JPI Urban Europe - URBAN TRANSITIONS PATHWAYS SYMPOSIUM

From 'smart' cities to 'wise':

synergistic pathways for collective urban intelligence

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This paper is focused on the questions on the workshop programme:

1) *contribution towards the issue outlined by 'Shaping common ground in urban sustainability'? What are your (new) insights? And what would you propose as the common case?*
2) *What is needed to go beyond and integrate the diversified state of the art in contemporary urban sustainability research and innovation? & 5. Where are and how can we constructively tackle limitations on language, methods, epistemologies, ontologies, etc.?*

Abstract

We start with the *problematique* of a typical urban challenge, how to de-carbonize and climate-proof existing urban areas. Such challenges involve multiple systems: social, technological, economic, environment, political and cultural, each in various transitions and combinations. But for the most part we lack the research methods and tools to understand such combinations. We also lack the design methods and tools, to explore potential opportunities and the synergies between such combinations. The result is a lack of capacity and progress on the Low-Carb city, and many other 'wicked' problems.

So, we set out at a body of theory and practice, designed for such complex inter-connected problems. ***Synergistics*** is the science and art, of understanding and working with ***synergies***, meaning literally 'working together'. This approach points beyond current 'silo' thinking in disciplines and sectors, towards a more co-learning, co-creation, co-innovation approach. It points towards an urban 'social-mind', i.e. a strategic 'collective intelligence', and a transition from a technically 'smart city', towards a more holistic 'wise city'.

To demonstrate this we sketch some practical applications of synergistic thinking. Finally we propose a 'common case' for the Living Laboratory of Greater Manchester, UK. This includes both analysis and synthesis, in a trans-disciplinary and multi-sectoral approach, suitable for a test-bed city-region in flux and opportunity.

Contents

1. Framing the Problematique

The future of the global climate might depend on urban de-carbonisation, i.e. the 'Low-Carb-City', but Greater Manchester (GM) is struggling at the moment. Much of the building stock is crumbling, private utility companies don't cooperate, new technology lies idle, finance is lacking, public subsidies are uncertain, builders lack the right skills, public attitudes are sceptical, and local government funding is cut back again. Such problems are inter-connected, and while some can be measured and modelled, many can't. There are 'elephants in the room' which are on the boundaries of discussion: for some, the overthrow of capitalism: for others, the carbon footprint of long haul holidays. When we analyse or run workshops, it seems the Low-Carb-City is both a technical problem, and combinations of social, economic, political, cultural problems. But we generally lack the methods and tools to understand or to work with such combinations.

The result is seen in gaps and contradictions: and too often, policy / governance cannot respond, economic systems are dysfunctional, social systems are fragmented, and climate policy makes little progress. Then, 'smart city' technology is thrown into complex societal problems, and while improving technical capacity, it seems likely to widen inequalities. And then, 'social innovation' follows, hoping that small insecure NGOs can fill the gaps of a dysfunctional system.

Overall the typical urban 'system of systems' has low capacity for feedback or mutual learning: government is divided into silos and not very smart: business might be a little smarter, but lacks responsibility outside its boundaries. Each sector can be analysed in terms of cognitive complexity, collective intelligence and social learning. With such insights, we can then map the pathways towards higher levels of cognitive complexity, urban synergy, 'social-mind' and 'strategic collective intelligence'. Then we can apply to the Low-Carb-City, or similar wicked problems, with some strategic directions for both problems and responses.

2. New insights on urban synergies

Here we look at an emerging body of theory and practice, with methods and tools to suit complex inter-connected 'wicked' problems. This is demonstrated most recently with the UK Foresight on Future of Cities (Ravetz 2015: Ravetz & Miles 2016: Ravetz 2017): it builds on earlier work such as the calls for an 'Urban 3.0' paradigm for research and policy (Cohen, 2012).

Synergistics is the science and art of understanding and working with ***synergies***, literally, 'working together'. There are synergies between people, organizations, communities, economies, political systems, technology systems and so on. There are positive synergies of learning or thinking or collaborating. There can also be negative synergies (*'syndromes'*), of conflict, oppression, exploitation or psychosis. To understand and work with synergies – this is the scope of ***Synergistics,*** in theory and practice. For instance, public health has many synergies with housing, education, food, employment, and welfare. Climate change has synergies with social, technical, economic, ecological, political systems.

So where to start? As in Figure 1, synergistic mapping works with simple sketches or diagrams: on flipcharts or napkins or sticky notes, we can map people and organizations and their relations ('actors' and 'factors'), with as much detail as needed at each stage. Then we can begin to explore the inter-connections, pushing beyond the normal boundaries and silos:

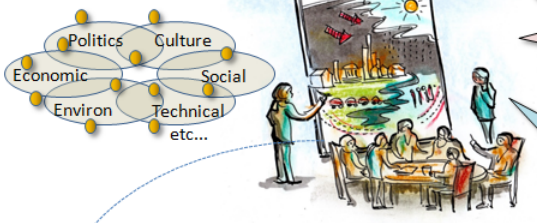
- ***Wider***, with communities of actors and factors, (people or organizations or institutions)
- ***Deeper***, with different domains of value and logic (social, technical, economic, political etc).
- ***Longer***, at further horizons for change, leading towards co-evolution and transformation.

Figure 1: synergistic: overview

SYNERGISTICS – OVERVIEW

Synergistics is the science and art of ***synergies***. It's suited to the 'real-world', where social, technical, economic & political issues are complex & inter-connected...

WHAT'S THE PROBLEM?



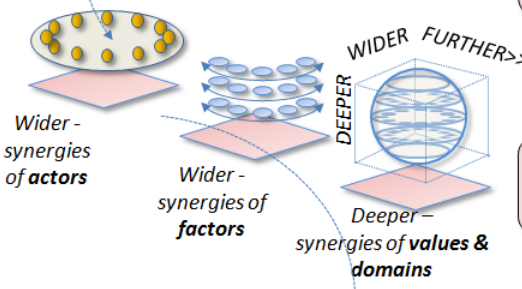
This Low-Carb City is a mess... the pieces of the jigsaw don't fit....

Is it a market failure, governance gap, social conflict or tech problem?

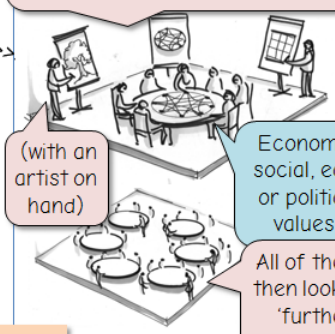
All of the above.... Isn't there some way to manage complex inter-connected problems??

First is a mapping of the system, the baseline at the present, with:
– ***Wider*** synergies of actors around the table:
- ***Wider*** synergies of factors, upstream & downstream:
- ***Deeper*** synergies between domains: (social, technical, economic, political etc).
- then we look '***Further***' into future changes...

SYSTEMS MAPPING: wider & deeper



Mapping is a way to go... we get people round a table... Then we draw maps of how they get along, & how they create 'value' (or not)



(with an artist on hand)

Economic, social, eco- or political values?

All of them... then look for 'further' synergies

SYNERGY MAPPING: from SMART to WISE

- & then ***Further*** towards new synergies. Three 'Modes' of synergy & transformation come up: -

- ***Mode-I, linear & 'clever':*** a mechanical complex system
- ***Mode-II, evolutionary & 'smart':*** a biological system of 'adaptive complexity'
- ***Mode-III, co-evolutionary & 'wise':*** human system of 'cognitive complexity' or collective intelligence

A 'CLEVER' city: a complex machine with fixed functions

A 'SMART' city: competitive, innovative, but myopic, selfish

A 'WISE' city works with the connexus, the urban collective intelligence...

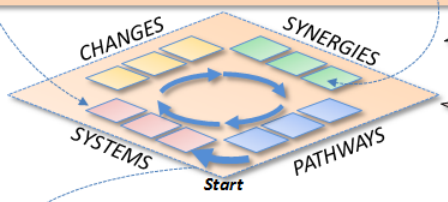
Similar logic for economies, technologies, politics, etc

SYNERGISTIC TOOLKIT: cycle of thinking

We explore all this with a Toolkit, a cycle of thinking. This links the 'present' with the 'future': and then back to the present:

a) Systems mapping: (co-learning):
b) Change mapping: (co-knowing):
c) Synergy mapping: (co-creation):
d) Pathway mapping: (co-production).

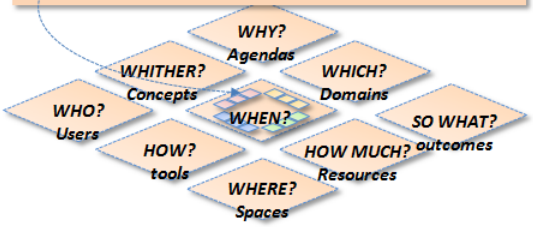
All this works in a cycle – 4 stages & 12 steps



We explore the present, & then the future... We look for visions & synergies, then actions..

SYNERGISTIC LIVING-LAB - in context

All this is part of the overall ***Synergistic Living-Lab***: a space for experimentation and learning with users, uses, methods, tools, spaces, applications...



The Synergistic Living-Lab takes the Toolkit out into the world !!

(Good luck with that...)

To follow this up, the ***'Synergistic cycle'*** of thinking then goes into more depth. We move from mapping problems to designing responses. We can follow the synergistic cycle of thinking in four main stages, (i.e. '4S'). This can be done in open debate, or as a desk study: it can be more about analysis or more about design. It can guide a synergistic Foresight which looks to the future, or a synergistic evaluation which looks at value-paths, or other:

- ***System mapping:*** (relational type thinking): the landscape, the baseline, and the system or issue on the table:
- ***Scenario mapping:*** (divergent thinking): the drivers of change, dynamics, risks, trends and alternative scenarios:
- ***Synergy mapping:*** (emergent thinking): the opportunities, synergies, innovations, transformations:
- ***Strategy mapping****:* (convergent thinking): the pathways and road-maps, policies and projects.

This synergistic mapping typically points towards ***co-evolution***, and the shift from 'smart' to 'wise'. It seems for every complex or 'wicked' societal challenge (climate change, poverty, mental health etc), it's not just about finding the right policy or the right price. The way forward is more about the capacity to collectively learn and think and create, with so called 'co-learning' and 'co-creation', where the whole is greater than the parts. Then we can map different levels or paradigms of synergy and inter-connections: here we identify three different 'modes', as a ***"1-2-3"*** scheme. A typical example of urban housing policy shows the shift, from clever, to smart, to 'wise':

- ***1.0 or 'mode-I' linear and 'clever':*** the synergy works as a 'functional system': it follows direct instructions and responds to direct short term changes. A linear-type city could be very complex and ***clever***, but with fixed functions and zero capacity to adapt or innovate. For housing, a clever 'Housing-I' policy aims just to build maximum number of units.
- ***2.0 or 'mode-II' evolutionary and 'smart':*** the synergy works as a 'complex adaptive system', evolving by natural selection and self-organization. An evolutionary-type city could be very ***'smart',*** but with un-thinking autonomous systems, which by their own logic extract value and dump impacts, making the rich richer, and the poor poorer. For housing, a smart 'Housing-II' aims at markets and incentives for more and better housing, but again with winners and losers.
- ***3.0 or 'mode-III' co-evolutionary and 'wise':*** here the synergy works on the cognitive level with social-mind co-learning, co-innovation and co-creation. A co-evolutionary city would be more like a '***wise'*** city organized with collective intelligence, which works not only on the material level but 'wider-deeper-longer'. A 'wise' city would recirculate all kinds of value, financial or material or cultural, between winners and losers, or between insiders and outsiders. A wise 'housing-III' program aims beyond physical construction, towards living breathing communities.

This framework seems very useful for mapping urban research paradigms. It also helps with the framing of problems or research questions, choice of methods, presentation of results, and application to end-users. For example:

- ***'Linear' Mode-I research paradigm'***: more focus on quantitative and specific problems, and more useful with specific and direct end-users and specific technical questions. For example, Mode-I urban research would look for relations between transport demand and housing density, and such technical information could be used by spatial planners.

- ***'Evolutionary' Mode-II research paradigm***: this focuses more on 'simple complexity', with agents, markets, entrepreneurs or policy actors. This could be more useful with urban problems which are more shaped by actors and incentives: such as market failure in housing, or agent-related traffic congestion.

- ***'Co-evolutionary' Mode-III research paradigm***: more focus on complex, inter-connected qualitative problems and challenges. This is suitable for problems with few 'objective' facts or models, where knowledge producers and intermediaries and users are mixed and merged together, and where solutions are more about a co-learning and co-innovation process. This can be framed as a 'Science-III' problematique and opportunity space (Ravetz & Ravetz 2016). For example, a Mode-III urban research program might look for inter-connections and creative synergies between transport demand, social inclusion, public health, cultural creativity, and social innovation in multi-functional neighbourhoods.

We argue here that each of these Modes or research paradigms has useful applications, not that one is superior to another. It seems that an integrated strategic urban research programme will need to work with multiple forms of knowledge. It should include both technical and human elements: analysis, modelling and creative design: and academic and practical types of knowledge (e.g. the *phronesis, episteme and techne*, from Aristotle).

As for pathways, if we know where we are going and how to travel, we could use a 'road-map'. But if goals are fuzzy, the routes are many, and uncertainties are all around, we need more of a ***pathway***. And if the pathway depends on synergistic thinking, and a wider-deeper-longer co-evolution as above, then we talk about ***Synergistic Pathways.*** And if such pathways start from present syndromes, and lead towards future synergies, they will tend to lead from 'clever' or ***'smart'*** concept models or cities, towards the ***'wise'***. This terminology is relevant to 'smart cities', (and has been tested in smart city workshops): now that the limits and vulnerabilities of technology-centred smart cities are emerging, there is a aspiration for more holistic forms of urban innovation.

Synergistic thinking seems to be helpful with common assumptions and discourses. For instance, many ***'low-carbon city transition pathways'*** are framed as linear technical issues, with just a few links to social or governance issues: suggesting that, 'we know how the system works, where we want to go, and how to get there' (e.g. Gouldson et al 2015). In contrast, experience shows that, as above, the economics, politics, social and cultural aspects are full of dysfunctions and contradictions. It seems more realistic to map and explore more open-ended pathways, based on opportunities and capacities for co-learning and co-creation. This is not to say such pathways are easy or simple, but they could be better connected to a complex many-layered reality. Another common aspiration is for ***'Frameworks and models for urban sustainability'***, as if sustainability is a measurable and tractable 'thing': likewise, a co-learning co-creation approach might be more realistic and relevant to policy and enterprise. In the background is a ***'science of cities'***, sophisticated and useful in many ways, but pointing towards a reductive view of urban systems as land parcels and trip origins (Batty, 2013). By contrast the synergistic approach doesn't stop at the boundaries of tractable models: it extends to more open-ended, inclusive and many-layered forms of knowledge and experience.

All this feeds back to the aspiration of JPI-Urban-Europe, as put in the 'Megatrends' report: for research which is *"interdisciplinary, integrative, pluralistic, relational, contextual, nuanced, empirical, research / conceptualization",* leading from concepts to applications. In this light we don't expect a fully detailed scientific 'model' or policy 'blueprint' for urban sustainability. But we can anticipate a space of opportunities, where the synergistic methods and tools, for analytic mapping and creative design of responses, will address these aspirations.

3. Applications to sectors and strategies

As for applications of the 'synergistic pathways from smart to wise', here a few sketches on key challenges of the JPI-UE strategic agenda.

Economies and livelihoods: a typical linear or Mode-II economics looks at GDP, infrastructure and hard indicators of skills and innovations. In contrast a synergistic Mode-III economy looks wider to all sections of society, both inside and outside: it looks 'deeper' at alternative forms of value beyond the material, social, ecological, ethical or cultural. It also looks 'longer' towards an urban economy, with better capacity for learning, feedback, strategy and co-creation.

Welfare and public finance: as above the bigger question is wider and deeper than GDP, it's about social or cultural livelihoods. This approach can be a great opportunity for public finance deficits, where at present much public funding is not well suited or targeted. Synergistic thinking helps to map new forms of combined value added, for instance new 'value-paths' which combine social care, childcare, ecological management and local social enterprise. Smart ICT can help greatly, but the agenda begins and ends with the social and community social-mind / collective intelligence.

Environment and resources: the Low-Carb-City example shows how complex inter-connected problems can be explored with a synergistic value-path approach. If a linear type decarbonisation strategy hits barriers, we can look for social-community-ecological value-paths, or innovation-procurement-crowd-finance value paths. There are few current 'models' to describe these, but there is a space of opportunity and experimentation in the Living Lab approach.

Connectivity: the issue here is how the powerful ***'smart city'*** bandwagon might lead to very 'un-smart' outcomes (in a similar way to automobile dependency some decades ago). So as above, we need to explore the potential for more ***'wise city***' systems where technology innovation is framed and guided by social-economic innovation and wider-deeper agendas.

Governance and participation: here the point is to look beyond the conventional top-down vs bottom-up divide. We look for ways in which wider-deeper systems of governance, in all sectors not just local government, can be more responsive, strategic, co-learning and co-creative. This includes for participation on a 'associative-deliberative' democratic model, enhanced by digital social media, and with a radical approach to inclusion and empowerment. It points towards emerging forms of networked or neural decision-making and co-investment: no fixed blueprints, but again a space of possibilities.

4. Applications to methods

Urban policy-making rests on layers of tools, methods, techniques, institutions and communities of practice. Here are a few which are most relevant, in the light of the synergistic thinking above. These are not separate, more like overlapping, inter-connected clusters, of methods, tools and thought processes: for instance a Foresight program can easily overlap into evaluation, learning or policy design.

- Values and valuation: beyond the economic, other social or cultural values seem crucial but quite intangible. So, a Mode-III synergistic mapping is useful for exploring values and valuations, not as isolated things but as part of an inter-connected whole.

- Risk and resilience: there are visible differences between linear risk, and a more synergistic view, of highly inter-connected and 'inter-cognitive' causes and effects and probabilities. Resilience, likewise, can be framed as a simple 'build more defences': or, 'let's explore social / policy innovation and adaptive capacity for collective intelligence'.

- Foresight and anticipatory governance: a linear Mode-I future outlook sees trend projections and 'more of the same'. In contrast a synergistic view sees opportunities for co-evolution, co-learning and co-creation. This can be seen in both 'objects' (i.e. 'what' is to be studied), and 'subjects' ('who' is the sponsor or agent).

- Social learning / collective intelligence: there's a narrow technical view of learning and intelligence. In contrast is a Mode-III view of the human level of questioning, deliberation, sense-making, and co-creation of more complex cognitive structures.

Each of these addresses in some way the JPI-UE call for *'tackling limitations on language, methods, epistemologies, ontologies'*. For instance a synergistic Mode-III evaluation / assessment method points beyond the current divisions into economic / social / environmental: or divisions into policies / plans / projects: or between MCDA or CBA, or other. With a focus on the system fundamentals of multi-layer value-paths, and synergistic knowledge / learning cycles, there is potential to work creatively with multiple 'epistemologies or ontologies'...

5. Proposition for a 'common case'

This is a proposition for Greater Manchester (GM) as the common case for the JPI-UE 'diorama'. Our research-into-practice and Living Laboratory programme has worked with, for, in, and around the GM city-region for several decades, with a first landmark text on the 'sustainable city-region' (Ravetz, 2000), and a follow-up in press (Ravetz, 2017). The Manchester Urban Institute is now emerging from 'Cities@Manchester', with over 60 academic staff working on spatial analysis, urban resilience, global urbanism, smart cities, urban political ecology and others: and with numerous links into policy, business and civil society. One of many objects of research is the Low-Carb / Climate-Proof agenda, as above.

GM is a conurbation of 2.7 million within a regional agglomeration of 6 million (Manchester is one of 10 municipalities in GM). The city-region is complex and messy, rich and poor, innovative and dysfunctional, all mixed up together. It was the epicentre of the industrial revolution, with the world's first railway, cooperative organization, and stored-memory computer. Now GM is typical of many industrial cities, with problems of ageing, public health, security, housing, energy and environment, inter-connected in a historic urban nexus. One side of the story is social stress, inefficient housing, low productivity, barriers to business, and a public deficit of £5bn per year. Another side is the upbeat story of the UK's second city, a hub of financial and professional life, a university cluster with 100,000 students and 3 Nobel Laureates on site: also in the frame is the cultural and sporting rivalry of United and City, totally global in scope. At the moment the city-region is leading the UK programme of devolution, which involves new strategic governances, a decentralized health service, and a very active 'multiple helix' community with many policy / business / social innovations (Etzkowitz & Leydesdorff 2000). Overall the city-region is now a fully active 'Living Laboratory', with current activities including:

- Living labs with H2020-funding: Triangulum is a major consortium on smart energy and transport solutions, which is part of the Living Laboratory programme. The RESIN consortium on climate change adaptation, builds on the long running Ecocities programme. Many previous EU-funded projects included 'Peri-Urban Land-Use Relations', on the dynamics of urban development, integrated city-region governance & policy innovation.

- Manchester is a hub of futures and foresight theory, practice and training: e.g. UK Foresight on Future of Cities: Greater Manchester 2040: the Futures Academic Network: and the Future of the UK Urban Environment: Manchester Energy Foresight and Security Foresight: Future of UK higher education etc.

- Smart city work continues with the £10m 'City-Verve', the largest urban IOT demonstration in the UK. This is linked to Future-Everything, the international digital media innovation platform. In the background is Manchester Informatics with specialisms in health ICT and machine learning, and the Manchester Science Partnerships, with an active multiple-helix community.

- Beyond smart, the next phase in the 'wise city' funded programme is starting with the MINI-LAB (Metropolitan INnovation & Intelligence Laboratory), a prototype for a foresight-focused urban collective intelligence and co-innovation platform.

Such inter-connected activities follow the 'vision' shared by many in policy, civil society and academia – not just general aspirations for 'prosperity' etc – but a practical proposition, for a city-region which can co-learn and co-create and co-innovate, in a more inter-connected and synergistic way. Meanwhile the first practical question, in the age of financial deficit and social fragmentation – how can cities and urban governance be more effective, integrated, and 'do more with less'? This question involves local government, the wider system of governance in civil society, and the urban community at every level.

How could such a 'common case' work in practice? To map out a huge space of potential opportunity, we can use the 'wider-deeper-longer' framework.

- ***Wider***, looking beyond the 'insiders' communities of policy, business and civil society. We explore the relations between all parts of a /multiple helix'. Then we explore possible linkages with 'outsiders' of many kinds – gender, age, ethnic group, disadvantage of many kinds. For urban challenges such as housing or Low-Carb retrofit, the whole community is involved in both problems and responses.
- ***Deeper***, looking beyond the techno-economic materialist view of urban systems. We would look for the inter-connections between social, technical, economic, ecological, political and cultural (i.e. "STEEPC") domains and value-paths. We follow different approaches in parallel, from technical modelling to cultural co-creation.
- ***Longer,*** looking beyond the assumption of a linear system and linear or evolutionary change. We actively explore the opportunities for co-learning, co-creation and co-innovation, leading towards an urban social-mind or urban collective intelligence. We would use both digital ICT enablers and platforms (with new possibilities emerging every day): combined with social-cultural-policy processes of many kinds (also with new possibilities).

Returning to the example of the Low-Carb-City: academics, policy, business and civil society each recognize the need for integration, for instance the ***'low carbon retrofit for growth / inclusion'*** theme of the Mini-Lab. There is an emerging realization of how this works, in terms of 'urban innovation': this is being framed as 'policy innovation / financial innovation / social-cultural innovation' to work alongside the conventional 'technology innovation'. All these combined add up to a Mode-III 'Living-Thinking-Laboratory' which can develop synergistic pathways.

The common case proposition would establish this space of possibilities in the Living Laboratory frame. It could be useful first to establish a programme with tangible goals, such as the Low-Carb-City, (complex, but in principle the CO2 can be measured after 5 or 10 years). In parallel we could establish a programme which is more exploratory and wide-ranging, such as the current 'Inclusive Growth' programme (RSA 2016), to demonstrate the principles of an urban social-mind / collective intelligence.

Underlying both these are larger emerging questions on co-learning and co-creation of 'societal knowledge' by multiple stakeholders: with application through co-innovation and co-production to complex challenges with no single rationality or evidence base. With digital social media / big data

on one side, and emerging social networks / processes / social-cultural formations on the other, there are opportunities ahead in many directions.

Citations

Batty, M. (2013): *The New Science of Cities.* Cambridge MA, MIT Press

Cohen, M.A. (2012): Reinventing the Future: Designing Urban 3.0: *Harvard International Review,* Summer 2012, Vol. 34 Issue 1, p52-57

Etzkowitz, H, and Leydesdorff, L, (2000). The dynamics of innovation: from National Systems and ‘‘Mode 2’’ to a Triple Helix of university–industry–government relations. *Research Policy* **29**:109–123

Gouldson, A., Colenbrander, S., Sudmant, A., Godfrey, N., Millward-Hopkins, J., Fang, W. and Zhao, X., 2015. *Accelerating Low-Carbon Development in the World's Cities*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: http://newclimateeconomy.report/misc/working-papers.

Ravetz J, 2000: *‘City-Region 2020: integrated planning for a sustainable environment’*: (with foreword by the UK Secretary of State for the Environment), London, Earthscan with the Town & Country Planning Association

Ravetz, J (2014): Inter-connected responses for inter-connected problems: synergistic thinking for local urban development in a global urban system: *International Journal of Global Environmental Issues*. Vol. 13(2/3/4):362-388 http://www.inderscience.com/info/inarticle.php?artid=64506

Ravetz, J, & Ravetz, A, (2016). Seeing the wood for the trees: Social Science 3.0 and the role of visual thinking. *Innovation: the European Journal of Social Science Research,* Vol **29**(5). http://dx.doi.org/10.1080/13511610.2016.1224155

Ravetz, J, (2015*): The Future of the Urban Environment & Ecosystem Services in the UK*: (Report to the Government Office of Science, Future of Cities programme): London, Government Office of Science. Available on: https://www.gov.uk/government/publications/future-of-cities-ecosystem-services

Ravetz, J, (2015): Urban ecosystems – simply complex or more so? *Environmental Scientist,* Vol 124, Sept 2015

Ravetz, J, (2017) *Co-opolis-III: synergistic pathways for the social mind from smart to wise*. NY, Routledge / Earthscan: http://www.routledge.com/books/details/9780415628976/

Ravetz, J, and Miles, I.D, (2016). Foresight in cities and the possibility of a ‘strategic urban intelligence’. *Foresight Journal,* Vol: 18(5). http://www.emeraldinsight.com/toc/fs/18/5

Royal Society of Arts (RSA), (2016): *Inclusive Growth Commission: Prospectus of Inquiry*: London, RSA