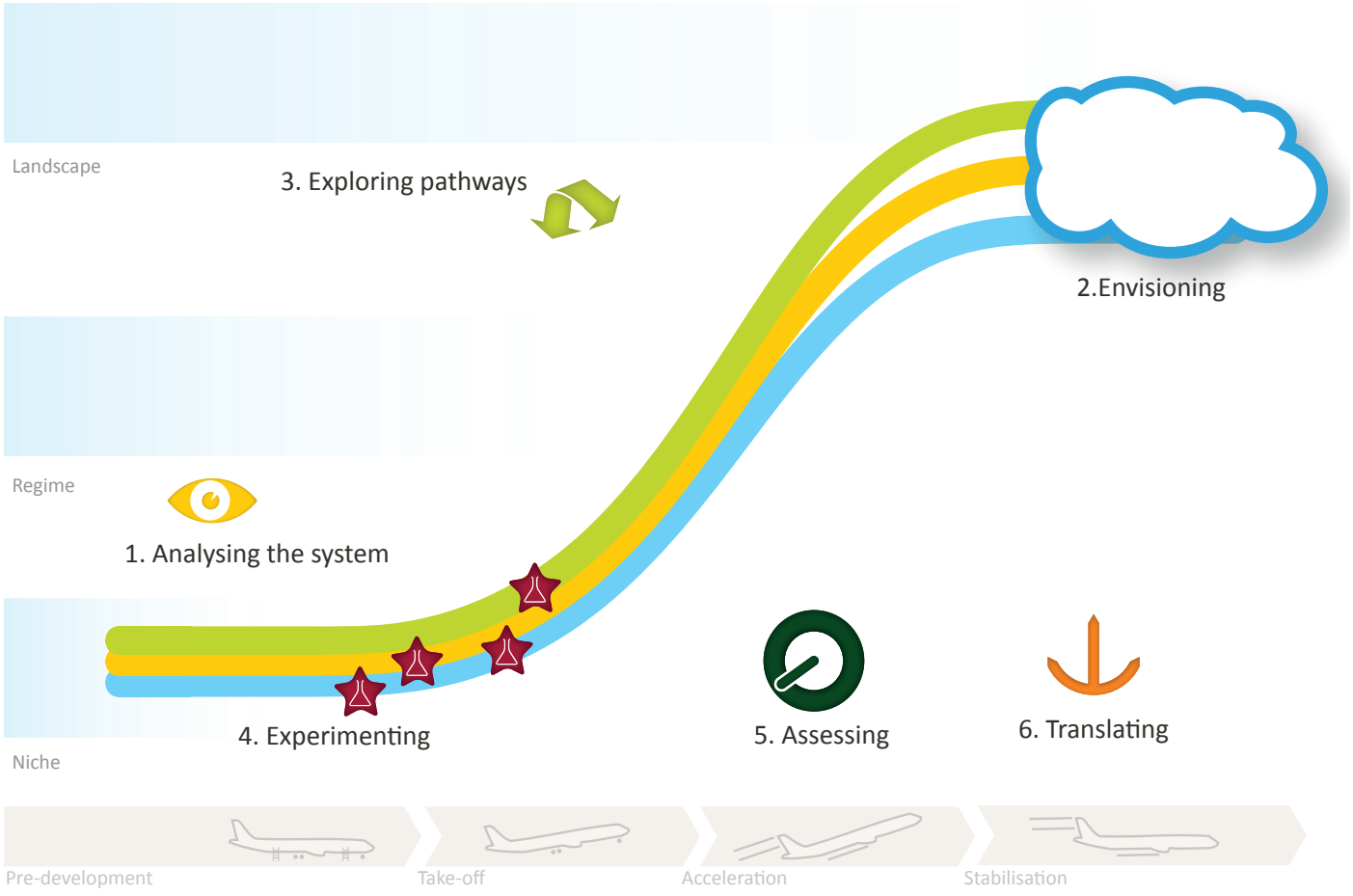
Multi-level perspective: transitions as interplay of structures

Transitions play simultaneously at different levels of structure, scale, organisation and (possibilities) for influence. This is expressed in the 'multi-level perspective' that distinguishes landscapes, regimes and niches.

Landscape At the landscape level 'gradients of force' are in play: dominant trends and evolutions from which it is difficult to deviate and which are rigid in the sense that it is difficult to change them on an individual base (e.g. globalisation, climate change, ageing populations …). Nevertheless, these prevailing evolutions and trends exert external pressure on the systems in place.

Regime A 'regime' refers to the dominant culture, structure and practice embodied in physical and immaterial infrastructures (e.g. roads, power grids, routines, actor-networks, regulations, government and policy …). Regimes are the backbone of the stability of societal systems and have a characteristic rigidity that very often prevents innovations from altering the standing structures fundamentally.

Niche Niches are protected, and often little visible small scale segments in society. In 'niches', novelties are created and tested. These novelties can be (combinations of) new technologies, new rules and legislation, new concepts, new organizations … Niches contain incubators for transition experiments and proofs of concept of radical innovations.


Landscape
3. Exploring pathways
2.Envisioning
Regime
1. Analysing the system
Niche
4. Experimenting
5. Assessing
6. Translating
Pre-development
Take-off
Acceleration
Stabilisation

Transition processes: a smart combination of logical steps

Theoretically, transitions are characterized by a combination of mutually reinforcing steps/activities. This sequence fits into a concept of 'logical frameworks' and envisages a (temporal) logic between different actions that combine into a consistent process of change. In our transition approach, we distinguish six major actions: analysing the system, envisioning the future, exploring pathways, experimenting, assessing the process and translating.

(1) 'Analyzing the system': the first step in changing a system is getting to know it. Actually determining the relevant players and their interrelations, the key system functions, the institutions and regulations, flows and barriers … are the elements of a profound system description and outline; quantitatively as well as qualitatively.

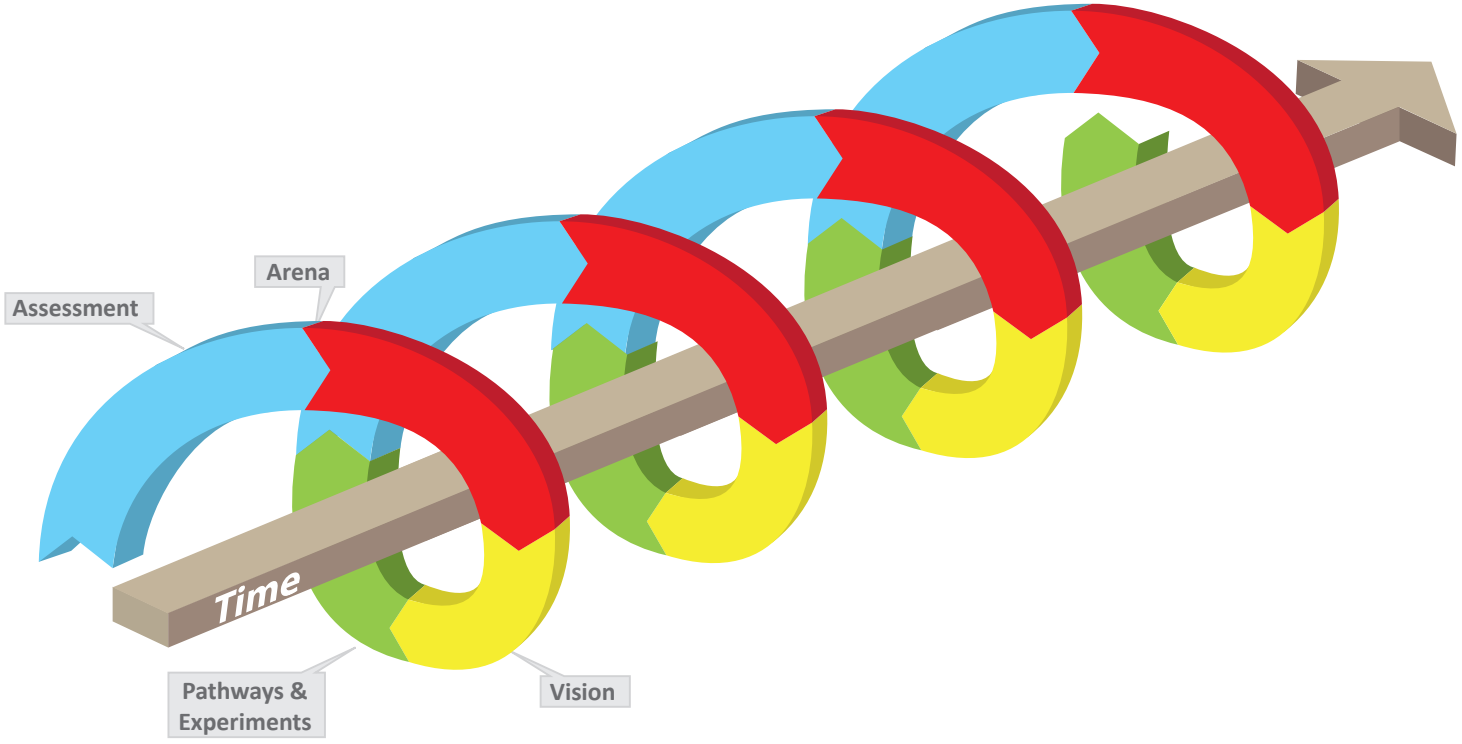
(2) 'Envisioning the future': a change trajectory towards a more sustainable society or system is mainly initiated by an appealing and inspiring vision. A vision entails clear images/narrative of desirable systems based on shared principles of sustainable development. Inspiring visions replace 'having to' by 'wanting to', 're-active' by 'pro-active' and 'creative'. Visions are developped in carefully composed 'arenas' of engaged, creative and visionary frontrunners.

(3) 'Exploring pathways': starting from an inspiring and clear vision, different strategies to realise the desired system can be outlined. This 'backcasting' exercise results in a number of strategic pathways that should be followed in order to co-establish the desired system configuration. Models/scenarios can assess and underpin the effectiveness and feasibility of pathways and the alignment of envisaged actions.

(4) 'Experimenting': transition-experiments are real-life developments of drastically alternative ways of working and/or thinking, fitting into envisaged new system approaches. Experiments develop in 'niches', where they can develop with a certain degree of protection from ruling regimes and their institutions, legislation, power, routines … and show their effectiveness and feasibility. Successful experiments link the future vision with concrete action potential and hence can me major triggers to enable take-off and acceleration of transition.

(5) 'Assessing': in the course of the different trajectories towards the vision, instruments can be designed for an effective follow-up of actions that are undertaken. Products, processes, technologies, organizations … can all be the subject of different types of monitoring and assessment, examining their compliance with the diverse sustainability criteria of the new systems. Assessment based knowledge of effectiveness, speed and 'distance to transition' can help to steer ongoing transition activities. Therefore, monitoring instruments should basically not be designed to 'measure' but to trigger action, to enhance system change in a desired direction.

(6) 'Translating' expresses that in order to actually initiate system change, experiences from the different typical transition activities have to be incorporated and multiplied in actions of the relevant system stakeholders. In that way, the lessons learned from experiments, backcasting or scenario exercises and envisioning result in an effective dynamic process of change.


Assessment
Arena
Time
Pathways &
Experiments
Vision

Chaos and dynamic: transitions, the real thing

Phases, multi-level perspective and logical activity sequences are complementary ordering frames (or perspectives) that help describing, explaining and understanding transition processes. In real life, however, transition processes are complex and cannot simply and unambiguously be fitted into available theoretic moulds. In fact, transitions are more about (creative) chaos than structure and order. This generic characteristic is of course closely related to the fact that sustainable development in its essence is not a single shot trip towards an unequivocal new steady state; it is about continuous dynamics. This dynamic is also referred to as the Transition Management Cycle. In other words, transition is about cyclic (and reflexive) continuation of thinking - acting - assessing - (re) thinking - acting - assessing … Every end- or mid-point in the process can become a new starting point of another transition process at any given time. This cyclic character of transition processes is an important reason why 'managing' these processes is so complex.

In spite of this ever-going dynamic and the sometimes chaotic complexity, using appropriate guiding frameworks can help to better understand the ongoing processes, barriers, success factors, key players … of effective change processes towards sustainable systems. As a consequence, the ordering frameworks can help to learn, recognise and use the possibilities to interfere, guide and facilitate the processes. It is in such a context that 'management' is used in transition approaches (and not in a classic connotation of running and controlling).

Sustainable development & transition at VITO, a challenging engagement

Transitions for sustainability: content and process

Many approaches to 'develop sustainability' are based on a number of tools and metrics, designed to indicate and audit progress on selected topics and areas. Such tools help to 'grasp' sustainable development in a large number of processes, products and systems. Sustainable development indicators, life cycle assessments, footprints … all have a common strong focus on the content side of sustainable development. Many approaches and systems have been launched and even commercialized; scientists in various fields and disciplines have specialized in specific approaches of sustainability assessment.

In the preceding sections, we argued that for realising genuinely sustainable systems, a strong process component has to be added to reach an integrated systems approach. We believe that transition management holds potential for such a process focus. After all, sustainability is about important changes, brought about by and with a variety of actors in our societies. Unfortunately, the complex processes that underlie drastic innovation trajectories are often poorly understood. This makes gathering support for such an approach a difficult task. Also, impediments to e.g. renewable power are 'socio-technical', a notion that encompasses the technological, social, political, regulatory and cultural aspects of (in that case) energy supply and use.

At VITO, we support that both aspects - 'content' and 'process' - are indispensable and should be systematically combined when outlining effective sustainable development trajectories. VITO therefore wants to develop and deploy a strategic framework that combines these two major components of effective progress in sustainable development in the years to come. Thereby, we build on current VITO expertise and competences while also developing new expertise, mainly regarding transition processes and transition management. The transition process approach is in a way merely a logical extension of VITO activities, based on a recognised need, as well as it is a window of opportunity in our home market and abroad.

Transition in research, research in transition

The embracement of the transition approach in the upcoming activities of our research will entail a number of fundamental assets and attitudes that we consider fundamental for the effectiveness of this strategy. Just some examples of these internal 'transition pathways':

Systems thinking

We emphasize a focus on holistic, integrated and hence genuine approaches of sustainable development, meaning that all relevant system aspects and actors are considered. Thereby, we are willing to creatively consider completely new, hypothetical systems and thus also go beyond the relative safety of optimizing existing ways of producing and/or consuming.

Inter- and transdisciplinarity

In a setting of system thinking, a prerequisite for effective work is the combination of all relevant expertises/competences/disciplines. And in such settings going beyond mere 'collaboration' to actual co-creation (from joint problem definition over joint solution methodology development and realization to joint application of results and evaluation). Within this scientific interdisciplinary approach, an active attitude of involving relevant actors/stakeholders (transdisciplinarity) is a basic requirement of relevant research action in service of sustainable development.

Action research

Working on science in a system context and with the relevant system actors in a way that leads to societal valorisation asks for a paradigm of action research. Actually initiating real-life transition processes/experiments establishes living labs where knowledge generation as well as practical realization are combined in a realm of 'learning by doing and doing by learning'. Thereby, we are aware that potentially new roles for transition researchers should carefully be held in the light of scientific independency/objectivity ... but such issues explain the fundamental own transition that is object of the choice for transition-like approaches.

A choice not free of consequences

Time and financial means will have to be invested in the necessary number of re-orientations, study, education, competence building, networking, knowledge sharing ... A learning period undoubtedly awaits us, in which also slow downs and failure will be on the agenda; and which starts with uncertainty on the magnitude of eventual 'success'.

An enabling management structure will be set up to support the 'internal transition'. The daring choice for a complex matter such as transitions puts VITO in front of major challenges, but also makes it a frontrunner in the search for pathways towards sustainable development.

Learning by doing, doing by learning

With the strategic transition-orientation approved, VITO researchers start to position current/typical work in the new context and/or try to introduce transition-related elements in new research proposals. As an aid, we use a non-exhaustive checklist that enables to reflect, evaluate and learn on the relevant elements that can potentially enhance the transition-related content and process of the research.

Analysing the system

- Are the relevant factors (technological, economic, political, social, industrial ...) that constitute the system known?
- Which are the driving forces that shape the current system or put it under pressure?
- Are the relevant quantitative data related to the system ('as is' and evolutions) available; will they be used?
- Will the relevant qualitative information on the system be inventoried; will they be used?
- Will the actors/stakeholders of the system be inventoried?
- Do we map the relations, patterns, connections and barriers/opportunities, communication ... between the stakeholders and factors?
- Do we determine and take into account the links of the specific system with other systems?
- Do we address the shortcomings/needs of the current system that need to be resolved?

Envisioning the future

- Do we incorporate interactive/participative dialogues?
- Are shared core values and norms determined?
- Do we establish basic principles for sustainable future systems?
- Does the project create space for creativity, freedom from current regimes/boundaries?
- Will vivid, concrete and inspiring images/narratives of future systems be built?

Exploring pathways

- Do our models link up with the factors and forces of the system analysis and envisioning?
- Are the considered models sufficiently integrated?
- Do we include behavioural changes in the scenarios to run?
- Do the scenarios reflect a narrative?
- Are stakeholders involved in scenario building?
- Are quantitative scenarios available that enable objective assessment?

Experimenting

- Will we try to effectively realise real-life scale demonstrators of new system settings?
- Will we capture relevant learning from new/existing experiments?
- Does the project allow to create (niche) space for out-of-the box experimenting?
- Do we establish innovative (entrepreneurial) consortia?
- Will new proofs-of-concept be established?
- Will we co-construct new (business) models for effective action?

Assessing

- Are the established evaluation and assessment tools integrated?
- Do we determine the relevant assessment parameters/indicators, aligned with vision and pathways?
- Are stakeholders involved in assessment tool construction?
- Do we consider relevant aspects for efficient/effective end-use during construction of assessment tools?

Translating

- Do we deploy activities to 'broker' knowledge instead of 'dispersing' it?
- Do we initiate collaborative and interdisciplinary initiatives to capture knowledge and generate system innovations?
- Do we actively support policy makers in developing new policies and improving current policies that support the transition to sustainability?
- Is action undertaken to stimulate the adoption and upscaling of transition process experiences by stakeholders?
- Will we (pro-)actively approach policy makers, industry ... to disperse new paradigms/ approaches and indicate further research?
- Do we consider actions to establish (innovative) ways to introduce new concepts in education?

VITO: ONE PIECE IN A JIGSAW PUZZLE

VITO does not claim exclusivity of the transition concept and content in its home market nor abroad, since this would be contradictory to the basic principles driving transition management. Sustainable development can only be realised in collaboration with the many relevant players in the societal systems concerned. VITO wants to tackle the challenge in an open and transparent mindset with regards to other actors and (Flemish) society, who should be our major beneficiary and 'shareholder' after all.

The strategic choice to adopt transition management as a guiding framework for VITO's activities and research, as well as a corporate responsibility, has been made. However, the development of the approach is only at the cradle, it is to be improved and accelerated, by application in real-life projects. A period of intense learning (failures included) lies ahead. Notwithstanding these facts, we have accepted the challenge, fully convinced of the potential contribution transition management could make to sustainable development, and motivated to make science and technology serve society in the best possible and future-oriented way.

We hope to be a significant piece in the complex jigsaw puzzle of genuine sustainable development; we welcome partners in solving the puzzle ...

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