THE FUTURE
IS NOW

SCIENCE FOR ACHIEVING
SUSTAINABLE DEVELOPMENT

GLOBAL SUSTAINABLE
DEVELOPMENT REPORT 2019

1. A decisive decade ahead

Sounding the alarm bell:

The need to scale-up and accelerate implementation

Business-as-usual approaches

GOAL	WITHIN 5%	5–10%	>10%	NEGATIVE LONG-TERM TREND
Goal 1		1.1. Eradicating extreme poverty	1.3. Social protection for all	
Goal 2		2.1. Ending hunger (undernourishment)	2.2. Ending malnutrition (stunting) 2.5. Maintaining genetic diversity 2.a. Investment in agriculture*	2.2. Ending malnutrition (overweight)
Goal 3	3.2. Under 5 mortality 3.2. Neonatal mortality		3.1. Maternal mortality 3.4. Premature deaths from non-communicable diseases	
Goal 4	4.1 Enrolment in primary education	4.6 Literacy among youth and adults	4.2. Early childhood development 4.1 Enrolment in secondary education 4.3 Enrolment in tertiary education	
Goal 5			5.5. Women political participation	
Goal 6		6.2. Access to safe sanitation (open defecation practices)	6.1. Access to safely managed drinking water 6.2. Access to safely managed sanitation services	
Goal 7		7.1. Access to electricity	7.2. Share of renewable energy* 7.3. Energy intensity	
Goal 8			8.7. Use of child labour	
Goal 9		9.5. Enhancing scientific research (R&D expenditure)	9.5. Enhancing scientific research (number of researchers)	
Goal 10			10.c. Remittance costs	Inequality in income**
Goal 11			11.1. Urban population living in slums*	
Goal 12				12.2. Absolute material footprint, and DMC*
Goal 13				Global GHG emissions relative to Paris targets**
Goal 14				14.1. Continued deterioration of coastal waters* 14.4. Overfishing*
Goal 15				15.5. Biodiversity loss* 15.7. Wildlife poaching and trafficking*
Goal 16			16.9 universal birth registration *	

* target not specified   ** based on most recently available data

Understanding the systemic challenges

Raising inequalities
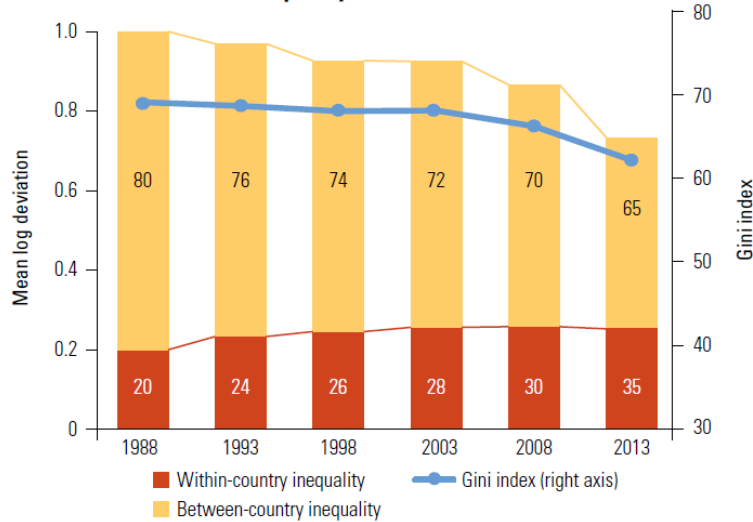
World Bank, 2016

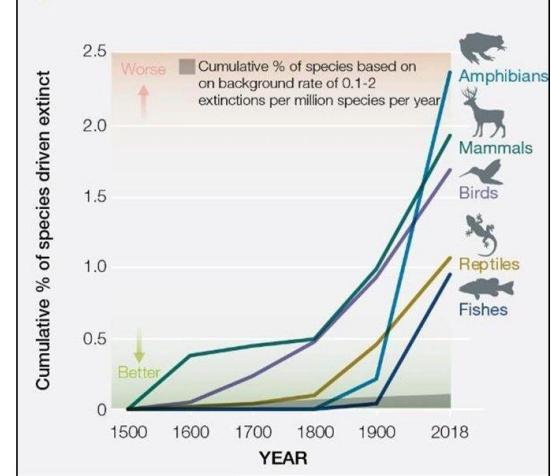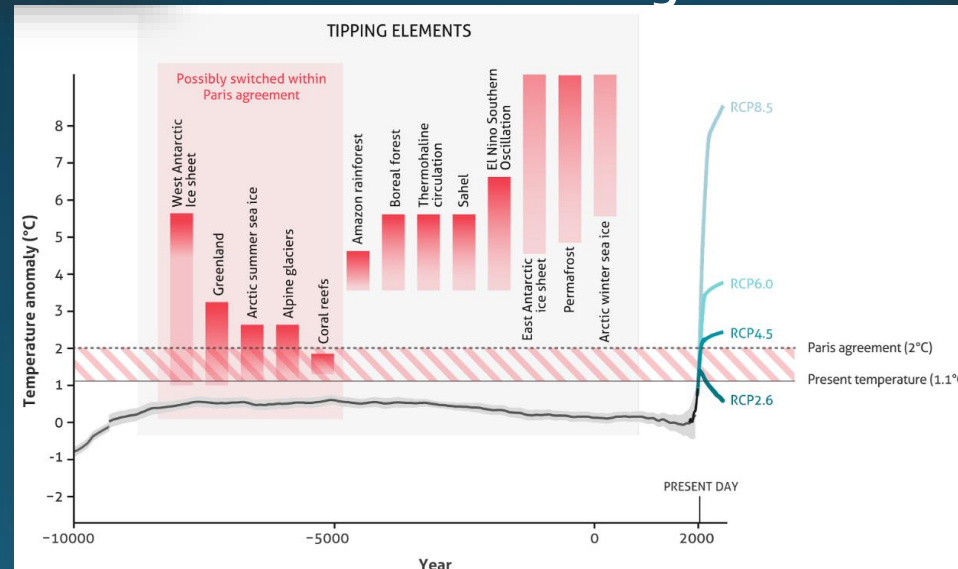## Biodiversity loss

Figure 3 (B) - Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

IPBES, 2019

Climate change

Future Earth, 2017, based on Schellnhuber et al. 2016

2. Knowledge-based transformations
Insight (a): From boxes to arrows – a systems perspective

Moving forward:

➢ *address trade-offs*

➢ *harness co-benefits*

➢ *turn vicious- into virtuous cycles*

SDG-level interactions

| SDGs | Targets | Interaction Details | References |

From SDG   To SDG

Trade-offs
Co-benefits

GEO-6 Regional Assessment for Asia and the Pacific

UNEP. 2016. (p. xvii)

2.3 → 15.5
ICSU Score -1: Constraining

🌐 Asia and the Pacific

Ecosystems integrity and biodiversity are threatened throughout the region due to extensive agriculture, oil palm and rubber plantations, aquaculture and illegal wildlife trade

Summary for policymakers of the global assessment report on biodiversity and ecosystem services

IPBES. 2019 (p. 8)

2.3 → 15.5
ICSU Score -2: Counteracting

Furthermore, increases in the production of some of nature's contributions are linked to declines in others [...], which also affects people differently [...]. For example, clearing of forest for conventional agriculture has increased the provision of food and feed (NCP 12) and other materials important for people (such as natural fibres, timber and ornamental flowers: NCP 13) but has reduced contributions as diverse as pollination (NCP 2), climate regulation (NCP 4), water quality regulation (NCP 7), opportunities for learning and inspiration (NCP 15) and the maintenance of options for the future (NCP 18).

Chapter 5: Sustainable Development, Poverty Eradication and Reducing Inequalities. In: Global Warming of 1.5°C

IPCC. 2018. (p. 501)

2.3 → 15.5
ICSU Score +1: Enabling

Land-based Greenhouse Gas Reduction and Soil Carbon Sequestration & Conservation of Biodiversity and Restoration of Land (15.1/15.5/15.9): Agricultural intensification can promote conservation of biological diversity by reducing deforestation, and by rehabilitation and restoration of biodiverse communities on previously developed farm or pasture land. However, planting monocultures on biodiversity hot spots can have adverse side-effects, reducing biodiversity. Genetically modified crops reduce demand for cultivated land. Adaptation of integrated landscape approaches can provide various ecosystem services. CSA enrich linkages across sectors including management of land and bioresources. Land sparing has the potential to be beneficial for biodiversity, including for many species of conservation concern, but benefits will depend strongly on the use of spared land. In addition, high yield farming involves trade-offs and is likely to be detrimental for wild species associated with farm land (Lamb et al., 2016).

Further material: *Iybbert and Sumner, 2010; Behnassi et al., 2014; Harvey et al., 2014; IPCC, 2014; Lamb et al., 2016)*

https://datablog.cde.unibe.ch/index.php/2019/08/29/sdg-interactions/

2. Knowledge-based transformations
Systemic entry points

ENTRY POINTS FOR TRANSFORMATION

| Human wellbeing and capabilities | Sustainable and just economies | Energy decarbonisation and access | Food systems and nutrition patterns | Urban and peri-urban development | Global environmental commons |

Insight (b): Levers for change in a hyper-connected world
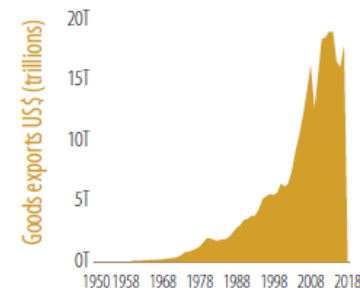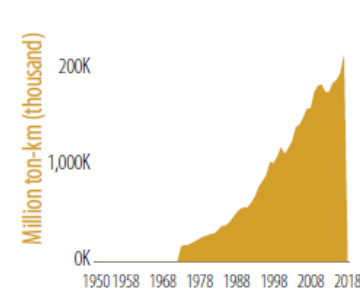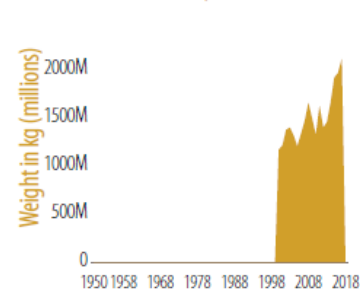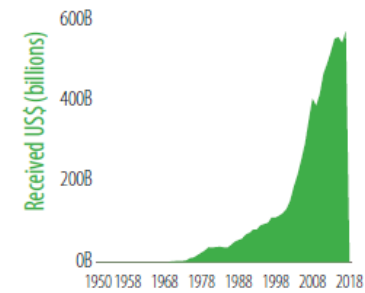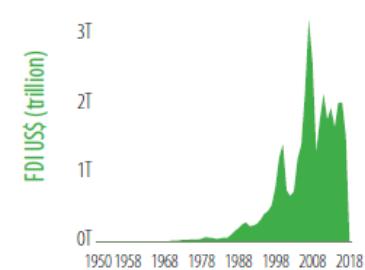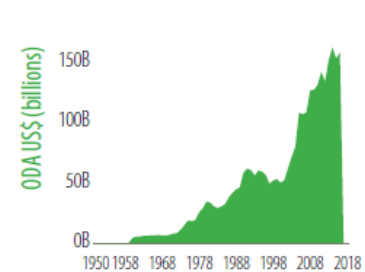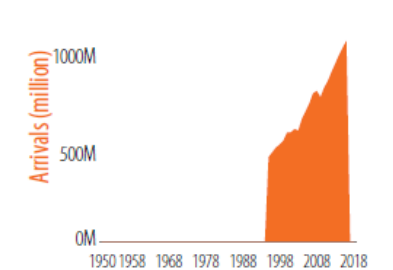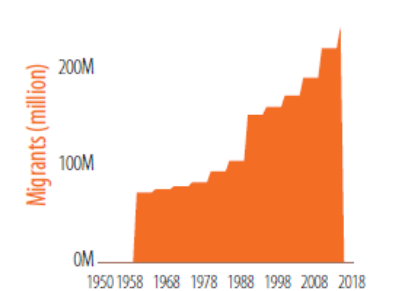
2. Knowledge-based transformations
Innovation through combined levers and new partnerships

ENTRY POINTS FOR TRANSFORMATION

LEVERS	Human wellbeing and capabilities	Sustainable and just economies	Energy decarbonisation and access	Food systems and nutrition patterns	Urban and peri-urban development	Global environmental commons
Governance						
Economy and Finance						
Individual and Collective Action						
Science and Technology						
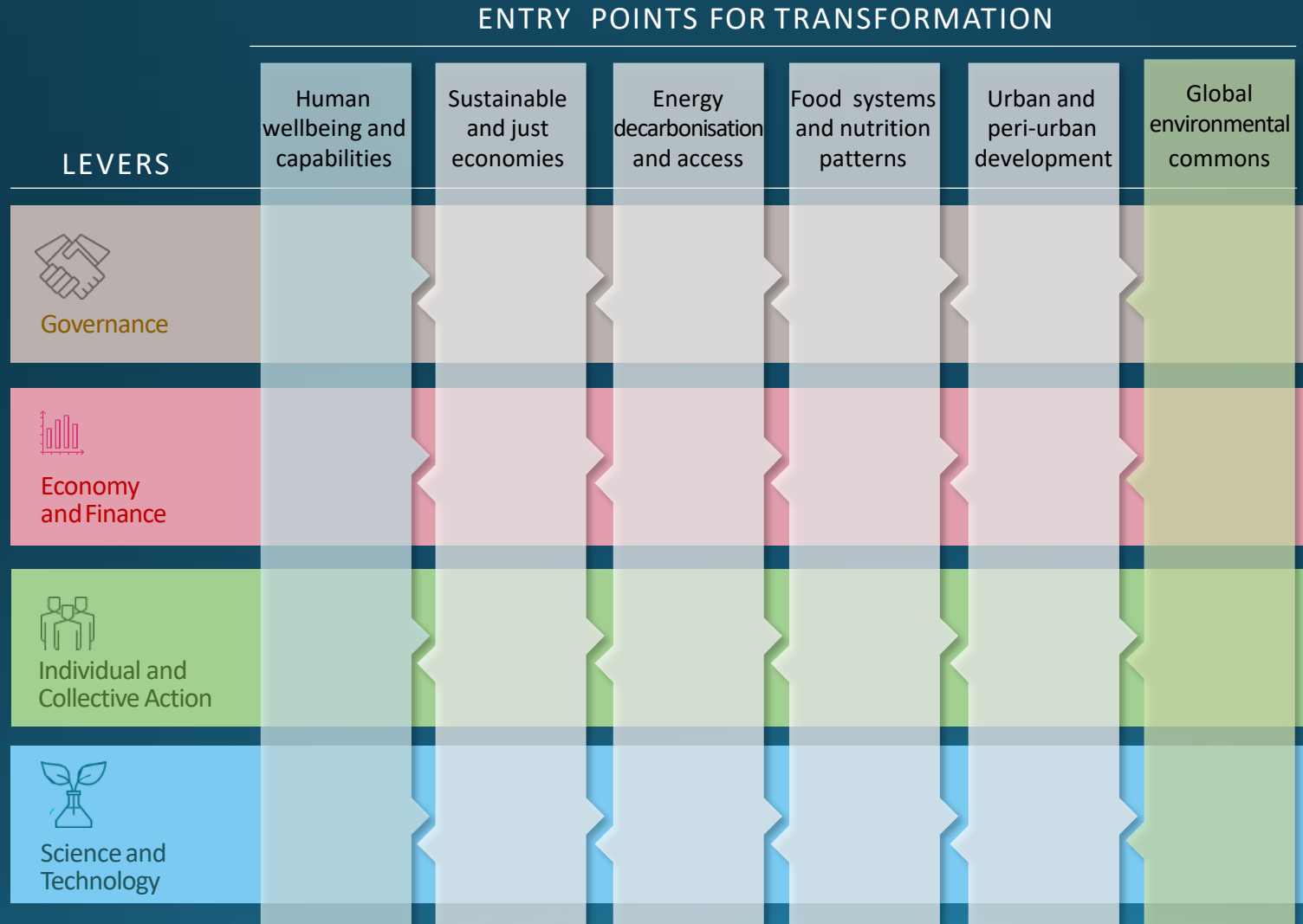
Insight (c): Context and universality matter!

Striking the balance: no country is meeting basic human goals within biophysical boundaries

O'Neill et al. 2018
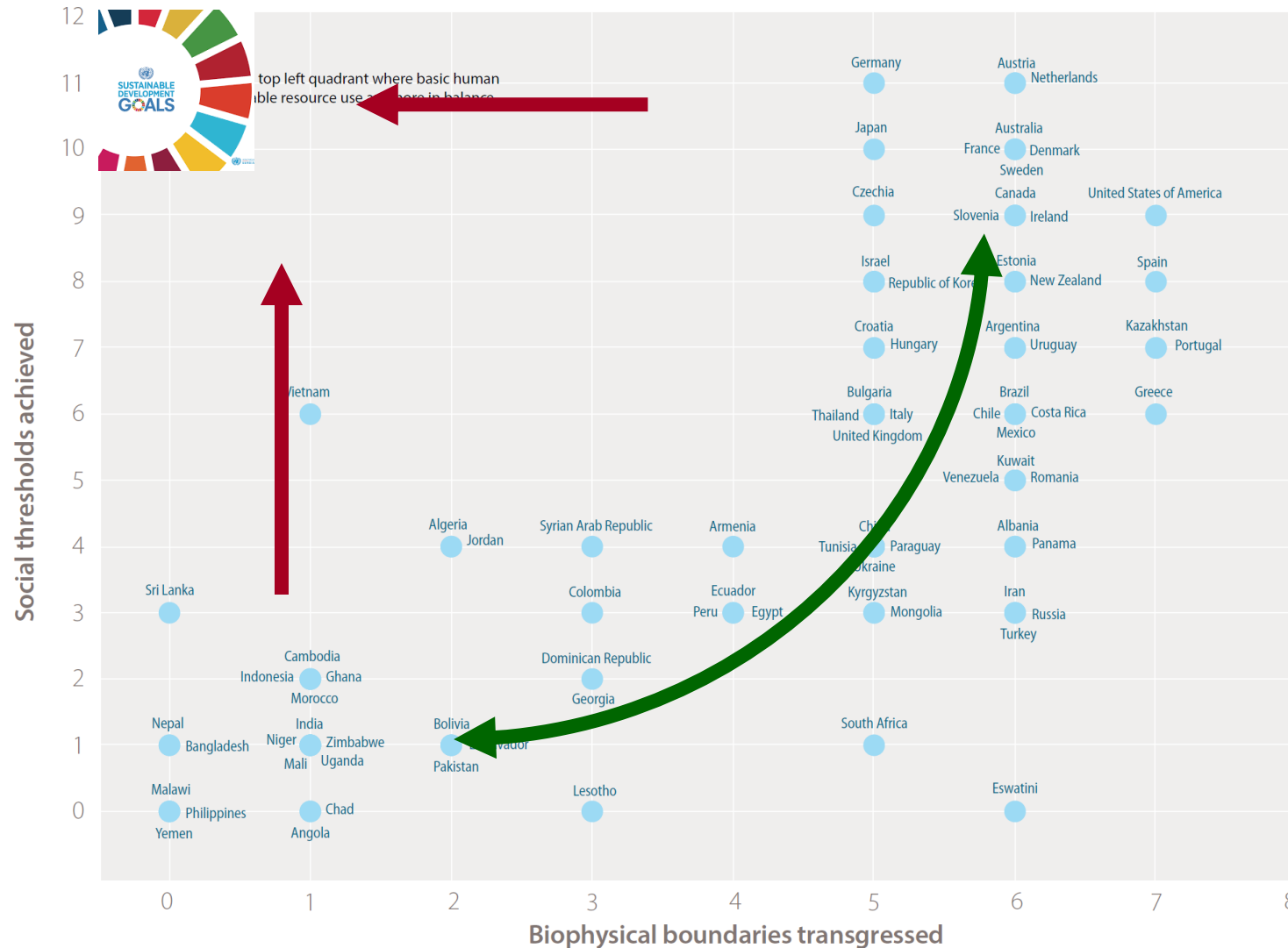
2. Knowledge-based transformations

Context-specific pathways to transformation for sustainability

ENTRY POINTS FOR TRANSFORMATION

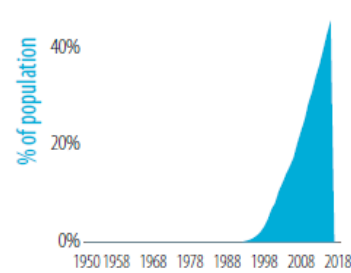| LEVERS	Human wellbeing and capabilities	Sustainable and just economies	Energy decarbonisation and access	Food systems and nutrition patterns	Urban and peri-urban development	Global environmental commons
Governance						
Economy and Finance						
Individual and Collective Action						
Science and Technology						
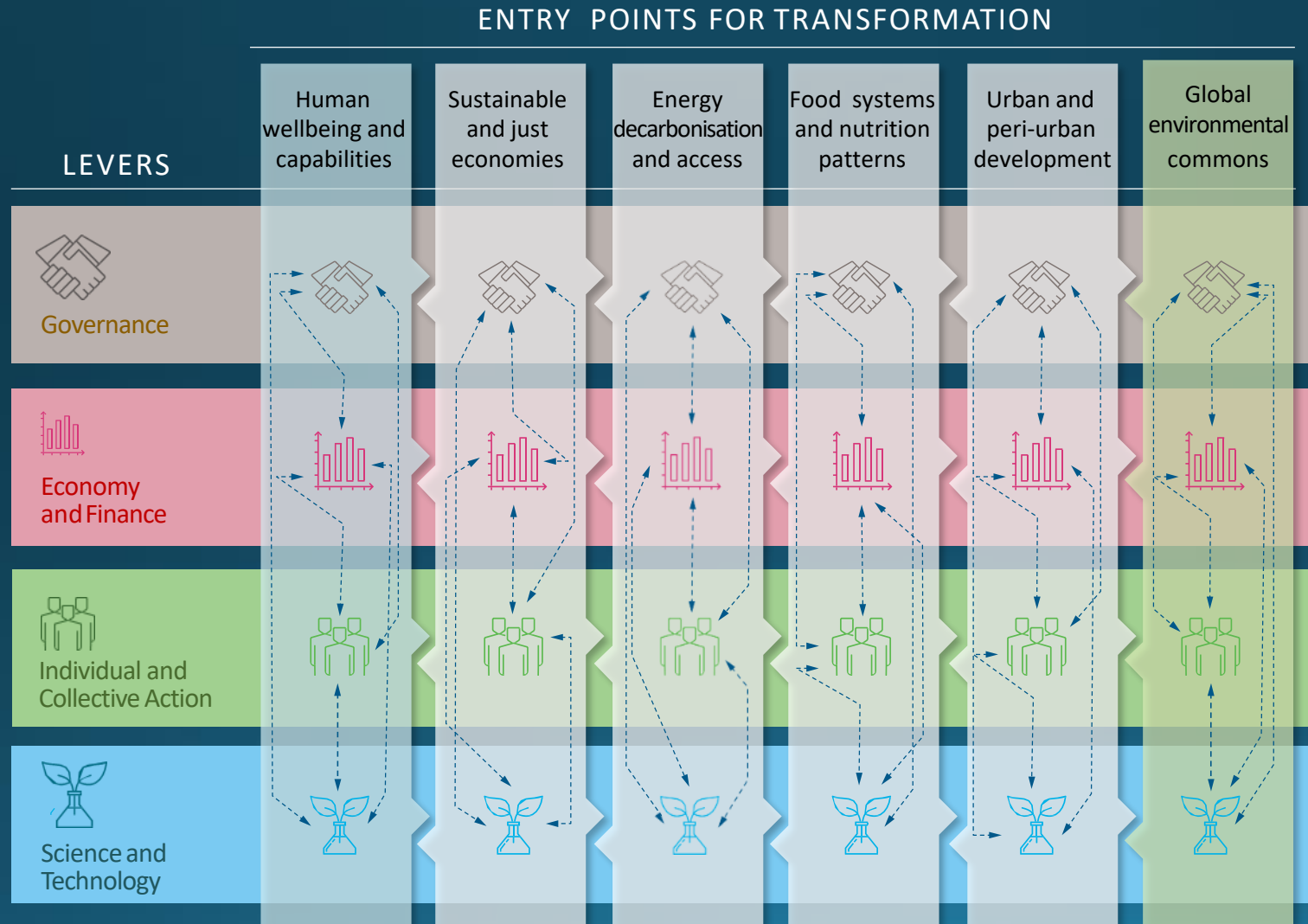
Each entry point:
- ✓ Impediments
- ✓ Levers
- ✓ Integrated and context-specific pathways
- ✓ Call to Action

Pathways to Transformation as context-specific configurations of levers to achieve transformation in each entry point

Building sustainable food systems and nutrition patterns

Pathways

Food systems and nutrition patterns

Levers

- Social protection floors
- Integrating social & env. externalities
- Governing value and supply chains

- Insurances against shocks
- Improved trade agreements
- Market access

- Reducing food waste
- Changing dietary habits

- Lower environmental impacts
- Access to information and data
- Infrastructure and transportation

Photo Credit: Xun Wang and Xin Zhang, University of Maryland

3. The role of science in knowledge-based transformations to sustainable development

Sustainable development challenges

Chaos
Unknowable and non-negotiable: denial, avoidance, demagoguery, violence

Wicked
Contested knowledge gaps: Scientific and societal actors jointly define problems and co-produce knowledge and solutions guided by equity

Complicated
Contested facts: Communication, awareness building, mobilization, and Knowledge diplomacy

Simple
Uncontested facts: cause-effect relations, rational decision- and policy making, project planning

Complex
Uncontested knowledge gaps: expertise, systemic analysis, modelling, scenario building

Socio-political agreement (low → high)
Factual certainty (high → low)

Examples

Chaos
• Ecological tipping points
• Fundamentalism
• ..

Wicked
• Inclusive energy transitions and decarbonisation
• Sustainable food systems
• Equitable trade and investment flows
• Fighting corruption
• …

Complicated
• Carbon taxation
• Redistribution of wealth and income
• Role of nuclear energy
• …

Simple
• Recycling
• Mosquito nets against malaria
• Communication technology
• …

Complex
• Promoting eco-friendly farming
• Maintaining social cohesion
• Ensuring equal opportunities
• …

Socio-political agreement (low → high)
Factual certainty (high → low)

Messerli und Bieri, 2018

Call to Action (1/3):
Harness existing knowledge for accelerated SDG implementation
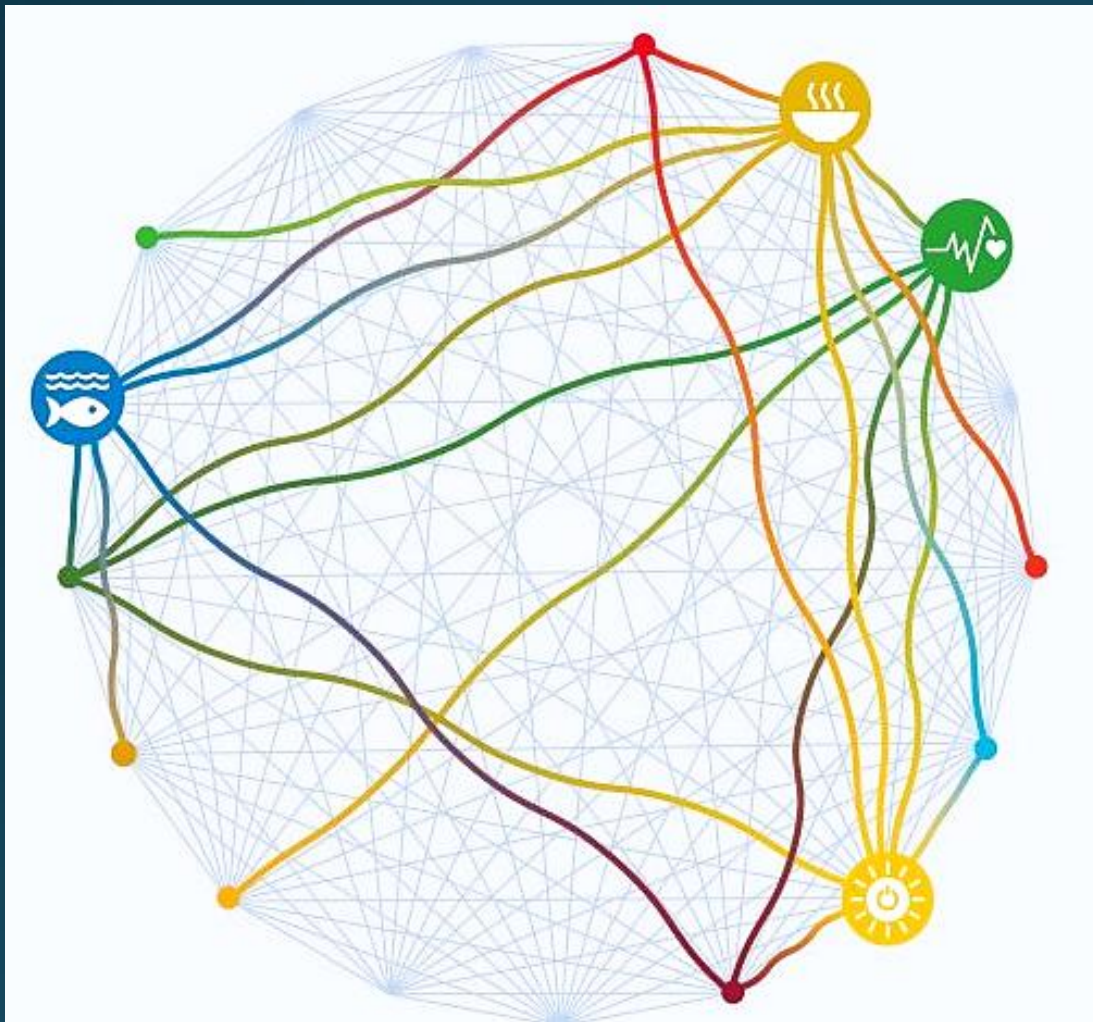
1. Continued support for international <u>scientific assessments and synthesis</u> and their increased coherence

2. <u>Open access</u> to scientific publications

3. Sustainable <u>development councils</u> and <u>knowledge diplomacy</u>

4. Support <u>novel partnership</u> of science (public-private-civil society) and building of competencies

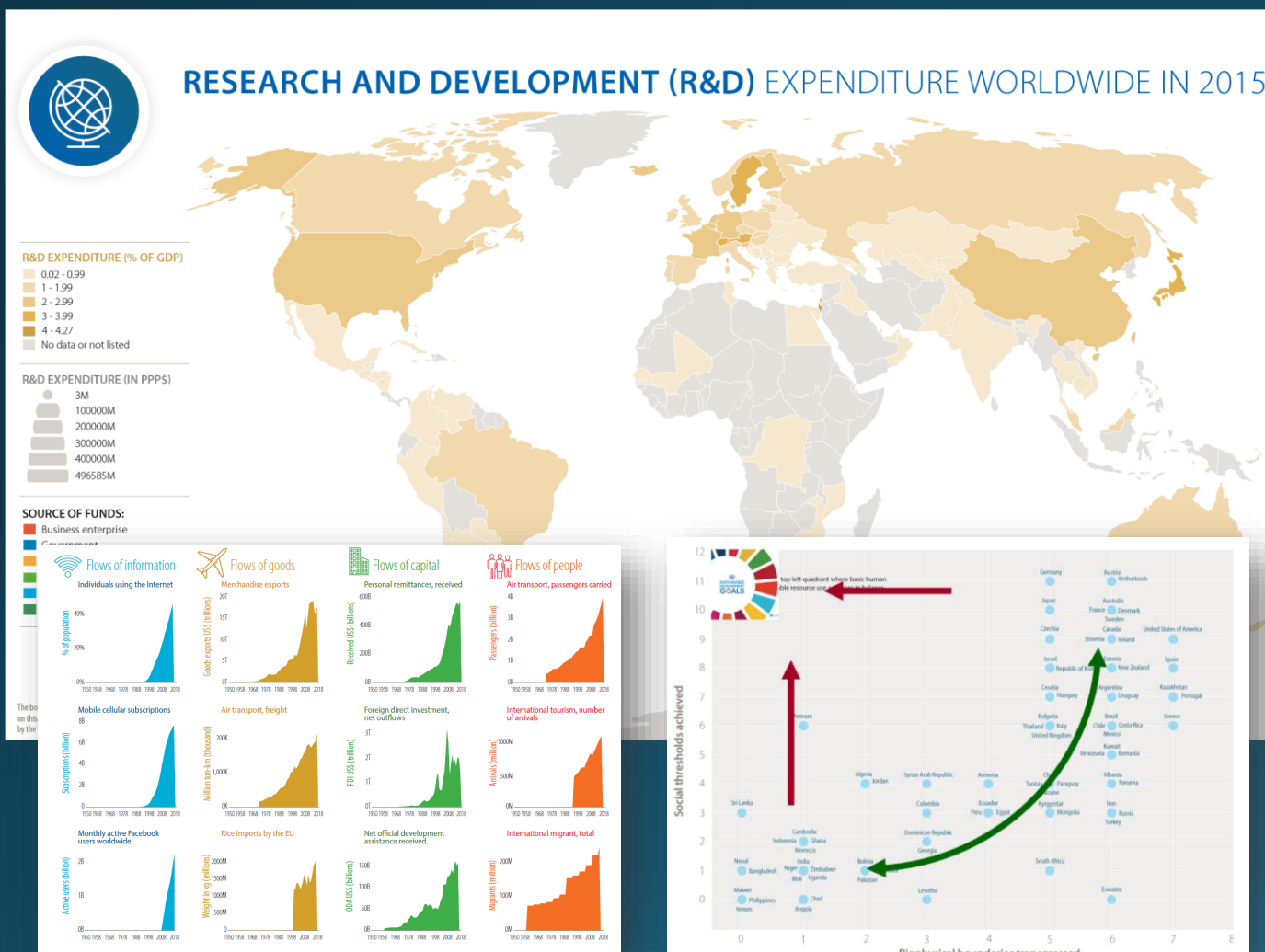## *Boosting scientific knowledge in low and middle income countries*
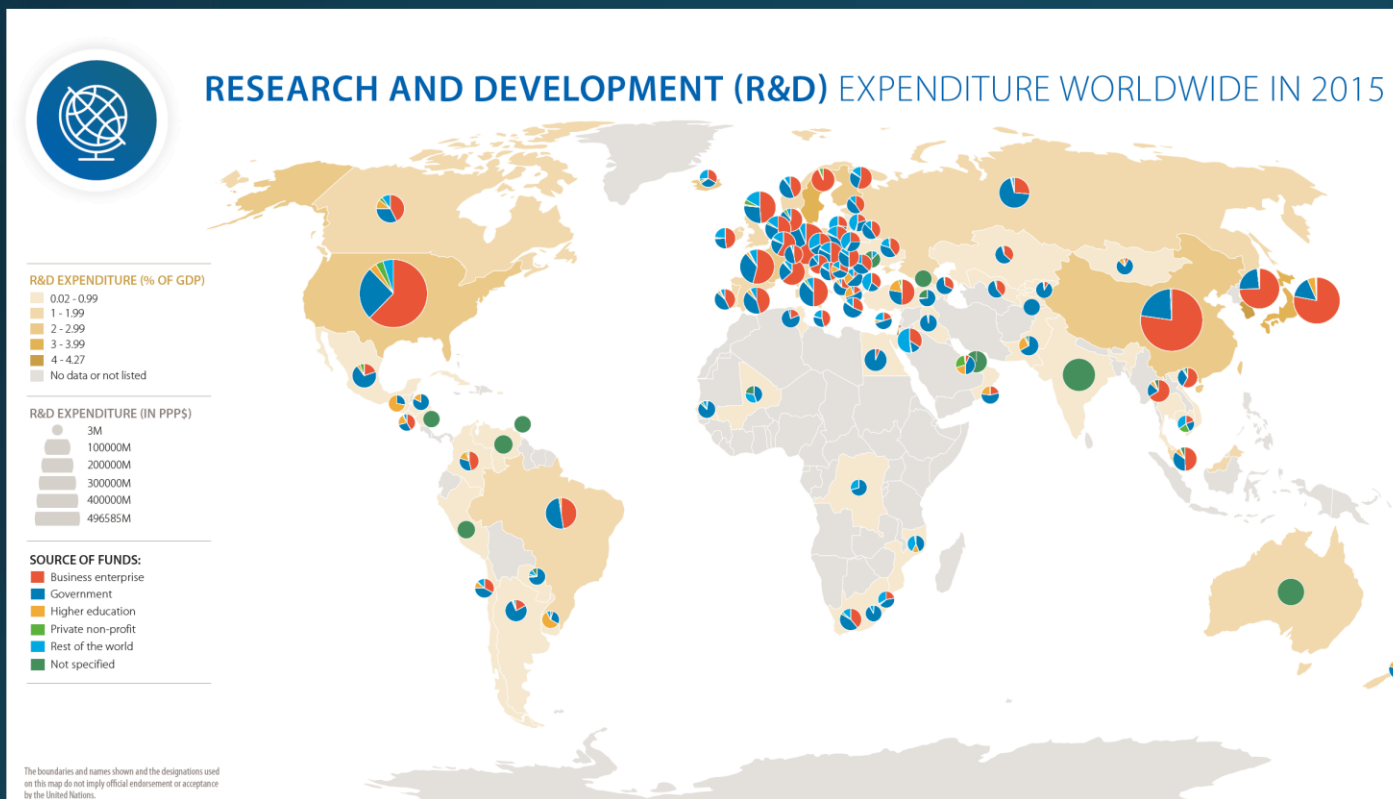
1. Build open-access SDG knowledge and technology platforms to design, monitor, and evaluate transformations to SD

2. Harnessing and boosting scientific capacities through North-South and South-South transboundary research partnerships

3. Support curricula and education in sustainable development

4. Build national and regional scientific funding institutions

Call to Action (3/3):
A 'moon-shot' mission for Sustainability Science

RESEARCH AND DEVELOPMENT (R&D) EXPENDITURE WORLDWIDE IN 2015

R&D EXPENDITURE (% OF GDP)
- 0.02 - 0.99
- 1 - 1.99
- 2 - 2.99
- 3 - 3.99
- 4 - 4.27
- No data or not listed

R&D EXPENDITURE (IN PPP$)
- 3M
- 100000M
- 200000M
- 300000M
- 400000M
- 496585M

SOURCE OF FUNDS:
- Business enterprise
- Government
- Higher education
- Private non-profit
- Rest of the world
- Not specified

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

1. Rapid increase of <u>mission-oriented research</u> guided by the 2030 Agenda

2. Scientific <u>assessment of existing transformation knowledge</u> including non-academic sources

3. Adapt funding schemes to <u>programme structures</u> supporting inter- and transdisciplinary research

4. Expand <u>incentive- and evaluation schemes</u>

5. Create <u>experimental spaces and transformation labs</u> for next generation science-policy interfaces