A Community of Practice: Visualizing Co-creation with Figures and Lines of Thought
A Working Tableau

Introduction

To avoid getting lost in Babel or Bubble, a tableau – a visual map is created to illustrate the process of knowledge integration throughout the participatory modeling project. It is structured around five key questions, detailing the methods applied, showing the resulting outputs, and following a chronological timeline – supplemented by notable events and interventions.

Reflections are prominently featured and connected by lines representing the recursive integration of knowledge, highlighting the interconnected nature of scientific research and participatory modeling. The visualization captures the progression from the initial call to "Let's co-create!" to the inquiry "What and how did stakeholders contribute?".

The project emphasized the integration of stakeholder knowledge from different perspectives, including target knowledge, transformation knowledge, and systems knowledge. This was further complemented by procedural and tacit knowledge, ensuring a comprehensive and collaborative approach to the modeling process.

Notations

V Bundles of Methods   M Models

Reflexions for recursive knowledge integration

— processing
- - - transferring
— differentiating
~~~ bridging
— weightening

Facts and Figures in a Nutshell

STAKEHOLDERS
n=108
108 unique contacts
40 unique participants
96 participations

EVENTS
● main n=8
* side n=13
CON Conferences
ALL Alliances

INTERACTONS
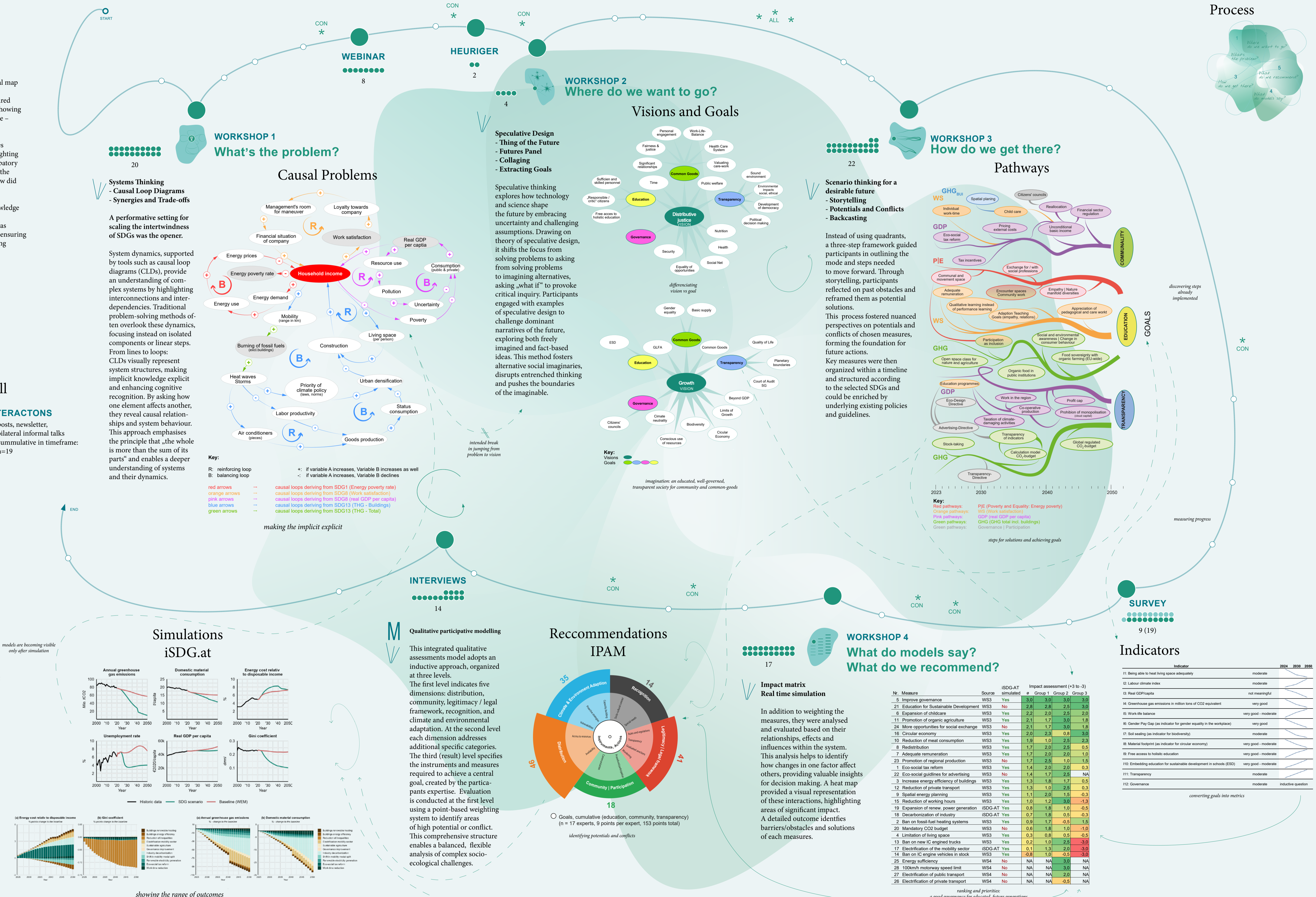○ posts, newsletter, bilateral informal talks
cummulative in timeframe: n=19

Materials at a Glance

n = 1 website, 1 newsletter, 16 papers, 5 working papers, 57 posts

Process

START

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HEURIGER 2

WORKSHOP 1
What's the problem?
20

Systems Thinking
- Causal Loop Diagrams
- Synergies and Trade-offs

A performative setting for scaling the intertwindness of SDGs was the opener.

System dynamics, supported by tools such as causal loop diagrams (CLDs), provide an understanding of complex systems by highlighting interconnections and interdependencies. Traditional problem-solving methods often overlook these dynamics, focusing instead on isolated components or linear steps. From lines to loops: CLDs visually represent system structures, making implicit knowledge explicit and enhancing cognitive recognition. By asking how one element affects another, they reveal causal relationships and system behaviour. This approach emphasises the principle that „the whole is more than the sum of its parts" and enables a deeper understanding of systems and their dynamics.

Causal Problems

Management's room for maneuver   Loyalty towards company
Financial situation of company   Work satisfaction   Real GDP per captia
Energy prices   Resource use   Consumption (public & private)
Energy poverty rate   Household income   Pollution   Uncertainty
Energy use   Energy demand   Poverty
Mobility (range in km)   Living space (per person)
Burning of fossil fuels (excl. buildings)   Construction
Heat waves Storms   Priority of climate policy (laws, norms)   Urban densification
Labor productivity   Status consumption
Air conditioners (pieces)   Goods production

Key:
R: reinforcing loop
B: balancing loop
+: if variable A increases, Variable B increases as well
-: if variable A increases, Variable B declines

red arrows → causal loops deriving from SDG1 (Energy poverty rate)
orange arrows → causal loops deriving from SDG8 (Work satisfaction)
pink arrows → causal loops deriving from SDG8 (real GDP per capita)
blue arrows → causal loops deriving from SDG13 (THG – Buildings)
green arrows → causal loops deriving from SDG13 (THG – Total)

making the implicit explicit

models are becoming visible only after simulation

Simulations
iSDG.at

Qualitative participative modelling

The iSDG model is a macro-economic, national simulation model based on system dynamics. The iSDG model and its predecessor the Threshold21 model have been applied to various country contexts for analyses of national development pathways and pathways to achieve the SDGs.
The model encompasses 30 sectors that represent economic (e.g. the production of different industry, services and agricultural sectors), social (e.g. population) and environmental (e.g. energy consumption and production) dynamics. Thereby, the model covers a broad range of elements relevant to targets and indicators of the SDGs.

Annual greenhouse gas emissions
Domestic material consumption
Energy cost relativ to disposable income
Unemployment rate
Real GDP per capita
Gini coefficient

— Historic data   — SDG scenario   — Baseline (WEM)

(a) Energy cost relativ to disposable income
(b) Gini coefficient
(c) Annual greenhouse gas emissions
(d) Domestic material consumption

showing the range of outcomes

WORKSHOP 2
Where do we want to go?
4

Visions and Goals

Speculative Design
- Thing of the Future
- Futures Panel
- Collaging
- Extracting Goals

Speculative thinking explores how technology and science shape the future by embracing uncertainty and challenging assumptions. Drawing on theory of speculative design, it shifts the focus from solving problems to imagining alternatives, asking „what if" to provoke critical inquiry. Participants engaged with examples of speculative design to challenge dominant narratives of the future, exploring both freely imagined and fact-based ideas. This method fosters alternative social imaginaries, disrupts entrenched thinking and pushes the boundaries of the imaginable.

Personal engagement   Work-Life-Balance
Fairness & justice   Health Care System
Significant relationships   Valuating care-work
Sufficient and decent personnel   Sound environment
Time   Environmental impacts social, ethical
'Responsible / critic' citizens   Development of democracy
Free access to holistic education   Political decision making
Common Goods   Transparency   Nutrition
Education   Distributive justice VISION   Health
Governance   Social Net
Security   Equality of opportunities

Gender equality   Basic supply
ESD   GLFA   Common Goods   Quality of Life
Education   Common Goods   Planetary boundaries
Transparency   Court of Audit SG
Growth VISION   Beyond GDP
Governance   Limits of Growth
Citizens' councils   Climate neutrality   Biodiversity   Circular Economy
Conscious use of resources

Key:
Visions
Goals

differentiating vision vs goal

imagination: an educated, well-governed, transparent society for community and common-goods

intended break in jumping from problem to vision

WORKSHOP 3
How do we get there?
22

Pathways

Scenario thinking for a desirable future
- Storytelling
- Potentials and Conflicts
- Backcasting

Instead of using quadrants, a three-step framework guided participants in outlining the mode and steps needed to move forward. Through storytelling, participants reflected on past obstacles and reframed them as potential solutions.
This process fostered nuanced perspectives on potentials and conflicts of chosen measures, forming the foundation for future actions.
Key measures were then organized within a timeline and structured according to the selected SDGs and could be enriched by underlying existing policies and guidelines.

GHG BUI   Citizens' councils
WS   Individual work-time   Spatial planing   Child care   Reallocation   Financial sector regulation
GDP   Eco-social tax reform   Pricing external costs   Unconditional basic income   COMMUNITY
P|E   Tax incentives   Exchange for / with social professions
WS   Communal and movement space   Encounter spaces Community work   Empathy | Nature manifold diversities
Adequate remuneration   Qualitative learning instead of performance learning   Adaption Teaching Goals (empathy, relations)   Appreciation of pedagogical and care work   GOALS
GHG   Participation as inclusion   Social and environmental awareness | Change in consumer behaviour   EDUCATION
Open space class for nature and agriculture   Organic food in public institutions   Food sovereignity with organic farming (EU-wide)
Education programmes: GDP   Work in the region   Profit cap   TRANSPARENCY
Eco-Design Directive   Co-operative production   Prohibition of monopolization (cloud capital)
Advertising-Directive   Taxation of climate-damaging activities
Stock-taking   Transparency of indicators   Global regulated CO2-budget
GHG   Calculation model CO2-budget
Transparency-Directive

2023   2030   2040   2050

Key:
Red pathways: P|E (Poverty and Equality: Energy poverty)
Orange pathways: WS (Work satisfaction)
Pink pathways: GDP (real GDP per capita)
Green pathways: GHG (GHG total incl. buildings)
Green pathways: Governance | Participation

discovering steps already implemented

steps for solutions and achieving goals

measuring progress

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INTERVIEWS
●●●●●●●● 14

SURVEY
●●●●●●● 9 (19)

Reccomendations
IPAM

Qualitative participative modelling

This integrated qualitative assessments model adopts an inductive approach, organized at three levels.
The first level indicates five dimensions: distribution, community, legitimacy / legal framework, recognition, and climate and environmental adaptation. At the second level each dimension addresses additional specific categories. The third (result) level specifies the instruments and measures required to achieve a central goal, created by the participants expertise. Evaluation is conducted at the first level using a point-based weighting system to identify areas of high potential or conflict. This comprehensive structure enables a balanced, flexible analysis of complex socio-ecological challenges.

Climate & Environment Adaption 35
Recognition 14
14
Distribution 49
Community | Participation 18
41

○ Goals, cumulative (education, community, transparency)
(n = 17 experts, 9 points per expert, 153 points total)

identifying potentials and conflicts

WORKSHOP 4
What do models say?
What do we recommend?
17

Impact matrix
Real time simulation

In addition to weighting the measures, they were analysed and evaluated based on their relationships, effects and influences within the system. This analysis helps to identify how changes in one factor affect others, providing valuable insights for decision making. A heat map provided a visual representation of these interactions, highlighting areas of significant impact. A detailed outcome identfies barriers/obstacles and solutions of each measures.

Nr.	Measure	Source	iSDG-AT simulated	Impact assessment (+3 to -3)		
			σ	Group 1	Group 2	Group 3
5	Improve governance	WS3	Yes	3,0	3,0	3,0	3,0
21	Education for Sustainable Development	WS3	No	2,8	2,8	2,5	3,0
6	Expansion of childcare	WS3	Yes	2,2	2,0	2,5	2,0
11	Promotion of organic agriculture	WS3	Yes	2,1	1,7	3,0	1,8
24	More opportunities for social exchange	WS3	No	2,1	1,7	3,0	1,8
16	Circular economy	WS3	Yes	2,0	2,3	0,8	3,0
10	Reduction of meat consumption	WS3	Yes	1,9	1,0	2,3	2,3
8	Redistribution	WS3	Yes	1,7	2,0	0,5	2,5
7	Adequate remuneration	WS3	Yes	1,7	2,0	1,0	2,0
23	Promotion of regional production	WS3	No	1,7	2,5	1,0	1,5
1	Eco-social tax reform	WS3	Yes	1,4	2,0	0,0	2,3
22	Eco-social guidlines for advertising	WS3	No	1,4	1,7	2,5	NA
3	Increase energy efficiency of buildings	WS3	Yes	1,3	1,8	1,7	0,5
12	Reduction of private transport	WS3	Yes	1,3	1,0	2,5	-0,3
9	Spatial energy planning	WS3	Yes	1,1	2,0	1,5	-0,3
15	Reduction of working hours	WS3	Yes	1,0	1,2	3,0	-1,3
19	Expansion of renew. power generation	WS3	Yes	0,8	1,8	1,0	-0,5
18	Decarbonization of industry	iSDG-AT	Yes	0,7	1,8	0,5	-0,3
2	Ban on fossil-fuel heating systems	WS3	Yes	0,9	1,7	-0,5	1,5
20	Mandatory CO2 budget	WS3	No	0,8	0,8	0,5	-0,3
4	Limitation of living space	WS3	Yes	0,3	0,8	0,5	-0,5
13	Ban on new IC engined trucks	WS3	Yes	0,2	1,0	2,5	-3,0
17	Electrification of the mobility sector	iSDG-AT	Yes	0,1	1,3	2,0	NA
14	Ban on IC engine vehicles in stock	WS3	Yes	-0,8	1,0	-0,5	-3,0
25	Energy sufficiency	WS4	No		NA	NA	NA
28	100km/h motorway speed limit	WS4	No	3,0	NA	NA	NA
27	Electrification of public transport	WS4	No		NA	2,0	NA
26	Electrification of private transport	WS4	No		NA	-0,5	NA

ranking and priorities: a good governance for educated, future generations

Indicators

Indicator		2024 2030 2060
I1: Being able to heat living space adequately	moderate	
I2: Labour climate index	moderate	
I3: Real GDP/capita	not meaningful	
I4: Greenhouse gas emissions in million tons of CO2 equivalent	very good	
I5: Work-life balance	very good - moderate	
I6: Gender Pay Gap (as indicator for gender equality in the workplace)	very good	
I7: Soil sealing (as indicator for biodiversity)	moderate	
I8: Material footprint (as indicator for circular economy)	very good - moderate	
I9: Free access to holistic education	very good	
I10: Embedding education for sustainable development in schools (ESD)	very good - moderate	
I11: Transparency	moderate	
I12: Governance	moderate	inductive question

converting goals into metrics