Towards a systematic framework for analysis of cross-disciplinary tools and approaches in biodiversity conservation

Dr Rosemary Hill
Prof Iain Gordon
Dr Leanne Cullen-Unsworth
Dr Kristen Williams
Dr Allan Dale

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Towards a systematic framework

- Context: Australia's humid tropical forests.
  - cross-disciplinary research – purpose to achieve a significant transformation of knowledge through the integration of ideas or tools typically used by different disciplines or knowledge-generation systems
  - Key challenge in integration – identifying and justifying most suitable tools and approaches for analysis/design
- Three key issues in developing a systematic framework for analysis and design.
- Towards a systematic framework for analysis and design:
  - Two-step process
- Concluding remarks – future directions

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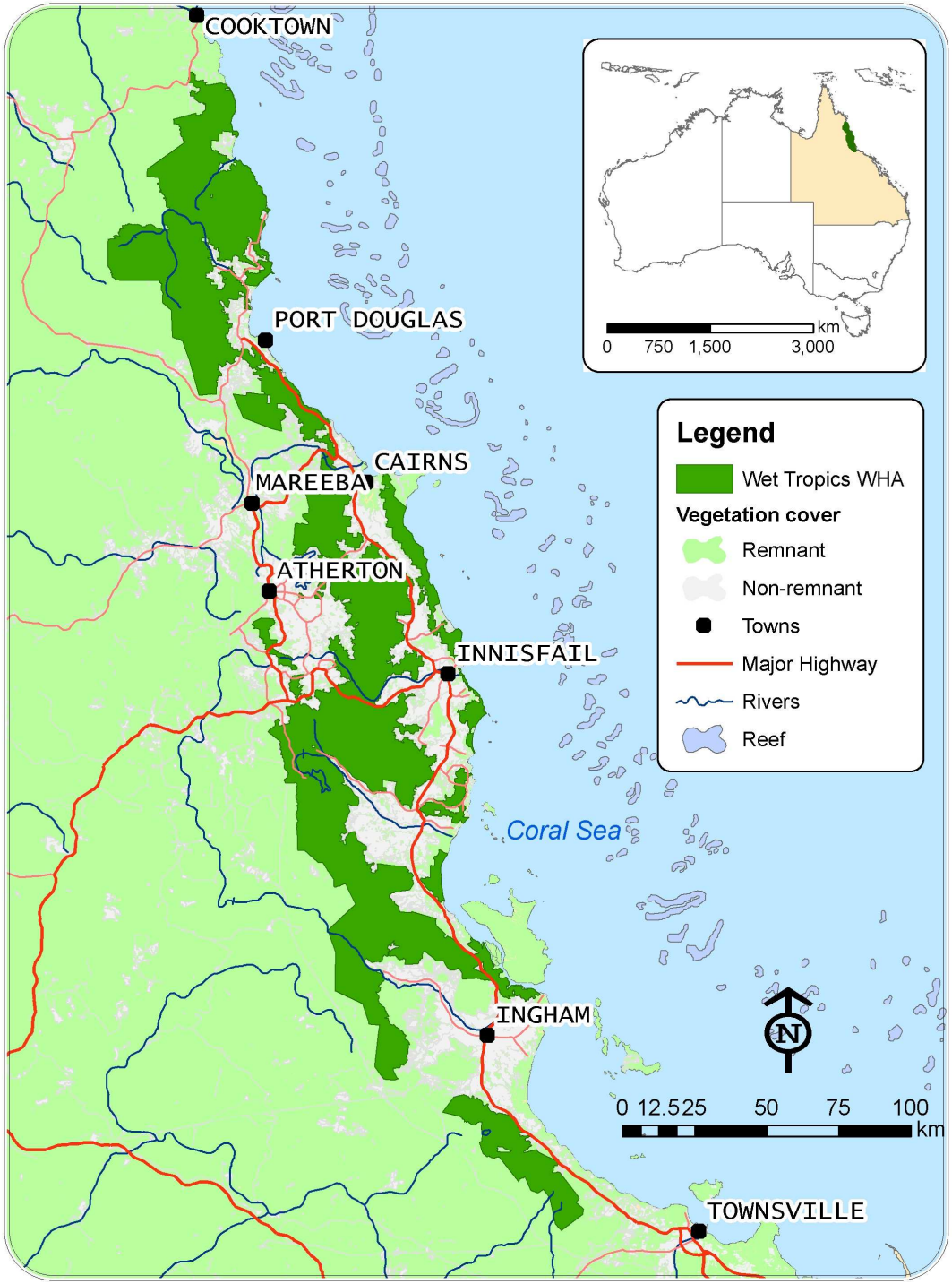

Australia's humid tropical forests

- Living record of the ecological and evolutionary processes that shaped Australian flora & fauna
- Listed as a World Heritage site for its natural values, adjacent Great Barrier Reef WH site
- Multiple and contested values: Indigenous, agriculture, tourism, lifestyle
- Ongoing loss of forest cover outside the protected area estate
- Two severe tropical cyclones in the last five years
- Need for better engagement of people in protecting biodiversity

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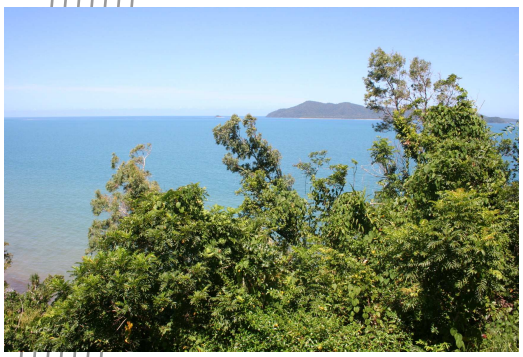
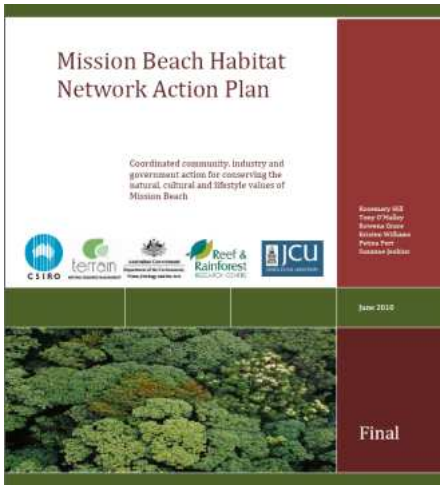
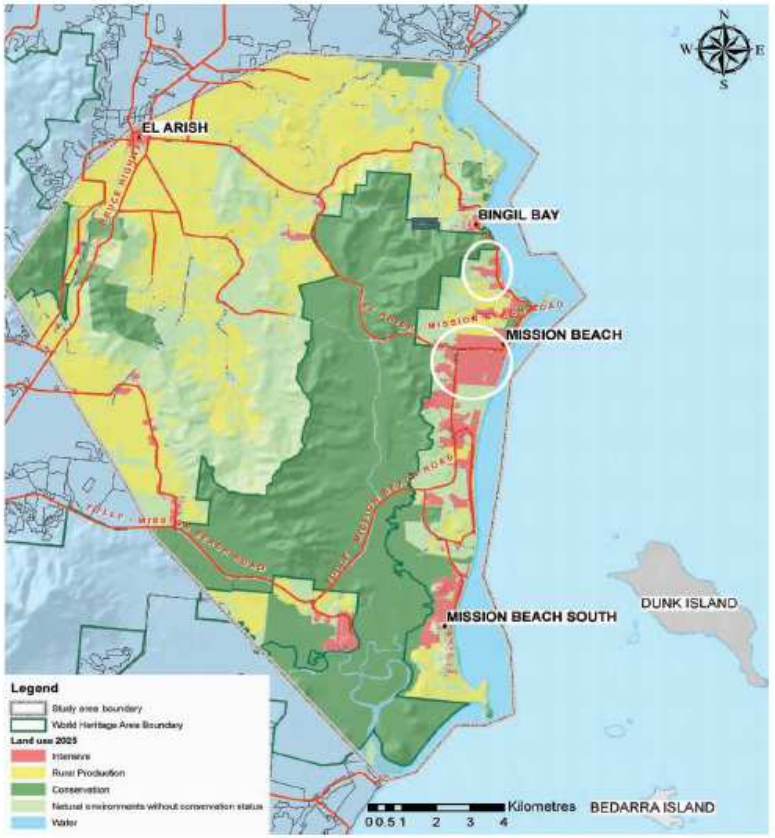


Cross-disciplinary science challenge: provide underpinning knowledge and tools for biodiversity conservation in this context of competing values, visions, knowledge, use

Participatory scenario generation

- Participatory scenario generation:
  - Intense science/community interaction over 2 year period
  - Key drivers of change, projected trends out to 2025, biophysical, social, institutional data
  - Part of an action co-research approach for a lowland Habitat Network Action Plan





Indigenous cultural indicators of the wet tropics

- Cooperative research for Indigenous cultural indicators :
  - Indigenous Ecological Knowledge (IEK):
  - Key principles of Indigenous governance, cooperative problem-framing, human relationship management, and scale-sensitivity
  - IEK-driven categories of indicators, science-based measurements

Categories	
1	Recognition of rights and interests
2	Participation in management
3	Socioeconomic benefits
4	Heritage and spiritual values
5	Understanding history
6	Climate change

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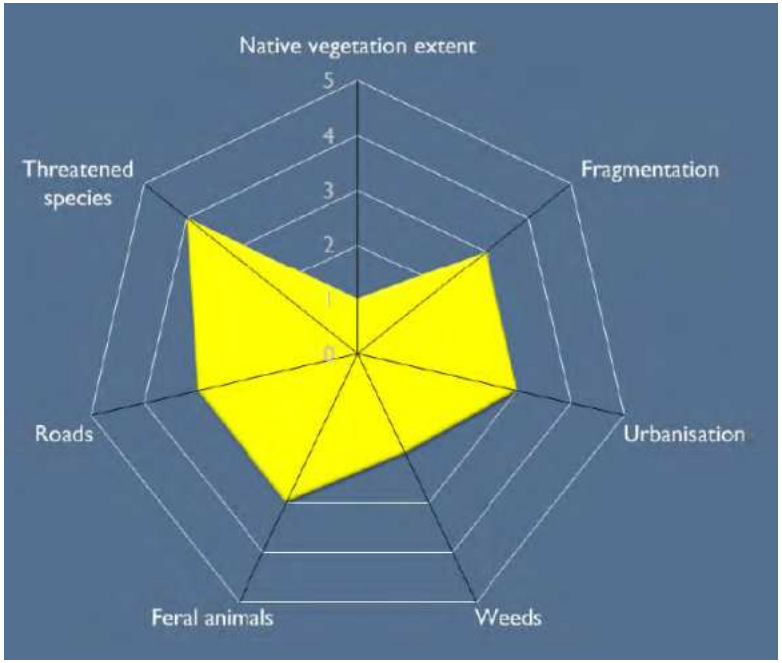
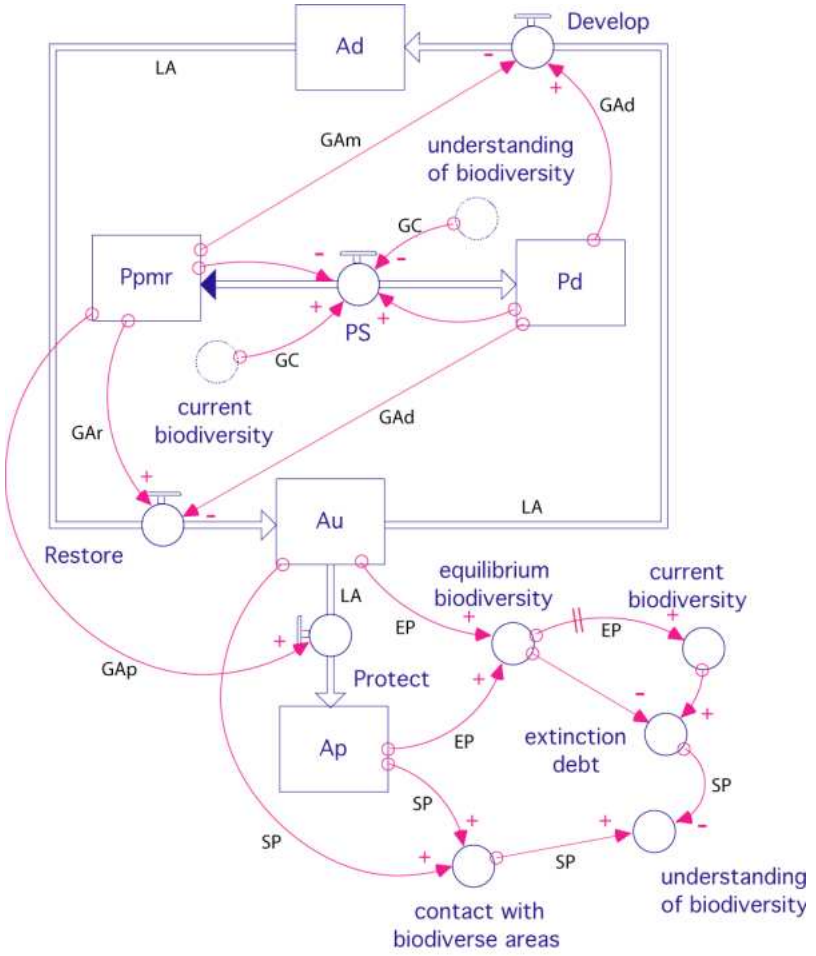
Status and trends of wet tropics environments

- Status and trends of wet tropics biodiversity, landscape and soils:
  - Prototype integrated indicator framework: radar plot, score-card, multiple data sources including remote sensed data, expert opinion, modelling of weed and pest distributions.
  - Pressure-state-response, ecosystem services.



Why biodiversity declines and protected areas increase

- Why biodiversity declines while protected areas increase:
  - System model of links between governance systems, public discourse about biodiversity risks/benefits, extinction debt, and increased public access to biodiversity in protected areas
  - STELLA dynamic systems model



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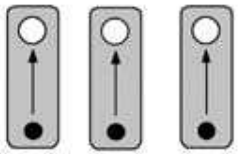
Systemization issue 1:

Different types of engagement between disciplines and other knowledge generation systems

Tress, G., B. Tress, and G. Fry. 2005. Clarifying integrative research concepts in landscape ecology. *Landscape Ecology* 20 (4):479-493

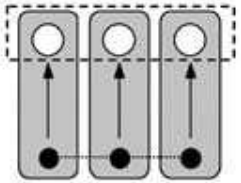
Disciplinarity

- Within one academic discipline
- Disciplinary goal setting
- No cooperation with other disciplines
- Development of new disciplinary knowledge and theory



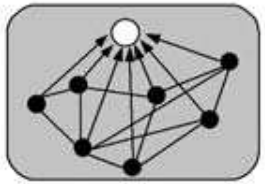
Multidisciplinarity

- Multiple disciplines
- Multiple disciplinary goal setting under one thematic umbrella
- Loose cooperation of disciplines for exchange of knowledge
- Disciplinary theory development



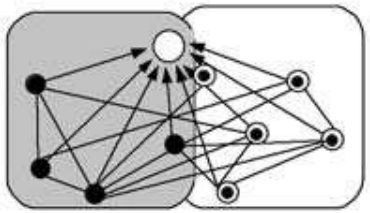
Interdisciplinarity

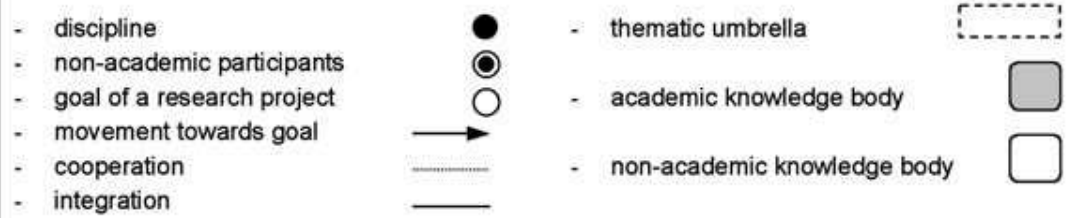
- Crosses disciplinary boundaries
- Common goal setting
- Integration of disciplines
- Development of integrated knowledge and theory



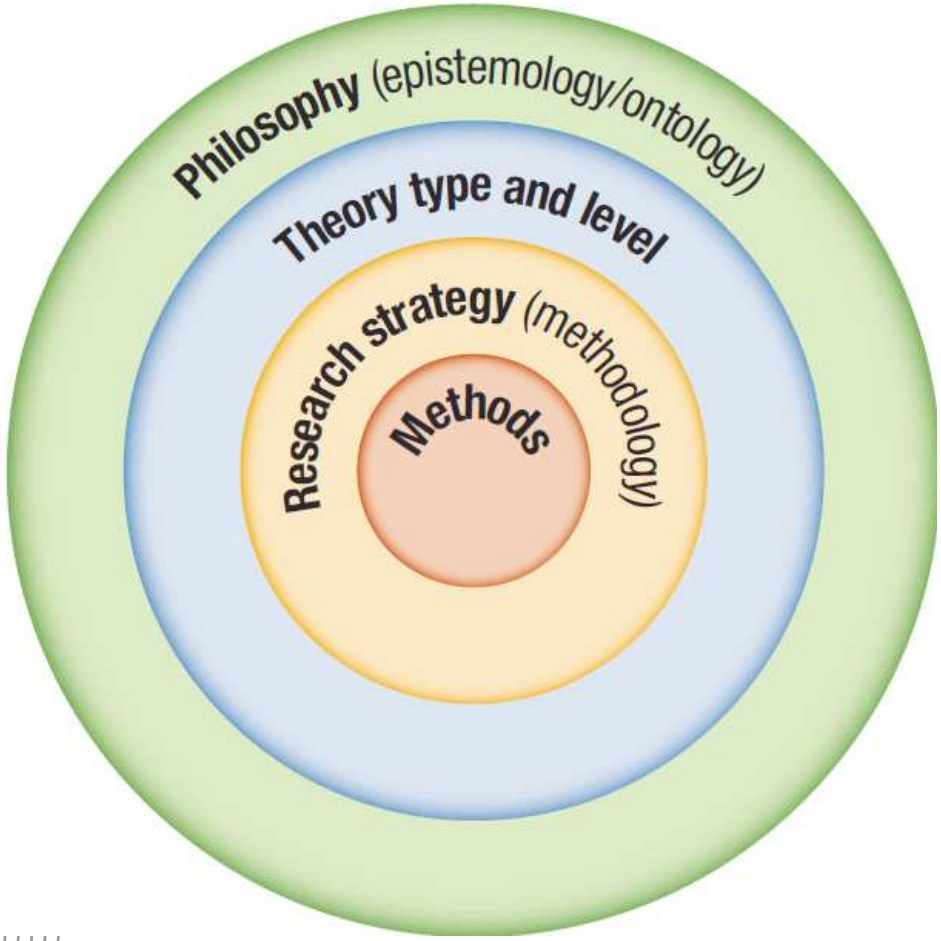
Transdisciplinarity

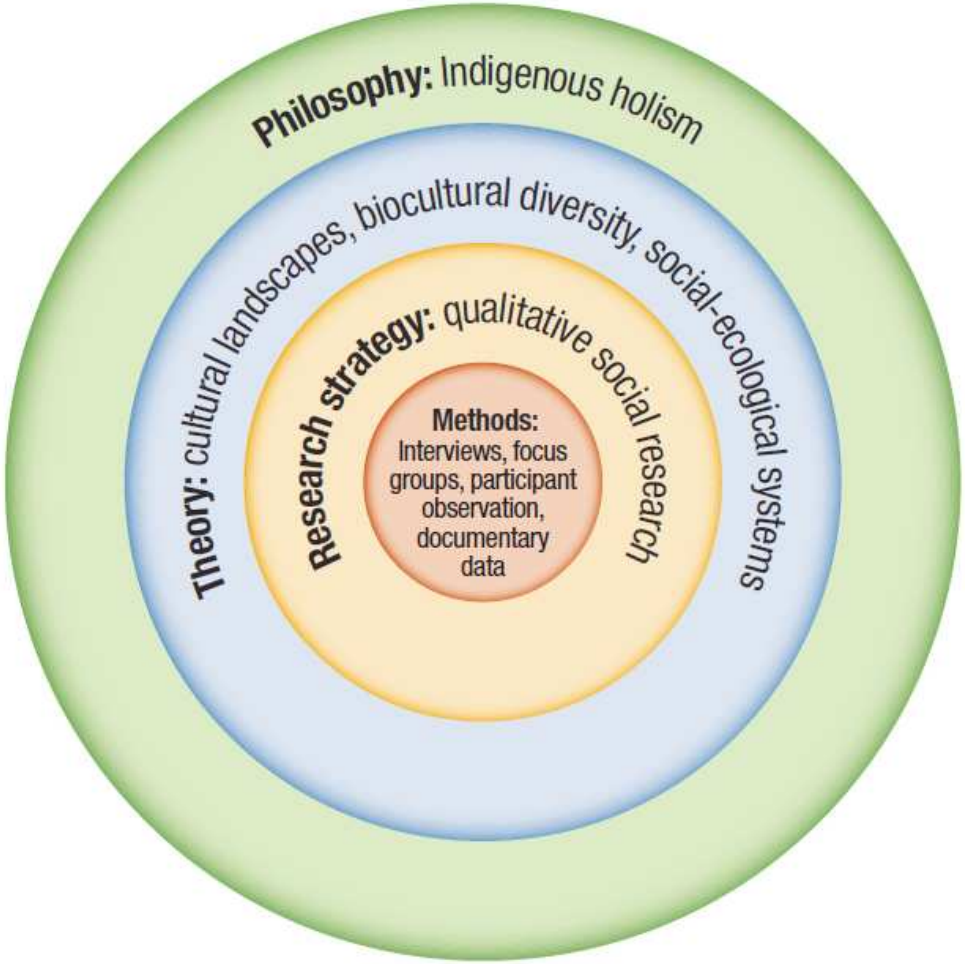
- Crosses disciplinary and scientific/academic boundaries
- Common goal-setting
- Integration of disciplines and non-academic participants
- Development of integrated knowledge and theory among science and society



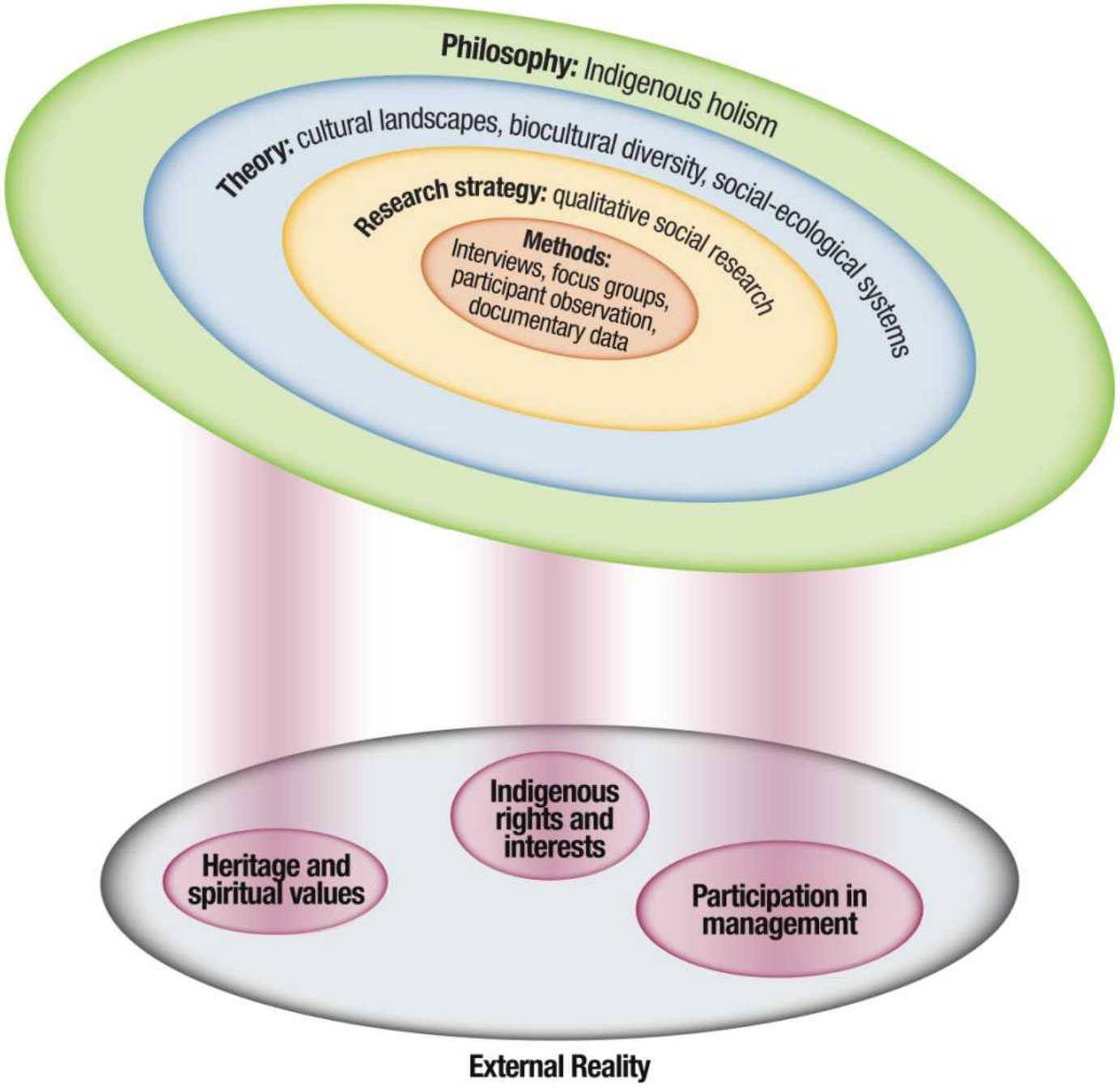


Systemization issue 2: differences in philosophy, theory, research strategy (methodology), method

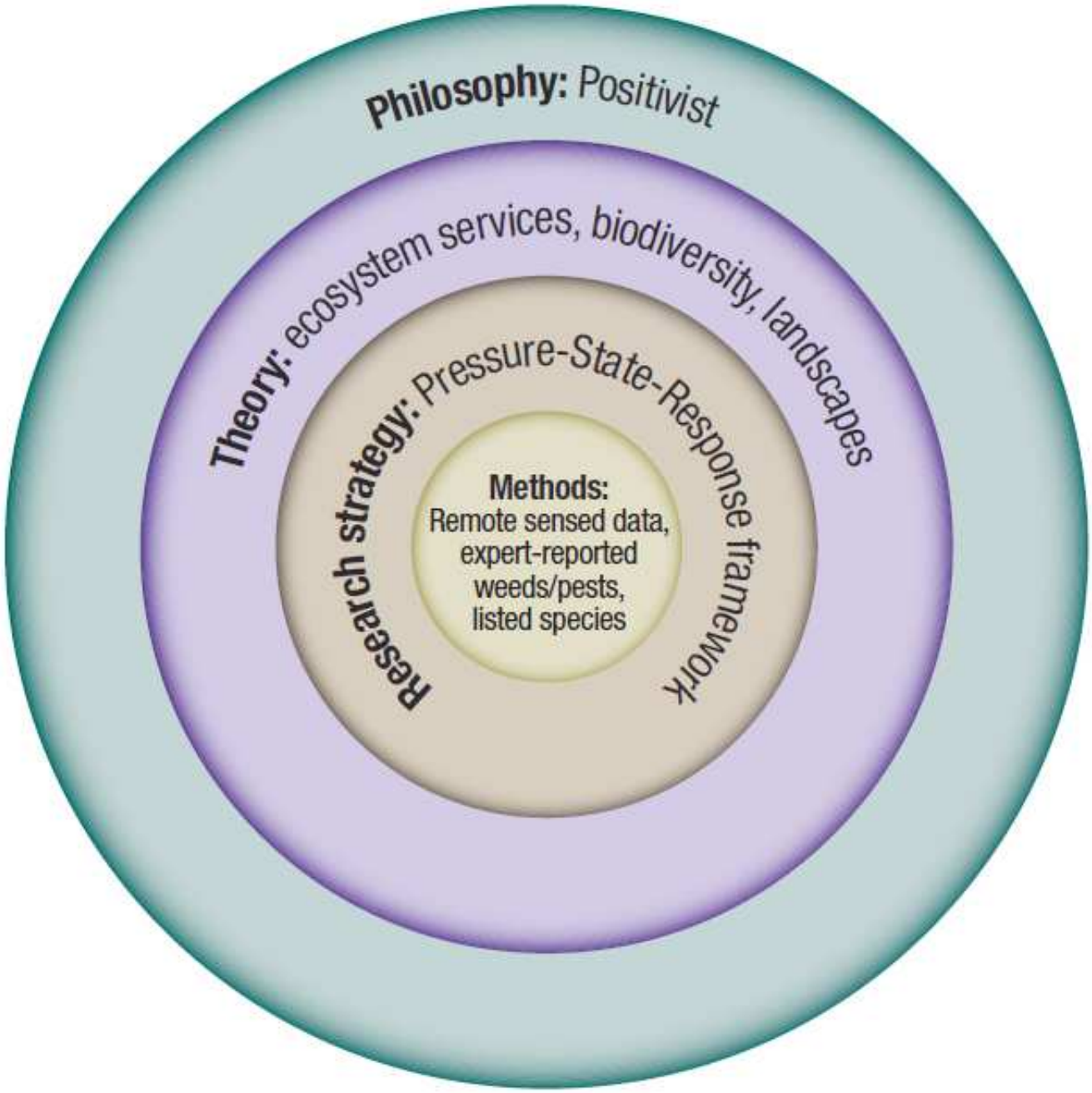




Cf. Khagram, S., Nicholas, K.A., Bever, D.M., Warren, J., Richards, E.H., Oleson, K., Kitzes, J., Katz, R., Hwany, R., Goldman, R., Funk, J., and Brauman, K.A., 2010: Thinking about knowing: conceptual foundations for interdisciplinary environmental research: *Environmental Conservation*, 37, 388-397; Crotty, M. 1998. *The Foundations of Social Research*. Sydney: Allen & Unwin.



Systemization issue 3: nesting of philosophy/ theory/ strategy can leads to significant perceptual gaps

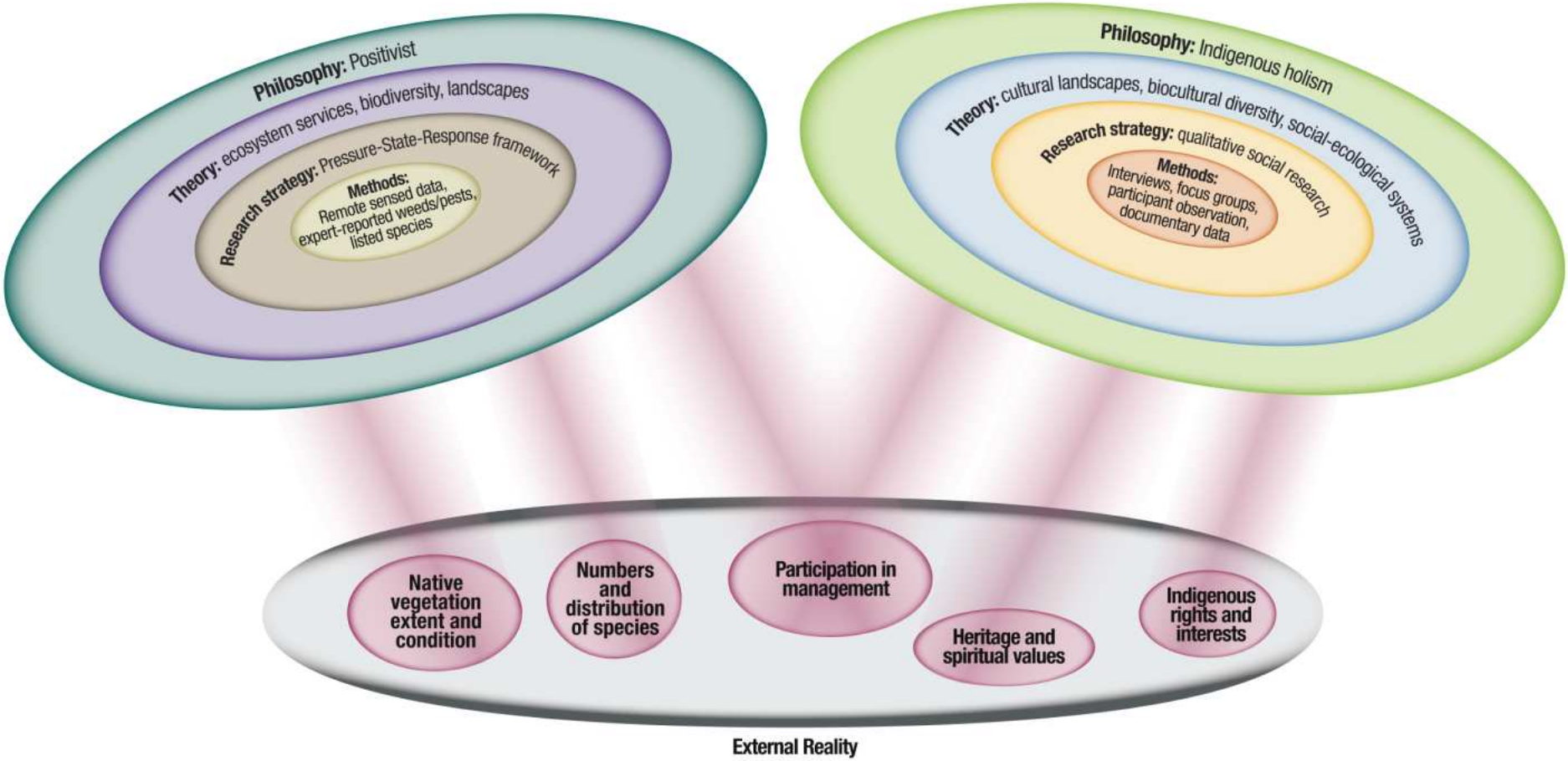


Status and trend in the wet tropics: prototype indicator framework

Perceptual gap

Status and trends of wet tropics environment

Indigenous cultural indicators of wet tropics environment



Systemization approach 1: matching tools

Nested hierarchy	Relevant integrative tool
Philosophy	Deep dialogic tools: Place-based learning communities; principles of Indigenous governance, cooperative frameworks
Theory	Topic-focused dialogic tools: Scenario-generation, dynamic systems conceptual models, common vision tools (e.g. collaborative planning for habitat)
Research strategy (methodology)	Common platform tools: Simulation and integrative models that can combine multiple data sources, radar plots, Bayesian Belief Networks, Mind-mapping software applications
Methods	Common data collection tools: Field based protocols and tools, citizen-based data collection, adaptive management experiments

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Systemization approach 2: prioritizing tools

Type (Issue 1)	**Highest level (Issue 2)**	**Perception diversity (Issue 3)**	**Our example**	**Priority tool selected**
Trans-disciplinary	Philosophy	Very high	Indigenous cultural indicators	Deep dialogic tools: Indigenous governance, relationship-building cooperative framework
	Theory	High:	Habitat Network Action Plan	Focused dialogic tool: Participatory scenario generation, participatory modelling
Inter-disciplinary	Theory	Medium	Why biodiversity declines when protected areas increase	Focused dialogic tool: dynamic systems conceptual modelling
	Research strategy	Low	Status and trends of wet tropics biodiversity soils, landscapes	Common platform tool: Computer models that can integrate data, radar plots, score-card.

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Conclusion

- Key challenge in cross-disciplinary research is about linking the a significant transformation of knowledge through integration across different disciplines and potentially knowledge-generation systems.

- Identified three key issues in systemization of approaches:
  1. Type of engagement between disciplines and other systems
  2. Differences in philosophy, theory, methodology and methods
  3. Perceptual gap that arises from these differences

- Initial framework for systemization of two steps:
  1. Matching tools to the research practice hierarchy: deep dialogic, topic-focused dialogic, common platform and common data-collection tools
  2. Consideration of the three issues above to identify the highest priority tools

- Climate adaptation and biodiversity conservation in the wet tropics highlight the need for transdisciplinary research that integrates knowledge between science and society. Key area for future interrogation:
  - Emerging new epistemology? : sustainability science
  - Mediating dialogic relations: power, values
  - Trust, respect, reciprocity

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Ecosystem Sciences Division
Social and Economic Sciences Program
Human Geography and Planning Group
Dr Rosemary Hill
Senior Research Scientist

Phone: 0740595013
Email: ro.hill@csiro.au
Web: www.csiro.au

www.csiro.au

Thank you

Contact Us
Phone: 1300 363 400 or +61 3 9545 2176
Email: enquiries@csiro.au Web: www.csiro.au

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