

Article

New Futures for Older Ports: Synergistic Development in a Global Urban System

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Abstract: Port cities are on the front-line of a changing global urban system. There are problems from restructuring of trade, logistics and ship-building, creating economic dependency, social exclusion and cultural destruction. Meanwhile, there exists new opportunities in heritage tourism, cultural industries and ecological restoration, but these opportunities often have negative impacts. This paper addresses the question of how port cities can steer from negative to positive development paths and outcomes. It sets out a way of working with inter-connected economic, social, political and technological factors—a ‘*synergistic*’ approach to mapping of problems and design of policy responses. Looking at three contrasting examples of port cities—Liverpool, Dubai and Mauritius—we can compare the inter-connected dynamics of growth and decline. Then we can understand the inter-connected factors of successful regeneration and sustainable prosperity, not as linear ‘policy fixes’, but more like synergistic processes of learning, innovation and capacity building. These call for new models for creative innovation in social and community enterprise: cultural heritage both old and new; new social finance and investment; socio-ecological restoration with participative governance, *etc.* Such pathways and opportunities are now emerging in many different locations; this paper provides methods and tools to understand them and promote them.

Keywords: ports and shipping; creative cities; urban heritage; community development; co-evolution; systems mapping and analysis

1. Introduction

Through history, the majority of larger cities have been located on the coast, as ports and harbors were the hubs for most forms of trade, investment and innovation. However, now there are other forces, such as global restructuring of trade and supply chains, changing logistics flows and technologies, modernization of fishing and shipbuilding, and growth of air passenger travel; as a result, many ports have lost their historic functions and suffer rapid decline. However, the port city as a ‘hotspot’ of decline can also offer opportunities as a hotspot for sustainable innovation, based on creative conjunctions of physical, social and economic resources.

In a wider context, cities are the hubs for resource consumption and climate change pressures, but they also offer possible solutions for low impact living. They are the sites for social and economic tensions and conflicts, but also for social and economic innovation and progress. Most cities show not one but many layers alongside the official version of policy-makers with endemic problems of poverty and exclusion, ethnic and religious conflict, expropriation and corruption. The new spatial geography of cities is fluid and emergent, and previously defined urban structures are now spreading into globalized ‘edge city’ sprawls, agglomerations, airport parks, logistics depots, and peri-urban hinterlands [1]. Such problems and conflicts also point to a unique set of opportunities, which are also centred on port areas, port cities or port-centred agglomerations:

- zones of creative destruction and creative experiments in obsolescent areas;
- crossroads for transients and migrants, marine workers and cultural diaspora;
- zones of capital accumulation in the circuit of urban property;
- hubs for new social movements, socio-cultural enterprise, community initiatives, *etc.*
- accumulation of cultural built heritage, both new, recycled and obsolete.

So, the agenda for port cities (as with any kind of city) is crucial—not only a local agenda, but for global-scale innovation and entrepreneurial action—on social, economic, cultural and political fronts. The challenge is not just to understand a static situation, but to anticipate and design creative responses, which work at multiple levels for multiple functions. All this calls for new ways of thinking and working with complex inter-connected problems. This challenge is the theme of this paper and its ‘synergistic’ approach: one of a series which explores the concepts and applications of synergistic methods, also summed up in a forthcoming text [2].

This paper firstly sets out the concepts and methods for synergistic mapping and design. Then, by mapping a ‘generic’ port city concept, it explores the different types of development paths, the goals of a synergistic “3.0” model, and the inter-connections of social, economic and cultural resources. This is then the basis for comparison of three very different case studies: Port Louis, Mauritius; Dubai, UAE; and Liverpool, UK. In each case, there are questions on how to understand and respond to the development options and agendas. A final conclusion draws out some further implications for policy and research.

2. Methodology

2.1. The Synergistic Approach

‘Synergistics’—the “science of synergy”, or ‘how things work together’—has been developed from long running policy-related research on sustainable cities and regions [3]. The synergistic approach centres on ‘mapping’, on the principle that in a complex situation, such as a large city, even a rough diagram or small scale map can be very useful. Such mapping is not necessarily a ‘solution’ or predictive ‘theory’, but it can aim to facilitate creative learning and anticipatory thinking. This approach builds on a very wide range of theory and practice. This starts with the concept of *wicked problems* [4], or *social messes* [5]. More recently, systems thinking has been applied to sustainability, emergence and ‘adaptive systems’ [6] leading to concepts of ‘complex adaptive systems’ [7–9], ‘resilience’ at different scales, or ‘post-normal science’ for problems with high uncertainty and controversy [10]. In parallel, there are many strands in relational thinking: the ‘relational turn’ in human geography [11–13]; ‘relational economic geography’ in firms and sectors [14,15]; ‘relational sociology’ for a complex society [16,17]; ‘relational governance’ and complex institutions [18–20]; and creativity and improvisation [21–23]. These concepts of emergence and adaptive capacity suggest several or multiple levels, which can be framed in terms of the ‘complex adaptive systems’ thinking above:

- ‘**Functional adaptive systems**’, which respond to short term pressures (with a metaphor of a *mechanical system*, with ‘engineering type’ resilience).
- ‘**Complex Adaptive Systems**’, respond to medium term environmental shifts and transitions to adapt (with a metaphor of a *biological system*, with ‘ecological’ resilience).
- ‘**Synergistic Adaptive Systems**’, driven more by human qualities of thinking, learning, questioning, creativity, strategy and reflexive awareness (a metaphor of a human system involving *cognitive deliberation* and *personal development*). The concept of resilience here focuses on these human qualities and their capacity not just to adapt, but to synthesise wider societal goals.

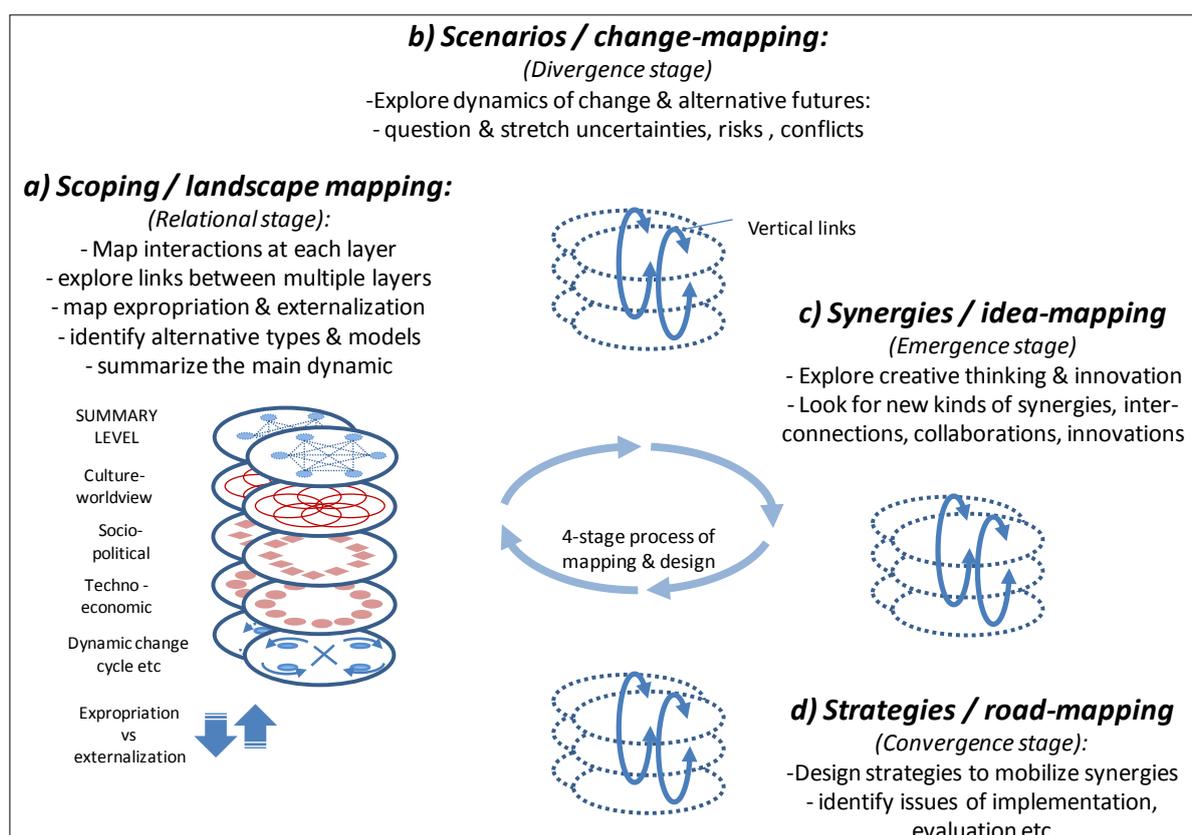
Overall, the combination of relational and emergent complex systems, and the understanding and responses to such systems, can be visualized as a ‘synergistic concept landscape’. This can be applied to the port cities agenda, as in Figure 1:

- On the left, a cluster of inter-connected ‘relational’ systems: economic, ecological, social, spatial *etc.* Each one shows a certain kind of community or eco-system; for instance, the ‘stakeholder’ level including public, private, civil, citizens *etc.* shows how each of these sectors can interact and collaborate with the others, and possibly form a wider agenda for community or society through collective action and learning.
- Above, there are alternative scenarios which can be generated by ‘divergent’ thinking, exploring the dynamics of change, and stretching the possible uncertainties, risks and conflicts;
- On the right, there are ‘emergent’ changes in these systems and their inter-connections, with effects seen in parallel; from linear change to complex and synergistic processes of cognitive learning, creative innovation, shared intelligence *etc.*

- The impacts of change can be visualized as vertical arrows showing ‘extraction-expropriation’, or ‘externality dumping’; *i.e.*, where one system/community exerts some kind of power over another, or displaces its negative impacts to another.
- Below are alternative types of responses, *i.e.*, policy interventions or business/enterprise models. Again, there are parallel tracks including direct functional responses, adaptation, and synergistic development.

All this provides a wider landscape, which helps to navigate complex problems, and develop synergistic responses. Experience shows many applications for creative and structured thinking: design and visual arts, policy development and conflict mediation, engineering and history, and of course foresight and future studies. In the study of inter-connected problems, and the design of inter-connected responses, we find that each of these different ways of understanding are linked.

Figure 1. Synergistic mapping and design: A four-stage process. (Source: author’s diagram).

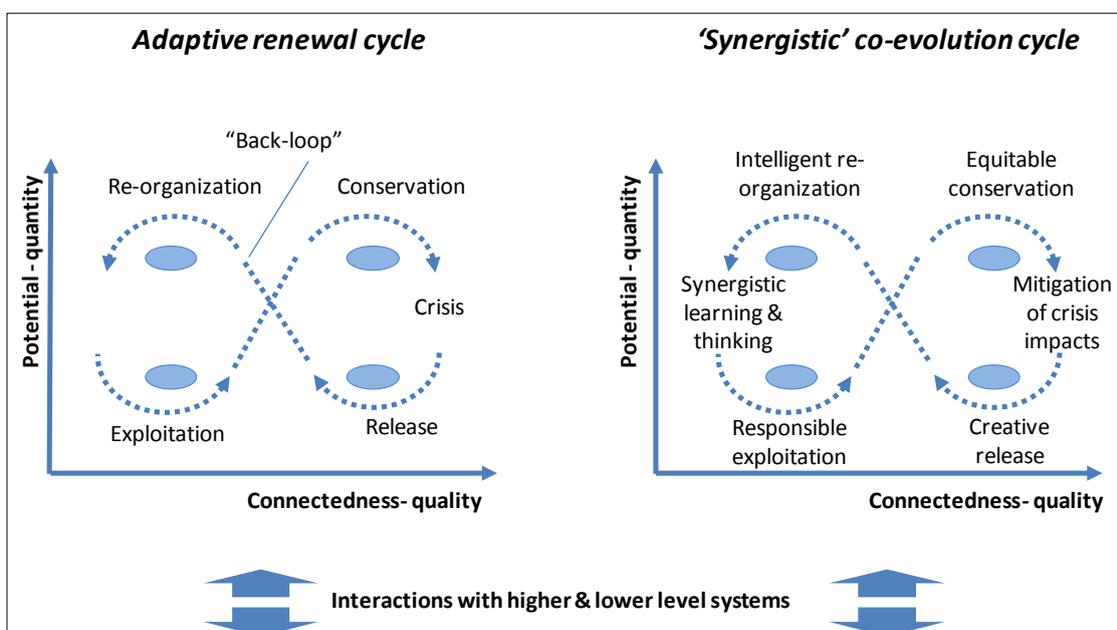


A further mapping layer which can be applied to city concepts is that of the cycle of renewal and co-evolution in ecological or socio-ecological systems. This draws on thinking on adaptive renewal and management: socio-ecological transitions and resilience qualities [23,24]. The adaptive renewal diagram identifies a “Y-axis” of system potential/quantity of resources and an “X-axis” of system connectedness/quality. It visualizes a ‘front loop’ or gradient of exploitation, where both quantity and quality increase, resulting in a ‘climax’ forest or similar habitat. This eventually leads to some kind of crisis or release, e.g., a forest fire: then there is a ‘back-loop’ or re-organization, where resources are rebuilt, often with a simplified structure, e.g., with a few predators or invasive species. This then lays the ground for a new cycle of exploitation. In terms of a historic port city, the initial expansion can be

seen as ‘exploitation leading to climax’; a further phase of restructuring and re-thinking of business models can be seen as ‘crisis, release and reorganization’.

Applying the insights from synergistic thinking, we can introduce human needs and qualities into what is otherwise a biological concept. In a human system, forest fires may have unacceptable impacts, whereas in a biological system they are more accepted as ‘nature’s way’ (Figure 2). In a more human-centred and synergistic cycle, the exploitation phase may be more responsible and less voracious. The crisis point (e.g., a forest fire) may be mitigated or managed, so that the impacts are less drastic on vulnerable people or communities. Then, the release point may be more of creative energy and less total destruction. The back-loop may aim to manage the growth of predators or invasive species (rather than letting the rats take over). Finally, the re-organization process may use more learning and memory for greater intelligence and strategic effect.

Figure 2. Adaptive and synergistic cycles. (Source: based on Holling (1986), [23], and Gunderson and Holling (2002) [24].



2.2. Applications to Port City Development Pathways

We can use this synergistic mapping and design toolkit as a guide to exploring the challenges and the opportunities facing typical port cities, and designing effective responses.

2.2.1. Linear and Adaptive Pathways

Firstly, the linear dynamic—restructuring of port activities, associated trade and economic systems, and the impacts on local economies and communities—typically takes the following forms:

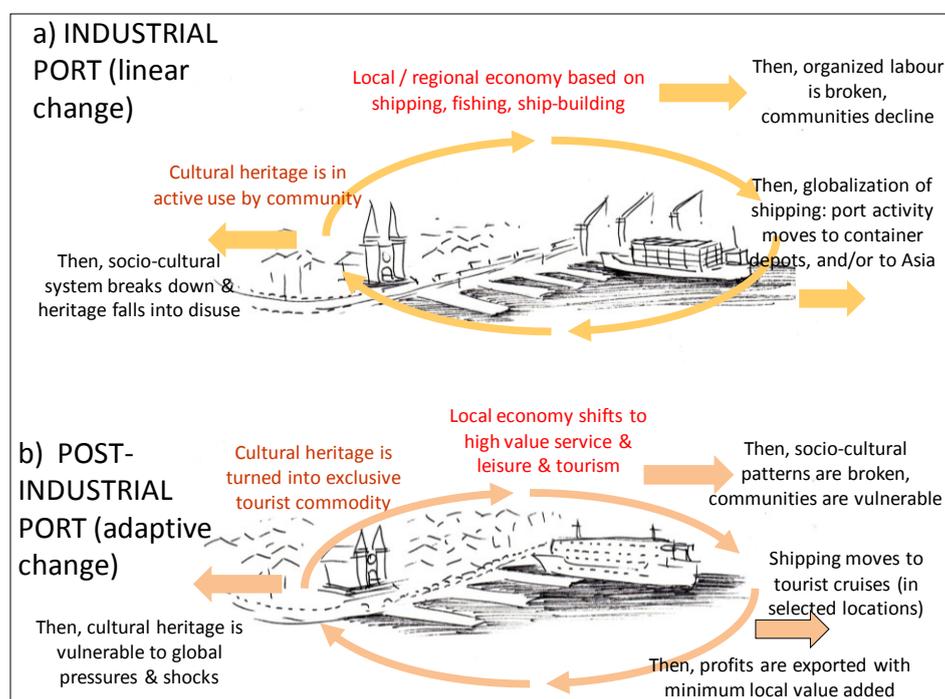
- Economic dynamics: increasing external pressures of globalization, liberalization, modernization, capital accumulation, which extract the value from port functions and labour markets.
- Technological dynamics: freight movements, fishing, passenger shipping and ship building, all under threat from alternative modes or scales of production.

- Social dynamics: internal pressures and contradictions of migration, demographics, economic restructuring, cultural change; cumulative social deprivation, coming from a spiral of economic disinvestment, shrinking cities *etc.*
- Spatial dynamics: locally, much obsolete port infrastructure is a physical barrier to effective spatial development, even while the port function is moved to a container transshipment zone. More widely, urbanization, peri-urbanization, and spatial policy agendas for development or containment.
- Environmental impacts from the city on to the marine and coastal zone (water, air, solid waste, habitat and landuse change, *etc.*). In some locations, vulnerability to natural hazards and catastrophes (climate related sea level rise, storms, earthquakes, tsunamis, landslides *etc.*).

Secondly, we can see responses on the level of ‘complex adaptive systems’ where stakeholders (economic, political, civil society *etc.*) are able to innovate and create business models or value-chains in their own interest, from their own boundaries, ‘value chains’ and ‘business models’. The result can be economic growth, alongside ‘extraction-expropriation’, and if ‘externality dumping’ continues, it is often displaced at a global scale. Hence, we can map out the many likely side-effects of a typical post-industrial adaptive restructuring port city:

- Waterfront colonization and gentrification
- Community and small business displacement
- Social exclusion from new labour markets
- Global dependency and vulnerability to unstable markets
- Cultural destruction and commodification
- Over-ambitious mega-projects
- Ecological damage, waste, displacement.

Figure 3. Historic port cities: linear change and adaptive development. (Source: author’s diagram).

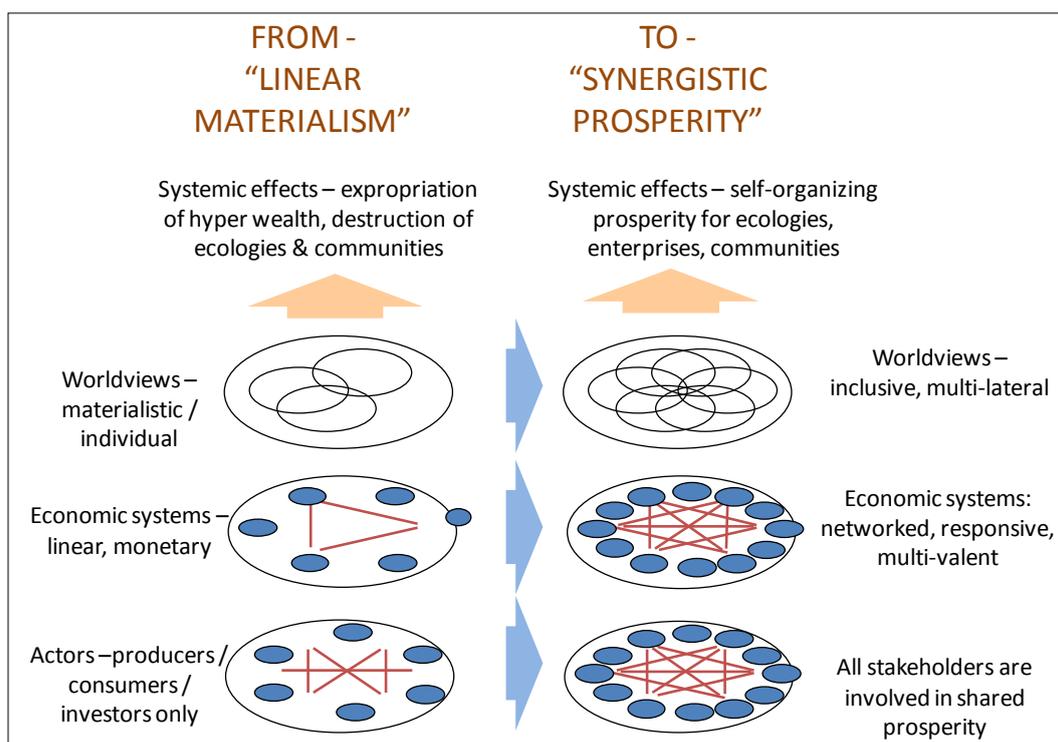


2.2.2. Synergistic Pathways

The concept of synergistic change raises the question: is there an overall goal for such change, and how to move towards it? In response, we propose a concept model—‘*Urban 3.0*’—which shows a ‘next generation’ system for cities, communities or organizations: networked, inclusive, creative, responsive, multi-valued, intelligent, and self-organizing. Urban 3.0 is not a fixed blueprint or checklist, but more a process for building capacity and intelligence to move towards economic vitality, social inclusion, ecological responsibility, cultural creativity, and political participation. Transitions towards the 3.0 model can be seen all around, in areas such as social enterprise, cultural heritage, and ecological restoration. However, there are equally or more powerful forces: globalization of local economies or financial expropriation by the elite, which are often oppressive and hierarchical, unsuited to complex challenges, with low levels of shared intelligence. In summary, a typical urban system in decline may well be too ‘stupid’ to survive and prosper, which suggests that the priority is to enhance its intelligence and learning capacity. Figure 4 shows the transition from a hierarchical, mono-functional materialistic economic development model, towards a synergistic, inclusive, self-organizing, multi-valent model. This is based on network type qualities including:

- Multiple forms of value are integrated: economic, social, ecological, cultural, *etc.*
- Multiple stakeholders are integrated: private, public, civic, community, knowledge sectors
- Multiple ways of organizing resources work in parallel: neo-liberal free-markets may be one strand, alongside others such as communitarian, cooperative, social network, or multi-cultural partnership approaches.

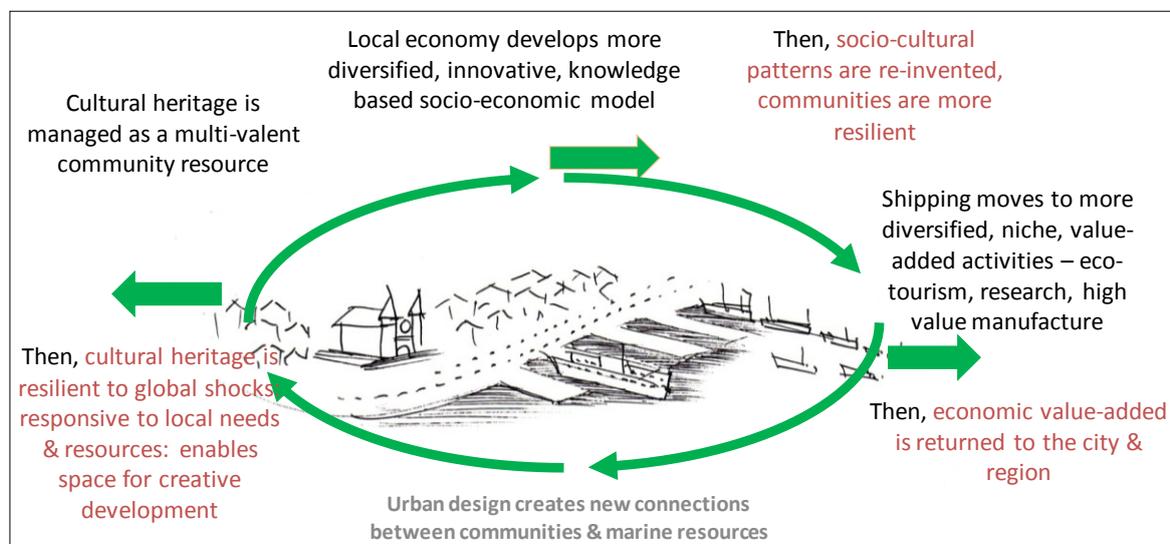
Figure 4. Transition from linear to synergistic “3.0” models. (Source: author’s diagram).



Applying this to a generic port city situation, a ‘synergistic development pathway’ would include, as in Figure 5:

- Shipping and waterfront activity moves to more diversified, niche, value-added activities, such as eco-tourism, research, high value manufacture. Then, economic value-added can be re-invested and returned to the city or city-region
- Local economy develops more diversified, innovative, knowledge based socio-economic model. Then, socio-cultural patterns can be re-invented, communities can be more resilient, and the vulnerable can be better protected.
- Cultural heritage can be managed as a multi-valent community resource: Urban design creates new connections between communities and marine resources. Then, cultural heritage can be more resilient to global shocks and responsive to local needs and resources, and enable space for creative development.

Figure 5. Historic Ports: Synergistic pathways (Source: author’s diagram).



2.2.3. Cultural Heritage Issues

A major resource of many port cities is a deep and rich cultural heritage, often built up over hundreds or thousands of years, through close interaction with geographic features and ecological assets. Such heritage often suffers physical displacement, where modern dock and container ports cut off the city from the waterfront. It then suffers economic disinvestment and social dislocation, where the indigenous active users of churches, marketplaces *etc.*, are in decline or active displacement by high value tourists, service industries or cultural expropriation. To counter this, a synergistic approach to cultural heritage is a key component of local integrated development. Examples can already be seen in many port cities around the world, but more are urgently needed to combat rapid decline or cultural destruction in many other areas. This starts from the following points:

- Cultural heritage is not so much an ‘absolute’ resource as ‘relational’, depending on interactions and value-chains between material objects/places/histories/worldviews/communities/individuals;

- At the centre is ‘relational value’, not only functional/monetary, but social, ethical, and concerning the relations between people, ideas, experiences, objects or places.
- ‘Values’ as such are less like fixed quantities, but more like potential energy, potential innovation or potential for relational activity (a metaphor is like money in the bank, which is only directly useful when it is spent, given or circulated).
- Urban cultural heritage has many layers and potentials which are often hidden, so its value generation capacity depends on a process of discovery. So, the creative challenge and opportunity of urban cultural heritage is a process of discovery of what is, what could be, and pathways towards it.

This points towards synergistic processes, methods and tools, which can help with this kind of creative discovery, re-discovery or innovation in business/enterprise models.

2.2.4. Summary—Synergistic Mapping of Integrated Development

The above can be combined into a summary of alternative pathways and development models, based on a typical post-industrial port city (Table 1): this provides the criteria for case study analysis in the next section

Table 1. Synergistic mapping for a generic port city.

	STATE	a) LINEAR CHANGE	b) ADAPTIVE CHANGE & DEVELOPMENT	c) SYNERGISTIC CHANGE & DEVELOPMENT
SYSTEM PARADIGM		Linear systems (mechanical)	Complex adaptive, dynamic systems (biological)	Creative, cognitive, co-evolutionary systems (human)
COMBINED DYNAMIC		Hollowing Unemployment Alienation	Restructuring Cosmopolitization Exclusion Ecology displacement	Creative learning Socio-cultural inclusion Ecology internalization
<i>Extractive processes</i>	<i>Global finance: ecological extraction: cultural hegemony.</i>	<i>Global finance: ecological extraction: cultural hegemony.</i>	<i>Global finance: ecological extraction: cultural hegemony</i>	<i>Global reinvestment Ecological balance Cultural integration</i>
Cultural issues	‘work & labor’ ‘community & mutual’ ‘free trade’ ‘heritage/dark history’	‘Dole culture’ ‘fragmented community’ ‘neo-liberal heist’ ‘Cultural alienation’	Cosmopolitization Consumerism Individualism Commodification	(‘network 3.0’) Living heritage Creative exchange Active multi-culturalism
Spatial issues	Waterfront infrastructure Industrial focus Suburban sprawl	Obsolete infrastructure Industrial dereliction Hollowing & shrinking	Restructuring Suburbanization New nodes & gateways	(“Spatial 3.0”) Urban-rural links Neighbourhood renaissance Social reinvestment

Table 1. Cont.

	STATE	d) LINEAR CHANGE	e) ADAPTIVE CHANGE & DEVELOPMENT	f) SYNERGISTIC CHANGE & DEVELOPMENT
Economic issues	Single sector vulnerability Branch plant dependency	Dis-investment Asset liquidation Structural unemployment	Service shift Tourism & leisure focus Property boom & bust	(“ <i>Economy 3.0</i> ”) Social reinvestment SME diversity Knowledge diversity Asset resilience
Social issues	Workers Owners Businesses Family structure	Alienation & migration Ethnic tension Generation gap Gender role conflict	Cosmopolitization Social restructuring Mobility shift Skills shift	(“ <i>Community 3.0</i> ”) Social enterprise Active community development Learning society
Governance issues	Municipal socialism City-region partnership	union labour decline local/national conflict public deficits	Suburban shift New governance model Public-private hybrids	(“ <i>Governance 3.0</i> ”) Active participation Anticipatory governance Knowledge based society
Ecological issues	Local pollution Local/global resources	Dereliction & disinvestment	Local selective cleaning Displacement to global resources	(“ <i>Ecology 3.0</i> ”) Local-global balance Climate & resource protection strategy
External-ization processes	<i>Local & global environments:</i> <i>Social exclusion:</i> <i>Economic externalities:</i>	<i>Increasing externalities</i>	<i>Neo-liberal type management & re-framing of externalities</i>	<i>Internalization of externalities.</i>

3. Case Studies

These three case studies were selected to show how the synergistic mapping can work and compare between different geographies and development stages. However, there is a thread which links them—that of British colonial and post-colonial history—which helps to place any further investigation with a historical dimension. The comparison between them helps to identify the qualities at the centre of this paper’s argument, *i.e.*, exploring the multiple levels of dynamic change and response in relation to port cities.

3.1. The Case of Port Louis, Mauritius

Port Louis is the capital and main port for the island nation of Mauritius, about 500 miles east of Madagascar in the western Indian Ocean. Founded by the French in 1736 as a port of call for ships coming around the Cape of Good Hope at the southern tip of the African continent, the island was occupied by the British in 1815 during the Napoleonic Wars. Until the Suez Canal was opened in 1869, Port Louis was on the critical path for trade vessels moving between Europe, Africa, and India.

From 1849–1923, the indentured labor system first established in Port Louis by the British was operated from the Aapravasi Ghat immigration depot, now a UNESCO World Heritage site. With the opening of the Suez Canal, shipping activity in Port Louis decreased, except for the period of closure between 1967 and 1975. In 2008, Port Louis received over 2000 vessel calls, handling 6.3 million tons of cargo, including 5.1 million tons of imports and 1.2 million tons of exports. [25] The Port Louis' private dry dock and ship repair facilities can accommodate vessels up to 150 meters long; it also has the biggest container facility in the Indian Ocean, accommodating today's fourth- and fifth-generation container vessels. The area around the waterfront was redeveloped in the last 15 years as mixed use shopping, leisure and cultural heritage for residents and visitors. . The economy of the wider city and the nation is now dominated by its financial centre, tourism and manufacturing sectors which include textiles, chemicals, plastics and pharmaceuticals: within a relatively forward looking social-democratic policy and fiscal regime [26]. The port is closely linked with the Export Processing Zones, a long running initiative to encourage entrepreneurs and industrialists, where the results seem to be mixed and not encouraging of local economic diversity and competitiveness [27].

This case is selected not only for historic port interest, but for its wider role in a potential trajectory and national agenda for the future. The author has recently completed a major project for the Mauritius Research Council, the 'National Research Foresight Exercise': a strategic and future-oriented outlook and strategy for research, science technology and innovation, in this small but dynamic island nation. Full reports and a continuing program can be seen on www.mrc.org.mu

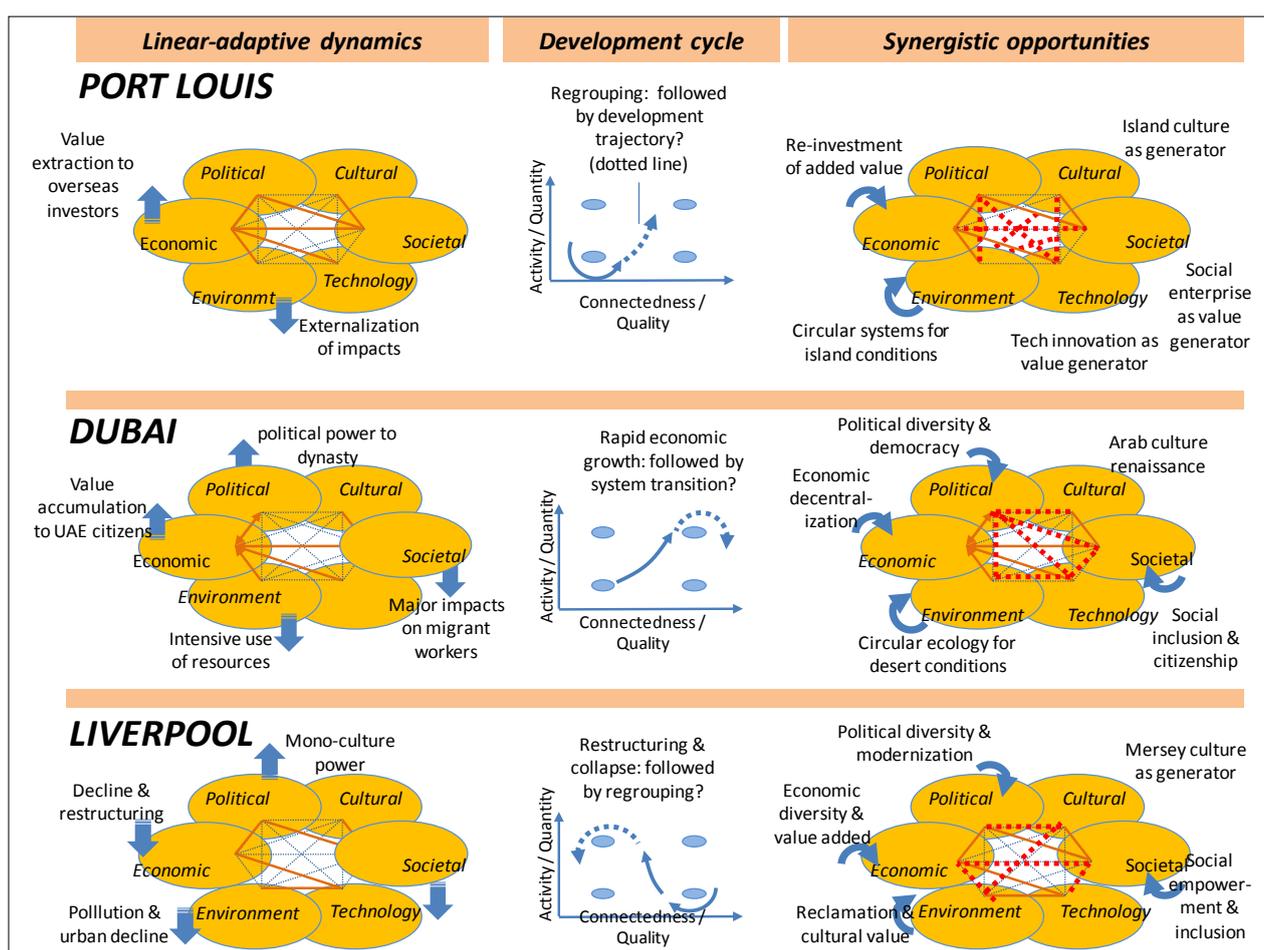
In relation to the port city agenda, the first and foremost theme which is explored with the Foresight approach is the 'Ocean Economy' (previously titled 'Land-Based Ocean Industries'). This aims to capitalize on the remote location of Mauritius with its outlying lagoons, islands, and an offshore area of 2 million square miles of ocean (a larger ocean area than that of the EU). Such oceanic and coastal resources can potentially provide energy, food, water, cooling, minerals, chemicals, fibres, pharmaceuticals and nutri-ceuticals, as well as biodiversity and scientific interest. At this stage, there is government interest and modest levels of funding, which addresses a huge agenda of national importance. The Ocean Economy raises wide-ranging issues, including law and ethics, oceanography and climate sciences, marine engineering and logistics, economic and business models, science and technology innovation, governance and management structures, infrastructure development, international relations, global trade policy, and many others.

Underlying all these, as highlighted by stakeholders in various consultations, is the need to pursue several tracks simultaneously: (a) physical infrastructure of shipping and ship-building; (b) human resources and skills in marine engineering and related infrastructure; (c) a general culture of oceanic thinking, in an island nation where there is a surprising disconnection between people and sea (for instance, only a minority of the population can swim). The backdrop to this is also highlighted in the Foresight studies, which identified how nearly all accessible coastline is rapidly being privatized and fenced off by 'Integrated Resort Schemes' (*i.e.*, large self-contained tourist complexes). This trend became the benchmark for defining alternative future scenarios, including an 'economic growth', 'win-win', and 'social/ecological prosperity'.

These aspects appear on the synergistic mapping of the dominant development cycle (Figure 6). The current linear-adaptive processes show an economic focus, relying on the environmental assets, with some financial extraction to the elite; however, there are active democratic politics and a strong

indigenous identity and culture. The current dominant development model can be seen as in a post-re-organization or pre-exploitation phase of the cycle (a more detailed analysis would explore different cycles for each of the social, ecological, cultural and other dimensions). With a new synergistic approach now under discussion in various forms in Mauritius, the re-investment of economic and environmental assets can be promoted, and a more balanced and regenerative system of political, social, cultural and environmental resources can emerge. A roadmap towards an Ocean Economy is set out in the Foresight studies and the Mauritius Research Council reports, but this is just an outline of the beginning of a long path. The continuing role of the port city in the past and future will be a key part of this.

Figure 6. Parallel development dynamics: case study comparison (Source: author’s diagram).



3.2. The Case of Dubai, UAE

This emerging metropolitan agglomeration is one of the wonders of the modern world [28,29]. As a post-colonial ‘Trucial State’, it only began modern development and basic infrastructure in the 1950s. The main natural harbor Dubai Creek was modernized in 1961, the first airport opened in 1960, and the municipal water supply came in 1968. In the two decades to 1980, the urban area increased by 16 times, and the population by five times.

The Dubai Creek port operations are now a colourful mixture of traditional small-scale cargo with tourist cruises and ferries. A huge new dry dock development was thought by many to be a white

elephant, but opened just in time to service profitably the many ships damaged in the Iran-Iraq war of the 1980s. The world's largest artificial harbor was constructed to the south at Jebel Ali with 66 berths, at a cost of \$1.6 billion, again to much critical comment. It later converted the surrounding area to a Freeport & Special Economic Zone, housing 6000 companies on a total area of 52 square miles: it is now the US Navy's largest overseas seaport. The sovereign company Dubai Ports World then began acquiring foreign port operations and infrastructure; however, its largest bid in the USA which included the port of Miami then turned politically risky and was eventually blocked. The airport leapt forward with the formation of the Dubai-based Emirates airline, and is now the fifth largest international hub in the world. After a hiatus caused by the global economic crisis of 2008–2011, development in Dubai and the UAE is back on track, with iconic towers, offices, shopping malls, luxury hotels and infrastructure going up as fast as they can be built. One iconic image is the world's tallest building surrounded by a unique artificial lake waterfront complete with animated fountains; another is the 'Palm' developments, bringing a whole new concept of artificial sea frontage, with the smallest at Jumeira now complete with 38 miles of new beach.

The Dubai case highlights several relevant themes. One is about socio-cultural issues in a totally multi-cultural city, which can be described as a kind of giant airport terminal [30]: less than 10% of the population is native to the UAE; the majority of the population is low income migrant workers in very poor conditions, and the upper-middle classes are from an extraordinary diversity of countries. Such a multi-cultural mix and tolerance is the essential strength of the city and its dynamic development, but there are many concerns about the complex hierarchy of citizenship, and its effect on human rights and social privileges. There is also an agenda concerning the political culture, with governance described as a 'tribal autocracy', where the ruling Maktoum dynasty maintains ultimate power and unimaginable wealth, apparently for all time. By delivering development and material prosperity, this system appears secure and accepted by the majority at present, but its durability in the longer term under changing conditions is debatable. This also applies to the question of material sustainability: with subsidized oil and gas used for air-conditioning and mobility on a massive scale, the ecological or carbon footprint per capita is twice that of the USA and nearly four times the EU average [31]. Again, the long term viability of this extractive model must be questioned.

In this context, we can draw an outline synergistic mapping of the Dubai case (Figure 6). The linear-adaptive picture shows a strong political-economic dominance and expropriation of power and wealth to the elite: environmental resources suffer large impacts, and the majority is migrants living and working in very poor conditions. There is a strong linear expansion stage of development, fed by entrepreneurial thinking on the part of the regime 'tribal autocracy'. Later developments in a post-climax phase can be imagined in terms of crisis due to war, civil unrest or resource shortage: responses through a more synergistic mode of governance and enterprise can only be sketched at this stage. However, other UAE or Gulf states such as Abu Dhabi and Qatar are possibly further along this process, with serious models for alternative energy and urbanization. Here, the mapping shows a rebalancing of wealth and power, a re-integration of social and cultural structures, and a re-investment in environmental resources and responsibilities.

3.3. The Case of Liverpool, UK

Liverpool is a good example of a port city with a history of rapid growth and decline, and with huge problems side by side with huge potential. From a position as a hub of the British Empire in the 19th century, with much of its wealth built on the former slave trade, Liverpool then lost half its population in the period 1945–1995, with massive de-industrialisation and physical dereliction. A brief outline of history includes:

- 1950s – post war restructuring, rapid decline of shipping and fishing
- 1960s – new cultural wave of ‘Merseybeat’ music
- 1970s – strategic planning for city-region of Merseyside (*i.e.*, Liverpool with four others)
- 1980s – confrontation between socialist council and right wing national government and between union labour and large firms in automotive, chemicals, *etc.*
- 1980s – first wave of urban regeneration and reclamation: rise of cooperatives, partnerships and community initiatives
- 1990s – new realism, continued by New Labour government: expanding airport, new industries, culture-based waterfront regeneration, green infrastructure
- 2000s – second wave of large ‘urban development corporations’, and ‘housing market renewal’ areas; large city centre retail investment
- 2010s – major redevelopment proposals in the former port areas in Birkenhead, as part of private sector driven ‘Ocean Gateway’. At the time, there were approximately 11 million square metres of empty and derelict land.

There is continuing loss of freight traffic, containerization and mechanization with shrinking national fishing fleets, and passenger ferry activity declining in competition with budget airlines. For social deprivation, some areas are among the worst 1% in the UK, and in the UK Coalition government’s austerity programme, Liverpool is deeply affected by financial cuts to the public sector and welfare. In spite of rhetoric on regional cooperation, there is a rivalry and lost competition with nearby Manchester for regional centre and ‘world city’ role. However, initiatives such as ‘European City of Culture’ 2008, the UNESCO World Heritage status for the central waterfront, and the urban tourism revival have helped to generate large commercial investment. The effects do not often reach the more deprived neighborhoods; however, there is a parallel stream of social innovation and enterprise, including cooperatives, ecological projects, local heritage, utopian grassroots and community initiatives. Although this appears to produce very positive social and economic results, there are often conflicts with other mainstream or ‘top-down’ solutions, both private and public sector.

The iconic but controversial flagship of regeneration is the recently opened ‘Liverpool 1’, an award winning integrated shopping development based on 18 hectares of city centre near the waterfront [32]. Unfortunately, the development involved privatizing what were once public streets, to the detriment of ordinary residents, and closing down a very popular cultural industries and small business warehouse. The ownership of the development by the UK’s third richest aristocrat does not help its image. On a much larger scale is the ‘Ocean Gateway’, a regional scale initiative by the near monopoly landowner and developer Peel Holdings. The scheme links their assets in the ports of Liverpool and Birkenhead, with the Liverpool airport, Manchester Ship Canal and many key industrial sites. Ironically, as the UK

Coalition government of 2010 rapidly destroyed most forms of regional planning, this private sector initiative is the only strategic planning framework which remains; its intentions are apparently good, with many ecological and social benefits, but its core purpose remains focused on private profit.

Some of this experience is visualized again in Figure 6. The linear-adaptive process has produced a city with many dysfunctions in the economy, social structure, environmental impacts and political system, although the political-economic nexus still dominates the city activity. On the development curve, the city has been through crisis and release (land, finance, occupations, *etc.*), and is now generally looking for a re-organization 'model'. At the moment, this is dominated by big business and finance, coupled with retail consumption, backed up by packaged tourism and heritage. If we compare this to the synergistic agenda on the right, we would look for economic reinvestment and political rebalancing; a more social and cultural focused agenda for empowerment and self-organization, and a more active engagement with ecological assets and opportunities.

This can be pointed at the cultural heritage agenda; from Liverpool's long history of conflict turbulence, cultural heritage is one of the key opportunities for urban regeneration. Following the 'adaptive' pathway, continuing financially driven commercial investment tends to increase economic divides and social vulnerability, and the physical structure and cultural resource of the port and waterfront can encourage this. For a 'synergistic' pathway, there are initiatives both from former 'sustainability' and 'community' groups, which have evolved over the decades towards 'resilience' or 'prosperity' agendas. These are some brief examples from the past decade:

- Groundwork trusts in various parts of Merseyside, from the 1980s onwards: these brought together public and private sectors, civil society and residents, to work on derelict or unused urban or fringe land:
- Inner city housing cooperative and community technical aid centres, which reclaimed or built new neighbourhoods on an integrated social model:
- Waterfront initiatives which combined historic buildings with economic revitalization:
- City centre development trusts, which combined heritage and cultural industry SMEs, innovation, with the interests of owners, developers and users of buildings in low demand [33].

4. Comparison and Conclusions

How to compare such very different examples of port cities at different stages of development and restructuring? One issue is just where to draw a line around the 'unit of analysis', whether it is the waterfront, port area, urban area as a whole, or regional agglomeration which may be the functional territory for the port activity. This question is more challenging by the day, as port operations become globalized logistics sites, with less connection to adjacent cities or regions. However, this paper is more focused on broad development pathways, rather than specifics of port operations or structures.

The three cases highlight some interesting questions, together with insights on how the method can be applied (Table 2). One is the different role of the sea/ocean in each case. In Mauritius, the ocean is seen as the catalyst for a whole new phase in national development, that of the Ocean Economy. In Dubai, the water is seen as a primary resource for artificial beachfront development for high value tourists. In Liverpool, there is a strong agenda for ecological restoration, which then unlocks value for waterfront redevelopment of former dockyards.

A further theme concerns the nature of change, and the formation of policy agendas to respond to change. Both Mauritius and Liverpool are in a phase of re-organization and re-thinking of development agendas and models, although in very different ways. Meanwhile, Dubai appears to be focused on a different part of the cycle, where linear expansion is very successful and provides its own logic. Each case example contains deep social problems and divisions—economic vulnerability, technological change, and environmental displacement—in different ways. While political autocracy appears to be concentrated in Dubai, it can be argued that the others have similar embedded structures of power and wealth, but are a little more effective at disguising and merging them into the policy landscape. In each case, there are signals and indicators which often seem to show up on the port waterfront, or generally on the land-ocean interaction zone. In Mauritius, the new integrated resorts are privatizing the coast as fast as possible; in Dubai, the migrant construction workers are excluded from the resorts and malls which they build; and in Liverpool, the flagship development is based again on shopping in privatized streets for extractive profit.

Table 2. Synergistic process thinking and case study comparison.

	Synergistic methods & tools	Generic issues for port cities	Mauritius case study	Dubai case study	Liverpool case study
SCOPING & MAPPING	<i>'how, where, which'</i> questions on the system structure & dynamics: horizontal links vertical links lateral links	port city system is 'extractive' of value. Conflict of labour/capital Conflict of spatial, economic, cultural	positive features: active democracy, growing economy, shift to knowledge base, hub for finance & tourism. Negative features: nepotism, inertia, sell-off to financial elite, economic divide & social exclusion.	The historic port is still a logistics centre for small/informal traders, now a vulnerable community. The wider urban agglomeration is a turbo-charged development machine with rapid linear expansion.	Long history of political conflict & economic turbulence: Cultural heritage is one of the key components of regeneration.
DIVERGENCE	<i>'What if'</i> questions for alternative pathways: test boundaries & assumptions: form new & challenging scenarios	Many ports are at a cross-roads, with diverging futures; obsolete structures are both problems & opportunities	Several schemes have looked at Mauritius' future. The National Foresight sees 3 scenarios: 'high economic growth': 'win-win': & 'social/ecological sustainability'.	National outlooks/scenarios not yet developed. Most strategic thinking is about continuation, with some visible shift towards social & environmental goals.	BAU is continuing decline: less likely is rapid re-investment for all-round economic success. For debate is a 'paradigm shift' in which the port city takes a new kind of role.
LINEAR/ADAPTIVE CHANGE	<i>'What then'</i> questions on new possibilities: emergence mapping of dynamic change & self-organization risk/opportunity assessment	linear/adaptive development paths can reproduce conflicts & failures: high value tourism & similar is vulnerable & extractive	linear development path is seen as economically, socially & ecologically unsustainable on a small & remote island. But it appears to be the current trend and could continue with the hub role of the island.	Very rapid linear-adaptive expansion is based on human resources (migrant labour): natural resources (oil/gas): & political security (autocracy). If any of these fail then a new phase may begin.	Continuing high value commercial investment tends to increase social & economic divides and vulnerability. The physical & cultural resource of the port & waterfront can encourage this.

Table 2. Cont.

	Synergistic methods & tools	Generic issues for port cities	Mauritius case study	Dubai case study	Liverpool case study
SYNERGISTIC CHANGE	'Synergistic' questions on new possibilities on the cognitive level: synergistic foresight for shared intelligence creative thinking & learning process	synergistic pathways link social, cultural, economic, political, spatial agendas. waterfront & coast are opportunities, may need radical intervention.	Synergistic pathway for the port city is focused on a) a new concept of ocean economy: b) the question of trade balance & sustainable resource management.	A more synergistic pathway would prioritize re-balancing of social structure: ecological sustainability: cultural integration & urban liveability; political & citizen integration including migrant workers	There is debate on alternatives coming from former 'sustainability' and 'community' groups, now with newer types of 'resilience' and/or 'prosperity' groups.
CONVERGENCE	'So what' questions, to bring possibilities back into focus: road-map for strategic planning assessment & evaluation	needs local/urban/regional integration. Plans depend on social entrepreneurs & creative capacity building.	An innovative program of knowledge-based enterprise & strategic policy intelligence is just being established.	Strategic planning on a synergistic basis is to be explored in the future.	Work is in progress in the UK & EU to explore what this alternative development pathway means and how it can work in practice.

This ability of the port and waterfront to bring to the surface and make visible the signs of larger forces is one of its most important features. If it can also serve as a catalyst for other positive changes then the port city role can again rebuild its role as a hub of creative and sustainable development. The question is then how to achieve the synergistic thinking which appears to be called for in each case, either sooner or later? There are few clear solutions; rather there are experiments at different points on the cycle, which are beyond the scope of this paper.

The overall implications are clear: firstly, that port cities are indeed 'hotspots' for both problems and potential solutions. Secondly, there is potential for alternative pathways which can avoid the impacts of adaptive change, and look towards a more synergistic, inclusive, creative and responsive future. Thirdly, to realize these pathways needs a new generation of methods and tools, now under development.

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Conflicts of Interest

The author declares no conflict of interest.

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