Peri-cene: summary for policy-makers

Fire & flood on the edge in the global Peri-cene

('peri-eco-urban anthropocene')

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1.1 Overview

With the Peri-cene project now completing - in challenging times - here are some key findings:

- The ***peri-urban*** is more than a spread-out urban: new kinds of 'metro-scapes' are emerging – distributed / bypassed\ communities, networked economies, displaced ecosystems;
- Likewise, ***climate change risk*** at the city-region level is more than a variation on known hazards: more a new kind of regime with new challenges – technical, social, economic and political;
- The interactions of peri-urbanization with climate risk involve a host of ***direct problems*** (flood, fire, storm, rising seas). They also involve many ***indirect and structural challenges*** (inequality, fragmentation, corruption & exploitation).

As for how the Peri-cene project worked –
- We focused the enquiry on ***four key themes:*** a) peri-urbanization – b) climate impacts and risks – c) societal vulnerability – d) governance capacity.
- We explored these at ***three different scales***: global comparison, city-region systems, and local initiatives.
- We developed responses in ***two key agendas***: adaptive pathways and adaptive governance, each essential for managing the peri-urban-climate interactions
- ***Cross-cutting themes and insights*** are also crucial: peri-urban-rural linkages: bio-regional thinking: system design thinking, and the emerging '*collective peri-cene intelligence*'.
- Overall this responds to the emerging IPCC agenda for risk, resilience and transformative adaptation.

This short SPM starts with key FAQs, and then follows with global-local comparison, adaptive pathways and governance, and cross-cutting themes.

It also introduces the main Synthesis Report, available in 2 parts:

- ***A) Overview***: with methods, themes, adaptive pathways and recommendations.
- ***B) Compendium of cases***: with outlines, maps and charts for each case study.
- This also links to the PCAT online mapping system, via http://peri-cene.net

1.2 'Frequently asked questions'

a) What is the problem?

In many parts of the world peri-urban settlements, both rich and poor, suffer the impacts of extreme weather caused by climate change - hurricanes in Central America and South East Asia: catastrophic wildfires in Australia and California: fluvial flooding in UK and Europe.

Peri-urban development is also likely to reduce the resilience of urban areas – where coastal mangroves are cleared away for tourist development:

historic water systems are filled in: forest natural cycles are disrupted.
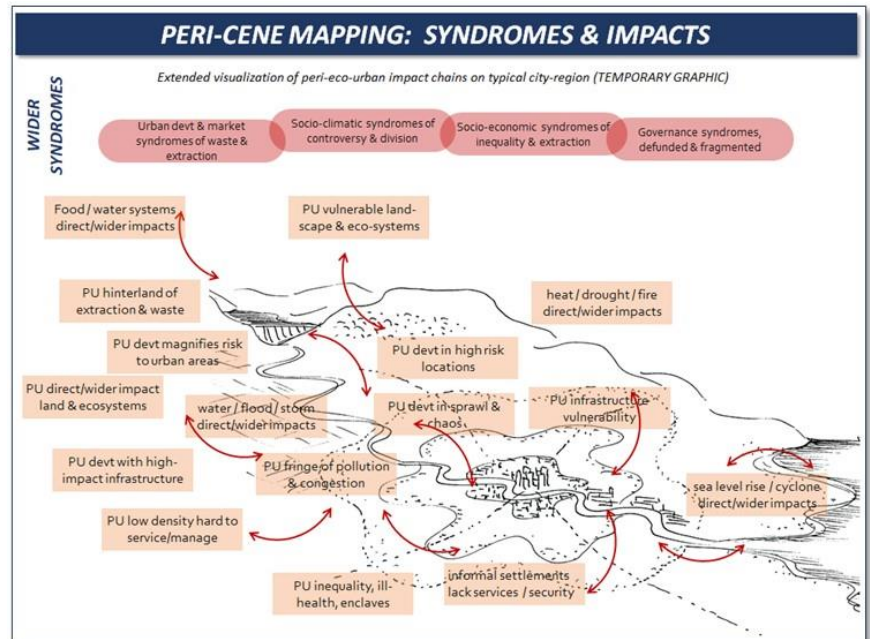
b) Where is the peri-urban?

The peri-urban is broadly, the area in the gravity field or hinterland of urban areas: there are many ways to define this: by population density, economic activity, travel patterns, urban infrastructure, water or bio-regions.

As defined by the (basic) Peri-cene method, peri-urban areas include land within the 'functional urban area' (FUA) at densities of 0-300 inhabitants/km^2: outside the FUA, 50-300. This covers a wide range of types: from the dense desakotas (urban-rural combinations) of South East Asia, to post-industrial UK, to the extended edge cities of North America and similar.

c) How big is the peri-urban & how is it changing?

Drawing from our 10% global sample, total peri-urban land around the world could be in the order of 1.8 million km^2 (approx. the size of Mexico). The rate of growth could be 3% of this, in the region of 60,000 km^2 per year (approx. the size of Ireland).

Peri-urban land areas overall have doubled in 25 years (urban land areas are slower growing at 9%). Meanwhile peri-urban populations have increased by 22% (urban area populations by 37%); this shows a smaller population spreading out, while the majority are still expanding and infilling urban areas.

d) Which climate risks are most crucial?

62% of our sample were in areas with 'high hazards' in over 3 multiple categories (World Bank data).

- ***Peri-urban impacts on climate change 'hazard':*** Peri-urban development leads to destruction or degradation of ecosystems (forests, water bodies, soils, mangroves etc) which protect urban areas from climate-related events or stresses.
- ***Peri-urban impacts on 'exposure':*** peri-urban population growth in areas of high risk (fire, flood, landslides, cyclones, coastal zone etc): many in informal settlements lacking infrastructure or defences:
- ***Peri-urban impacts on 'adaptive capacity':*** dependency on critical but vulnerable infrastructure: social vulnerability: lowers population density where defence is more difficult (e.g. fire risk zones): urban centred economic development leads to disruption or bypassing of lower income livelihoods, which increases social & ecological vulnerability.
- ***Peri-urban impacts on 'governance':*** governance is typically fragmented in political units, lacking connection to ecological zones: collaborative governance is more difficult, with a society polarized into higher / lower income enclaves.

e) What can be done?

Starting from the challenges – that the peri-urban is typically between units and policy sectors: climate change is either a short term disaster, or longer term risk and uncertainty. In response we look for a '*collective peri-eco-urban intelligence*' – the capacity for communication, learning, innovation and co-production between all involved. Then we look to design and plan for one of the 25 adaptive pathways, as co-designed by the Peri-cene Policy Lab:

- Direct and strategic adaptation for flooding, wildfires, drought, sea level rise etc;
- Design thinking and systems approach for food, energy, water, housing, landscape etc;
- Peri-urban-rural linkages and bio-regional ecosystems approach

To support these, we set up adaptive governance systems in each of four tracks:

- Formal government: strategic multi-level, integrated planning & public services
- Market-centred governance: integrated social & ecological values in markets & enterprises
- Civil society governance: collaborative, inclusive & participative forms of governance
- Grassroots social initiatives: enabling the energy of social innovations

f) What are the next steps?

First there is a need to raise the awareness of this vital interface in the new global '*peri-eco-urban anthropocene'.* Our case studies showed that the peri-urban is often little understood, and climate change policy is typically in near-denial. Given that this project is but a small pilot for others to follow on, some next steps include -

- Building the knowledge base, communications and learning;
- Building on the insights and responses to the IPCC and similar;
- Building capacity in governance enterprise and civil society.

1.3 From global to local

Global overview

This summary table includes land and population as defined by the Peri-cene method: (inside the 'Functional Urban Area' or FUA, 0-300 p/km^2: outside the FUA, 50-300 p/km^2). *Data is compiled for the sample of 21 city-regions, each with a 200km frame, from the GHSL mapping system, which covers 10% of the global urban population).*

	2015	1990	growth 25 years	APR	Doubling time years
LAND AREA (1000km^2)					
peri-urban land	182	89	105%	2.9%	22
urban land	158	145	9%	0.3%	
total populated land	340	234	45%	1.5%	48
POPULATION (millions)					
peri-urban population	15	12	22%	0.8%	90
urban population	410	299	37%	1.3%	
total population	424	311	37%	1.3%	50

The headline is that peri-urban areas around the world (as here defined) are doubling every 22 years. Such trends are the result of many factors, but the implication is, (if all else stays equal), peri-urban areas may be four times their present size by 2060, as the climate crisis accelerates.

City-region profiles

Following from the 'spatial profiling' (section 2.2), we use these key indicators for each city-region, to explore various cross sections. Our sample size is 21, so the analysis here is not about statistical analysis: more about comparison and insights on the peri-urban typology. These are selected indicators for the four key themes above:

- *Peri-urban area growth* (1990-2015): a broad measure of the scale of change in peri-urban areas (from GHSL data); a range from Cairo, Manchester (near zero) to Chennai (12.5);
- *Peri-urban climate hazard:* a combined index of 11 direct impacts, including flood, fire, sea level rise etc (World Bank data 2020): from Toronto (16) to Melbourne (41);
- *Social vulnerability / inequality* (national-level Gini index, World Bank 2020): a proxy for social capacity and resilience: a range from Helsinki (27) to Johannesburg (63);
- *Governance capacity* (transparency index of corruption 2020), as a proxy for many forms of adaptive capacity: ranging from (Manchester (78) to Dhaka (26);

The charts below then put these together:
- *Combined peri-urban growth / climate hazard index*: Mexicali, Chennai, Naples each show problematic combinations;
- *Combined social vulnerability / governance index*: Johannesburg, Belo Horizonte, Mexicali again show problematic combinations.

Figure xx: global comparison
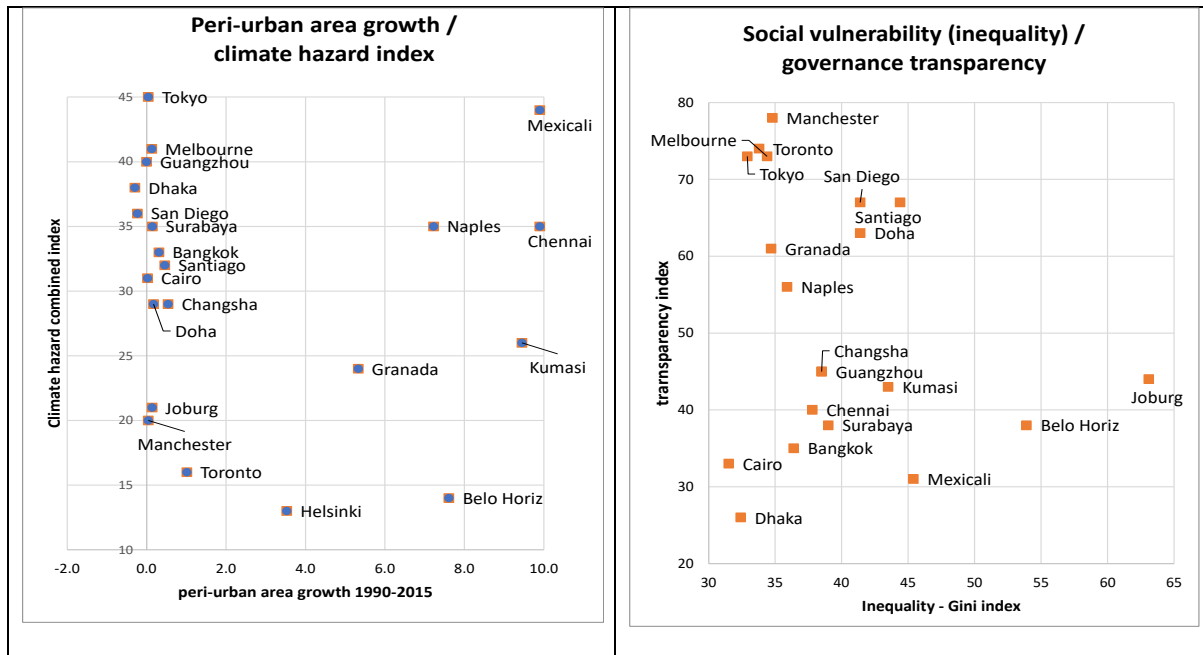
Local initiatives

There are countless local examples of grassroots resilience in the face of climate risk and disruption.

- In the Manchester region, the peri-urban town of Todmorden set up the Incredible Edible food project, linking environmental goals with social, economic, and cultural innovations.
- In the Chennai region, the village of Katchipattu shows how mobilization of excluded social groups can create new possibilities in ecosystems resilience.   Different levels from local to regional can be seen in this combined case study:

Chennai is a rapidly growing coastal megacity. Its story shows vulnerability to sea level rise and cyclones, riverine flooding and water stress, and the major disruption of livelihoods and ecosystems by the impact of peri-urban sprawl on a very complex sensitive water-based landscape.

- *Peri-urban syndromes:* rapid urban & industrial sprawl into low-lying landscape of complex water systems, & further hinterland: general disruption of ecosystems & livelihoods, development in high risk locations:
- *Climate change syndromes*: riverine & flash flooding: major cyclones: sea level rise & incursion: general water stress, disruption to soil & ecosystems, displacement of floodwater to urban areas: urban heat island & air pollution: increasing extreme wet heat days:

- *Societal vulnerability*: large scale transformation of rural economies & livelihoods: rapid social change & gentrification: disruption to rural farming & landscape systems:
- *Governance syndromes*: political fragmentation, widespread elite capture, illegal construction & encroachment: growing climate awareness but policy so far is lacking:
- *Adaptive pathways*: social grassroots innovations & community resilience (village scale): urban-rural linkages and integrated water & adaptation management (district scale): agro-ecology & integrated food systems (regional scale)
- *Adaptive governance*: integrated regional climate-wise planning: public / private sector partnership & market integration: civil society mobilization.

1.4 Responses: adaptive pathways & governance

Adaptive pathways

On the positive side, there are great examples of renewing the 'peri-eco-urban' resilience. Looking beyond one-off projects, the Peri-cene *21 adaptive pathways* combine ecological stewardship, collaborative governance, agro-ecology farming, integrated water systems, low impact coastal defence, nature based livelihoods, and so on. And to make all these work calls for enhanced forms of governance – adaptive, collaborative and inclusive of all stakeholders.

These *adaptive pathways* are likely to be combinations of many actions (social, technical, ecological, economic, political, cultural etc), which can overcome multiple challenges, and lead towards transformation.

The Peri-cene project aims at a unique contribution to these adaptive pathways – an interactive co-design process, with systematic analysis & development, from direct solutions to structural transformations.

PERI-CENE ADAPTIVE PATHWAYS

Overlapping pathways / policy agendas: example of north east Manchester region (Ravetz & Warhurst 2013)

PERI-URBAN PATHWAYS new urban-rural linkages, building forms, stewardship of commons, local/global synergies

STRATEGIC GOVERNANCE: balancing the globalizing city-region, with peri-urban zones & local community

CLIMATE PATHWAYS: Eco-system services exchange & links: water & flood protection: carbon & bio-mass: energy-waste-minerals

COLLABORATIVE GOVERNANCE: combinations of civil organizations, enterprise & grassroots, for new synergies & value chain opportunities

LANDSCAPE PATHWAYS: diversity of forms & habitats, building resilience to climate change, flood protection

SOCIAL PATHWAYS urban / peri-urban / rural: exchanges of workers, visitors, students, residents, social groups

ECONOMIC PATHWAYS: new value-chains, livelihoods, investments - visitor / leisure: farm & forestry: socio-ecosystem services

The more direct pathways include, for *flood and storm:*

- Short term: we need ways to manage rising floodwaters and extreme events, via SUDS, canals and basins, all integrated to the peri-urban metro-scape.
- Longer term: (in some areas) we need to rethink – where are the settlements, what kind of forms & surroundings, how can low impact eco-design manage a transformation towards a water-friendly co-existence.

And then for drought, heat and wildfire:

- Short term: arid zone water management in buildings and land: fire defence via forest breaks and natural fire cycle management.
- Longer term: (in some areas) we need to rethink – where are the settlements, what kind of forms & surroundings, how can low impact eco-design manage a transformation towards a drought / fire-friendly co-existence.
- For extreme heat, a growing agenda for building eco-design, social welfare, public health & safety, adaptation of livelihoods etc.

Also for sea level rise:

- Short term: sea defences, adaptation of coastal peri-urban livelihoods: cyclone-proofing buildings, infrastructure, ecosystems where possible.
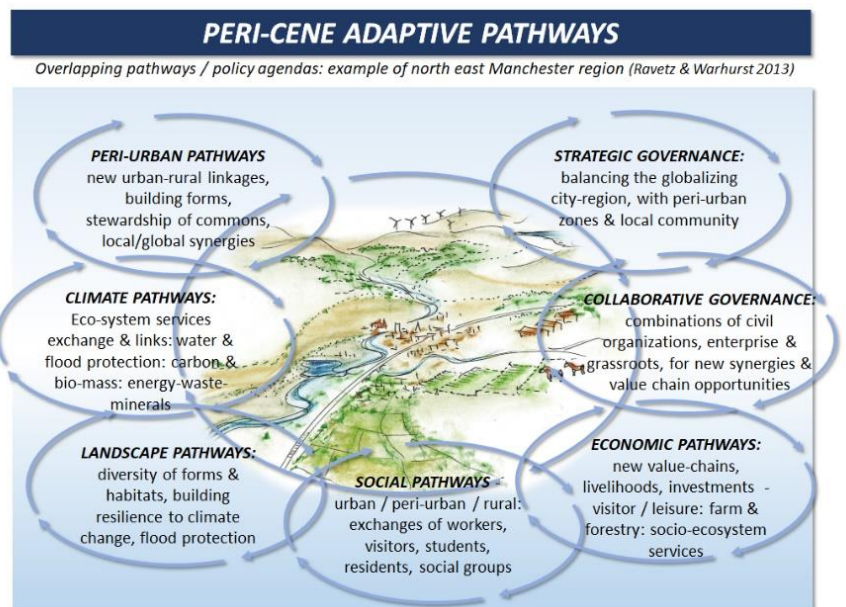
- Longer term: (in some areas) we need to rethink – where are the settlements & infrastructure, can they be defended, managed retreat or whole relocation. For cyclones etc, replanting of mangroves, dunes & coastal ecosystems

Adaptive governance

To enable these pathways calls for advanced forms of governance, able to manage complex problems with wider communities and deeper values. In practice nearly all our case studies found the current governance situation problematic:

- Peri-urban governance: typically trans-boundary, divisive and fragmented, lacking lines of authority and accountability;
- Climate adaptation governance: dealing with large uncertainties, controversial and divisive, hard choices between possible future impacts and present day costs / benefits.

The synergistic approach then helps to define different 'modes' of governance, and map the pathways towards a *'collective peri-urban governance intelligence'*: (i.e. the communication, learning, innovation and co-production between all stakeholders).   This also provides the logic for analysis of the case studies. We tracked in each one the various sectors of governance - public, private, civic and grassroots - where different kinds of logic may be dominant:

- Mode 1 'functional': the logic of bureaucratic efficiency, with possible dysfunctionality & inertia in the face of complex problems;
- Mode 2 'mal-evolutionary': elite / corporate capture, corruption either tacit or open;
- Mode 2 'evolutionary': innovative, entrepreneurial, mobilizing new forms of value;
- Mode 3 'co-evolutionary': collaborative-associative-participative-inclusive forms of governance, with *deeper* forms of value, with *wider* communities.

This provides a crucial insight to complex governance situations around the world, facing the special challenges of the peri-urban and climate response. In Manchester we see well established functional systems, in a 'mal-evolutionary' context of tacit elite capture and austerity, also with marginal possibilities on the co-evolutionary front. In Chennai, the 'mal-evolutionary' logic tends to be dominant over the functional, while the co-evolutionary potential is also a powerful force, as seen with agro-ecology.

This analytic framework has now been applied to a practical scheme, 'ELSA':

- Engage: collaborative, participative etc;
- Learning: knowledge based, deliberative, experimental;
- Situated: responsive to local issues and stakeholders, in multi-level systems;
- Action-oriented: innovative, creative, 'SMART' etc.

This is then applied to explore and define the meaning of 'adaptive governance' for each sector:
- Formal government: strategic multi-level, integrated planning & public services
- Market-centred governance: integrated social & ecological values in markets & enterprises
- Civil society governance: collaborative, inclusive & participative forms of governance
- Grassroots social initiatives: enabling the energy of social innovations

1.5 Cross-cutting themes

As peri-urban / climate interactions are typically complex, uncertain and controversial, we need new ways to understand and manage them. Starting with cross-cutting peri-urban syndromes (car based sprawl, inequality and gentrification, rural disruption and bypassing, high risk housing and so on) – we look at cross cutting themes of linkages, design thinking, bio-regional thinking, and the '*collective peri-eco-urban intelligence'*.   These are highlighted below as common syndromes – *versus* – potential pathways.

Peri-urban-rural linkages:

Urban & rural areas are highly linked and inter-dependent, in resources, infrastructure, housing, travel and ecosystems, and the peri-urban adds another dimension to that mix. 'PURL' (peri-urban-rural linkages) planning aims to maximize opportunities and minimize impacts on each kind of territory.

- Peri-urban commuter sprawl, congestion, isolation & exclusion – *versus* - **local livelihood pathways** for community resilience: *(e.g. Melbourne, San Diego);*

- Peri-urban flood defence diverts water down to the urban - *versus* - **integrated catchment pathways** with natural flood management and multi-functional landscape: *(e.g. Chennai, Manchester);*

Peri-urban bio-regional thinking

This puts the ecological bio-region (bio-ome, eco-region etc) at the centre of integrated planning (social, technical, ecological, economic, political, cultural), at multiple scales between urban / peri-urban / rural. Again the contrast includes:

- Peri-urban exploitation by intensive agri-business, with cheap migrant workers, pollution of air & water: - *versus* - **agro-ecology** pathways for local livelihoods & food democracy, circular resource systems *(e.g. Granada, Toronto)*

- Peri-urban forests and catastrophic fire risk from disruption by housing, infrastructure, mismanagement - *versus* – **integrated forestry pathways** with re-wilding, landscape diversity, fire-wise design *(e.g. Bangkok, San Diego).*

Peri-urban systems design thinking

Seeing the peri-urban as a complex system, we need to look beyond one-off solutions, towards collaborative (co-) design for system levels: for example,

- Peri-urban overloaded by combined flood and storm, water stress & heat stress – *versus* - **integrated design pathways** for buildings & urban form, natural flood / drought / heat management: *(e.g. Cairo, Bangkok);*

- Peri-urban development patterns which magnify up the exposure and vulnerability to fire or flood – *versus* – **integrated climate-wise pathways** for emerging development patterns: *(e.g. Mexicali, Surabaya);*

Strategic thinking & 'collective peri-eco-urban intelligence'

The pathways outlined above are basically starters for debate, on how far can the existing stakeholders can go to be creative or radical, for situations which are contested or controversial. Sooner or later such pathways will challenge in some way the existing system which has produced and reproduced such problems.

Here we apply the concepts of *'collective peri-eco-urban intelligence'* (aka '*deeper peri-eco-urban mind'*): the capacity for communication, learning, innovation and co-production between all stakeholders. This can be framed with 3 levels:

- *Functional intelligence*, *(mode 1)*: fixing of defined problems with known methods: e.g. raising of flood defence walls

- *Evolutionary intelligence*, *(mode 2)*: where one-off innovation / competition can produce new responses: e.g. peri-urban ecosystem markets

- *Co-evolutionary intelligence*, *(mode 3)*: where deeper and wider effects are all included: e.g. peri-eco-urban community enterprise with multi-level adaptive governance.

Climate risk & transformative adaptation

All the above responds to the IPCC report AR6-WGII, chapter 1, and its overview of key concepts. One is the **adaptation gap** - *'the difference between actually implemented adaptation and a societally set goal".* For the peri-urban reality this seems problematic, as often there is little idea of what kind of adaptation, for complex systems in rapid change, and with few 'societally set' goals.

There is a simple technical version for building flood defence. But a more strategic transformative adaptation has to include for the transformation of the peri-urban itself (ongoing and/or intentional), highlighting all the stresses and contradictions of the society around it. In our case studies the lower income megacities (e.g. Chennai, Dhaka) show this directly: but also the apparently safer places (Manchester, San Diego) show deeper layers of vulnerability and myopia. This points to the **socio-climatic interface,** where most case studies show little consensus or evidence 'out there', on climate change – instead there are power games, hijack, displacement, inertia and myopia

As for **transformative adaptation**, the Peri-cene contributes some essential insights. The first is to reframe the problem, as **not** all about climate change – more about finding common opportunities and pathways, in which climate adaptation is an added 'co-benefit'.

Another is to look for **adaptation pathways**, not as one-off solutions, more as extended processes of collaboration, which can enhance and mobilize the seeds of positive change: e.g. in urban design, real estate markets, landscape diversity, community development *(e.g. Toronto Greenbelt Foundation, Manchester South Pennine Park, Indian agro-ecology programs etc)*. These also bring in parallel perspectives, such as gender issues, indigenous and first peoples, decolonization, general social inclusion and empowerment.

A third theme is the **'Climate-wise'** agenda, starting with 'what could possibly go wrong: how can these pathways be hijacked to make more money, power, ideology? Could money or power be better made by blocking or stalling climate action? In the light of current events it seems more than ever essential to explore the 'big bad world' effects and possible responses.

1.6 Next steps

Here these research findings / recommendations feed into ongoing research-policy agendas.

- ***IPCC WGII: a research-policy agenda:*** Recommendations / guidance for strategic urban / peri-urban policy, planning & design;
- ***ARA (adaptation research alliance), a research agenda***: guidance & demonstrations for 'trans-boundary / trans-formative / trans-modal' research;
- ***Urban-rural linkages (UN Habitat), a practical agenda*** – ([https://unhabitat.org/topic/urban-rural-linkages):](https://unhabitat.org/topic/urban-rural-linkages) This aims at case studies, policy recommendations, capacity building.

Generally there is an urgent need to understand and manage the new global *'peri-eco-urban anthropocene'.* Our case studies showed that the fast expanding peri-urban is little understood, and strategic climate adaptation in most peri-urban areas is hardly started. Given that this project is but a small pilot for others follow on, the next steps aim to continue –

- Building the knowledge base, communications and learning;
- Building further insights and responses to the IPCC and similar;
- Building adaptive capacity in governance enterprise and civil society.

All who are interested in the global peri-cene – research, policy, business, civil society – are invited to join this challenge.

As a first step we are now exploring ways forward, with some options;

- Community of experimentation, exploring pathways towards the '*collective peri-urban intelligence'*: (in association with the *[Laboratory for collective intelligence –)](#)*
- Community of practice, for applications of these insights on the ground: (in association with UN Habitat [https://unhabitat.org/topic/urban-rural-linkages.](https://unhabitat.org/topic/urban-rural-linkages))
- As a first milestone, a special issue in the journal *Frontiers of Sustainable Cities*;

We propose to take this forward at the WPSC Track 10, in 2 special sessions and paper presentations – ([https://wpsc-apsa2022.org/track-10-rural-regional-and-small-island-development/:](https://wpsc-apsa2022.org/track-10-rural-regional-and-small-island-development/)