"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

**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
- 4200 publications

Findings:

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

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- 2017–2019
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Findings:
- Cross-sectoral SDGs are critical.
- Consistent incorporation of local sustainability across all SDGs required.
Best policy practices

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

Policy initiatives have evolved gradually:
- Resources
- Agenda
- Scope
Best policy practices

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

Policy initiatives have evolved gradually:
- Resources
- Agenda
- Scope

Navigating the overarching process

Resource

Serving socio-economic-political priorities

Toolkits to assist with implementation

Supporting a balanced representation of sustainability goals

Focusing on capability building in local authorities

Agenda

Facilitating multi-sectoral collaborations in communities, cities, and businesses

Scope
Viable approaches to local sustainability

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

**Trade-offs:** Design effective trade-offs across competing, divergent local needs

**Stress-testing:** 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

1. **Contextual analysis**
   - **Visioning**: To envision a ‘desirable’ future based on local needs and priorities.
   - **Target setting**: To identify ‘locally-relevant goals’ and set measurable ‘targets’.
   - **Scenario framing**: To identify ‘robust’ pathway(s) among generated pathways.

2. **Pathways selection**
   - **Pathways assembly**: To generate ‘pathways’ towards targets from sequences of actions.
   - **Actions evaluation**: To identify ‘vulnerabilities’, ‘opportunities’, and ‘tipping points’ of current actions.
   - **Actions formulation**: To assess ‘tipping points’ where actions would fail to meet targets.

3. **Monitoring system**
   - **Contingency planning**: To identify ‘signposts’ and ‘triggers’ that signal for adaptation.
   - **Dynamic adaptive plan**: To summarise actions, pathways, and logical transfer points between pathways.

4. **Implementation & Monitoring**
   - **Review & reassess**: To provide directions for further adaptation in response to monitoring signals.
   - **Dynamic adaptive plan**: To implement the plan and monitor if modifications are required.

5. **Review & reassess**
   - **Pathways assembly**
   - **Actions formulation**
   - **Actions evaluation**
   - **Scenario framing**

Reassess

To implement the plan and monitor if modifications are required.
Viewpoints of experts about the co-development of pathways

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
- qualitative vs. quantitative

Methods are compared based on:
- Decision problem
- Analytical approach
- Role of modelling
- Role of participatory
- Examples
Selection criteria for choosing suitable methods

<table>
<thead>
<tr>
<th>Outcome-oriented factors</th>
<th>Research-oriented factors</th>
<th>Stakeholder-oriented factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysing objectives</strong></td>
<td><strong>Dealing with problem characteristics</strong></td>
<td><strong>Engaging stakeholders</strong></td>
</tr>
<tr>
<td>Agenda setting to develop a vision and downscale global goals</td>
<td>Dealing with high problem complexity in form of feedback interactions, conflicting trade-offs</td>
<td>Engaging with cross-sectoral actors brought together by geography and community interest</td>
</tr>
<tr>
<td>Exploring scenarios to generate and identify important future uncertainties</td>
<td>Dealing with high problem uncertainty in form of limited knowledge/agreement about the system</td>
<td>Engaging with single sector practitioners (e.g., water practitioners, engineers, etc.)</td>
</tr>
<tr>
<td>Analysing solutions to formulate policies and evaluate their effectiveness</td>
<td>Working under limited data availability and access to information</td>
<td>Engaging with policymakers who may not be directly involved in the on-ground management</td>
</tr>
<tr>
<td>Understanding the system to analyse complex real-world interactions</td>
<td>Building on existing participatory experience in form of qualitative skills</td>
<td>Enabling front-end participation by engaging from the early stage (e.g., problem definition)</td>
</tr>
<tr>
<td>Vulnerability analysis to stress test policies under uncertainty</td>
<td>Capturing system details to represent heterogeneities instead of pre-mature aggregation</td>
<td>Enabling back-end participation by engaging towards the end (e.g., validation)</td>
</tr>
<tr>
<td>Working with quantitative indicators in form of numerical value and descriptive statistics</td>
<td>Easy communication of results for understandability with minimum misinterpretation</td>
<td>Extracting information from stakeholders (e.g., interviews)</td>
</tr>
<tr>
<td>Working with qualitative indicators in form of pattern, ranking, quality, and storyline</td>
<td>Stakeholder characteristics: Working under stakeholder fatigue in form of unwillingness to participate</td>
<td></td>
</tr>
<tr>
<td>Capturing system details to represent heterogeneities instead of pre-mature aggregation</td>
<td>Stakeholder characteristics: Working under limited strategic thinking maturity when stakeholder knowledge is limited</td>
<td></td>
</tr>
<tr>
<td>Easy communication of results for understandability with minimum misinterpretation</td>
<td>Stakeholder characteristics: Coping with divergence of values in form of disagreement and plurality of views</td>
<td></td>
</tr>
</tbody>
</table>

**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.
Assessing method capabilities under criteria
Selecting methods for the case studies
Effective methods vary across cases and one-size-fits-all solutions are not feasible.

The development of pathways requires context-specific method integration.

Comments

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How to model the SDGs?

- Problem definition
- System conceptualisation
- Model formulation
- Simulation

Figures: Courtesy of the Felix Model
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
Model formulation