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How SD modelling facilitates the transition process to sustainable assets

Copernicos

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Problem statement

- Physical assets play a key role in the transition to a sustainable society
- Human beings use physical assets like buildings, production plants, infrastructure and means of transport
- The current assets have to be transformed to sustainable assets
 - Zero emissions
 - Low energy need
 - Circularity in re-use
- For assets to be really sustainable a different operations model and a different business model is required which also have an impact on the assets
- A lot of stakeholders with different stakes have to be aligned to make this transition e.g. physical assets require investments and have a long life cycle.
- Uncertainty about the future and about the development of external factors have to be included in the decisionmaking process

Dynamic hypothesis

- Scenario-analyses with system dynamics modelling will contribute to this transition process:
 - It enables a system view which includes the stakes of all the stakeholders
 - It enables decisionmaking from a system's perspective, getting and keeping stakes and stakeholders aligned
 - Dynamics can be included like the changing conditions and circumstances during the transition process, and like the changing external factors.

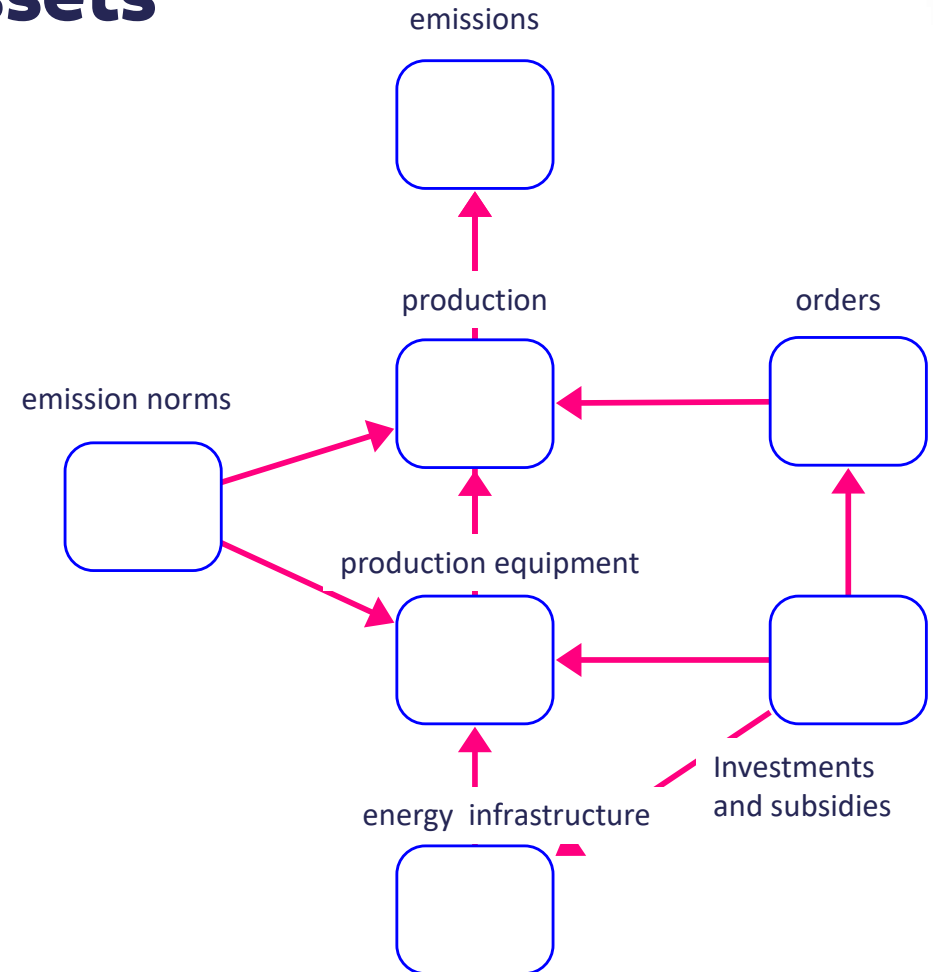
Model structure: transition to sustainable assets

For the simulation of different scenarios, a simulation model is required

The transition model Construction site and Construction logistics is a system dynamic model that consists of a number of related modules.

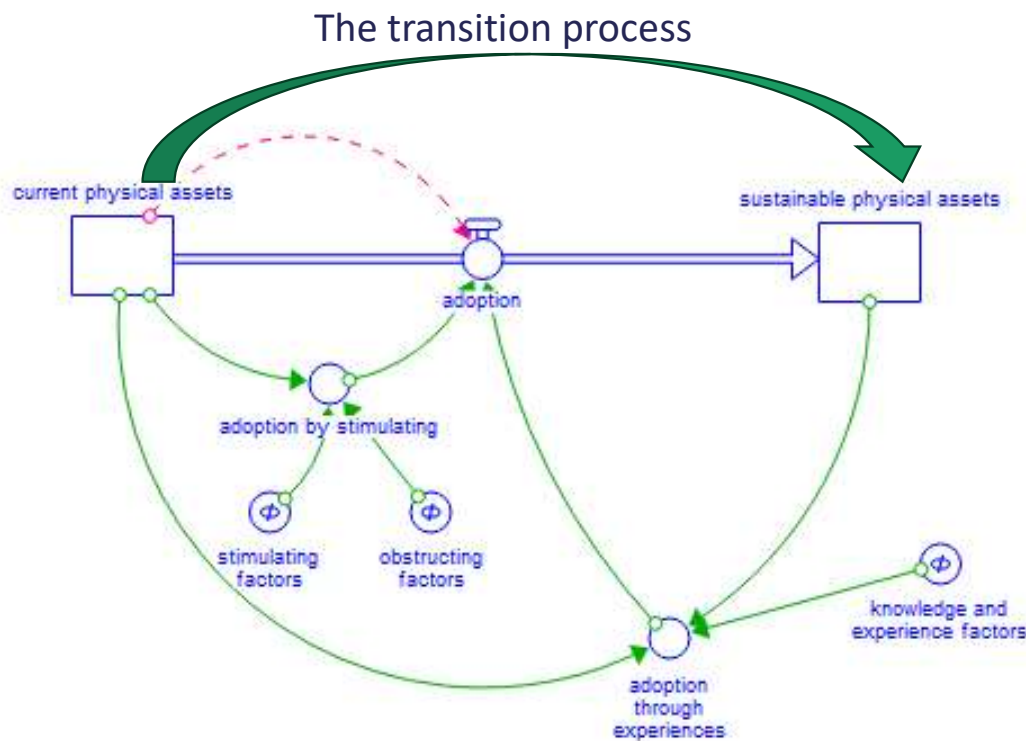
The model is dimensioned to material categories, emission classes, emission types and work categories.

Measures are possible in all modules, the effects of (combinations of) measures can be simulated. In this way, packages of measures can be put together. It also provides insight into where possible bottlenecks occur and how these can be tackled.



Adoption concept model

- The bass diffusion model as a basic model for the transition: the adoption of sustainable assets



Copernicos approach to facilitate transitions

Map
to
connect

Model
to
understand

Analyse
to
decide

Improve
to
transform

Monitor
to
progress

01
mapping



02
modelling



03
analysing



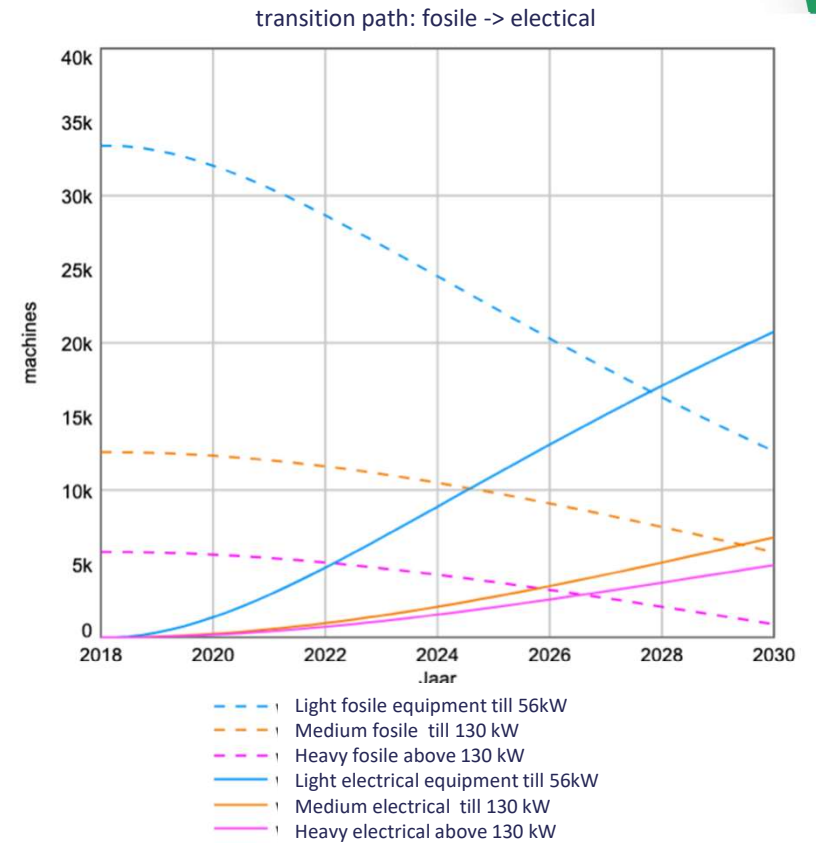
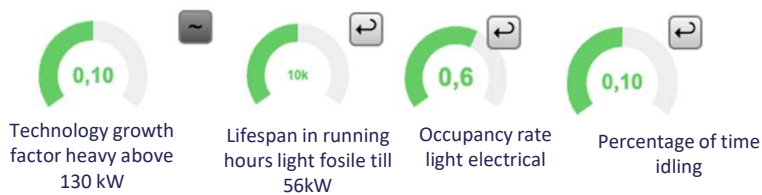
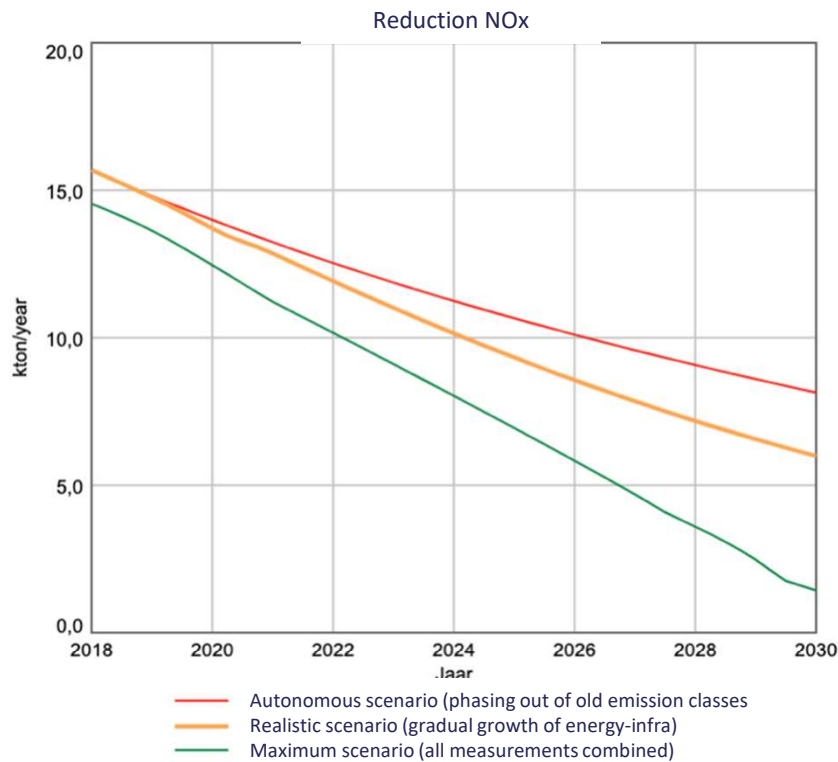
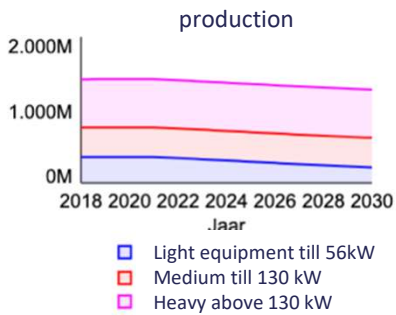
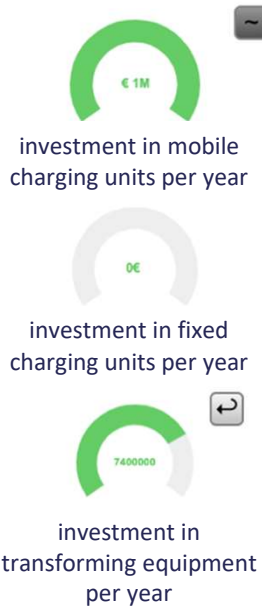
04
improving



05
monitoring



Dashboard for scenario-analysis



Approach used/in use in several transitions

- Road and rail construction equipment
- Coastal care
- Waterway maintenance
- Production and application of road pavement
- Re-use of soil

Key finding

- Stakeholders together have better understanding of the future uncertainty:
 - Uncertainty means risk and leads to postponing and even not making decisions i.e. hindering the transition process
 - Investments are needed and important decisions with future uncertainty have to be made
 - A shared roadmap of measurements to reduce the uncertainty and to monitor the progress to reach the ambition

Conclusions

- SD modelling facilitates transition to sustainable physical assets i.e. to a sustainable society:
 - Connects the mental models of the stakeholders
 - Represents the shared view of the stakeholders
 - Enables decisionmaking supported by the stakeholders
 - Explicit lines of reasoning
 - Quantified a.o. with data and knowledge from:
 - experts/knowledge institutes
 - asset owners
 - Asset contractors (design, built, maintain physical assets)
 - Equipment suppliers
 - Sets the transition process in motion
 - Keeps the transition process running