Localising the Sustainable Development Goals

A new research Agenda

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Print (c. 1902) by Albert Robida: a futuristic view of air travel over Paris in the year 2000 as people leave the opera



"We aimed to develop a general framework



"We aimed to develop a general framework for charting pathways to sustainability



"We aimed to develop a general framework for charting pathways to sustainability to futureproof local communities



"We aimed to develop a **general framework** for charting **pathways** to sustainability to futureproof **local communities**, using computer **modelling and participatory** approaches"

Our goals

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Goal 1 Reviewing the state-of-the-art knowledge in local sustainability

Goal 2 Developing adaptive pathways in the Forrest community

Goal 3 Developing adaptive pathways in the Goulburn-Murray region

Goal 4 Developing and communicating a general framework for designing sustainability pathways



Goal 1 The state-of-the-art knowledge in local sustainability

Goal 2 Developing adaptive pathways in the Forrest community

Goal 3 Developing adaptive pathways in the Goulburn-Murray region

Goal 4 Developing and communicating a general framework for designing sustainability pathways



Goal 1 Reviewing the state-of-the-art knowledge in local sustainability

- **Goal 2** Developing adaptive pathways in the Forrest community
- **Goal 3** Developing adaptive pathways in the Goulburn-Murray region
- **Goal 4** Developing and communicating a general framework for designing sustainability pathways



Goal 1

Reviewing the state-of-the-art knowledge in local sustainability

We investigated effective approaches for grassroots transformative change for local sustainability.

Scientific literature

A meta-synthesis across the scientific articles (abstracts):

• 2017–2019

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• 4200 publications

Findings:

- Cross-sectoral SDGs are critical.
- Consistent incorporation of local sustainability across all SDGs required.

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Best policy practices

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Started by Local Agenda 21 (LA21), we identified 55 initiatives on local sustainability.

Policy initiatives have evolved gradually:

- Resources
- > Agenda
- Scope

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Viable approaches to local sustainability

Downscaling: Identify and prioritise global SDGs according to the community's needs

<u>Trade-offs</u>: Design effective trade-offs across competing, divergent local needs

<u>Stress-testing</u>: Remain adaptive in response to future instabilities



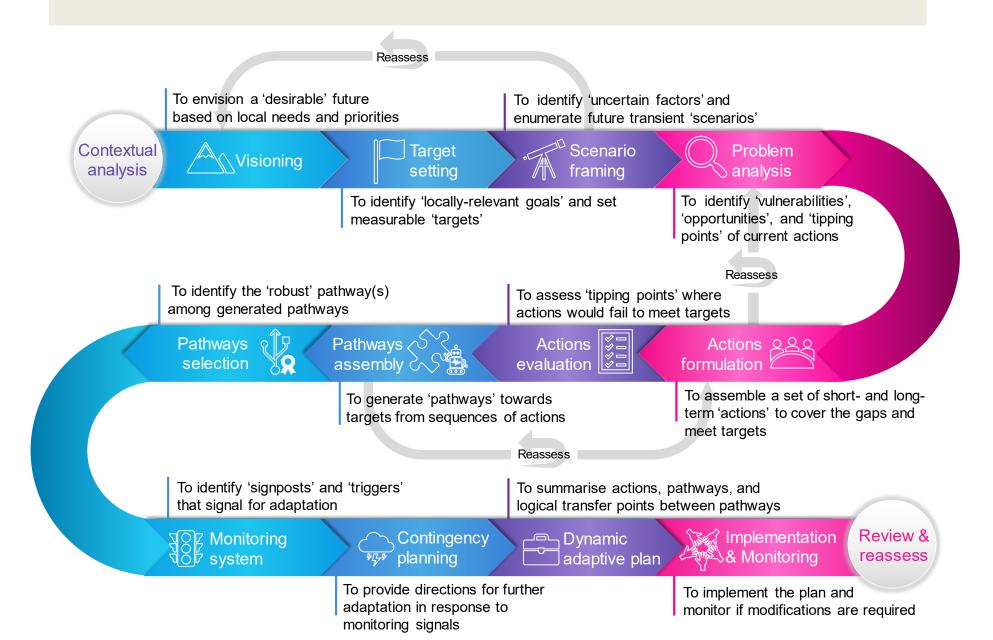
Goal 4

Developing a general framework for designing sustainability pathways

We developed a unifying framework to guide how scientists and stakeholders for co-creating viable sustainability pathways.



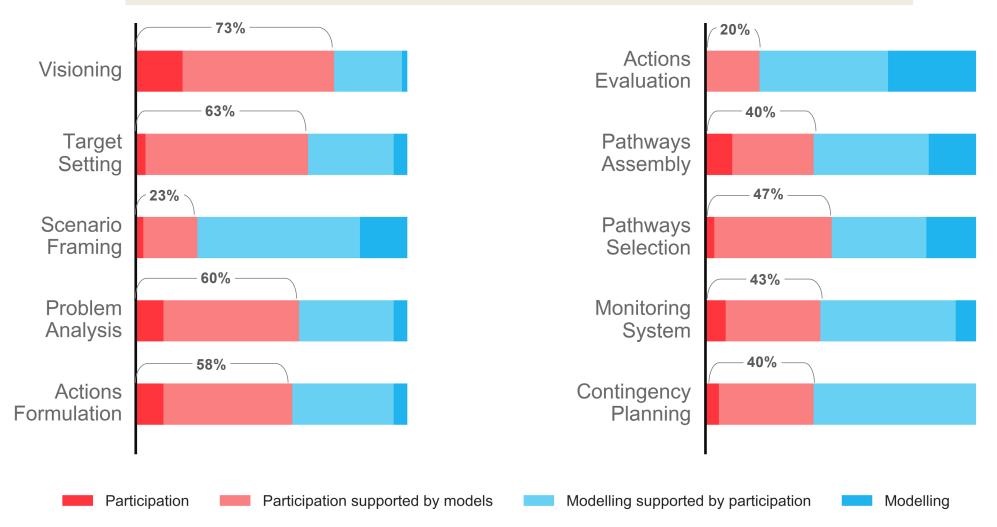
Overview of steps in co-developing pathways



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Viewpoints of experts about the co-development of pathways

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Survey views of 20 practitioners on method combination. The percentage shows the combined role for participation and participation supported by models.

Methods for co-developing pathways

A total of 43 methods identified across sciences for developing pathways.

• Level of participation

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• qualitative vs. quantitative

Methods are compared based on:

- Decision problem
- Analytical approach
- Role of modelling
- Role of participatory
- Examples

Level of formalisation ve Quantitative	 Biophysical modelling Statistical analysis Econometric analysis Time series analysis Bayesian networks analysis Life Cycle Assessme Input-output analysis Cost-benefit analysis 			delling odelling • Participatory GIS • Crowdsourcing • Multi-Criteria
Semi-quantitative	 Network Analysis Story-and-Simulatio Crossover points analysis 		■Surveys	Decision Analysis Decision tree analysis Cultural consensus Q methodology Fuzzy cognitive mapping
Qualitative	 Literature review Content analysis Narrative analysis 	 Observation 	 Interviews SWOT analysis Cognitive mapping 	 Causal loop diagram Deliberative mapping Brainstorming Open space Facilitation Role playing games Rich pictures Visual representation Sociotechnical Imaginaries
	Limited	Mode	erate	Intensive
				18 Level o

participation

Selection criteria for choosing suitable methods

Outcome-oriented factors represent the analytical objectives

Research-oriented factors represent the scientific rigour of methods and the availability of resources for a specific context

Stakeholder-oriented factors represent stakeholder characteristics and their requirement

Agenda setting to develop a vision and downscale Engaging with cross-sectoral actors brought holders global goals Exploring scenarios to generate and identify important future uncertainties Analysing solutions to formulate policies and evaluate their effectiveness **Understanding the system** to analyse complex real-world interactions Vulnerability analysis to stress test policies under uncertainty Working with quantitative indicators in form of numerical value and descriptive statistics Stakeholder-oriented Working with gualitative indicators in form of pattern, ranking, quality, and storyline Capturing system details to represent heterogeneities instead of pre-mature aggregation Easy communication of results for understandability with minimum misinterpretation Dealing with high problem complexity in form of

Research-oriented Problem feedback interactions, conflicting trade-offs Dealing with high problem uncertainty in form of

limited knowledge/agreement about the system Working under limited data availability and access to information

Building on existing participatory experience in form of qualitative skills

Building on existing computational experience Re in form of modelling skills

Working under limited hardware and software access in form of technical/model fidelity

together by geography and community interest Engaging with single sector practitioners (e.g., water practitioners, engineers, etc.) Engaging with policymakers who may not be directly involved in the on-ground management Enabling front-end participation by engaging from the early stage (e.g., problem definition)

Enabling back-end participation by engaging towards the end (e.g., validation)

Extracting information from stakeholders (e.g., interviews)

Creating co-learning between stakeholders to exchange knowledge (e.g., focus group)

Co-design/managing with stakeholders in decision-making

Working under stakeholder fatigue in form of unwillingness to participate

Working under limited strategic thinking maturity when stakeholder knowledge is limited

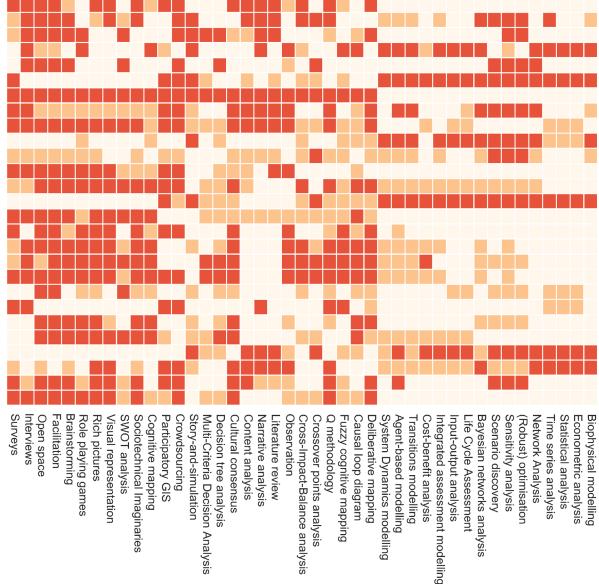
Coping with divergence of values in form of disagreement and plurality of views

Co-creating buy-in and ownership of results to support the implementation of the results

Assessing method capabilities under criteria

Agenda (vision, targets) setting Exploring scenarios Analysing solutions Understanding the system Vulnerability analysis Working with quantitative indicators Working with qualitative indicators Capturing system details Easy communication of results Dealing with high problem complexity Dealing with high problem uncertainty Working under limited data availability Building on existing participatory experience Building on existing computational experience Working under limited hardware and software access Engaging with cross-sectoral actors Engaging with single sector practitioners Engaging with policymakers Enabling front-end participation Enabling back-end participation Extracting information from stakeholders Creating co-learning between stakeholders Co-designing/managing with stakeholders Working under stakeholder fatigue Working under limited strategic thinking maturity Coping with divergence of values Co-creating buy-in and ownership of results

> Limited Moderate High Method suitability



review

Analysis

Analysis

analysis

optimisation

analysis

discovery

etworks analysis

Assessment

modelling

mapping



Selecting methods for the case studies

		Sustainability contexts																				
	Decision Decision Methods	Visioning	Target Setting	Scenario Framing	Problem Analysis	Actions Formulation	Actions Evaluation	Pathways Assembly	Pathways Selection	Monitoring System	Contingency Planning		Visioning	Target Setting	Scenario Framing	Problem Analysis	Actions Formulation	Actions Evaluation	Pathways Assembly	Pathways Selection	Monitoring System	
	Surveys																					i
	Interviews														+			+	+			i
	Open space												+	+	+	+	+	+	+	+	+	i
e	Facilitation		÷										÷	+	÷	÷	+	÷	+	÷	÷	i
ativ	Brainstorming	+	Ŧ												+	+	+	+	+		+	
ip ita	Role playing games		Ŧ													+	+					ï
Qualitative	Rich pictures				-								Ŧ	+			+			Ŧ	÷	i
Qualitative Participation	Visual representation												+	+	+					+		ü
	SWOT analysis																	+	+	+	+	ï
	Sociotechnical Imaginaries												+	+								ï
	Cognitive mapping	+	+																			ï
a c	Participatory GIS																					ï
Quantitative Participation	Crowdsourcing															+						İ
tat oat	Story-and-simulation	+		+	+	+	+	+	+		+											
cip Cip	Multi-Criteria Decision Analysis																					
ua	Decision tree analysis																					Ì
ά ^ω	Cultural consensus																					I
	Content analysis																					
	Narrative analysis																					I
ο_	Literature review																					I
ig ti	Observation																					I
Qualitative Research	Cross-Impact-Balance analysis	+							+	+												
lal es(Crossover points analysis									+	+											
Q R	Q methodology																					I
	Fuzzy cognitive mapping																					
	Causal loop diagram	+	+		+	+				+												
	Deliberative mapping									+												
	System Dynamics modelling																					
	Agent-based modelling					+	+															
	Transitions modelling					+		+	+													
	Cost-benefit analysis																					
	Integrated assessment modelling								_													
h ve	Input-output analysis																					
ati	Life Cycle Assessment					+		+	+													
Quantitative Research	Bayesian networks analysis			Ŧ																		
lar	Scenario discovery			ŧ	+		Ŧ	Ŧ			÷											
бĔ	Sensitivity analysis			Ŧ	+		Ť.	Ŧ	+	+												
	(Robust) optimisation			Ŧ			Ŧ				÷											
	Network Analysis				Ŧ																	
	Time series analysis																					
	Statistical analysis																					
	Econometric analysis																					
	Biophysical modelling																					

0.64 0.72 0.80 0.88 0.96

0.64 0.72 0.80 0.88 0.96 Forrest/Otways (SDG3

Goulburn Murray (SDG2) Forrest/Otways (SDG3)



Selecting methods for the case studies

Effective methods vary across cases and onesize-fits-all solutions are not feasible.

The development of pathways requires context-specific method integration.

Comments

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	Decision Methods	Visioning	Target Setting	Scenario Framing	Problem Analysis	Actions Formulation	Actions Evaluation	Pathways Assembly	Pathways Selection	Monitoring System	Contingency Planning		Visioning	Target Setting	Scenario Framing	Problem Analysis	Actions Formulation	Actions Evaluation	Pathways Assembly	Pathways Selection	Monitoring System	Contingency Planning
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Quantitative Research	Bayesian networks analysis Scenario discovery Sensitivity analysis (Robust) optimisation Network Analysis Time series analysis Statistical analysis Econometric analysis Biophysical modelling				+ +				+		+ +											

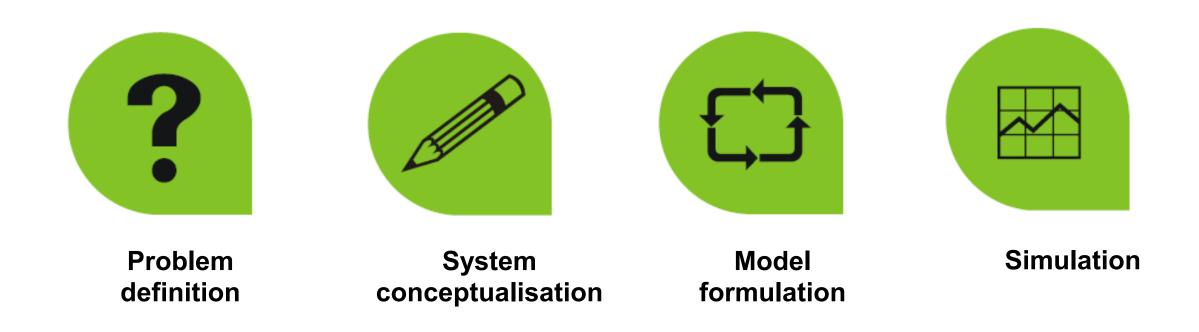
0.64 0.72 0.80 0.88 0.96







How to model the SDGs?





Problem definition

What are the priority challenges that each community is facing?

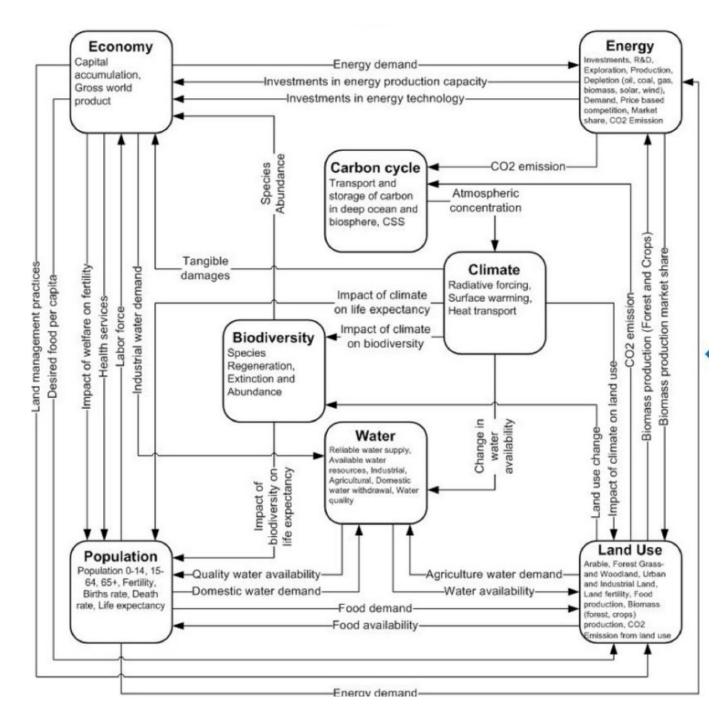
- Water scarcity
- Increasing risk of bushfires
- Increasing energy demand
- Regional economy
- Etc.

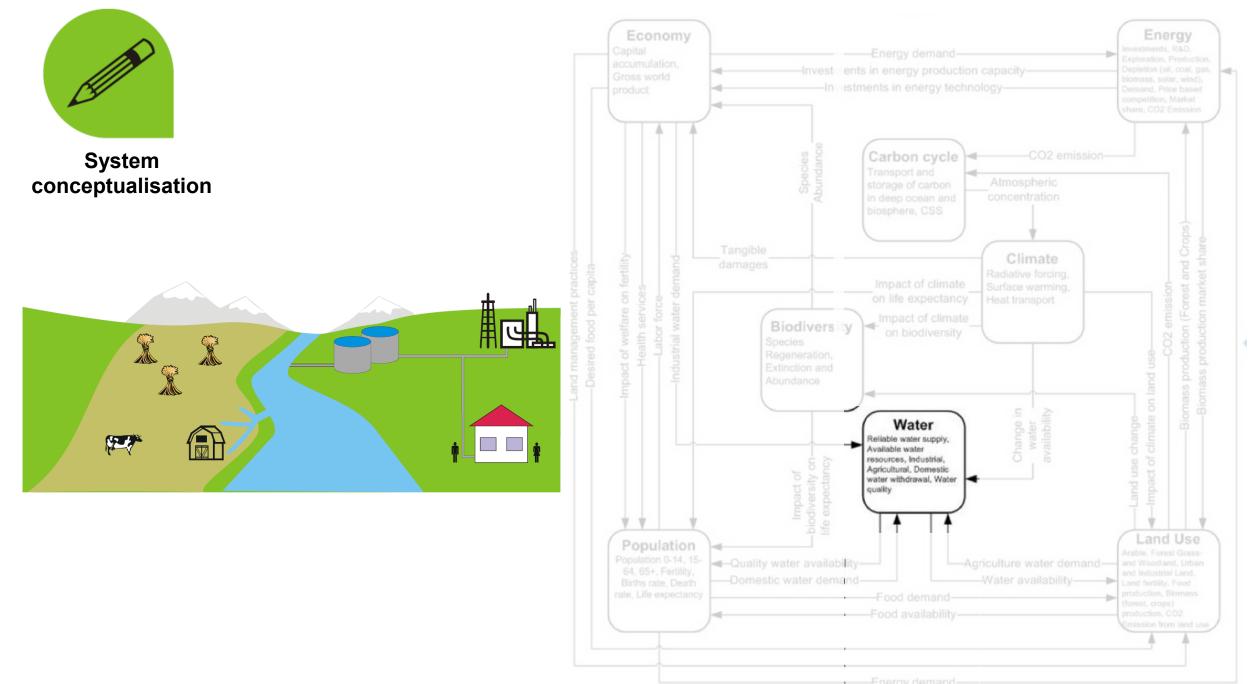






System conceptualisation

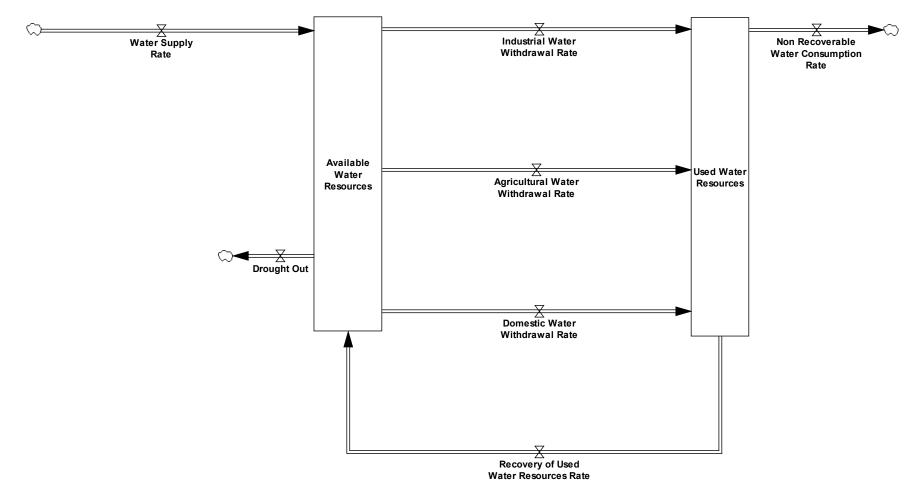




Figures: Courtesy of the Felix Model



Model formulation



Figures: Courtesy of the Felix Model



