Modelling national transformations to achieve the SDGs within planetary boundaries

Dr Cameron Allen

University of New South Wales (UNSW), Sydney

Monash University, Melbourne

UNSW SYDNEY

MONASH University

MONASH SUSTAINABLE DEVELOPMENT INSTITUTE

Sustainability transformations are key to achieving SDGs

- *With 10 years left, we still **lack a clear understanding of the national transformations** needed to accelerate progress:*
  - *… scale and pace of change, the key levers, where to invest, how much will it cost, the winners and losers, resistance to change?*

Sustainability transformations are key to achieving SDGs

- *With 10 years left, we still **lack a clear understanding of the national transformations** needed to accelerate progress:*
  - *The scale and pace of change, the key levers, where to invest, how much will it cost, who are the winners and losers, where is the resistance to change?*

- *Many **disciplines researching STs:***
  - *Agree that STs require **large-scale fundamental changes** to social systems*
  - *Common normative goals include respect for **global limits and social foundations** – "SJS"*
  - *Types of STs: **six transformations** or entry points to organize implementation of the SDGs*
- *Different analytical approaches - **quantitative systems modelling** provides a critical tool to explore and better understand transformations*
- *Modelling at the **national or local scales** is important – where decision are made*

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Modelling national transformations to achieve the SDGs within planetary boundaries in small island developing states

Cameron Allen[1,2,3], Graciela Metternicht[1], Thomas Wiedmann[2] and Matteo Pedercini[4]

https://doi.org/10.1017/sus.2021.13

nature research

nature sustainability

ANALYSIS

https://doi.org/10.1038/s41893-019-0409-9

Greater gains for Australia by tackling all SDGs but the last steps will be the most challenging

Cameron Allen[1*], Graciela Metternicht[1], Thomas Wiedmann[2,3] and Matteo Pedercini[4]

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Q. How can countries accelerate progress on the SDGs by 2030 while ensuring longer-term coherence with climate and sustainability thresholds?

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Long Form Research Paper

Modelling national transformations to achieve the SDGs within planetary boundaries in small island developing states

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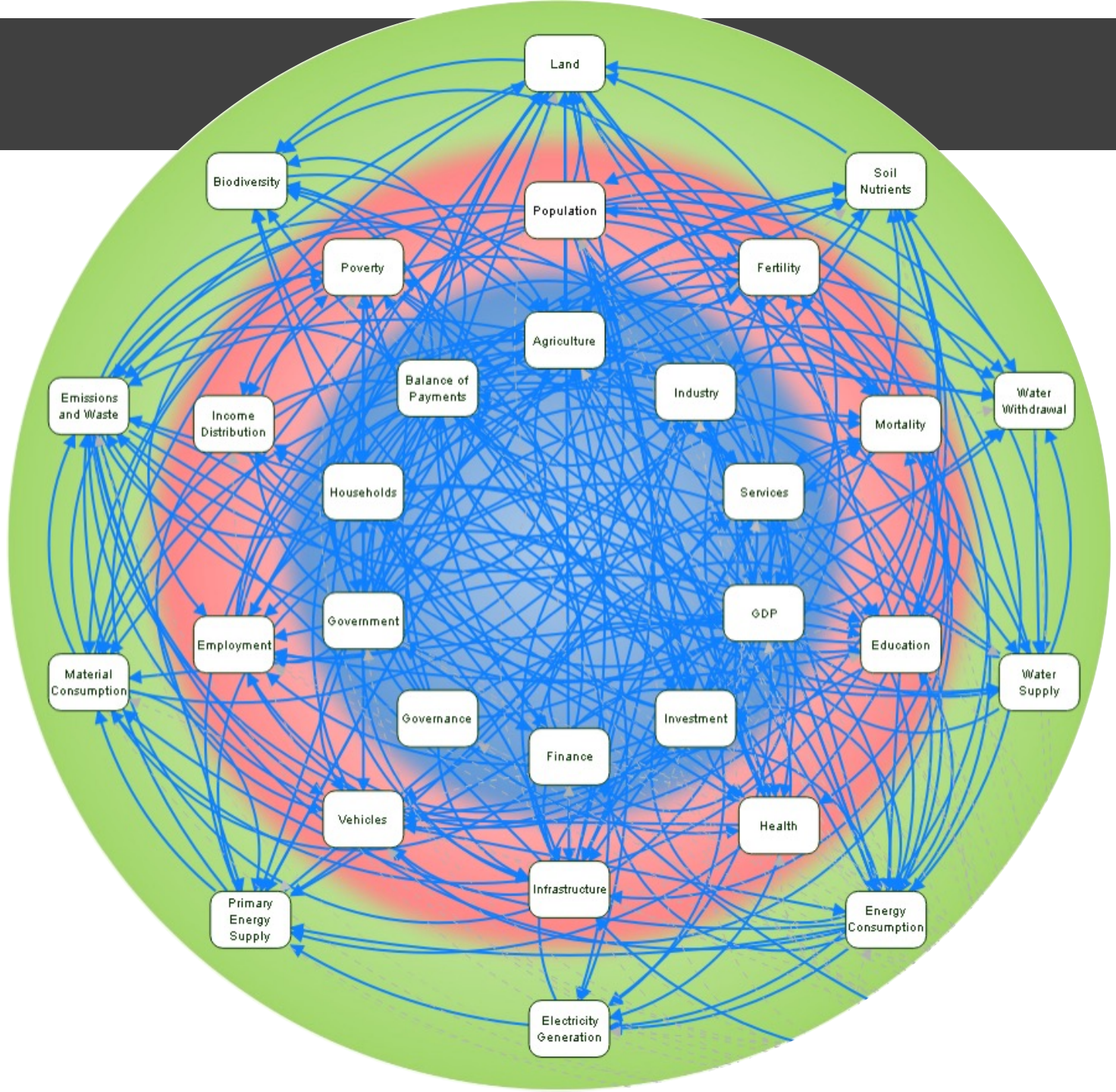
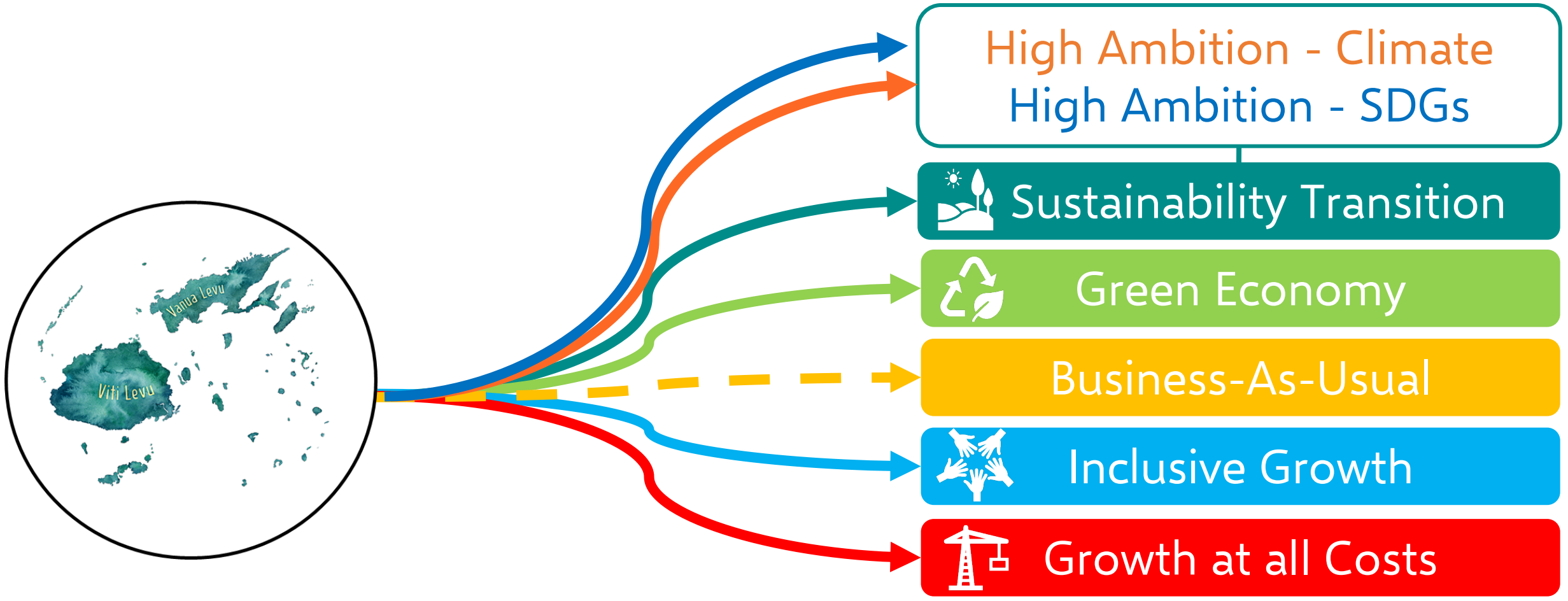
1. THE MODEL

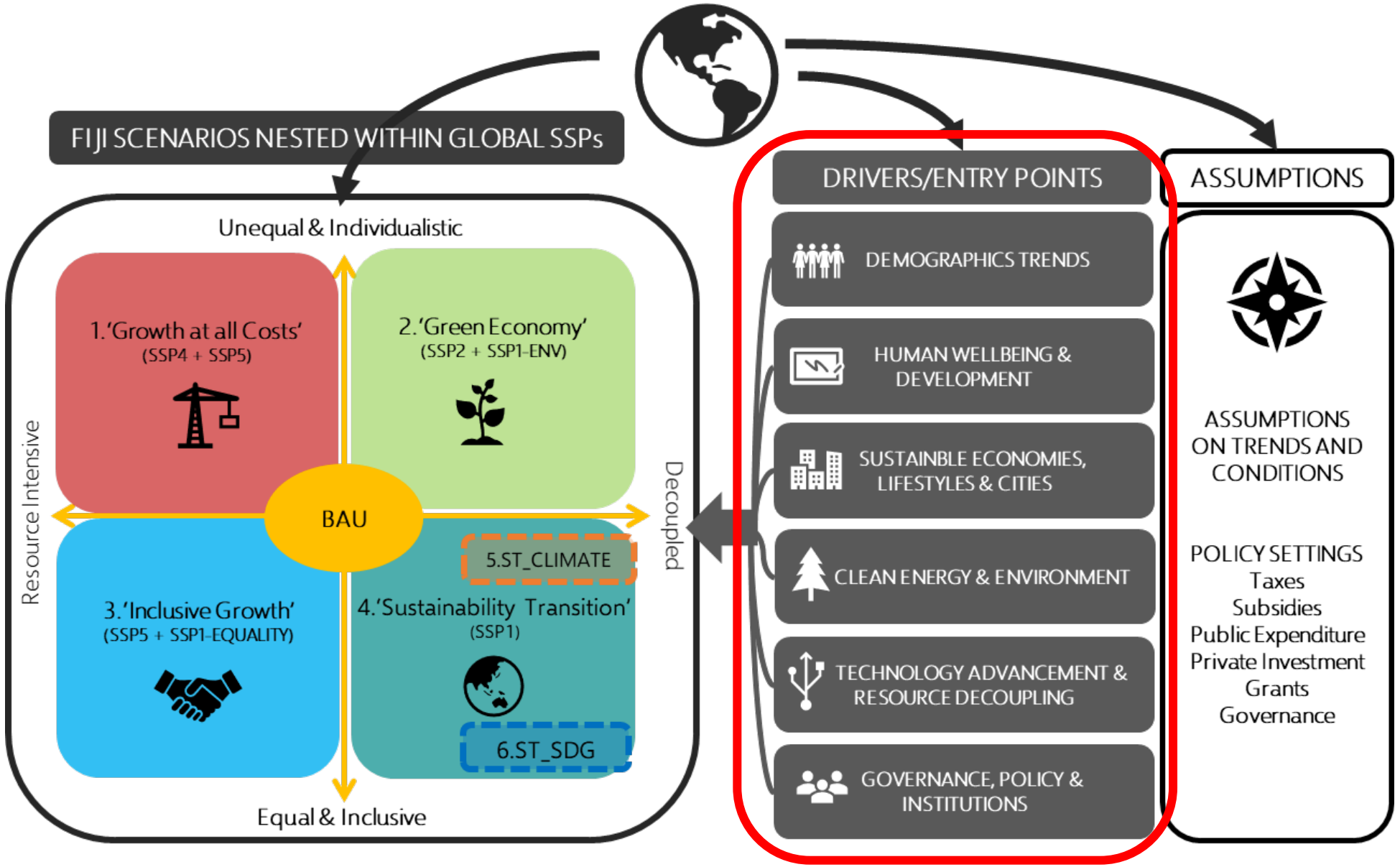
- ✓ *iSDG* integrated simulation model – Millennium Institute
- ✓ System dynamics language
- ✓ 30 sectors; 17 SDGs
- ✓ 3000+variables
- ✓ Flexible, modular & transparent structure – adaptable
- ✓ Calibrated on 25+ years of data
- ✓ Investment-driven – tax, subsidy, investment, policy settings



2. THE SCENARIOS



Scenario Entry Points – Sustainability Transformations



Entry Points & Interventions

DRIVERS/ENTRY POINTS

- DEMOGRAPHICS TRENDS
- HUMAN WELLBEING & DEVELOPMENT
- SUSTAINBLE ECONOMIES, LIFESTYLES & CITIES
- CLEAN ENERGY & ENVIRONMENT
- TECHNOLOGY ADVANCEMENT & RESOURCE DECOUPLING
- GOVERNANCE, POLICY & INSTITUTIONS

Human Wellbeing and Development:

- Expenditure on education and access to healthcare and basic services
- Social subsidies and transfers
- Gender equality targets

Entry Points & Interventions

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<u>Sustainable economies, lifestyles and cities</u>

- Tax burden on consumption, income & profits and trade
- Investment in sustainable infrastructure, transport, buildings, industry
- Expenditure on climate change adaptation

Entry Points & Interventions

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<u>Clean energy and environment / Resource Decoupling</u>

- Investment in solar, wind, hydro, biomass energy
- Investment in energy efficiency (household, industry, vehicles)
- Electrification of buildings and transport
- Investment in reforestation, sustainable ag, marine and terrestrial protected areas
- Material and resource efficiency targets

Entry Points & Interventions

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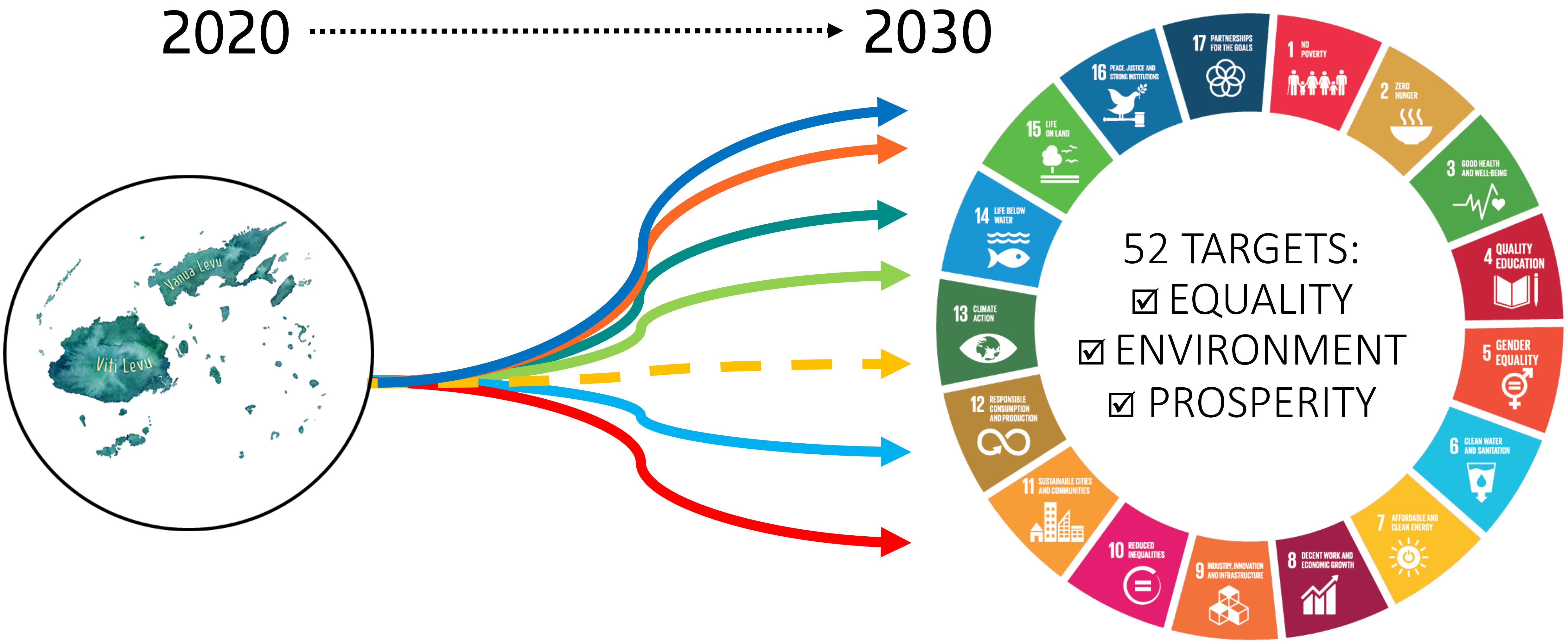
- GOVERNANCE, POLICY & INSTITUTIONS

<u>Governance and Institutions:</u>

- Government effectiveness
- Regulatory quality
- Control of corruption
- Political stability
- Voice and accountability

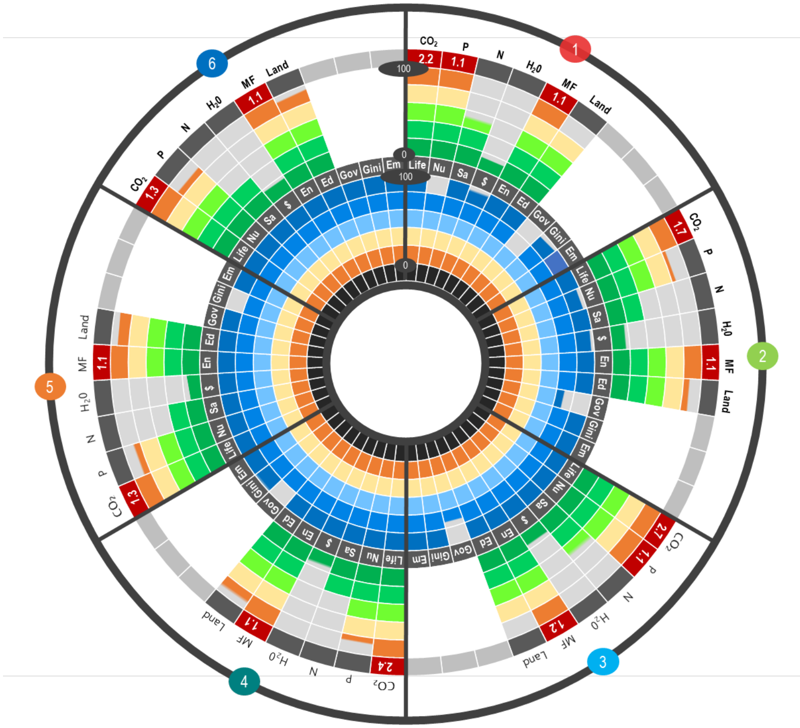
3. SDGs TARGETS



4. SJS THRESHOLDS

2020 → 2050

‘Safe and Just Space (SJS) Framework’
- 6 Biophysical Boundaries
- 9 Social Thresholds



Total SDG Progress:

1 34%

2 57%

3 51%

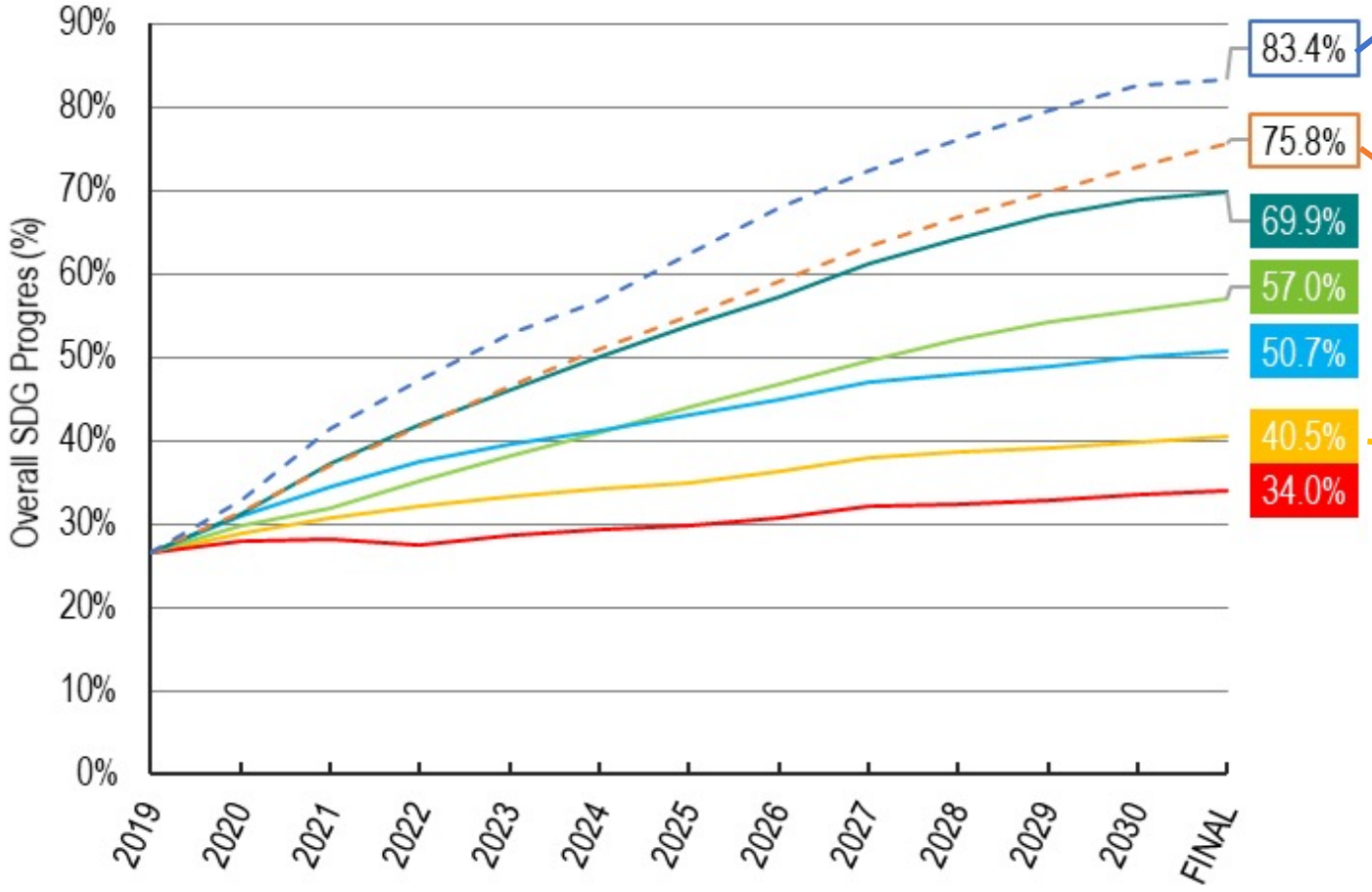
4 70%

Total SDG Progress:

5 76%

6 83%

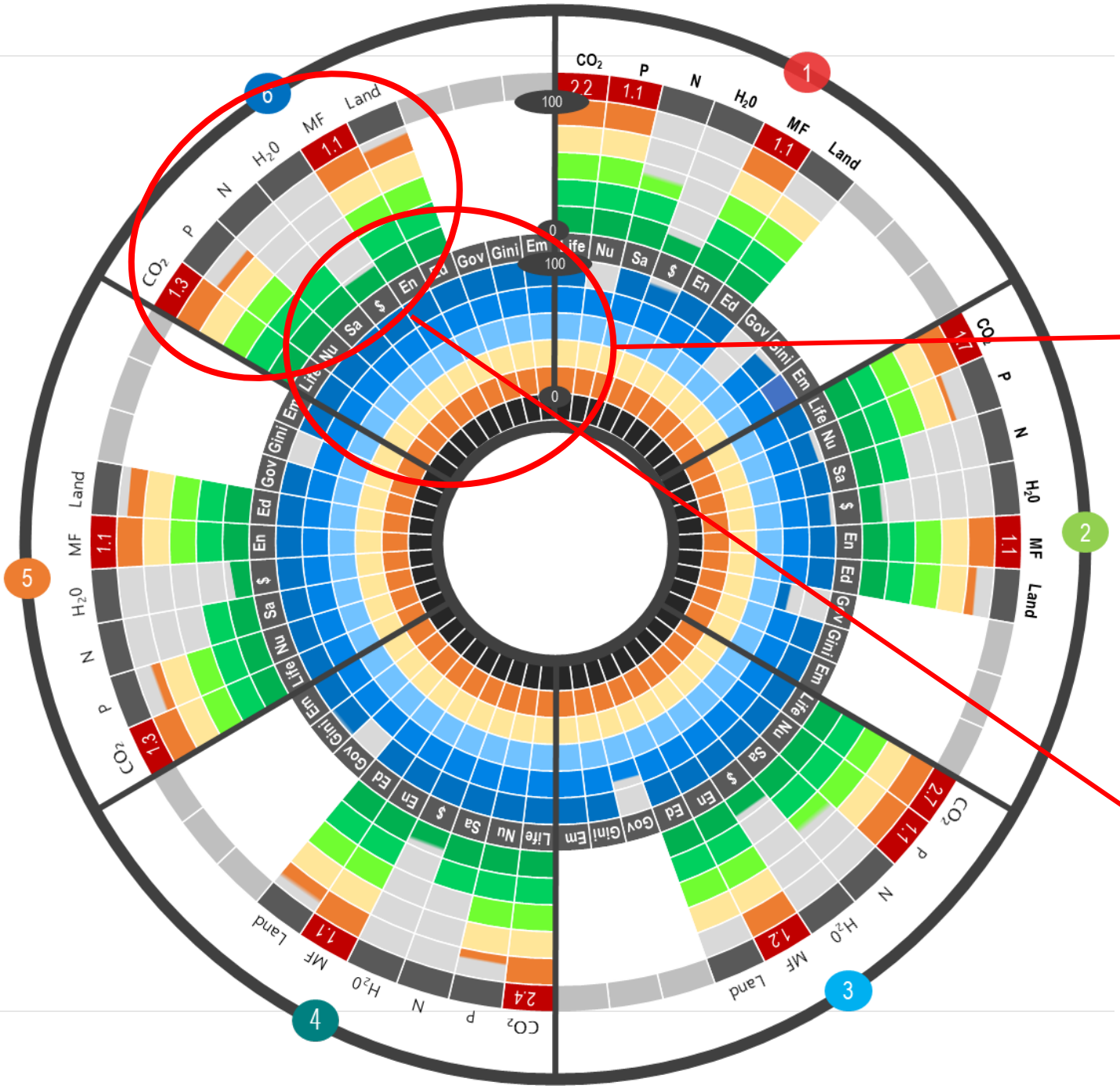
Overall progress on SDGs by 2030



6
SDG Transform 83%

5
Climate Action 76%

BAU 41%



SJS Framework - SDGs Transformation Scenario:

Social Thresholds:

- ✓ Life Expectancy
- ✓ Malnutrition
- ✓ Sanitation
- ✓ Poverty
- ✓ Electricity
- ✓ Education
- ✓ Governance
- ✓ Equality
- ✓ Employment

Biophysical Boundaries

- ✓ Phosphorus
- ✓ Nitrogen
- ✓ Water
- ✓ Land
- × Material Footprint (10% over)
- × CO2 Emissions (30% over)

Insights and issues explored in the paper:

- Key transformations needed to achieve the SDGs within PBs
- Scale and pace of change needed
- Investment requirements - $, % GDP

- Where are the remaining trade-offs?
- What can be done to address these?
- Is it feasible to achieve the SDGs?
- Do the SDGs enable long-term sustainability?

Some Trade-Offs Remain…

- Increasing industrial output and jobs (Goals 8 and 9) while reducing material consumption (Goal 12 and 8);
- Increasing agricultural output and nutrition (Goals 2 and 8) while ensuring sustainable fish stocks (Goal 14) and water (Goal 6);
- Raising revenue while reducing tax burden (Goal 17);
- Increasing incomes and consumption (Goal 8) while reducing non-communicable diseases (Goal 3); and
- Increasing overall SDG expenditure while reducing public debt (Goal 17)

Future Research Directions

- More in-depth modelling of sustainability transitions in key sectors for climate action – transport, energy, industry, built environment, food systems – and broader feedbacks
- SJS Framework – integration with input-output models; consumption-based approach; footprint indicators
- Spatial dynamics – multiple scales, national/local
- Inter-industry dynamics – job losses; just transitions
- Governance of transformations – vested interests; winners and losers; resistance and inertia;
- New ‘transformative paradigms’ – post-growth, degrowth