

Argument for TransitionScaping Hub

Professor Susan Krumdieck, MNZM
Energy Systems Transition Engineering
Heriot-Watt University
Islands Centre for Net Zero
Scotland

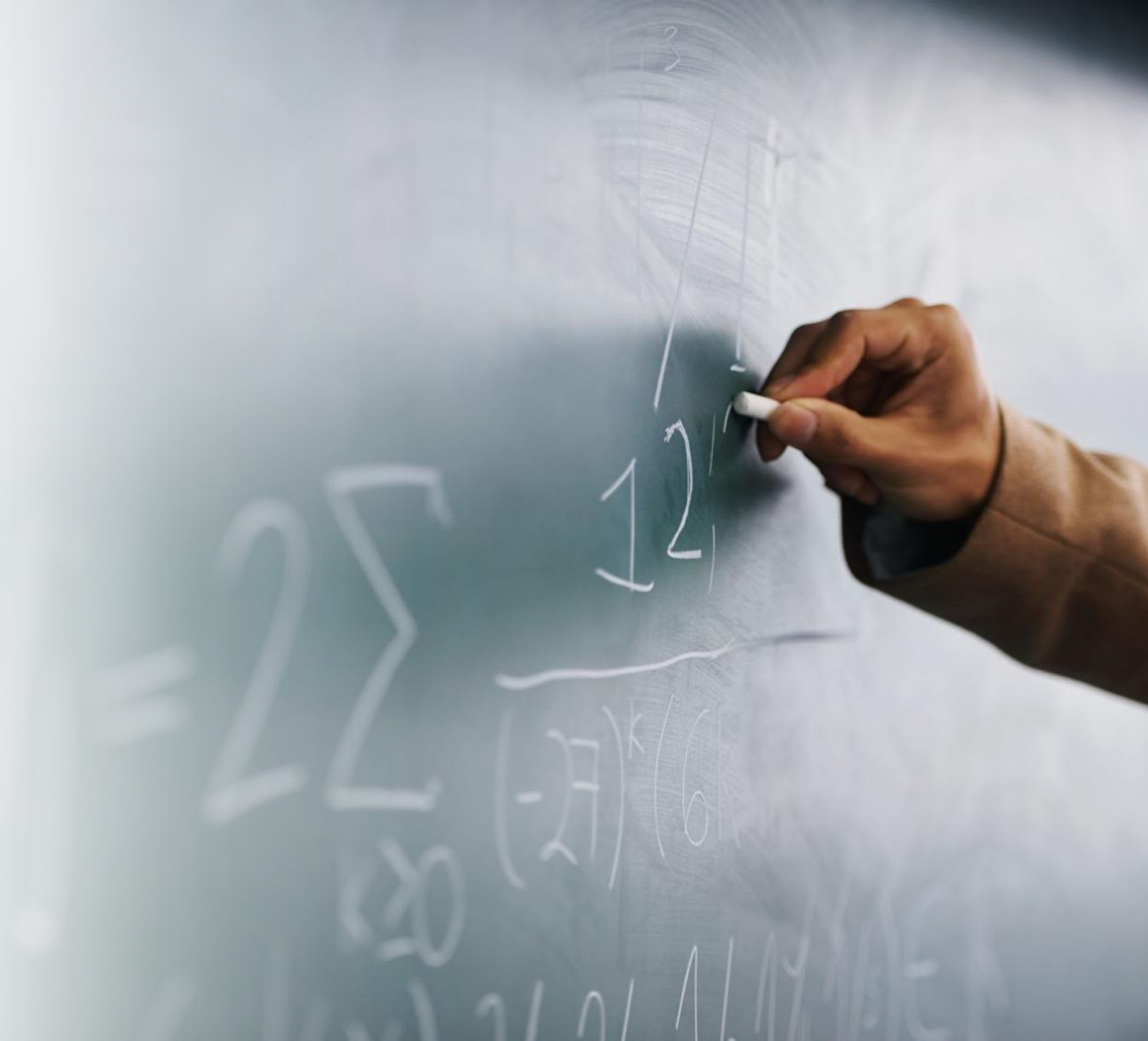
HERIOT



*21 Years in Mechanical Engineering
Energy Transition and Transport*

How about something different?

- One Argument
- One Conclusion
- Fill in with as much evidence as I can pack into the slot.



The Argument

The problem is not about getting people to care for the planet and future generations

The problem is **normalcy**

The Green Tech Solutions and AI innovations are perpetuating the unsustainable normal

Systems Sustainability Transitions create a new normal we can live with



MAXIMUM
800G
tonnes

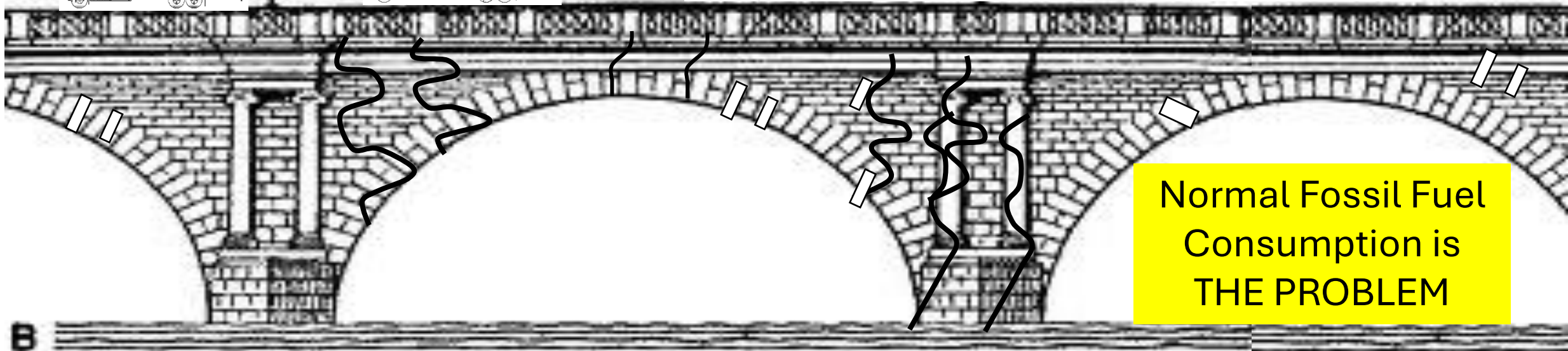
“Carbon Budget” Fossil Carbon Load to Failure

Economically Recoverable Reserves after 2023 @\$60/bl

1430 Gt-C

1800-1960

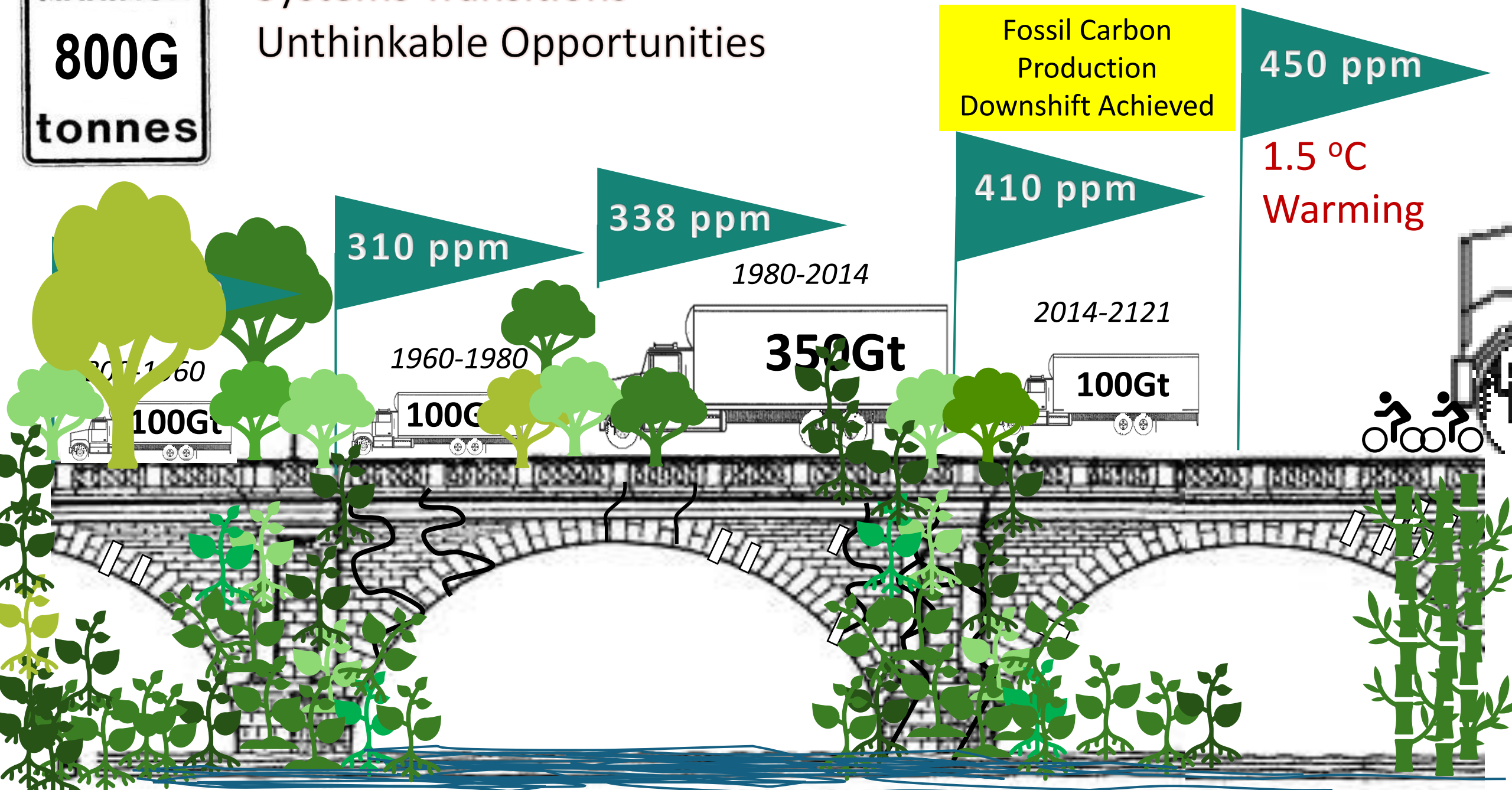
100Gt



Normal Fossil Fuel
Consumption is
THE PROBLEM

MAXIMUM
800G
tonnes

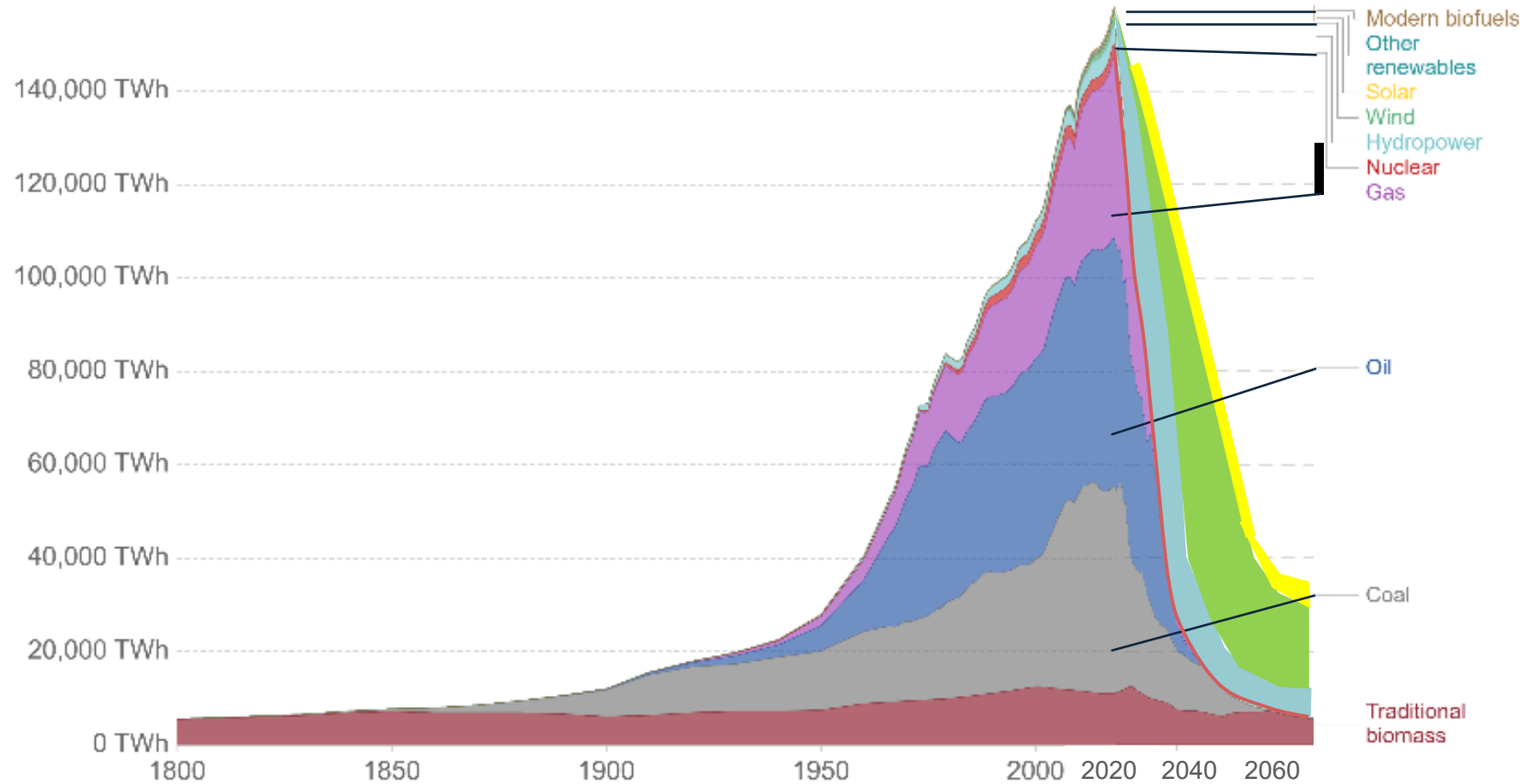
Systems Transitions Unthinkable Opportunities



Global direct primary energy consumption

Direct primary energy consumption does not take account of inefficiencies in fossil fuel production.

Our World
in Data

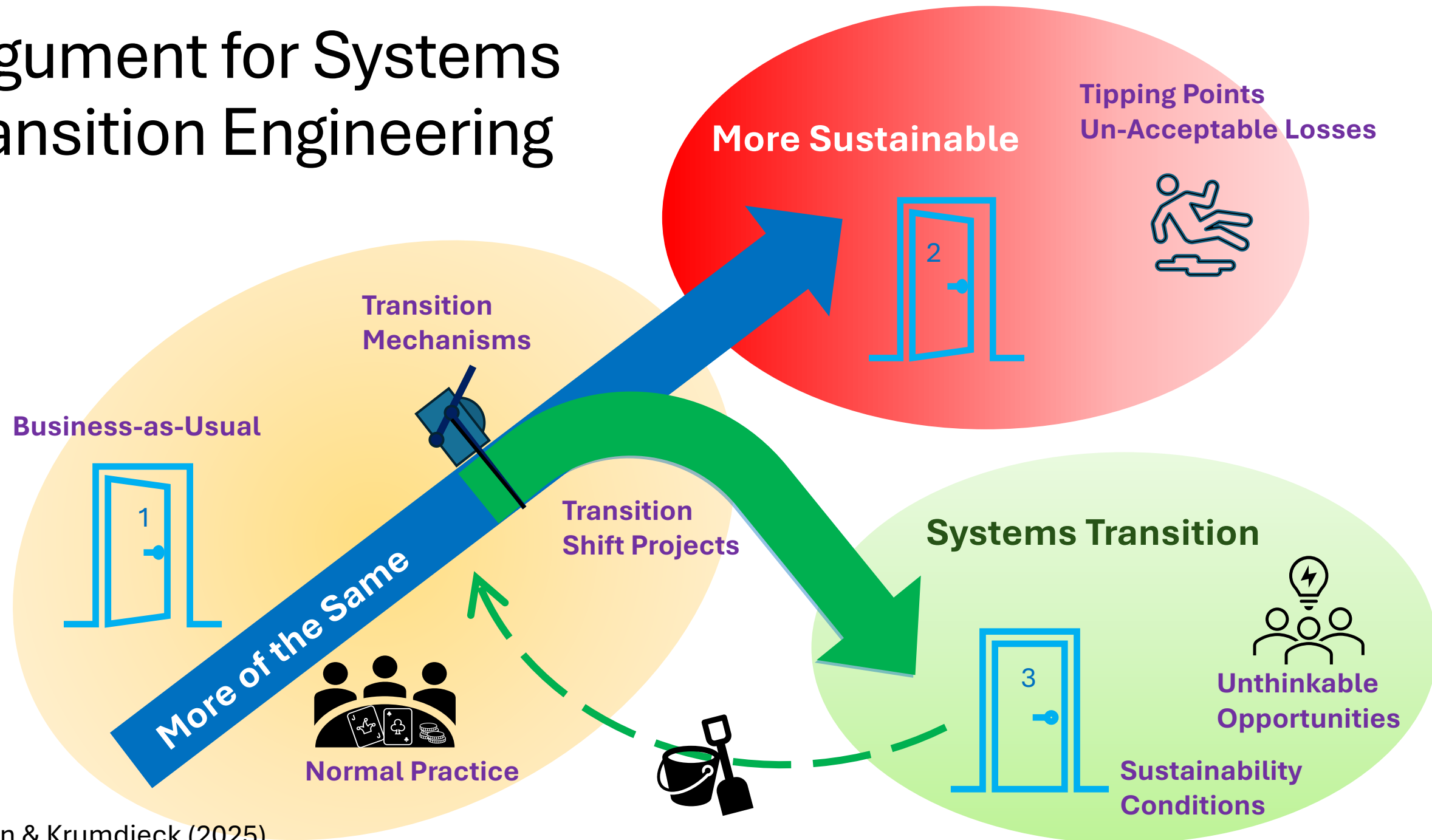


Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

OurWorldInData.org/energy • CC BY



Argument for Systems Transition Engineering





Conclusion

It is time for a Nightingale -
Johns Hopkins moment

Quick History of University Research & Teaching Hospitals

SuperMassive Systems Transition



14th Century
Religious orders set up hospitals to isolate plague victims



18th Century
Scientific ideas, anatomy, and training – but hospitals still “where the poor went to die”



1860
Florence Nightingale cleanliness and sanitation, data analysis
1st Nurse’s training school at a hospital



1889 Johns Hopkins donated \$7M endowment to establish the first University Research & Teaching Hospital “for the good of all who suffer”

Change makers struggled with the powerful men making good money on opium and myths: purging, leaching, dosing with mercury and antimony.... to balance the humours.

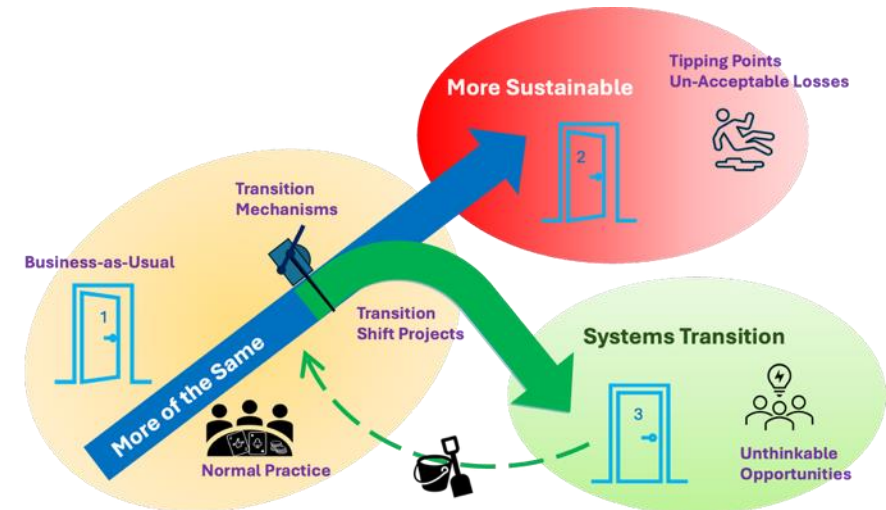
Conclusion: Raise an endowment to establish the first

TransitionScaping Hub

Using the university teaching hospital model for the sustainable re-development of the urban systems for the good of all

Door Number 3

Environment Regeneration
Climate Adaptation
Built Environment Resilience
Travel, Access and Trade Economy
Wellbeing and Livelihood
Governance and Solvency



TransitionScaping Hub

Navigating complex emergent re-development landscapes for the good of all who suffer



Education

*Global Curriculum
Transition Engineering
Undergraduate Casework
CPD Training
MSc Standardisation*



Research

*Real world research on
adaptive change and
emergent re-growth STEPs
Systems Transition
Engineering Processes*



Services

*New ways of knowing and
navigating built for the city
Data Exchanges
Modellizations
Observatories*



Edinburgh City TransitionScaping Hub

Development Landscape

Imagine if... cities could reconcile strategic objectives and agreed city plans and harmonise the objectives of city departments and stakeholders

National

Climate Strategy

National Planning Framework

National Strategy

GDP Growth

National Transport Strategy

Security

Regional

Isolated and Segregated Economy

Regional Economic Strategy

Regional Housing Programme

Fast Tracking

Tram Extension

Road Building

Regional Transport Strategy

Growth

Jobs

Local

Local Development Plans

Housebuilding Households Skills

Affordability

Energy Poverty

Transport Costs

Housing Crisis

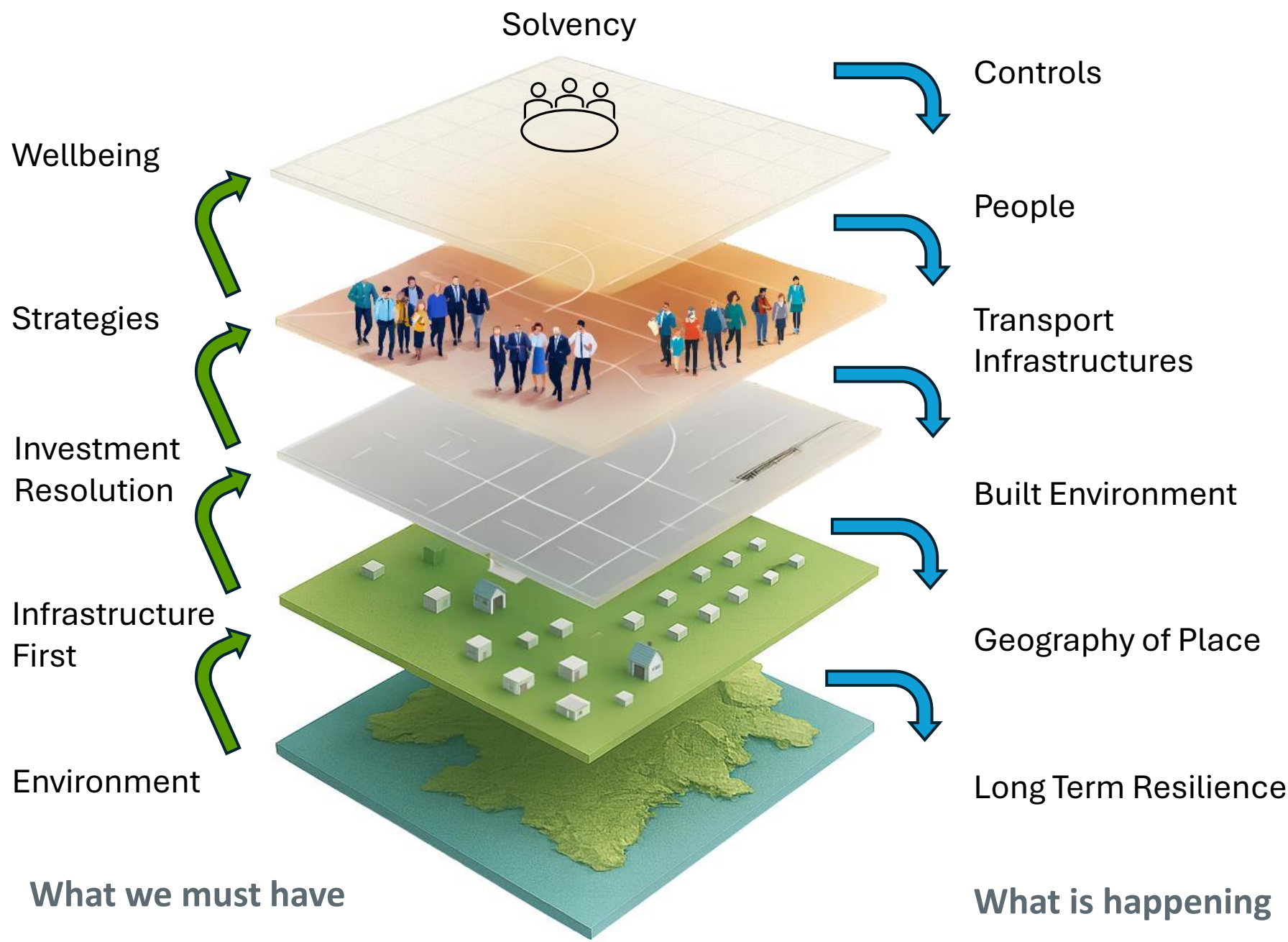
Jobs

Debt

Resilience

Wellbeing

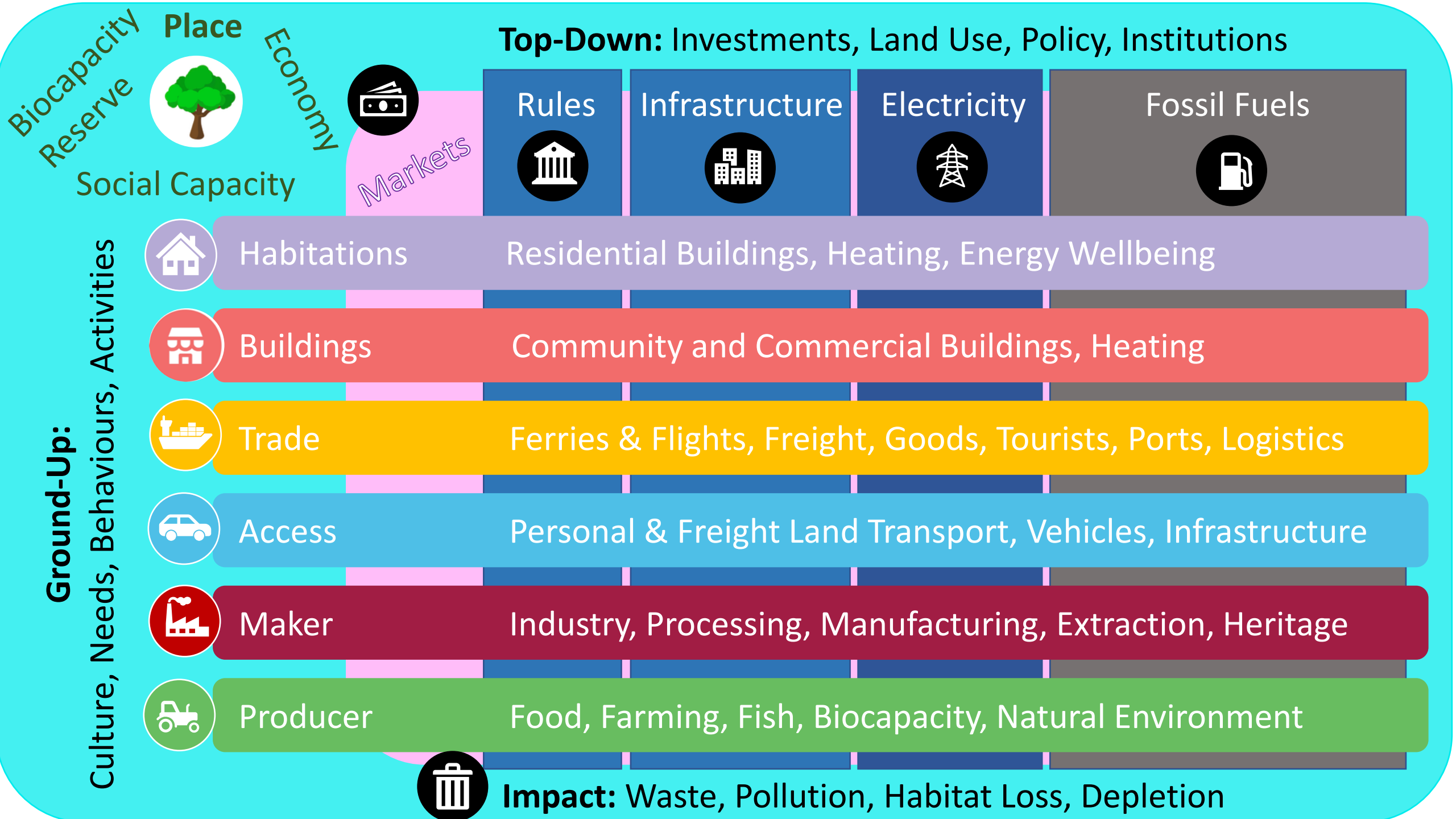
Imagine if...
New ways of managing
Scale and Complexity
could be built by
integrating and reconciling
layers of data and
understanding in real time
options for navigating
complex emergent
systems



Imagine if...

There was a Safe Space –
a ‘Sandbox’ with data and modelling,
processes to resolve conflicts
and harmonise competing objectives

Conflict Areas	Conflict Types
Housing Crisis Affordable housing vs. Low-carbon housing	<i>Housing Trap</i> Cost vs. climate goals
Urban Liveability Mobility plan vs. Urban development	<i>Transport Trap</i> More \$ Mobility vs. Regeneration
End of Old Growth Short-term carbon targets vs. Long-term flexibility	<i>Solvency Trap</i> More \$ on 20 th Century Projects vs. Emergent Regeneration
...	...



Top-Down: Investments, Land Use, Policy, Institutions

Rules



Infrastructure



Electricity



Fossil Fuels



Ground-Up:

Culture, Needs, Behaviours, Activities



Habitations

Residential Buildings, Heating, Energy Wellbeing



Buildings

Community and Commercial Buildings, Heating



Trade

Ferries & Flights, Freight, Goods, Tourists, Ports, Logistics



Access

Personal & Freight Land Transport, Vehicles, Infrastructure



Maker

Industry, Processing, Manufacturing, Extraction, Heritage



Producer

Food, Farming, Fish, Biocapacity, Natural Environment



Impact: Waste, Pollution, Habitat Loss, Depletion

Biocapacity Reserve



Place
Economy
Social Capacity



Markets

TransitionScaping Hub Operation Structure

Pressures on Decision Making

Stakeholder Triage



Wicked Problems Clinic

Activity Ecosystems



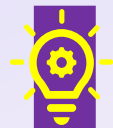
Learning, Exploring, By Doing

Transition Engineering Labs

InTIME 7-Stage Process

Interdisciplinary Transition Innovation, Management and Engineering

Ingenuity & Insights



Entrepreneur & Business Model Sandbox



Institution Policy Regulation Sandbox



Community Sandbox



People's Jury, Demonstration, Testing, Accelerating, Showcasing

InTIME Design

Digital Capital

Cyber Infrastructure

Digital Exploration, Modellization, Observation

Local Curated & Trusted



Data Exchanges

Visualising Systems
Live Local Data Curation
Crowd Sourcing
Simple, Specific



Modellization

Simulations
Digital Twins



Observatories

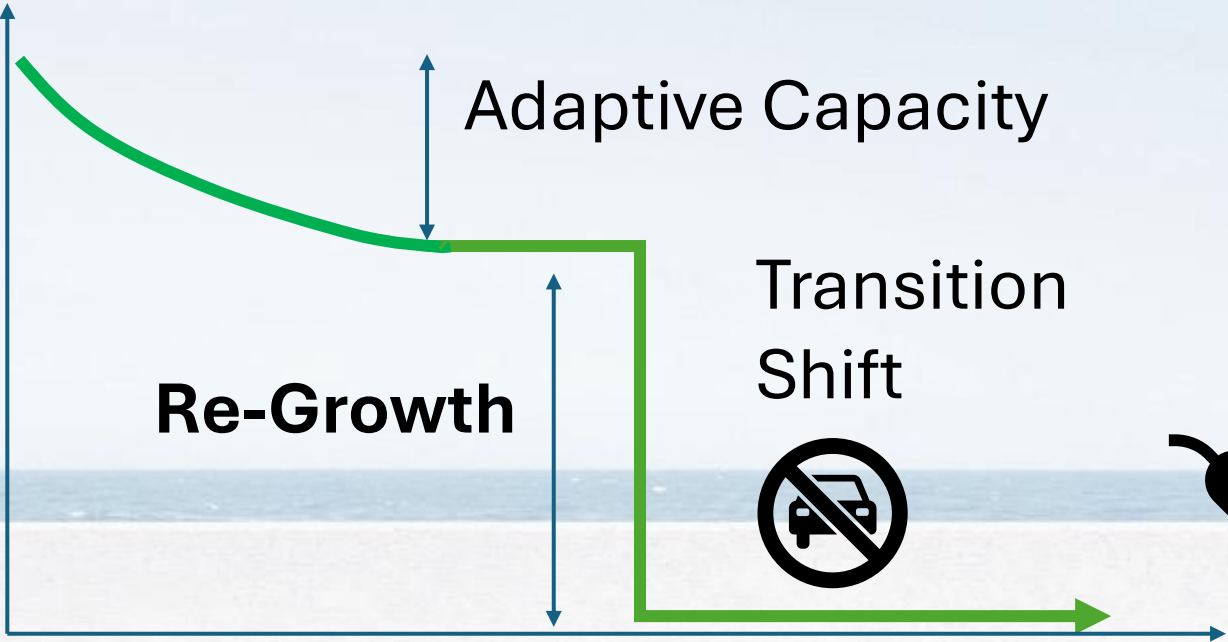
Market Mechanisms
Behaviours
Lifestyles
Finance



Adaptation and Transition Shift

Ability to meet needs and re-grow while shifting away from fossil fuel energy.

Household Fossil Energy



Household Transition Processes

**SHIFT
PROJECT:
Cyber
Infrastructure
Example**

Household
Activity Web
Place Finder
Place Maker

Novel Placemaking Utility

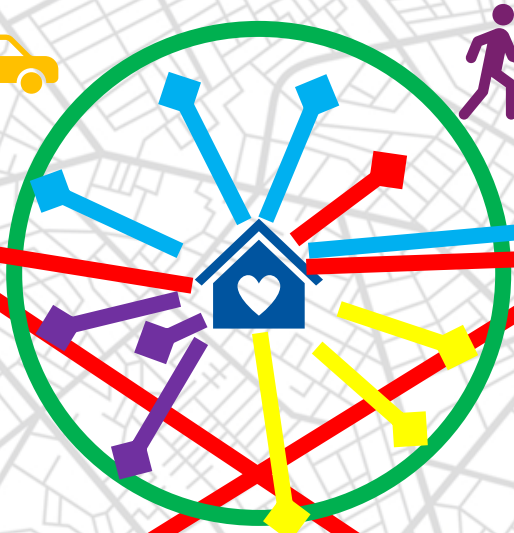


Sim Utility approach to Housing Market Transition
emphasizing Employment Connection, Essential Needs,
Activity Demand and Housing Demand

Household Activity Web Livability Orientation



Work 1



Activity Ecosystem

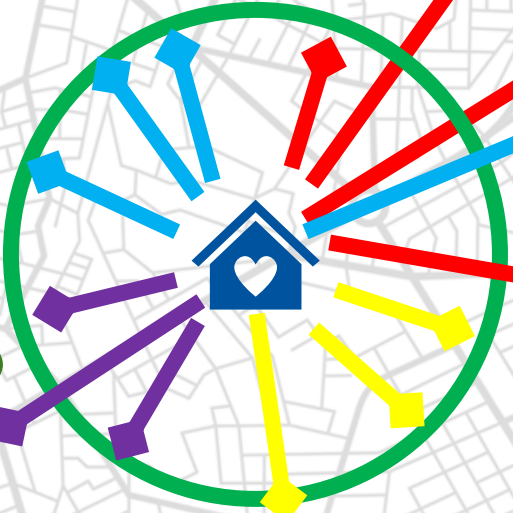
Work 2



Environment
Beach



Walkable Suburb with Commute

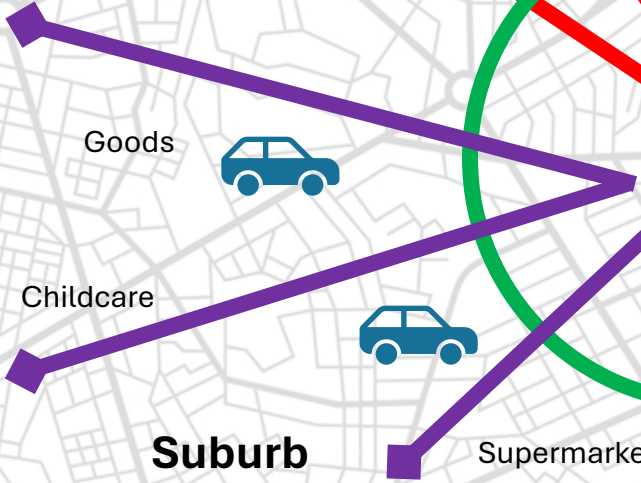


Fuels

School

Clinic

Sport



Goods



Childcare



Supermarket

Transit

Community

Exercise

Suburb

Re-Growth

Household Activity Web
Creates Activity Demand
Data for Business
Development and
Housing Re-Development



Needs-Meeting Modelling

Economy & Regulation

Property & Rental Markets

Public Investment

Property Development

Climate, Ecology & Geology



Ways things happen

Council Budget
Finance Market

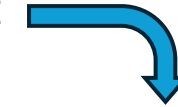
Needs Meeting

Supply Chains

Transport
Infrastructures

Built Environment

Geography of Place



Transition Scaping

Data Exchanges,
Modellizations,
Observatories

Risk
Activity Web
PlaceFinder

Access to Activities
Adaptive Capacity
Economic & Social
Productivity Sandboxes

Access to Goods
PlaceMaker
Economic & Social
Productivity

Regeneration
Climate Adaptations

What is happening

Harmonizing Objectives

City TransitionScaping Cases

Orkney Housing Crisis for Incoming Employees

Why can't we get employees in post at OIC, NHS, HWU, and other good jobs?

- Diverse TransitionScape: featuring 3 build projects leveraging local capability, 5 research projects developing novel cyber infrastructure
- ORIC temporary housing village
- New micro-housing scheme
- Investors, builders – Community mortgage programme
- Homestay scheme



Christchurch University Earthquake Recovery Crisis

How do we get students to come back to Canterbury?

- “University Town” redevelopment
- Cyber Infrastructure and harmonizing of objectives – **From the Ground Up**
- Developers – New Product Development sustainable, high value, mixed value redevelopment of a town
- Investors – Long-term
- Council – new zoning, transport, sustainability objectives met



Grenoble Metropole Car Congestion & Pollution

Why won't people share rides?

- A new understanding of the problem
- Invention of novel Place Finder system
- € 175 M Transition Strategy setting up university programme, building cyber infrastructure, industry integration with transport, housing, schools
- Sustainable economic growth through redevelopment of old 1970's blight
- Efficient Tram extensions



Why Edinburgh TransitionScaping?



Unprecedented levels of development planned around the city **driven by housing crisis**



Important to protect and promote Scottish Capital City's A-List Climate Leadership and historical enlightenment legacy



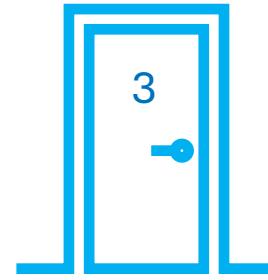
Exploit world class capability on the city's doorstep at Heriot-Watt University



“Commuting distance to Edinburgh”

Unthinkable Opportunity Space:

*Systems Transition Engineering Processes and
'TransitionScaping' for the good of everyone*



Enhancing intelligence. Building capabilities and capacities for emergent re-generative growth



Bringing together relevant and diverse stakeholder expertise into Complex Adaptive Systems



Relieve conflicts. Policy cohesion.

Finding the best future pathways through our complex development landscapes



Transition Engineering

Building a Sustainable Future

Susan Krumdieck



CRC Press
Taylor & Francis Group

Transition Engineering

Approach, Methods, Tools

Interdisciplinary Professional Organisation

CPD and MSc Courses at HWU

Systems Transition Engineering Processes (STEPs) Programme

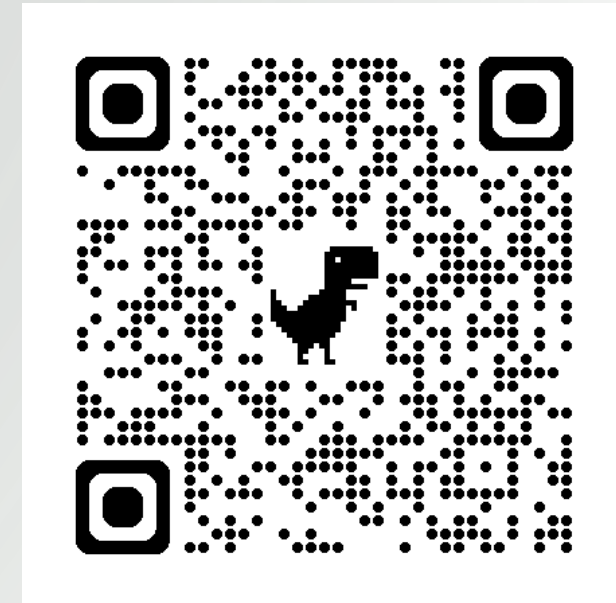
Transition Engineering Research Lab

Standards of Practice

Consultancies on Path Break Strategy

Policy and Regulation Recommendations

MSc Renewable and Sustainable Energy Transition
Orkney Campus



What is the biggest Systems Transition Challenge for our Civilization?

Our Cities

