



Smart ways to mobilise more efficient and effective long-term investment in city regions



the ecological
sequestration trust

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Acknowledgment

The Rockefeller Foundation provided their Bellagio Centre from 24 to 28 February 2015 for The Ecological Sequestration Trust to convene a high-level meeting on how to finance improved planetary health and the delivery of the Post-2015 Sustainable Development Goals. The aim was to provide a very practical insight into what can be done and how progress can be quickly demonstrated in selected regions of China, Africa, Brazil, Mongolia and Europe and then scaled up in those countries and around the world.



Bellagio, Italy

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Foreword

By Josep Roig

UCLG Secretary General

'Smart ways to mobilise more efficient and effective long-term investment in city regions' arrives at the ideal time to contribute to the discussions leading up to the 3rd International Conference on Financing for Development.

As the organisation that represents the voices of local and regional governments across the world, United Cities and Local Governments (UCLG) is convinced that investment, particularly in basic service infrastructures, is an essential condition for sustainable urban development. However, it is essential to acknowledge that the aspirations of the Post-2015 Agenda will simply not be achievable if we rely on current public and private investment models. Systematic change and innovative new tools will be required, particularly at local level. This report is a welcome contribution to the debate.

The international community has recognised that backlogs in infrastructure, housing and service provision to the urban poor pose an enormous challenge to the cities of the global South. At the same time, there is a need to retrofit and rebuild aging or obsolete urban infrastructure, which is a ticking time bomb in many of the world's industrial and post-industrial cities.

These vast needs for investment in urban infrastructure coincide with unprecedented levels of global liquidity. However, this financing will only be mobilised if both public and private investors have confidence in the investment environment over the whole investment cycle, as well as in the households, local and national governments who will attract, manage and benefit from these investments.

This report presents suggestions of how new tools can be used to harness investment to finance urban development at household, municipal, national and global level.

Of course, in the complex and often technical debates on investment mechanisms that will be had over the coming months and years, it is important to recall that financing for development, if it is to be sustainable, must be managed so that it meets both citizens' needs for basic services and supports the four pillars of sustainable development (economic, social, environmental and cultural).



Executive summary

The post-2015 development path, being mapped out by the Sustainable Development Goals (SDGs), is very different from the Millennium Development Goal (MDG) path because of the additional needs to deal with climate change mitigation and adaptation, manage global resources within their limits and restore damaged ecosystems that support human resilience. Many people are questioning how it is possible to change direction quickly and scale up the investment to make this happen. The development of goals and innovative finance approaches is not enough. What is needed is additional transformational change in policy, governance, public and private investment and community life across local, regional, national and global scales.

The Ecological Sequestration Trust brought together leading practitioners, who had expressed a desire to lead this understanding, in a high-level meeting at the Bellagio Rockefeller Foundation Centre from 24 to 28 February 2015 in order to produce this report that provides new insights into tackling the challenge of how to rapidly scale up SDG delivery globally. Attendees included representatives from potential demonstration regions in China, Mongolia, Africa, Brazil and the UK who developed case study examples. Attendees were able to draw on all the latest research reports in their analysis, which was done in teams during three days of intensive work.

The key recommendations from the analysis are summarised below:

1. The battle to deliver Post-2015 SDGs globally will be won or lost in cities
2. City regions need an adequate share of government funds to enable them to attract the necessary private capital
3. The availability of finance is not an issue
4. The main barrier is the lack of capacity and tools to bring forward 'bankable' projects
5. Transfers of knowledge, best practices and human and ecological resource data are needed at different scales - from local communities and regions, different cities, entire nations and on up to global scale. Such practice is being established
6. The best way to connect to funding sources is to set up an Urban Development Fund (UDF) financing vehicle, supported by a systems platform
7. Local data and systems modelling are needed in the platform. Open-source tools, which enable the use of local open-data in systems models are now being developed for this purpose
8. Projects are best taken forward using the Public Private Partnership (PPP) aggregator model in which the platform is used to support planning, design, delivery and ongoing maintenance. Leverage of around 70% could be raised
9. Projects need to integrate human and ecological systems to reduce the cost of mitigation and adaptation and to support human well-being
10. Local capacity for planning, modelling and project development needs to be developed urgently in city regions, so that there are the tools and training required to plan, design and implement such projects with appropriate governance arrangements
11. Overseas Development Aid (ODA) funding can be specifically targeted at capacity building and the provision of the necessary tools for city regions
12. New financial instruments and mechanisms are needed both within and outside the formal banking sector to enable financing and development to be inclusive and to reach down to the needs of the community
13. The (re)insurance sector has a key role to play in risk assessment in developing countries and enabling risks to be better accounted for in the wider financial system



1. The opportunity

“The year 2015 - our generation’s greatest opportunity to move the world toward sustainable development” Jeff Sachs

The year 2015 will be our generation’s greatest opportunity to move the world toward more sustainable development.¹

Four high-level negotiations are taking place between March and December 2015, which involve discussions on disaster risk reduction, financing for sustainable development, climate change and the Post-2015 Sustainable Development Goals (SDGs) that will replace the previous Millennium Development Goals.

It is hoped that all of this progress will reshape the future global development agenda and give an important push to vital changes in the workings of the global economy, and that low-carbon development which allows for ecosystem recovery will become the overriding model of success. This will require a fast global transformation from where we are today. Progress in this new direction will be hard to measure, and at the moment we see interesting incremental innovations happening, but only on a small scale and in disconnected sectors, with few cross-linkages to the public sector.

Very large-scale transformative steps will be needed, requiring massive capacity building for multidisciplinary collaboration, supported by independent, trusted local sources, and such steps must be able to draw on inclusive finance to allow communities to move forward whatever their circumstances.

Fortunately, we are at a unique moment in human history when we have the capability to make this transition by bringing together

wide-ranging innovations. For the first time, a combination of science, big data and sensor network technology, and advanced systems modelling, along with visualisation, internet access and great leaps in computing power enable the practical use of collaborative simulations involving human activity, ecological activity and economics. These can be used for policy setting, planning and design so as to guide everyday life. This opportunity has the potential to lift human development by advancing collaborative intelligence.

Fast-growing city regions are now the main drivers of job creation and investment globally, and so the second opportunity is for city regions to take this modelling and simulation technology on board and demonstrate how to use it. This includes attracting capital while accelerating their nations towards inclusive, resilient, low-carbon development, and simultaneously meeting their required contribution to the newly established holistic SDGs. Systems modelling is the key for local communities to find resource-efficient and lower-cost ways of living in which climate mitigation and adaptation are integrated and ecological vibrancy is embedded so that they can create greater community resilience.

This is a good time to progress these developments because there is an adequate supply of capital looking for projects and investments. If appropriate tools evolve quickly under the right governance and transparency arrangements then rapid progress could be made. However, such tools and systems have to meet all communities’ and stakeholders’ needs in practical day-to-day decision and

policy making, and must connect global, national, regional and local scales if they are to succeed.

This is itself a major challenge but one that organisations are starting to take forward. Such tools must be able to become a useful part of everyday working life for slum dwellers, farmers, foresters, business people, industry, local authorities and national governments.

Children need to have access to these tools at school to learn about the way their local society works, including its history and cultural diversity. Students coming out of college should be able to use the tools to find work and to help create new businesses. The internet means that tools which are open access can be downloaded and used anywhere, loaded with local data, and put into use quickly, with remote online training support.

There is an opportunity to make such tools freely available to stakeholders in any region through using them for performance-based project procurement. A charge could be levied locally for their use, which would come from the design cost savings they bring and the extra value they create.



¹ Sachs J D, 2014. The Year of Sustainable Development. Project Syndicate - The World’s Opinion Page.

2. A viable global financial system investing in the real economy

“We must learn from the “tragedy of horizons” - the market failure brought about by the short-term thinking of businesses and investors through an inadequate response to future challenges”
Mark Carney

Following the 2008 financial crisis, the issue of securing volumes of developmental finance and institutional capital for frontier markets has not been fully addressed. Volumes of finance need to be redirected towards investment in tangible assets. Expectations of total need vary widely, but some estimates are USD 90 trillion², of which it is estimated that some 80% will need to come from the private sector³.

The scale of the need in world cities is of particular concern given the expected huge increases in population from migration and internal growth, which will lead to vast numbers living in slums (estimated to be in the region of 2 billion by 2030⁴). The World Bank estimates that 80% of the annual global costs of climate adaptation will be borne by cities, and the High Level Panel on the Post-2015 Agenda argues that the battle for sustainable development will be lost or won in cities. Populations in cities will struggle to renew and develop their infrastructure through their own resources owing to very low levels (<10%) of financial inclusion, and hence there is a massive need to attract external sources of financing.

Currently, both local and international sources of private capital for investment in cities are concerned about risk and return. Despite progress in a number of countries, our contention is that further incentives are needed to increase the level of investment in city-level sustainable and resilient infrastructure. Such incentives could include risk amelioration through the utilisation of longer-term public sector support, including the use of guarantees

for specific risk elements such as tariffs and currency; reduced capital charge needs, obtained through the recognition by regulators of the benefits of offering sustainable and resilient infrastructure; and the utilisation of risk instruments offered by the insurance industry. An increase in the number of cities achieving ratings will also enhance the level of finance they may attract for sustainable infrastructure.

In order to offer these incentives, it is most effective to work within and enhance the present structure of the world’s financial system – one that is heavily influenced by regulation and rating. We feel that supporting these regulators and rating agencies is required to encourage them to account for the quantifiable and positive impact of incorporating sustainability and resilience into investments. This approach could be allied to existing work being undertaken in relation to risk assessment and benchmarking of infrastructure investment⁵.

Levels of liquidity in the financial markets are at a record high, and interest rates are at record lows. Availability of finance is not an issue. The real issue is creating viable structures and environments in which people wish to invest, as well as a full understanding of the holistic nature of the projects in which they are investing. Investment propositions need to be clearly defined with specific parameters, and cities need to demonstrate a responsible plan for managing assets to include operation and maintenance.

We support the Brookings Institution’s recommendation to establish new mechanisms for financing cities in developing countries by the end of 2016, and to bring 20 large cities to the international capital market by 2020⁶. We also support the extended use of Public Private Partnerships (PPPs) in developing sustainable infrastructure, and we believe the above incentives will engage investors further in contributing to PPP projects.

One potential PPP mechanism for consideration by cities as a vehicle for development is an enhancement of an urban agency concept into a financing vehicle, an Urban Development Fund (UDF) that can bring institutional investors, development finance and the public sector within cities together. This would build on an aggregator model used in PPPs. This vehicle would serve as an aggregator of income from various sources within the cities (e.g. rates, taxes and user income from city services, including funds from sales of real estate to private investors or from development gains).

The vehicle would then act as an initiator, developer and creator of projects within the cities. It is envisaged that these would be relatively medium-sized projects (i.e. not transit systems or airports that would be large enough to attract capital as individual entities, but instead, for example, schools, hospitals, energy efficiency systems or biomass plants). The vehicle could also utilise planning tools to ensure city-wide engagement. It is envisaged that the ownership of the vehicle

would be shared between the public and the private sector to ensure full transparency and accountability. Financing could be made available by those who would be attracted by the diversification benefits of investing in a series of projects, and leverage of around 70% could be raised. In the longer term, this vehicle could be rated to ensure an efficient and lower cost of capital.

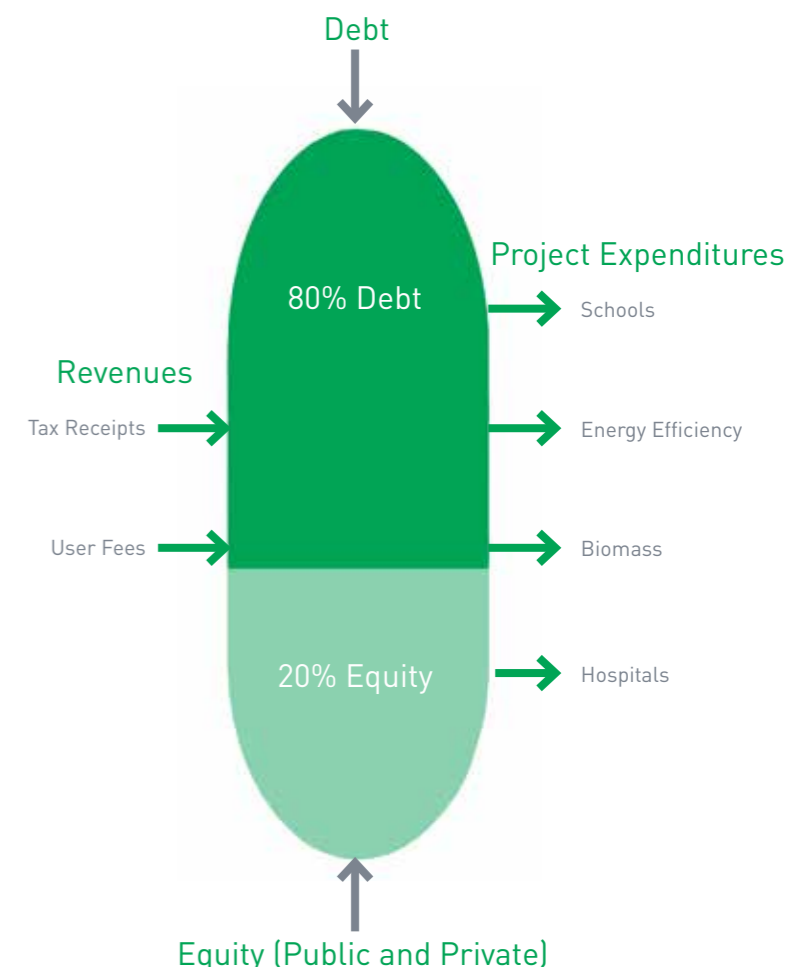


Figure 1 – Urban Development Fund model

2 The New Climate Economy, 2014. Better Growth Better Climate. The New Climate Economy Synthesis Report.
3 UNCTAD, 2014. World Investment Report. United Nations Conference on Trade and Development, New York and Geneva.
4 UN-Habitat, 2003. The Challenge of Slums: Global Report on Human Settlements. United Nations Human Settlements Programme.
5 EDHEC-Risk, 2013. Towards efficient benchmarks for infrastructure equity investments. EDHEC-Risk Institute.

6 The Brookings Institution. Nine Priority Commitments to be Made at the UN’s July 2015 Financing for Development Conference in Addis Ababa, Ethiopia.

3. Financing cities - how can city regions create bankable investments?

The path to integrated strategic planning for city development

The path for the transformational change of cities to resilient centres of living is anchored on the ability to concisely formulate the direction of change and make the capitalisation of opportunities of change happen using sensible and financially sound approaches. Key to the way forward is unlocking project visibility and financing so as to progress economically, in line with the possibilities for citizens to develop and grow whilst inclusive of an environmentally benign process of development.

The starting point of any transformative process is to refocus strategic planning within the capabilities of the city environment to be in line with the SDGs. A journey that starts with a series of structured dialogues among all key stakeholders, informed by a preliminary diagnosis of the problems and issues driving the territorial agenda in a structured, governed and guided approach, is normally managed by the city government. Many views will emerge from the stakeholder process to unlock a focused and well-informed series of perspectives on the future, as part of a collaborative and iterative approach to creating the draft strategic plan in question. The end result will be an identification of key on-the-ground needs as they exist in communities and are perceived by civil society and the private sector, structured in the form of a concise set of goals and objectives to be achieved on different timescales. This report includes some illustrative case studies.

The value of a set of tools that can identify systemic relationships is essential in the process. Its purpose is to identify at an early stage interrelationships and tentative ideas that address needs and wants and their place within the spatial hierarchy, and the urban fabric of districts and natural zones, productive centres and places of social interactions. Transformation can then be implemented by identifying the individual building blocks of its realisation via integrated project development. It is crucial that proposed and developed projects fit in with the strategic plan as an ongoing effort in Sustainable City Development – in short, projects should be ‘planning led’. In determining investment priorities, the power of analysis comes into play in the use of a series of diagnostic tools to create a sustainable, development-led identification of the financial project’s potential value. Projects can be ranked to start the selection process on the basis of how they advance inclusive goals within the city region. The end of this stage of the process will produce a list of well-informed projects that can provide for particular needs, also enabling prioritisation of which should be developed. A new online tool is available to support early stage development of projects⁷.

A crucial next step is the building of bankable projects, where bankable is defined as projects that have both economic and financial efficacy. With respect to the latter, two main conditions are the financial strength and capacity of the local government, including a greater degree of political and financial discretion than is often the case at the local level, to lead the project’s

“Good design is at the core — and we must front-load our thinking and planning for resilience at a large scale”
Judith Rodin



Image provided by Turenscape

7 Global Green Growth Institute 2014. Global development banks and the private sector come together to support a practical solution for reducing the infrastructure gap. <http://gggi.org/global-development-banks-and-the-private-sector-come-together-to-support-a-practical-solution-for-reducing-the-infrastructure-gap/>

development process. There is an equal need for funding for projects focused on the development of social and human capital and for those that deliver a physical infrastructure that embraces natural systems. It is also important to provide cities with appropriate advisory services, that have limited-capacity, but are free of charge in a development context, to help turn the series of desirable projects into bankable ones, as the cost of feasibility studies can be a key constraint.⁸

Within the emerging project portfolio, there are those that will lend themselves to Public Private Partnerships (PPPs)⁹, there are those that can be funded directly by the municipality or public agency using conventional forms of finance and, given prevailing budget constraints, there are those residual projects that will need more creative financial instruments to facilitate their implementation. The value of the residual projects, although economically and financially feasible, is often difficult to valorise. Solving the challenge of funding the residual projects is key to enhancing the financing in cities to deliver the urban SDG

An example of a more innovative form of financing could be the setting up of a development agency such as an Urban Development Fund (UDF). It could fill a gap in finance markets with its specific focus on cities, including their environmental and social dimensions, while providing an acceptable

rate of return. Such funds should therefore be policy driven and not constrained by traditional commercial criteria. They should exploit the long-term benefits of the projects that they fund by providing adaptable finance, such as generous grace periods and progressive repayment terms, which is reflective of the development agenda. In various places the fund's nature can be truly unique, in focusing on particularly neglected areas and building up expertise in these fields, such as in the regeneration and renewal of deprived city neighbourhoods. Although the establishment of UDFs often has to be catalysed by the injection of public funds in cash or in kind, their development usually attracts private investment and facilitates PPPs.¹⁰

Most importantly, it is imperative that the process takes place in the form of periodic review and iterative improvement and learning, driven by the set of tools used in strategic planning and the outcome of robust financial assessment (deployment of the platform). This will enable the inclusion of data and knowledge in a way that allows periodic updates to be easily achieved at low costs. Otherwise, the adaptability/flexibility of the planning process will be compromised when responding to crucial developments such as migration, demographic change, socio-economic developments, technological change, and global economic and environmental impacts.

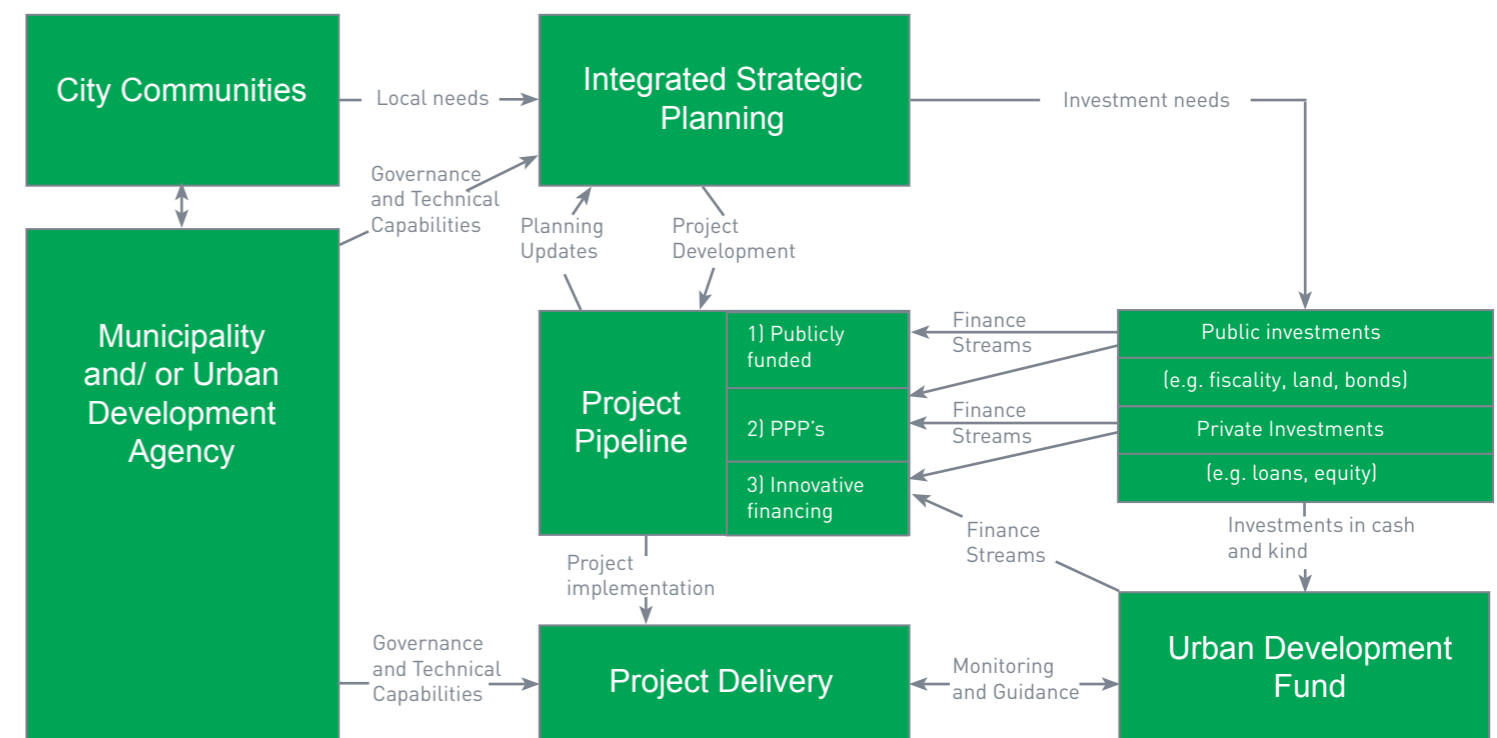


Figure 2 – Overview of strategic planning process including urban investment fund

8 To make that happen services need to be made available by development agencies, on an independent basis outside of their direct funding needs.

9 By Public Private Partnership, PPP, we mean the public and private sectors entering into a creative coalition to deliver a specific project to the mutual advantage of both parties.

10 See, for example, the JESSICA initiative in the EU - Joint European Support for Sustainable Investment in City Areas

Resilient city initiatives: Ulaanbaatar, Mongolia

Current situation in country/region

There is a fundamental requirement to link city development challenges with private sector funding: Ulaanbaatar (UB) supports nearly 50% of the Mongolian population and produces 63% of its GDP and 86% of its bank savings. UB is central to the Mongolian economy but its heritage is being challenged because of rapid urbanisation and industrialisation, with growing levels of inefficient consumption. A collective solution is required 'with a strong public-private partnership and mutual support to create a positive sustainable future'.¹¹

Sustainable development project approaches

The UB Master Plan to 2030 was approved by parliament in May 2013. This key planning document, supported by the UB Economic Development Strategy, has led to the formation of the UB Development Corporation (UBDC). The corporation will be the main vehicle for project delivery, working with the private sector, and there are plans to implement an integrated planning platform which models human and ecological resource systems and the economic value they create. It is of prime importance to the city administration of UB to utilise the power of a systems platform capable of producing economic, social and environmental scenarios for city projects and their predicted outputs and impacts prior to investments being made.

In parallel, a working group comprising the Mongolian Bankers Association, the Ministry of Environment, Green Development and Tourism and the Financial Regulatory Commission has

established the Mongolia Sustainable Finance Initiative Principles, to which 13 commercial and 1 development bank have signed up to 8 principles:

Protect

1. Protect the natural environment
2. Protect people and communities
3. Protect cultural heritage

Promote

4. Promote green economy
5. Promote financial inclusion
6. Promote ethical finance and corporate governance
7. Promote transparency and accountability

Lead by example

8. Practice what we preach

With an ambition **“To secure a green economic infrastructure and financial system by 2020 and become the global leading example for sustainable finance by 2016”** the benefits of considering environmental and social responsibilities alongside economic responsibilities are expected to be:

- A significant contribution to Mongolia's Green Development Goals.
- Collaborative delivery to include government, policy makers, city administration, banks, businesses, citizens, international organisations,

There are 186,000 households or nearly 600,000 people living in the ger slum districts of UB, of whom only 22% are served by an engineered sewerage infrastructure. Investment is needed to rectify this, to make use of biomass for energy and fertilizer and to combat the air pollution of 64 ug/m³ caused mainly by coal-fired cooking stoves. The coupling of global and private sector finance, channelled through the city direct to local projects at scale, will enable successful implementation and delivery of national and global SDGs.

All images by Mike Cherret



academia and media.

- Increased business, trade and investment
- Reduced credit and market risk through the use of data scenarios, analysis and interpretation

To deliver this, there is a pressing need for open-source data and technical capacity

building at multiple levels to accelerate development in planning that is based on systemic thinking, is appropriate for the Mongolian context, and has measurable, practical outcomes that enable independence in terms of furthering the country's economic and Sustainable Development Goals.

Greater Accra and Future Cities Africa

Current situation in country/region

The Greater Accra Metropolitan Area (GAMA) is a natural port and the economic, administrative and cultural capital of Ghana, but suffers from the same problems as many rapidly urbanising African cities. These include an ageing infrastructure, flooding, a lack of affordable housing and social inequity, while serious and sustained water pollution, from human and industrial waste, threatens economic stability and growth and the population is overshadowed by the constant threat of cholera.

Almost two thirds of Accra's households lack safe sanitation services, and solid waste management represents a daunting task – the city generates on average 3,000 tonnes of waste daily, and continues to spend about 62% (USD 4.38m) of its internally generated funds on waste collection¹².

Ghana needs at least 100,000 additional housing units annually, with supply being estimated at 35% of the total need. Consequently, the slum population is estimated to be about 5 million and is growing at a rate of 1.8% per annum.

Sustainable development project approaches

Despite these challenges, the city has made a significant effort in starting to collect GIS data, and has contributed to a United Nations Sustainable Development Solutions Network (UN-SDSN) report on how cities could report their progress towards reaching the Post-2015

Urban Sustainable Development Goal targets.

Partly as a result of this work, Accra has recently been appointed as one of Rockefeller's 100 Resilient Cities and is trying to achieve a shift towards a more sustainable and resilient pathway for development.

In order to foster this kind of commitment to improvement across Africa, the UK government's Department for International Development is scoping the Future Cities Africa programme to support rapidly urbanising African cities. It is working with the Cities Alliance to identify appropriate programmes to support at least 8 cities in Africa to become future-proofed to climate, environment and natural resource challenges so that they are inclusive and resilient and have growing economies. It will help make cities work for the urban poor. It will also develop innovative tools to enable rapidly growing cities to realise their potential as centres of growth and job creation; use research and evidence to develop targeted urban action plans; and will deliver new research to fill data and evidence gaps to maximise sustainable economic growth and to enable future programming.

The project will involve in-depth consultation with urban local authorities, other donors, development actors and research institutions and will deliver outcomes for cities in four African countries. The tools will support inclusive planning processes and ensure that knowledge and experiences can be widely shared.

- For any country to initiate, implement and sustain its economic growth and development, it needs an appropriate economic and social infrastructure
- This is critical for propelling economic growth and ensuring sustainable poverty reduction
- The World Bank has estimated that to achieve the 7% growth rate needed to combat poverty, Ghana, among other countries in Sub-Saharan Africa, needs to invest 5% of its GDP in new infrastructure



Top - 'City of Accra' by Dansoman
 Left bottom image - 'Cape Coast Central' Ghana by Adam Cohn
 Right bottom image - 'Accra's Makola Market' by Transaid

12 PAR, 2013. Performance audit report of the auditor-general on solid waste management by Accra metropolitan assembly (AMA) Vol 2/34. Ref. No. AG.01/109/

Sustainable project design: China

- Human health and livelihoods are completely dependent on the health of natural systems
- The comprehensive analysis of economic, human and ecological systems models leads to the improved design of urban areas
- China has recognised that urbanisation need to have an ecological approach

Current situation in country/region

China is developing at an unprecedented rate and is undergoing a previously unseen pace of urbanisation, with around 20 million more citizens becoming city-dwellers each year. However, many of China's towns and cities have huge areas of underused, ill-designed and isolated public space. There has also been a massive explosion in resource consumption in recent years, and these issues have led to enormous challenges. Firstly, water, soil and air in many towns and cities, including in the capital, Beijing, have been badly polluted. Secondly, ill-designed cities cause damage to the heritage and fabric of local architecture forms and culture. For many cities and towns thriving on the tourism industry, a deteriorating environment and ill-preserved local features will eventually affect local people's livelihoods.

Sustainable development project approaches

Xixinan, a typical ancient village in Anhui province, is renowned for its heritage and culture relating to ancient water irrigation, traditional Chinese gardens and historical buildings.

The Turenscape Xixinan Village Project¹³ aims at improving the living conditions of local residents while preserving the historical value and cultural essence of Xixinan village and creating a regional tourist, recreational and educational destination. The project has the potential to play a demonstrative role in improving local and regional development in a multi-scale view, drawing on the area's natural ecology and strong cultural heritage.

The project has used simulation and geographic information data analysis to map and analyse water and ecological systems, infrastructure, housing, local service provision and historical buildings, and to simulate flood processes, human activity, infrastructure and service use in order to improve design.

Ecological measures have been used to treat water pollution and protect the aquatic environment of the Fengle River. This river has cradled ancient Huizhou civilisations for centuries and nourishes the best-preserved natural Wingnut forests and wetlands in the south of Anhui Province.

Ancient Huizhou buildings have been restored with landscape planting used to improve open spaces; local service provision has been improved and a design school created. A recreational park for local residents will be built, agricultural efficiency will be increased and poverty reduced.

A more efficient traffic system has been developed to improve traffic safety and boost communication with other regions. The tourist industry in this village, along with the livelihood of local people, is also likely to benefit from this improved system.



All images provided by Turenscape

13 Turenscape: <http://www.turenscape.com/english/>

Creating a new engine for financing sustainable growth: Dorset, UK

Current situation in country/region

Dorset, in the UK, is a diverse, predominantly rural county, covering 1,650 square kilometres; it has a population of 750,000 citizens, 75% of whom are located in three conurbations in the south-east. Most economic activity is inextricably linked to an environment which is treasured by locals and visitors alike and which includes a spectacular World Heritage Coastline.

Dorset has ambitious goals to deliver growth through business enterprise while safeguarding communities and the natural systems that support them, but it faces the challenges of an ageing population, areas of significant deprivation and environmental challenges, such as flooding, which are set to worsen in projected future climate scenarios.

The banking sector remains dominated by four large banks that continue to prioritise short-term profit maximisation and which are still 'too big to fail'. The local economy is therefore starved of the funding it needs to reignite growth and invest in sustainable infrastructure.

Sustainable development project approaches

Innovative investors in Dorset are collaborating to create a financial system that has sustainable values and banks that are aligned with host communities in terms of scale, incentives and vision. This is a pilot for a national network with similar initiatives.

The idea is to establish a community investment platform with a community bank at its centre, in order to:

- Distribute financial services from a number

- of sources and help with debt advice
- Support the creation of a community energy company (ESCO and utility)
- Finance and build low-carbon housing and other infrastructures
- Fund a social enterprise incubator/accelerator to develop new solutions to local problems

The vision is to transform the way money is lent and invested so that it:

- Accelerates decarbonisation of energy systems
- Recapitalises communities
- Democratises local investment
- Ensures that the proceeds of growth are more equitably distributed
- Allows people to see what their money is doing and empowers them to move their money so it is working in alignment with their own views and values

Multiple benefits have been evidenced through the enabling of projects that could not proceed with loans at the rates and on the loan terms offered by mainstream banks. These include benefits to the local economy through increased job creation and economic activity – analysis of the local banking system in North Dakota suggests that on average 10 additional jobs are created by each £1 million of locally focused lending.¹⁴

Increased business-led innovation in clean and green technologies is permitted through the funding of innovative climate-change mitigation and adaptation projects not otherwise able to secure funding. There is substantial research showing how the provision of credit to

- Social enterprises are transformative – local resource ownership allows communities to develop sustainable projects and dividends and co-benefits that are fed directly back into the region
- Local banks can align their objectives with those of social enterprises and accelerate 'good' projects¹⁷ – the use of robust evidence and collaborative, cross-sector management encourages investment in sustainable local projects
- Precedents for this are happening around the world, and they motivate local people and provide regions with the autonomy to develop sustainably



Image by Gwyn Jones

European small and medium-sized enterprises by high street banks has declined over the last decade¹⁵, which has meant that start-ups and higher-growth, young companies have been chronically credit-rationed due to the shift by lenders towards mature companies with more physical assets.¹⁶

Surpluses from the operation of the local bank will be reinvested according to local priorities, and community cohesion will be enhanced by the knowledge that local depositors are assisting local businesses. Local authorities will see the emergence of a new partner that can help to deliver sustainable economic

prosperity and the creation of a low-carbon economy, since the bank's social, economic and environmental objectives will overlap considerably with those of the local authorities.

Alongside this initiative, Dorset has established a collaborative local steering board for such innovative projects. This brings together public, private, voluntary and community sectors to collectively use, and help to develop, an integrated systems model that will provide an evidence base to support sustainable investment and decision making.

¹⁴ BNDL Lending Services, 2009. Partnership in Assisting Community Expansion Program http://banknd.nd.gov/lending_services/business_financing_programs/PACE_program.html

¹⁵ David Merlin-Jones, 2010. The Industrial and Commercial Finance Corporation: Lessons from the past for the Future. Civitas; Bank of England statistics, Industrial analysis of monetary financial institutions lending to UK residents 2000-2010; Stephen L. Clarke, 2012. Street Cred: Local banks and strong local economies. Civitas.

¹⁶ Robson, P., Akueteh, C., Stone, I., Westhead, P. & Wright, M., 2013. Credit-rationing and entrepreneurial experience: evidence from a resource deficit context. Entrepreneurship and regional development, 25 (5-6), 349-370.

¹⁷ 'Good' projects are a portfolio of PPPs that meet the social, economic and environmental objectives for a region whilst meeting the revenue and asset value increases required to achieve return on capital

Market mechanisms to facilitate compliance: Rio de Janeiro, Brazil

Current situation in country/region

Rio de Janeiro has made huge investments in recent years in urban and social development and transport infrastructure for the World Cup and Olympic Games. However, extreme regional differences remain, particularly in social indicators such as health, infant mortality and nutrition, with the richer south bearing up better than the north. Although poverty overall has fallen markedly, income inequality remains at relatively high levels for a middle-income country. Deforestation is decreasing, but there remain development challenges in combining the benefits of agricultural growth, environmental protection and sustainable development.

Sustainable development project approaches

Bolsa Verde do Rio de Janeiro (BVRio, or Rio de Janeiro's Environmental Exchange) is a not-for-profit association with the objective of developing market mechanisms to facilitate compliance with Brazilian environmental laws and provide and operate a trading platform for these assets.

BVRio has established partnerships with a wide range of stakeholders from government, NGOs and industry to identify and prioritise sectors on which to focus its efforts. Through consultation with them, it became clear that BVRio should operate in both rural and urban environments, as well as with the industrial sector:

- **Rural land use** – the current priority is to support compliance with the Brazilian Forest Law through the use of its

mechanisms – Forest Legal Reserve Credits, Consolidation of Conservation Areas, and Reforestation Credits. BVRio has launched BVTrade (www.bvtrade.org), a trading platform that supports the market for Forest Legal Reserve Credits to support compliance with the Brazilian Forest Law, involves the participation of more than 3,000 participants and covers over 3 million hectares of rural properties offering credits throughout Brazil

- **Urban environment** – BVRio developed a system of Recycling Credits, based on the collection and separation of waste, in partnership with the National Movement of Waste Collectors (an association with a membership of over 800,000 individual waste collectors organised through cooperatives) to effectively implement the National Solid Waste Legislation (PNRS). More than 7,000 waste collectors are already involved in BVTrade, and they are represented by 150 cooperatives distributed throughout the country. The sale of Reverse Logistics Credits increased the income of these waste collectors by approximately 50%
- **Industry** – BVRio has worked closely with the Rio de Janeiro state government to create a greenhouse gas (GHG) cap and trade system for the industries operating in the state. This system will serve as a pilot for a planned federal GHG cap and trade scheme to be developed at a later stage
- **Trade** – BVRio is now developing a Responsible Commodities Trading Hub, which is a multi-market negotiations platform combined with a management system and supply-chain document

- Environmental service trading platforms have expanded due to increasingly demanding environmental regulations
- Market mechanisms that facilitate compliance with environmental laws have been successful in addressing the issues of deforestation, urban waste, industrial carbon emissions and sustainable supply chains in Rio de Janeiro



tracker. The objective is to make it a hub for sourcing legally and/or sustainably produced forest and agricultural products and providing transparency, efficiency and liquidity to catalyse and accelerate the growth of responsible commodities markets in tropical countries.

Top - 'Rio' by Felipe Neves
Left bottom image - 'Deforestation' by CIFOR
Right small image - 'favelascape' by Alex

4. Holistic SDG objectives, procurement, innovative financing and scaling

“In the contest with reality, reality always wins”

K. B. Brown

Context

The financial sector and its practices are currently not aligned with the reality of the threats we face. As Jeffrey Sachs notes, ‘Achieving the SDGs will require deep reform of the global financial system.’¹⁸ It is driven primarily by the profit motive and, together with its accounting systems, is not sensitive to ecosystem services or increasing inequality.

We no longer have an excuse to ignore evidence-based data when making key long-term investment decisions. Decisions about the built environment can no longer be made at the expense of the environment. It is incumbent on current decision makers to take full responsibility for the stewardship of the planet in its entirety for the sake of future generations and for all other life forms.

Not only is sustainability required as an essential element of project design and implementation, but restorative action is required for many vital ecosystems and natural processes that sustain human and other life forms.

Recommendations regarding procurement, innovative financing and scaling

Projects should be structured to meet community needs and investor goals. Early community-level consultation is vital to ensure socially and regionally inclusive practices. Good governance is needed to ensure and encourage viable public and private partnerships. We need to see improved

transparency in the project selection process so that community needs are not infringed and planetary boundaries are not exceeded. Long-term human well-being can only be achieved if the earth’s regenerative processes are respected. The increased occurrence of extreme weather implies the value and weight of resiliency and multifaceted solutions in the project selection process.

National, regional and local governments have the potential to advance a transformational change in mainstreaming environmental and social considerations by adopting procurement policies that favour environmental and social goals. Performance-based public and private sector procurement offers an effective mechanism to influence environmental and social sustainability goals as long as a trusted evidence base regarding impact can be built in for both the tendering and the delivery phases. This could either be legislated for or could be voluntarily incentivised. For example, in South Africa, state procurement has been used to ensure the economic advancement of black communities by setting affirmative action requirements that companies bidding for government contracts need to comply with. Procurement was seen as a means to achieve specific social objectives, including direct and indirect economic empowerment as well as broader human resource development. Public sector procurement at all levels can also become a means of exerting moral pressure on the private sector to change its procurement practices to achieve social and environmental objectives.

In some countries, new, locally focused financial institutions and banks are required to address the needs of local communities as the large banking groups are no longer accessible to local businesses and entrepreneurs.

New financial instruments and mechanisms are needed both within the formal banking sector and outside it. Innovative financing solutions include peer-to-peer and crowd financing as well as microfinance and crypto and complementary currencies, which are emerging as potentially viable models to meet local and environmental needs.

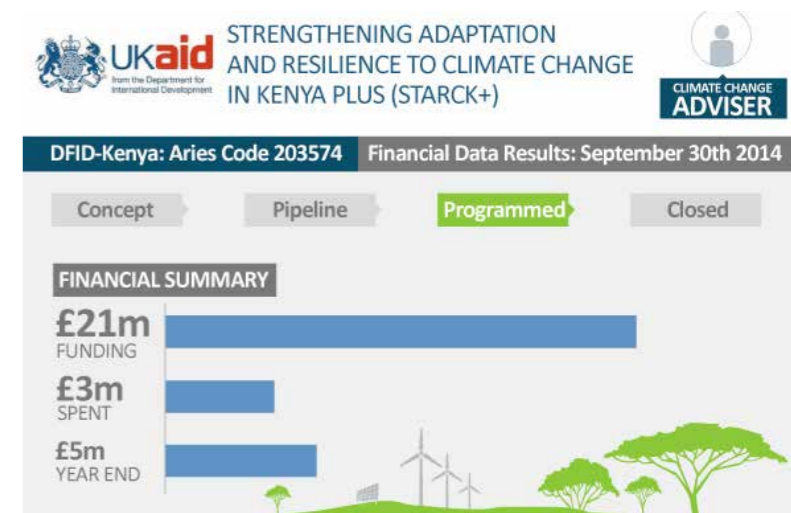
A complementary currency can take a variety of forms and can be used to achieve specific objectives. These could be economic, social or environmental aims. A complementary currency is a voucher meant to be used as a complement to a formal national currency. Complementary currencies can be regional or even global and can be used to align financial resources with local priorities. According to Investopedia, complementary currency systems have four main purposes:

- To promote local economic development
- To build social capital
- To nurture more sustainable lifestyles
- To meet the needs that mainstream money does not

The creation of mortgageable assets is vital to economic prosperity, but it is essential to ensure that land and ecological assets are retained or enhanced.

There is also the option to institutionalise national accounts to include human health and environmental impacts of development plans so that they are systematically considered in SDG planning, implementation and evaluation over time. Sophisticated dashboards can help to make this happen consistently across city-regions and nations.

Existing financing mechanisms and investments should enhance planetary health over the short, medium and long term, for example by supporting policies that halt and reverse the erosion of the earth’s life support systems and promote human health, well-being and development. In doing so, synergies and economies of scale in financial investments can be identified to achieve short-term benefits and long-term progress towards the SDGs as well as to develop novel financing mechanisms that can address harmful externalities of policies. We cannot grow at the continued expense of the natural resource base, and financial incentives should reflect this.



International Climate Fund performance dashboard - Gaiasoft

18 Sachs J D, 2014. The Year of Sustainable Development. Project Syndicate - The World’s Opinion Page.

5. Risk assessment and resilience

The Hyogo Framework for Action (HFA), launched in 2005, has been critical in strengthening and guiding international cooperation efforts and in generating the political momentum necessary to ensure that disaster risk reduction be used as a foundation for sound national and international development agendas as well as in providing a common language and a framework of critical actions to follow, to which governments have clearly responded.

Recommendations in the HFA 2010 Mid-Term Review¹⁹ include ‘Standards to ensure quality in the delivery of the guidance could be developed at regional and national levels’. The request for the collection of standards, where already available, or the development of standards for disaster risk reduction is consistent with a call for stronger accountability measures and in line with the application of targets for disaster risk reduction.

The review also concludes that ‘the international community should develop a more coherent and integrated approach to support HFA implementation with solid and structural links with sustainable development and climate change international framework agreements’.

Resilience is ‘the capacity of individuals, communities and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it’.²⁰ If resilience is higher, risks and losses

are lower. The (re)insurance sector has made considerable progress in evaluating the risks posed by extreme weather. These risks now need to be better accounted for in the wider financial system in order to inform valuations and investment decisions and to incentivise organisations to reduce their exposure. There is considerable evidence that the natural environment has a key role in building resilience and so tools for assessing human and ecological system interaction, and for modelling extreme events are very important for financing and insurance appraisal. Generally, it has been shown that including natural systems can substantially reduce mitigation costs.²¹

Cities and urban environments are highly interconnected to their hinterlands for resource supply and support, as well as to the global economy for matters relating to import and export. Likewise, cities and urban environments are deeply embedded in a network of natural systems, both regional and global, a clear understanding of which is imperative to the health, happiness and long-term security of populations living in them.

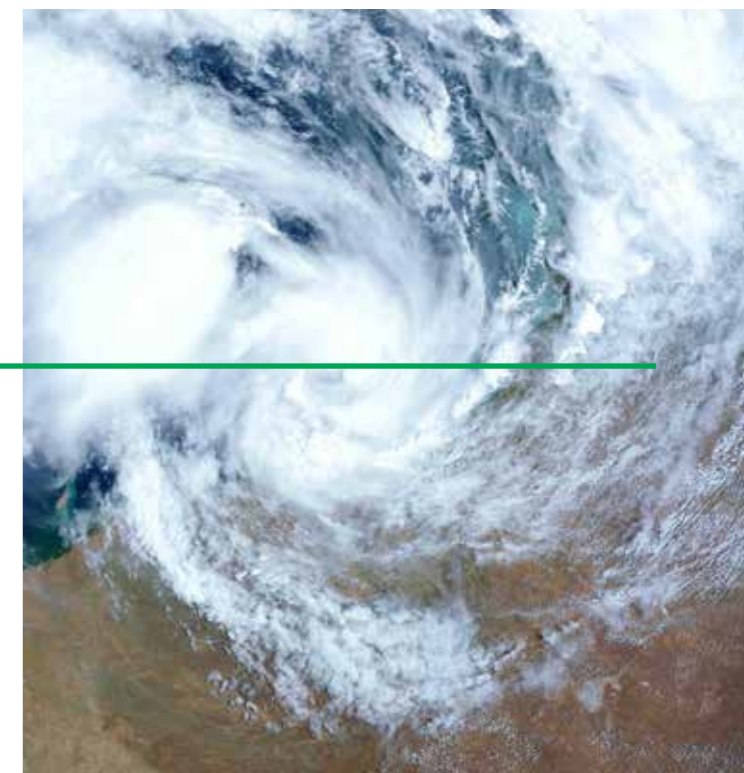
The transfer of knowledge, best practices and data from local to regional areas, and on up to the global level, is of great value in dealing with mitigation, adaptation, risk modelling and the design of insurance products, and these are beginning to be brought together.²² Open-source loss-modelling frameworks²³ now exist that:

- provide a plug and play open-source software package for catastrophic risk models
- link to communities of academics and companies globally that are interested in developing skills and tools in this area
- contain a defined set of standards that allow for model and data interoperability with evolving regional and global systems models

As modelling has improved, the insurance industry has made available USD 9 billion for climate adaptation projects, to which it would contribute 40% of the total cost.²⁴ The insurance industry believes that 60% of disaster losses could be mitigated through adaptation. An estimate of disaster loss potential is becoming a requirement for the insurance sector, and it has become a natural investment partner for adaptation projects, which are otherwise not easy to finance.

Communities can sometimes be best suited to self-fund their resilience solutions. By utilising crowd-funding mechanisms or accessing microcredit, citizens can access funds for small-scale solutions.²⁵

Adequate operations and maintenance budgets need to be incorporated into financial modelling for all projects to take account of extreme risks.



Top - ‘Tropical Cyclone Bianca off Western Australia’ image by NASA Goddard Space Flight Centre
Bottom - ‘Mississippi River Flooding (NASA, International Space Station, 05/12/11)’ by NASA’s Marshall Space Flight Centre

19 United Nations, 2011. Hyogo Framework for Action 2005-2015 Mid-term Review 2010-2011. The United Nations Office for Disaster Risk Reduction.

20 Rockefeller Foundation, 2009. Building Climate Change Resilience. Rockefeller Foundation White Paper.

21 Royal Society, 2014. Resilience to extreme weather report. The Royal Society Science Policy Centre.

22 The Ecological Sequestration Trust, 2014. Soil to Sky. Short film. <http://ecosequestertrust.org/about/film/>

23 OASIS Loss Modelling Framework. <http://www.oasislmf.org/>

24 Michael Lies CEO Swiss Re speech at Guildhall London Understanding Risk Conference July 1st 2014 <https://www.ucl.ac.uk/steapp/docs/ur2014-programme>

25 For example, Kiva.org; ioby.org; give2asia.org all provide funding in the \$5,000-\$2m range that is too small for most private sector or development banks to manage.

6. The role of science and data and systems modelling

“We need a more calibrated, coordinated approach to both scientific research and policy that shows why ecosystems matter”
Richard Horton

To better harness finance for the delivery of resilient, resource-efficient and socially equitable projects in city regions, we need a different analytical toolkit, as conventional terminology and metrics are not producing the insights that are needed. There is a whole set of issues, including soils, water and climate change, which are not being adequately addressed in the current financial system due to a limited ability to measure the benefits that these systems bring to human societies and an inability to provide trusted evidence of project impact. Advances in science, data collection and systems modelling, however, offer real opportunities to address this gap.

The interdependence between human health/well-being and ecology is complex, and the impacts of climate change, increased human activity and resource consumption are tending to destabilise many systems. It is vital that we reach a better understanding of human-ecological systems' interactions, just as we are doing in climate science through computer modelling. Indeed science has evolved to give us the tools that we now need to be able to deal effectively with problems of 'organised complexity', exactly the type of challenge that city regions are facing globally.²⁶

Systems modelling, as a result, has been evolving quickly in the last 10 years, with growing computing power, the ability to gather and harmonise large data sets and the rapid revolution in science resulting in it being able to understand cause-and-effect relationships across environmental, economic, and social dimensions, as well

as new agent-based simulation approaches incorporating close to real-life decision-maker perspectives. However, the journey on the road to harnessing these possibilities is only just beginning. In 2013, an analysis of 17 different city-level models showed a significant focus on the development of the built environment, land-use change, transportation and technology system optimisation, but no analysis so far has connected the cause and effects across ecological systems, economic production and human well-being using science-driven insights.²⁷ A next step towards a new decision support tool needs to emerge to model the interplay between economic development, societal impacts (health, welfare and productivity) and environmental and ecological systems. The purpose should be to create knowledge about how planning can be carried out and investments can be made, inclusive of their environmental and social costs and benefits, to support long-term SDG led planning and decision making.

The full performance of the SDGs can be measured using environmental and health indicators in concert with economic/development indicators. There is a need to make available and to increase capacity for the use of systems platform tools as part of a decision support toolkit. We need systems tools that integrate different types of data (economic, environment, health and social), to allow us to understand their dynamic relationships/trade-offs/unintended consequences and how decisions and policies impact these over time.

As an example of one of these pioneering developments, a major programme is taking place to develop an open-source model²⁸ that seeks to simulate the spatial-temporal dynamics of a city on the basis of natural- and human-driven resource flows and to connect economic modelling to social and environmental dimensions, such as the impact of climate change. The fundamental links between social and economic dimensions are built by the representation of people, their well-being and their activities in daily life, including employment labour inputs and consumptive leisure. The connections between economic activity and ecosystems are made on the basis of the connection between the ecosystem services provided, such as the supply and filtering of water and air. Further, resource-flow waste outputs are traced across the spatial landscape so as to create visibility of the pollution affecting the functioning of natural systems and the provision of their ecosystem services on a physical basis.

The external impact of changes on a planetary scale, including climate change, can be assessed by Earth Systems models, which take measurement based on changes in local environmental conditions caused by global environmental change, which are also rapidly evolving.²⁹ The platform's development aims to create collaborative decision-making environments to foster well-informed investment and procurement processes that take into account the interconnectivity between city regions' ecological, social and economic systems. The next stage of evolution will be using cockpits, or user dashboards, that allow



26 Weaver, W 1958, quoted from Jacobs, J., 1961. *Death and Life of Great American Cities*. Random House, New York.
27 Koppelaar, R., 2013. *Review of Current Advanced Integrated Models for City-Regions*. Institute for Integrated Economic Research for Innovate UK. <http://ecosequestertrust.org/news/publications/review-of-current-advanced-integrated-models-for-city-regions/>

28 Passmore, S and Schmidt, A., 2015. *Resilience.io - a Revolution in Planning*. The Ecological Sequestration Trust for Cities Alliance and Department for International Development. <http://resilience.io>
29 Climate and Earth Systems Modelling. *Nature*. <http://www.nature.com/subjects/climate-and-earth-system-modelling>

everyone in a region to work collaboratively using their own tailored user interface, enhanced with high-resolution visualisations, to access exactly what they need. Gaming versions can be made available to schools and communities. Another emerging initiative, from the US Environmental Protection Agency, is starting to use human-ecosystems modelling for management of coastal pollution and land-use practices in the USA.³⁰

The data to support such modelling can come from earth observation, ground-based sensors, census surveys and crowd-sourced approaches. An explosion in the volume of data being collected from an ever-expanding network of satellites and cheaper, more pervasive, ocean, land and air sensors will underpin more informed decision making. Indeed there are also a growing number of data observatories in cities, such as the command centre in Rio de Janeiro. These bring together real-time data streams and enable tactical management of city systems. The real use of available data is still limited, however, because of the lack of use of it in city systems models to understand how problems and issues can be addressed by local decision making and long-term strategic planning and development.

The UN Independent Expert Advisory Group (IEAG), established in August 2014, has offered the UN Secretary-General several key recommendations for actions to be taken for developing appropriate data collection efforts which reflect this opportunity³¹, and these

include a push for a global consensus on use principles and data standards to build trust and confidence.

Indeed in Europe a major recent development in opening up government data has been the INSPIRE Directive, which has established a legally enforced infrastructure for spatial information in Europe to support community environmental policies and policies or activities which may have an impact on the environment.³²

Best practices need to be established quickly using all these tools and structures for translating science/data into useful, useable and used knowledge that informs decisions and practice, including political policies. Strong partnerships and understanding among key stakeholders will be necessary to identify and implement sustainable solutions to planetary health threats such as climate change and biodiversity loss.



30 U.S. Environmental Protection Agency, 2013. Striving for balance in the Narragansett Watershed: EPA's Triple Value Simulation (3VS) Model. <http://www.epa.gov/research/docs/3vs-tool-nutrient-mgt-narr-bay.pdf>

31 United Nations, 2014. A world that counts. UN Secretary General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development.

32 European Commission INSPIRE, Infrastructure for Spatial Information in the European Community: <http://inspire.ec.europa.eu/>

“Whatever you can do or dream you can, begin it. Boldness has genius, power and magic in it.”
Goethe

7. Conclusion

Following the 2008 financial crisis, the issue of securing the necessary volumes of developmental finance and institutional capital for frontier markets has not been fully addressed. Funding is urgently needed to support delivery of the Post-2015 Sustainable Development Goals.

The World Bank estimates that 80% of the annual global costs of climate adaptation will be borne by cities, and the High Level Panel on the Post-2015 agenda argues that the battle for sustainable development will be lost or won in cities. It is logical therefore to focus on pathways to finance in city regions. It is clear that further incentives are needed to increase the level of investment in city-level sustainable and resilient infrastructure. However, it is noted that this will only be successful if transfer of knowledge, best practices and data from local to region, and on up to the global level takes place to deal with mitigation, adaptation, risk modelling and policy and economics integration.

Incentives could include risk amelioration through longer-term public sector support, including guarantees in relation to tariffs and currency, a reduced capital charge by regulators, because they recognise the benefits of sustainable and resilient infrastructure, and the use of risk instruments offered by the insurance industry.

Levels of liquidity in the financial markets are at a record high, and interest rates are at record lows. Availability of finance is not an issue. The crucial missing step is the building of bankable projects, where bankable is defined as projects that have both economic and financial efficacy.

The best way forward is extended use of Public Private Partnerships (PPPs) to build an integrated and sustainable infrastructure. A possible PPP vehicle for development in city regions is an enhancement of an urban agency, an Urban Development Fund (UDF), to create a financing vehicle that can bring institutional investors, development finance and the public sector within cities together. This could build on an aggregator model already used in PPPs. Financing could then be made available by those who would be attracted by the diversification benefits of investing in a series of projects, and leverage of around 70% could be raised. In the longer term, this vehicle could be rated to ensure an efficient and lower cost of capital.

Local capacity will need to be developed urgently to plan, design and implement such projects as an integral part of strategic plans and the long-term delivery of SDGs. New governance arrangements will be needed, underpinned by local data and systems thinking. ODA funding can be specifically targeted at this capacity building and the provision of the necessary tools.

A set of tools, or a platform, that can identify and measure the systemic relationships between human activity, the environment and economics is essential in the process. With these systems insights available at an early stage of project design and development can lead to greater benefits for communities, cities and regions. This can be started with a series of structured dialogues among all key stakeholders, informed by a preliminary diagnosis of the problems and issues driving the territorial agenda, in a structured, governed and guided approach. The deployment of the platform needs periodic review and iterative improvement. It should facilitate learning,

driven by the set of tools used for strategic planning, and support robust financial assessment within the UDF. This evolving capability can create collaborative intelligence of city-regions. The platform could be hosted by a social enterprise, supported by local universities.

The tools need to be accessible, easy to use, online and supported by up-to-date data. Data to support such tools can be collected locally from earth observation, ground-based sensors, census surveys and crowd-sourced approaches. PPP project procurement can then proceed using performance-based tendering underpinned by the evidence of the platform for social, environmental and economic impact and revenue flows.

New financial instruments and mechanisms are needed both within the formal banking sector as well as outside it to support the UDF and to ensure that financing and development are inclusive. Innovative financing solutions can include peer-to-peer and crowd financing as well as microfinance. Crypto and complementary currencies are emerging as potentially viable supporting models to meet local and environmental needs. Case studies show that local banks are willing to sign up to sustainable finance objectives to support local inclusion and resilience needs.

The (re)insurance sector has made considerable progress in evaluating the risks posed by extreme weather. These risks now need to be better accounted for in the wider financial system in order to inform valuations and investment decisions and to incentivise organisations to reduce their exposure. The city region platform provides an ideal vehicle for this practice because it integrates risk assessments into the design of bankable

projects and understands infrastructure interdependency. The role of ecology in improving community resilience and adapting to climate change is shown through case studies.

Systems modelling has evolved quickly in the last 10 years, with growing computing power, the ability to gather and harmonise large data sets, the rapid revolution in science so that it can understand cause-and-effect relationships across environmental, economic and social dimensions, and new agent-based simulation approaches incorporating close to real-life decision-maker perspectives. A major programme is taking place to develop an open-source model that seeks to simulate the spatial-temporal dynamics of a city region on the basis of natural- and human-driven resource flows and to connect economic modelling to social and environmental dimensions, such as the impact of climate change. This is being designed to enable city regions all over the world to create their own platform and learn how to use it to create bankable projects and carry out risk assessments. The platform can also be used in communities, schools and colleges for learning and can store the cultural history of the region.

The external impact on a city region of changes on a planetary and national scale, including climate change, can be assessed by Earth Systems Models that take measurement on the basis of changes in local environmental and economic conditions caused by global environmental change and trade. It will be possible to create data links between such models and the city region platforms around the world to enable the regions to assess possible impacts in the future.

8. Meeting Participants



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