

Using systems thinking to increase the sustainability and resilience of the built and natural environment

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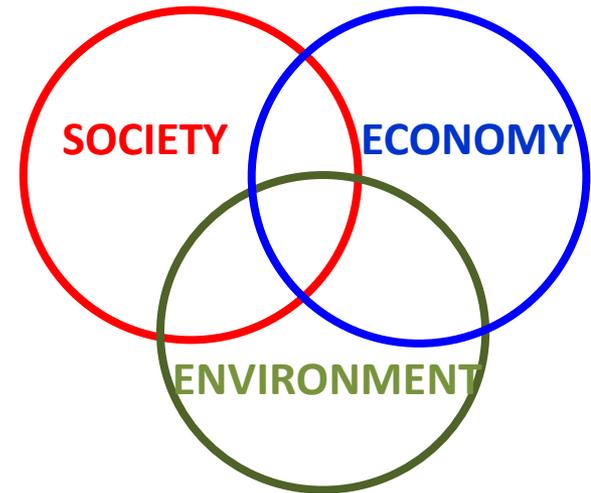
Reminders and pointers

- Sustainable development and systems thinking
- Approaches to sustainable development
- 'Big Data' for decision-making
- Towards system thinking tools for different users

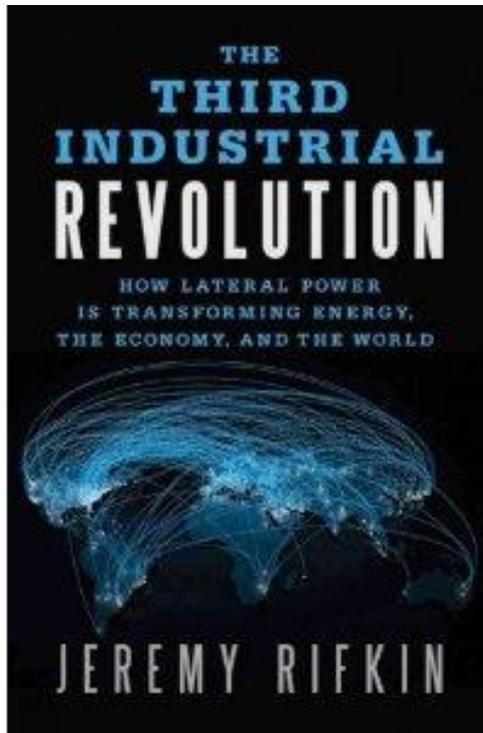


Sustainable development and systems thinking

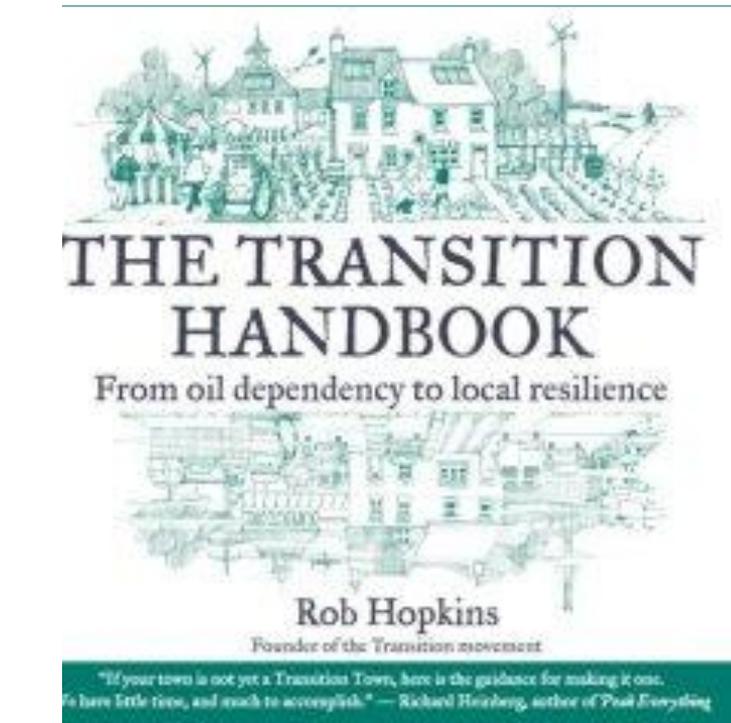
- The Earth Summit in Rio, 1992: **Agenda 21**
- Proposals for applying a systems approach to thinking and actions for sustainability (Clayton and Radcliffe, 1996)
- Consideration of conditions and interactions between the linked systems



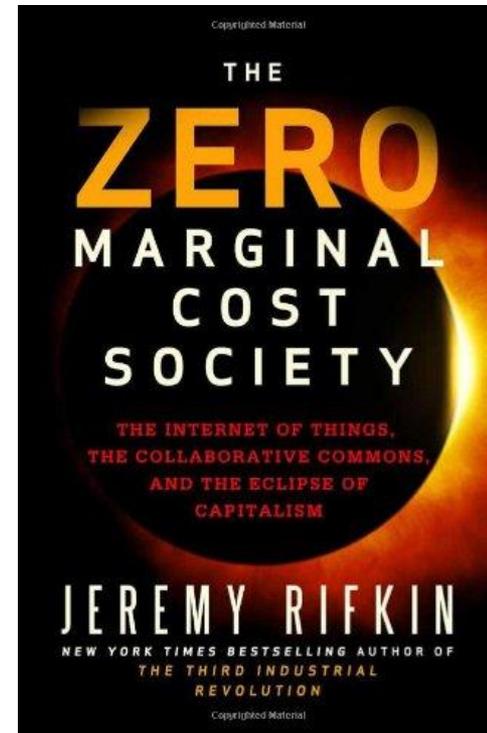
Engaging with political structures and communities to address global and local problems



2007

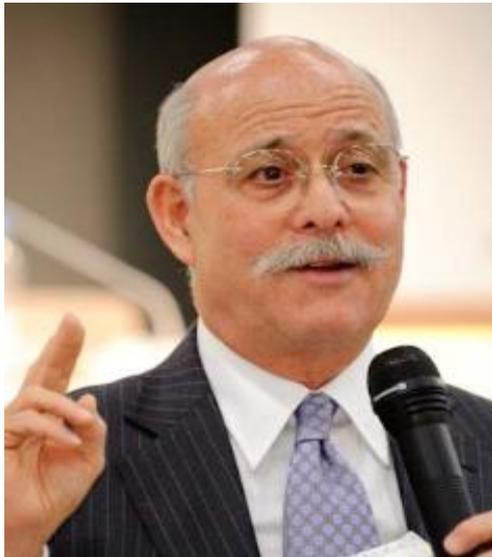


2008



2014

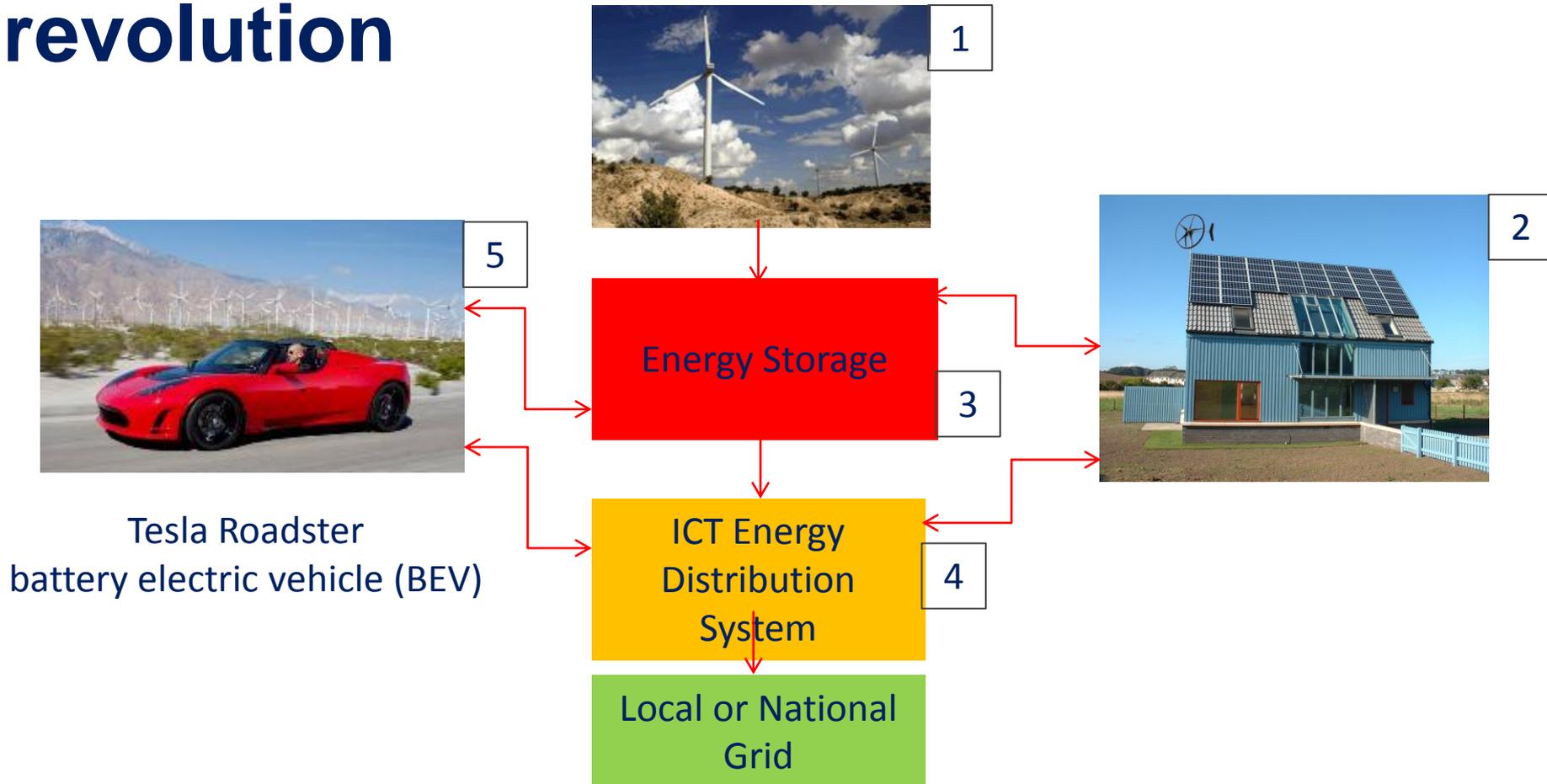
The Third Industrial Revolution, 2007



Jeremy Rifkin
American
economist, writer,
political advisor and
activist

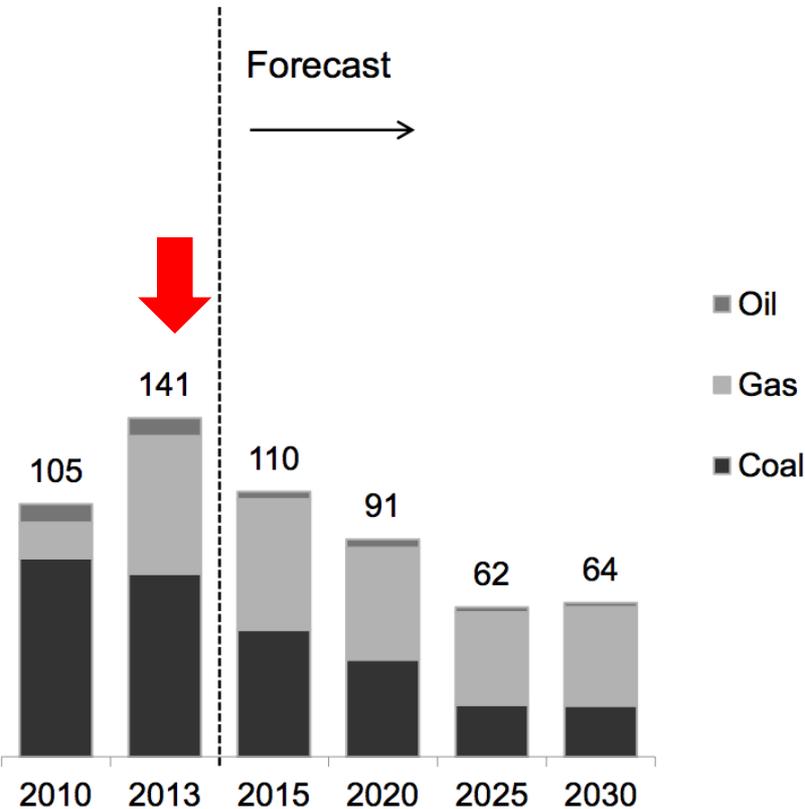
- Long-term economic sustainability plan to address the global economic crisis, energy security, and climate change
- Endorsed by the European Parliament in 2007, the UK Government's White Paper on Energy, 2007, and United Nations Industrial Development Organization (UNIDO) in 2011

Rifkin's vision of the third industrial revolution

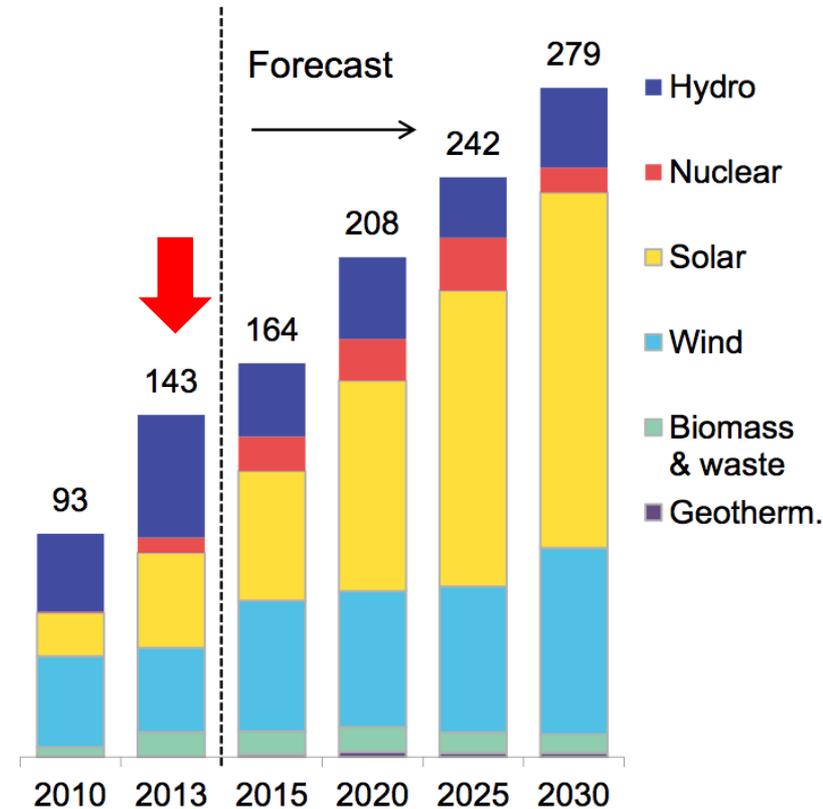


In 2013 - more capacity for renewable power added than in fossil fuels power

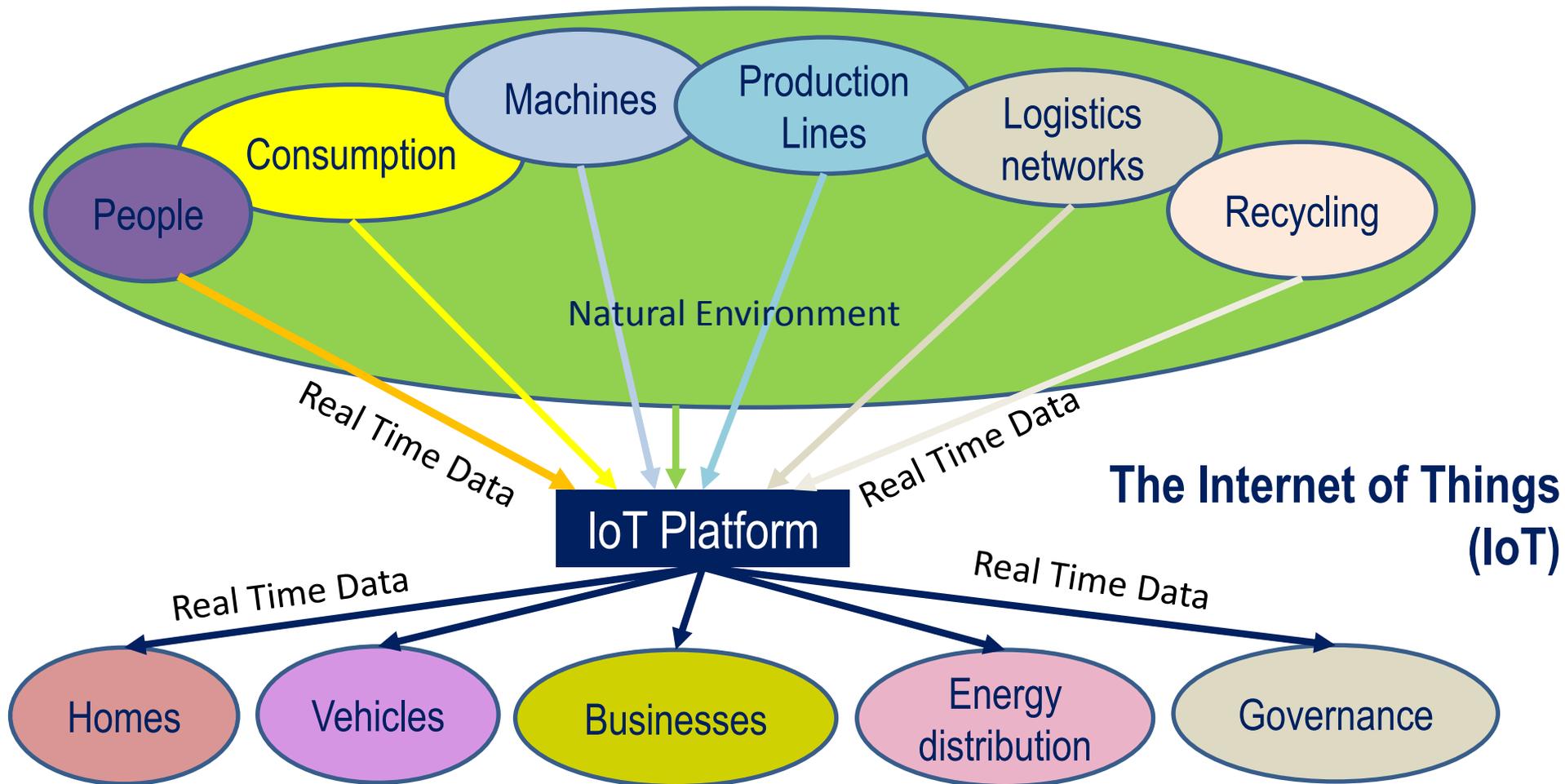
FOSSIL FUEL



CLEAN ENERGY



Rifkin (2014) The Zero Marginal Cost Society



The Transition Handbook, 2008

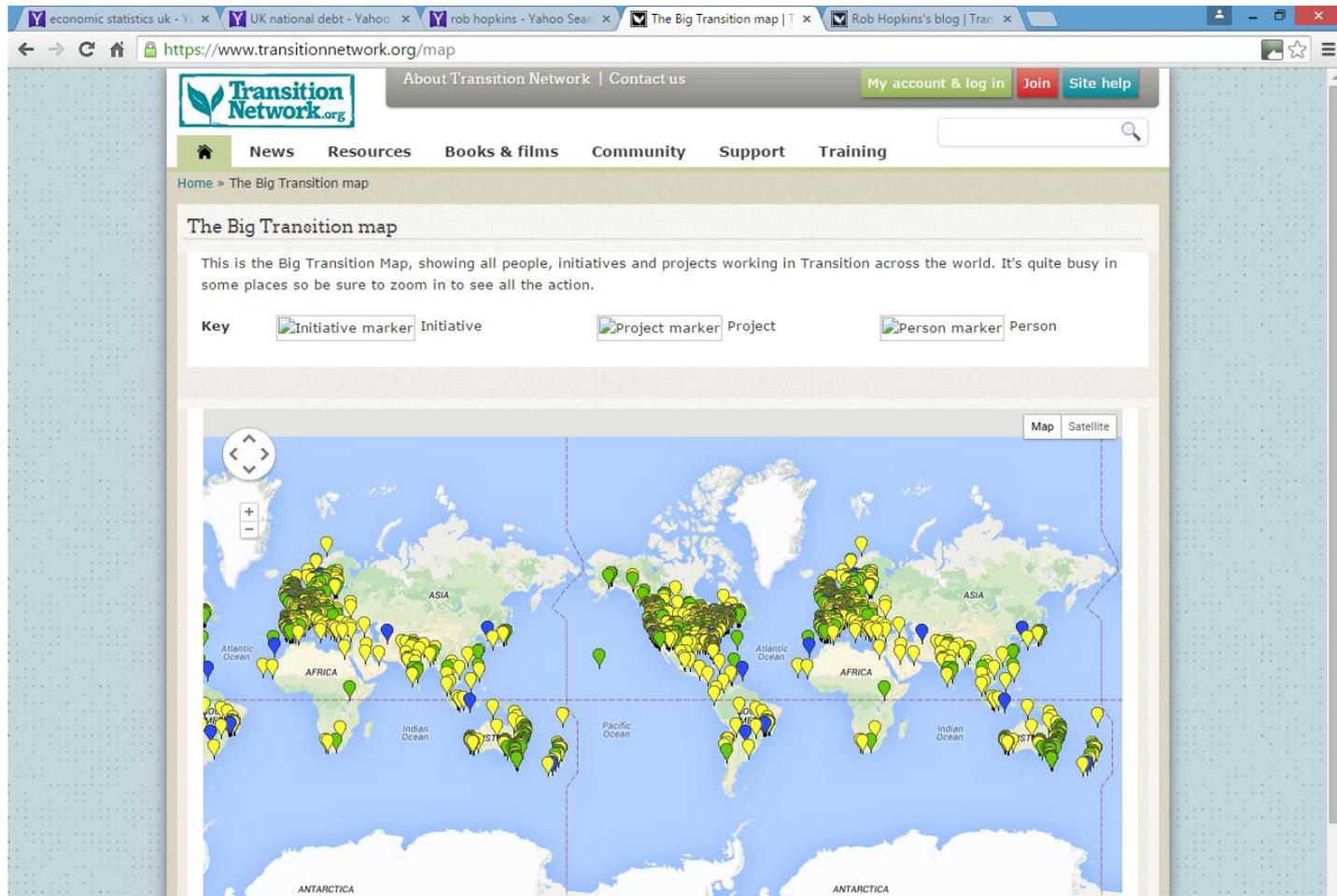


Rob Hopkins, an independent activist and writer on environmental issues, based in Totnes, England

Resilient communities:

- local generation of energy and food production
- different organisation of healthcare
- use of local building materials
- reduction and reuse of waste
- other activities that communities might initiate according to their social, economic and environmental context

Transition Towns Worldwide



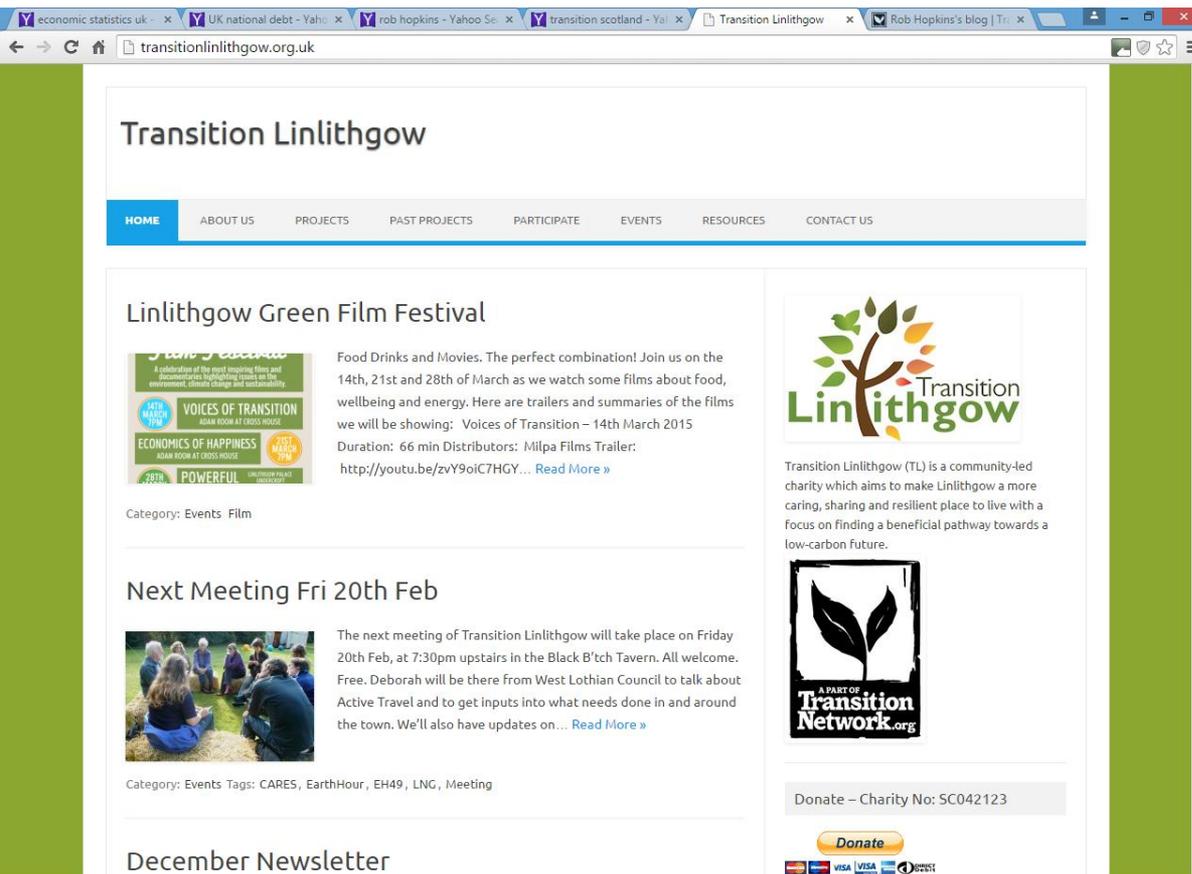
The screenshot shows a web browser window displaying the website <https://www.transitionnetwork.org/map>. The browser's address bar and tabs are visible at the top. The website's header includes the "Transition Network.org" logo, navigation links for "About Transition Network" and "Contact us", and user options for "My account & log in", "Join", and "Site help". A main navigation menu contains "News", "Resources", "Books & films", "Community", "Support", and "Training". Below the menu, the page title is "The Big Transition map". A descriptive paragraph states: "This is the Big Transition Map, showing all people, initiatives and projects working in Transition across the world. It's quite busy in some places so be sure to zoom in to see all the action." A key below the text identifies three types of markers: "Initiative marker" (green), "Project marker" (yellow), and "Person marker" (blue). The main content area features a world map with numerous colored pins indicating the locations of these activities. The map includes a compass, zoom controls, and a "Map/Satellite" toggle. The continents are labeled: ASIA, AFRICA, and ANTARCTICA. The oceans are labeled: Atlantic Ocean, Indian Ocean, and Pacific Ocean.

Transition Towns in Scotland



- 11 'official groups'
- over 35 'active communities'
- over 25 communities that 'show interest in this area'

Transition Linlithgow

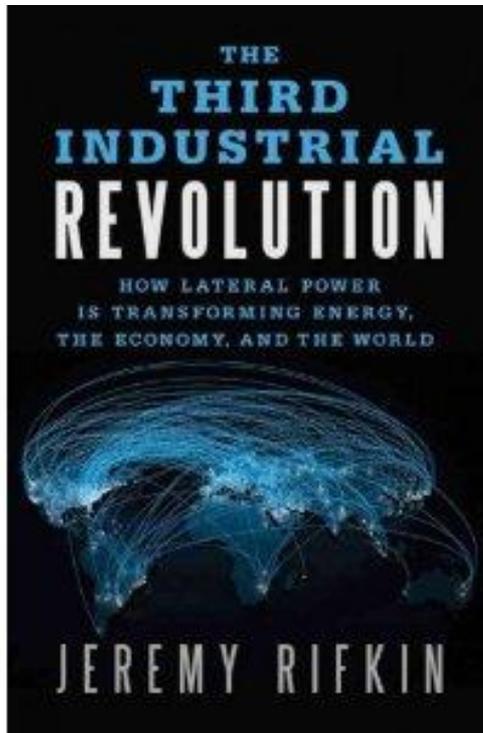


The screenshot shows the website transitionlinlithgow.org.uk. The page features a green header with the site name and a navigation menu with links: HOME, ABOUT US, PROJECTS, PAST PROJECTS, PARTICIPATE, EVENTS, RESOURCES, and CONTACT US. The main content area is divided into two columns. The left column contains a section for the 'Linlithgow Green Film Festival' with a list of events: '14th MARCH 2015 VOICES OF TRANSITION AGAN ROOM AT CROSS HOUSE', 'ECONOMICS OF HAPPINESS AGAN ROOM AT CROSS HOUSE', and '28th MARCH 2015 POWERFUL'. Below this is a 'Next Meeting Fri 20th Feb' section with a photo of a group of people sitting on the grass and a description of the meeting. The right column features the 'Transition Linlithgow' logo, a description of the organization as a community-led charity, and a 'Donate' button with a 'Charity No: SC042123'.

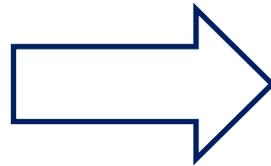
Transition Linlithgow, formerly called Linlithgow Climate Challenge, was formed in 2008.

Sustainable development approaches

Bottom-up



2007



Top-down

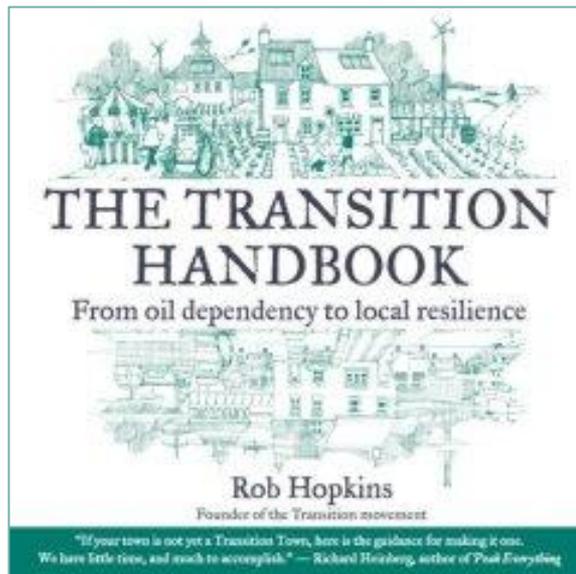
Endorsed by:

- the European Parliament in 2007
- the UK Government 's White Paper on Energy, 2007
- United Nations Industrial Development Organization (UNIDO) in 2011

Sustainable development approaches

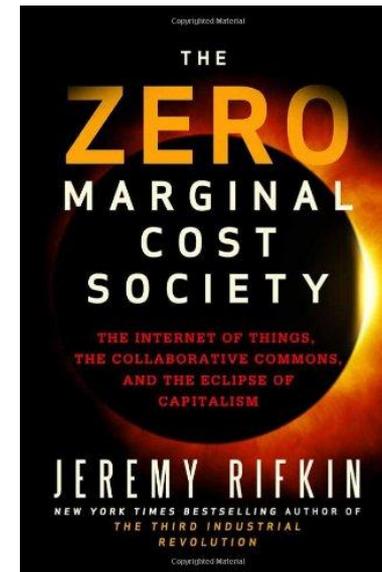
Bottom-up

2008



Transition Towns

2014



Collaborative Commons

SOCIAL INNOVATION

Sustainable development approaches

Bottom-up: Collaborative Commons

- Rise of a Collaborative Commons as the dominant model for organising economic life
- Commons is the oldest form of self-managed activity
- The contemporary commons is where billions of people engage in the deeply social aspects of life
- Expanding with the Internet

Sustainable development approaches

Bottom-up: SOCIAL INNOVATION



- 2009 – the first one opened in Amsterdam by Martine Postma, a journalist
- Spread to 16 countries to date
- 19 Repair Cafes in the UK



Sustainable development approaches

Bottom-up: SOCIAL INNOVATION

Hackerspace, hacklab, makerspace or hackspace: peer learning and knowledge sharing through workshops, presentations, and lectures.

2009 - **London Hackspace** - a community-run workshop

Facilities and equipment for : electronics, 3D printing, craft, laser cutting, woodwork, metalwork, biology, amateur radio, robotics, etc.



University 'hackerspaces'?

Should universities further develop and use a 'hackerspace' model to:

- support social innovation for sustainability and resilience
- increase research impact?



University ‘hackerspaces’?

A reply from a LinkedIn contact:

‘Well yes. I would frame the question differently: why wouldn't they?’

I suppose there are limits to the practice, as with anything; so that should condition expectations or relying too much on 'the next big thing'.

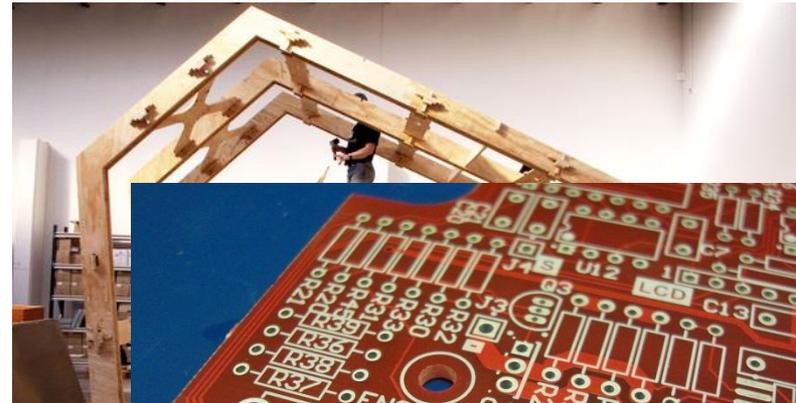
That said, a lot of encouraging work is coming out of hacker and maker spaces, which would seem to say that these practices should be explored further – no?’

Sustainable development approaches

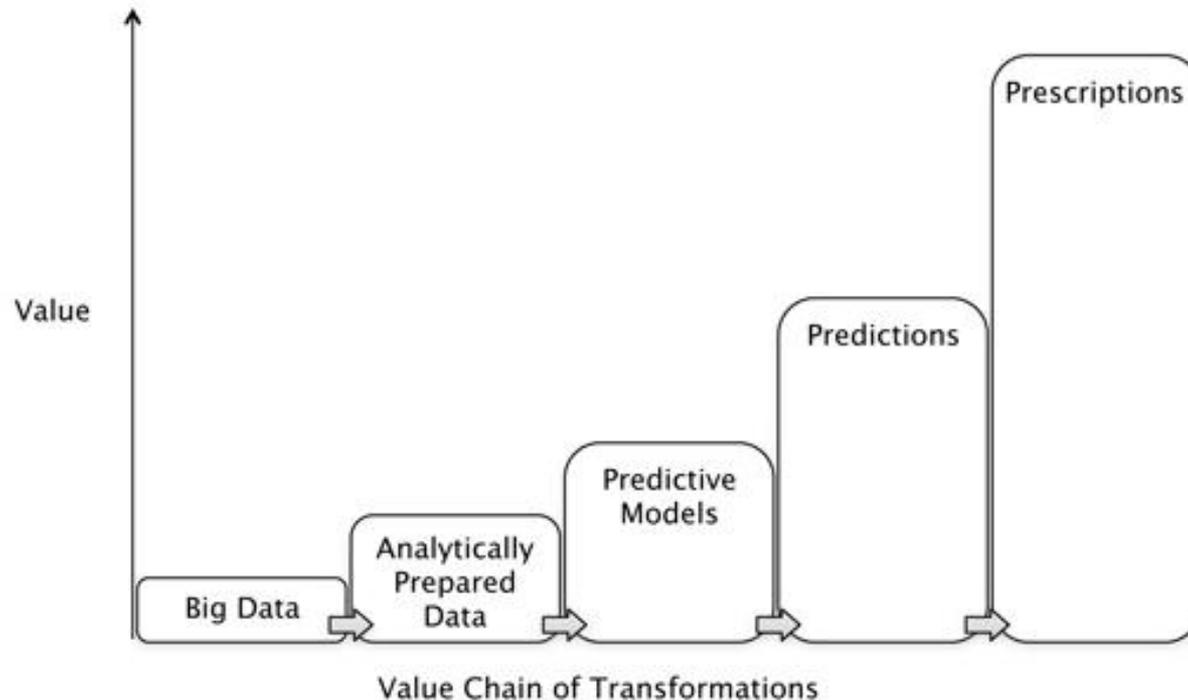
Bottom-up: SOCIAL INNOVATION

- **Open design** - publicly shared design information
 - Free software
 - Open-source hardware

- **Crowdfunding** - typically via the internet



‘Big Data’ = Large data sets



- **Challenges:** analysis, capture, curation, search, sharing, storage, transfer, visualization, and information privacy
- **Application:** identification of trends to inform decision-making

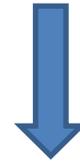
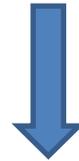
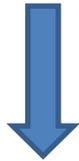
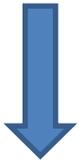
Data and decision-making on what?

POLICIES

ACTIONS

SERVICES

PRODUCTS



Sustainability and resilience of economic, social and environmental systems on global, national, regional and local levels

What decision-making tools are needed?

For decision-making actions of:

- global, national, regional and local governance structures and agencies
- organisations, institutions and business
- community groups
- individuals.



europa.eu



Government agencies



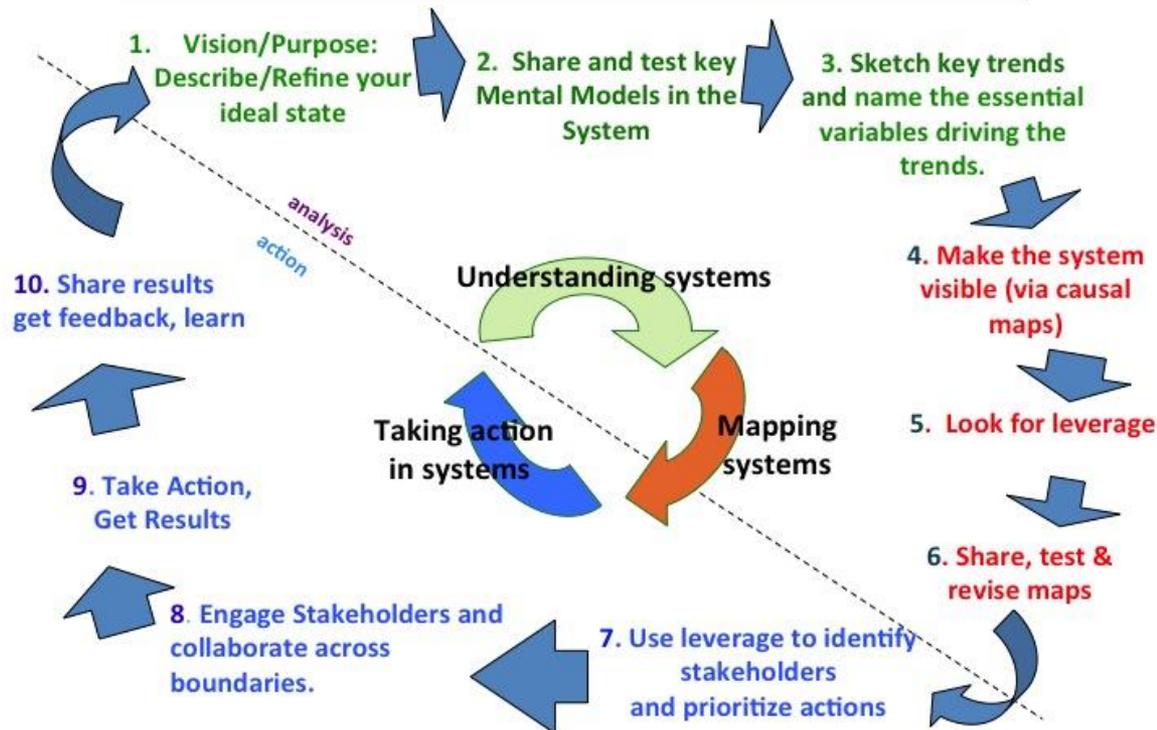
What approach should be adopted in the development of decision-making tools?

Systems thinking

to identify interdependencies and opportunities

Because it provides 'a multi-dimensional framework in which information from different disciplines and domains can be integrated without being forced into a one-dimensional mapping'. Clayton and Radcliffe (1996)

Systems Thinking in Action



Systems thinking in planning of infrastructure systems

Report on **‘Infrastructure Interdependencies Timelines’**
(Engineering the Future, The Royal Academy of Engineering, 2013)

The need of application of systems thinking in planning of national transport, waste, water, energy, ICT and space systems by identifying their physical, digital, geographic and organisational interdependency.

Report: Infrastructure Interdependencies Timelines

Engineering the Future, The Royal Academy of Engineering, 2013

A linear mapping of policies and plans for development of the UK infrastructure systems from 2010 until 2060 which allows the reader to visualise:

- the interdependencies and opportunities
- where and when events resulting from lack of capacity, co-ordination or planning are likely to occur.

Report: Infrastructure Interdependencies Timelines

Engineering the Future, The Royal Academy of Engineering, 2013

Recommendations

- Policy makers should utilise interdependency analysis and the Infrastructure Timelines to **plot** current and future policies and **align policy development** where necessary.
- Government departments should improve the **coordination and communication** between and among regulators and asset owners.
- **Further research and implementation of interdependency analysis is required.**

CONCLUSIONS

- Providing data to achieve desired outcomes at global, national, regional and local level
- Supporting social innovation
- Developing decision-making tools for different users
- Exploring novel models of knowledge exchange to increase research impact

