One City – Multiple Futures
Two scenarios for exploring the future of Greater Manchester

Jeremy Carter
2011
EcoCities is a joint initiative between the School of Environment and Development at the University of Manchester and commercial property company Bruntwood. The project looks at the impacts of climate change and at how we can adapt our cities and urban areas to the challenges and potential opportunities that a changing climate presents.

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1 Introduction

The EcoCities project takes a long term perspective. The key output of EcoCities, an online platform to support climate change adaptation decision making in Greater Manchester, sets a planning horizon to 2050. Significantly, the climate change projections used within the project also focus on the 2050’s. Although it is not possible to predict how the future might unfold over such time periods, it is clear that significant transformations will take place in Greater Manchester over the coming decades. Over the past 25 years, for example, Manchester has experienced internal changes including the reinvigoration of city centre living, and has been exposed to broader changes such as the globalisation of markets. These forces have changed the complexion of the city-region. The development and use of scenarios provides a route into exploring such driving forces and considering their potential impact on the future growth and development of Greater Manchester. This method is broadly transferable to other cities and urban areas looking to understand more about these issues.

In developing climate change adaptation strategies and responses, it is important to acknowledge and seek to understand not just the dynamic nature of weather and climate, but also the evolving characteristics of cities and urban areas. Greater Manchester’s capacity to adapt to climate change will be influenced by environmental, economic and social shifts over the coming decades. Patterns of exposure and vulnerability to climate change impacts will shift over the coming decades as development takes place and population structures change. Scenario planning engages with this debate through providing a methodology to put forward different future perspectives for growth and development. Planners and decision makers can use scenarios as a platform to inform adaptation strategies, and to enquire more broadly into the multiple interacting forces with the potential to influence future climate change impacts and adaptation responses.

This report synthesises the key outputs of a scenario development process undertaken within the EcoCities project during 2009 and 2010. There follows an overview of scenarios and how they link to the EcoCities. The method applied to create the scenarios is then outlined. Two scenarios created through this process, upward spiral and long descent, are presented in the form of narrative storylines.
2 What are scenarios and how are they used?

A scenario is a description of a possible future course of events. Scenarios summarise contracting paths of key drivers of change to paint pictures of different possible futures. The Intergovernmental Panel on Climate Change (IPCC) define a scenario as:

a coherent, internally consistent and plausible description of a possible future state of the world’ (IPCC 1994: 16).

Scenarios have been used for over 30 years within the public and private sector, and for longer during military planning. Several reviews have looked across the scope of existing scenario approaches in order to learn more about their use in practice (Bishop et al 2007, EEA 2000 and 2001, Van Notten et al 2003). It is apparent that scenarios can be broadly categorised according to several issues. These include their authorship, topic focus and the nature of the output produced.

2.1 Authorship

Scenarios are produced by a range of organisations from the public, private and third sectors. Categories of organisations leading on the development of scenarios include:

- **Supra-national agencies:** The European Environment Agency’s land use scenarios for Europe project (Hoogeveen et al 2006) developed five coherent, possible and plausible scenarios for the future of land use development across the continent to 2035.
- **National public sector bodies:** The Environment Agency for England and Wales 2030 scenario set (Environment Agency 2006) created four scenarios to explore different futures for the evolution of pressures on the UK’s environment to 2030.
- **Regional planning authorities:** In England there are several examples of regional planning authorities developing scenarios. These include the East of England Development Agency’s scenarios (EEDA 2004) for understanding the influences on the economic development of the region to 2020.
• **Academic institutions and ‘think tanks’**: Forum for the Future are a sustainable development charity working with businesses and public sector. Their *Climate Futures* scenarios (Forum for the Future 2008) offer five different visions of how the world could respond to climate change to the year 2030.

• **Private corporations**: Royal Dutch Shell pioneered the use of scenarios in a corporate setting. Since the 1970s, scenarios have been used by Shell as an input into strategy making and have helped them to anticipate changes in oil markets. Their most recent project (Shell International 2008) develops two scenarios outlining different possible futures for the energy sector to 2050.

### 2.2 Topic focus

The Intergovernmental Panel on Climate Change greenhouse gas emissions scenarios (IPCC 2000) and the Stockholm Environment Institute ‘Great Transitions’ scenarios (Raskin et al 2002) pull together a range of broad drivers of change to build overarching ‘global’ scenarios incorporating numerous interlinked issues. Other scenarios focus specifically on single issues, examples of which include:

• The Government Office for Science (2010): The *Foresight land use future project* presents three scenarios looking at different futures for UK land use over the next 50 years.

• World Business Council for Sustainable Development (2006): The *Business in the world of water: water scenarios to 2025* report highlights three scenarios that detail how business may respond to key issues and challenges relating to water.

• PricewaterhouseCoopers LLP (2007): The *Managing tomorrow’s people: the future of work to 2020* project developed three scenarios exploring different possible futures for the world of work in 2020.

• Energy Research Centre of the Netherlands (2005): The *next 50 years: four European energy futures* report provides four storylines reflecting different energy futures for Europe, and assesses their potential implications for the Netherlands.
2.3 Output

The outputs of scenario planning exercises differ according to several factors. Firstly, the number of scenarios included within each individual framework generally varies between two and five. Secondly, the format of the outputs differs significantly. Some look forward, moving sequentially through subsequent decades, to create future visions under the influence of different drivers (e.g. Carter and White 2010). Others take a ‘back casting’ approach, beginning with the possible future before considering different actions and policy choices that can help to cultivate, and in some cases avoid, the challenges and opportunities that this presents (e.g. Netherlands Environmental Assessment Agency and Stockholm Resilience Centre 2009). Thirdly, some scenarios focus exclusively on qualitative ‘storylines’, such as the ‘Great Transitions’ scenarios (Raskin et al 2002) whilst others, such as the IPCC’s climate change projections (IPCC 2000) and the European Environment Agency’s land use scenarios (Hoogeveen et al 2006), combine qualitative visioning with quantitative modelling to provide a platform for projecting variables such as levels of greenhouse gas emissions or land use change. Fourthly, scenario outputs vary in spatial scale from the global level (IPCC 2000), to whole continents (Hoogeveen et al 2006), individual nations (Byrne 2003), regions within countries (Yorkshire Futures 2008) and down to individual organisations (Shell International 2008). Lastly, scenarios look towards different time horizons, broadly encompassing medium term (2020-2030) and long term (2031-2060) outlooks.

Research into the use of scenarios highlights their role in making decisions more robust, strengthening organisational performance and enhancing policy making (EEA 2009). Long term decisions must be made in the face of considerable uncertainty, and scenarios provide a means of cutting through some of this uncertainty. They are tools to inform long term planning and decision making, or to explore the implications of actions likely to have long term consequences. It is important to emphasise that scenarios should not be used to guide short term decisions. Where necessary, changes can be made to address and exploit potential challenges and opportunities raised by scenario planning that might have otherwise have been missed. Scenarios are also a valuable learning and awareness raising tool. The creation of a scenario can be a collaborative process that incorporates many stakeholders, and in doing so can help to challenge established perceptions of the future within organisations (Carter and White 2010).
3 How do scenarios fit with the EcoCities project?

A key goal of EcoCities is to increase the adaptive capacity of stakeholders in Greater Manchester to respond to climate change. Adaptive capacity relates to the ability of an actor, which in the case of EcoCities concerns individuals and organisations in Greater Manchester, to develop and implement effective responses to climate change impacts. The scenarios and futures element of the project, of which this report is a part, aims to challenge people’s perceptions of how the future may unfold and what this could mean for adapting to climate change. This is particularly important in the context of climate change adaptation, where long term planning for what are sometimes uncertain changes in the climate is necessary.

The systems on which climate change will impact are characterised by complexity and uncertainty. Just as Greater Manchester’s climate is likely to change significantly over the coming decades, so the city will also be subject to change. Greater Manchester is dynamic and evolving, influenced by a range of drivers of change operating within and beyond the city. Awareness of these drivers is important in the context of developing adaptation plans and strategies to respond to the future challenges and opportunities that a changing climate will present. For example, development activity may alter people’s level of exposure to climate change hazards, such as where urban densification intensifies the ‘heat island effect’. Similarly patterns of vulnerability of people and communities, or their susceptibility to harm from climate change hazards (floods, heat waves etc), are also likely to change. For example, demographic change looks set to increase the proportion of elderly people in the population, who are generally more susceptible to heat stress (Semenza et al 1996).

A scenario set has been constructed specifically for EcoCities in order to respond to this issue. The scenarios will be used during the project to encourage strategic and creative long term thinking around climate change adaptation responses. They have acted as an input into a land use model that has been used to project possible future land use change in Greater Manchester, and also as a platform to analyse adaptation options and responses from a futures perspective (Carter 2011). Further, EcoCities places an important emphasis on stakeholder engagement. The development and use of the EcoCities scenarios was highly participatory, and acted as a route through which individuals and organisations with a role to play in adapting the city to climate change have been engaged within EcoCities and the agendas that the project addresses.
4 Building the EcoCities scenarios

The EcoCities scenarios have been based on the guiding principles of established scenario sets, such as those developed by the UK government’s Foresight programme (The Government Office for Science 2010), the Environment Agency (England and Wales) (EA 2006), and the Intergovernmental Panel on Climate Change (IPCC 2000). Insights gained from existing scenarios provided a platform to develop a framework tailored to Greater Manchester and the EcoCities agenda. A collaborative approach was employed to create the scenarios, which included a number of opportunities for stakeholder involvement, via workshops and interviews. The scenario creation method is summarised in Figure 1.

Figure 1. Method followed to create the EcoCities scenarios

![Diagram of scenario creation method]

- Desk top analysis
- Develop drivers ‘long list’
  - Develop drivers ‘short list’
  - Scenario creation
  - Scenario testing and refinement
  - Final reporting and dissemination
- 8 interviews
- 2 stakeholder workshops
- 2 Scenario testing workshops
An important early stage in the development of scenarios is the identification and prioritisation of drivers of change. Many of the most influential and well recognised scenario sets, including those from the IPCC (IPCC 2000) and the UK government’s Foresight programme (Government Office for Science 2010), employ a ‘drivers-based’ approach to scenario development. In the case of the EcoCities scenarios, drivers of change are defined as the issues with significant potential to influence the future growth and development of Greater Manchester.

Drivers of change form the framework around which scenarios are built. In effect, the drivers are the ‘raw materials’ used to develop scenario storyline narratives. Drivers can be broadly categorised into social, technical, economic, environmental and political factors. In each of the two scenarios developed within the EcoCities project, the core drivers remain the same; however, the way that drivers are expressed and interact between one and other changes to create contrasting scenarios for Greater Manchester.

The approach taken to selecting and prioritising drivers of change involved several research methods including:

- Eight interviews with decision makers from Greater Manchester and beyond.
- Two workshops, which in total involved around 50 people from a range of different stakeholder groups from the public, private and third sectors.
- An extensive literature review of relevant scenarios and futures studies.

Synthesising the outputs of the workshops, interviews and literature review, provided insights into the factors thought to have the potential to influence the future growth and development of Greater Manchester. Through this process we identified ten drivers of change that appear to present particularly significant challenges and opportunities to Greater Manchester over the coming decades. These are:

1. The nature of technological change (global)
2. The form and functioning of critical infrastructure (Greater Manchester [GM] scale)
3. Patterns of economic growth (global)
4. The state of the economy (GM scale)
5. The values and consumption patterns of citizens (global)
6. Social dynamics in the city (GM scale)
7. Population and demographic change (global)
8. Climate change - direct impacts and secondary effects (global)
9. Availability and use of natural resources (particularly energy) (global)
10. Governance, regulation and legislation (GM scale)

These drivers relate to both the global scale systems and processes with the potential to influence the form and function of the city, as well as issues that operate at a more local scale within the city. Figure 2 separates those drivers that are external, global forces from those that express themselves at city scale. A supporting document provides details of the methods underlying the selection of the ten drivers of change used within the EcoCities project, and of the drivers of change themselves (Carter 2011a).

**Figure 2. Drivers of change with potential to influence the future growth and development of Greater Manchester**

![Diagram showing the ten drivers of change with potential to influence the future growth and development of Greater Manchester. The drivers include: Population and demographic change, Social dynamics in the city, Patterns of economic growth, The nature of technological change, Values and consumption patterns of citizens, Climate change direct/secondary effects, Governance, regulation and legislation, Form and functioning of critical infrastructure, State of the economy, and Availability and use of natural resources.]
Outputs from the interviews and workshops outlined above (Figure 1), supported by an additional two workshops to test emerging prototype scenarios, have led to the creation of two scenarios. We call these ‘Upward Spiral’ and ‘Long Descent’. The following sections of this report provide detailed descriptions of the two scenario narratives and highlight two distinct futures for Greater Manchester. The scenarios provide readers with the opportunity to explore their own organisations or key issues of concern in the context of two contrasting futures. Each narrative is accompanied by a ‘radio bulletin from the future’ and a visual summary to assist the process of understanding and working with the scenarios, both of which are available from the EcoCities website.¹

¹ www.manchester.ac.uk/ecocities
5 Upward Spiral: Storyline Narrative

The future belongs to those who prepare for it today.

Malcolm X²

Figure 3. Visual summary of the Upward Spiral scenario

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² http://en.wikiquotes.org/wiki/Future
5.1 The crucial decade (2010-2020)

Climate change is quickly acknowledged by governments and industry as the defining issue of the 21st Century. This is due to the challenges that it poses to traditional patterns of growth and development, with the consequences of weather and climate impacts mounting year on year. The opportunities that responding to the problem presents to flagging growth and employment prospects, which have suffered since the ‘Great Recession’ that began in 2008, are also recognised. This is crucial as countries are searching intently for a route out of the recession that continues to grip many during the first years of this decade. Recognition of the cross-cutting implications of climate change for agendas including health, agriculture and economic development stimulate a change in perspective, both in terms of public sector policy and private sector investment decisions. Difficulties in developing a successor to the Kyoto Protocol are lessened as consensus builds.

Mounting domestic environmental challenges lead China to become the first major economy to take significant steps forward. Desertification, water pollution and social unrest constrain Chinese economic and political growth potential. Crucially, Beijing realises that stimulating sustainable patterns of growth and development will cement its position in the geo-political elite and secure long term global markets. They exert their growing influence in Asia and Africa by financially supporting, amongst other initiatives, less energy intensive industries and processes. Governments in other parts of the world tentatively follow suit. Sustainable growth is encouraged through investment in research and encouraging public sector procurement to stimulate emerging services and technology markets. Land use policies are developed to support low carbon public transportation, renewable energy and domestic agriculture.

Putting a price on carbon gains support as the only realistic way to reduce greenhouse gas emissions, now widely accepted as the key driver of climate change. Despite these actions, entrenched human behaviour, industrial and economic practices take some time to change. Towards the end of the decade a more sophisticated global emissions trading scheme is developed to create a functioning carbon market. Nevertheless, fossil fuels continue to play a central role in the energy mix. This is principally due to the considerable inertia within systems of energy supply, generation and use, as well as the historic under-investment in other forms of energy.
However, sustained global climate change legislation, keenly enforced regulations, rising energy prices and the increasing threat of supply shortages (particularly for oil) begins to stimulate major investment in alternative energy sources. Technologies such as off-shore wind and solar photovoltaics become increasingly competitive within energy markets. The carbon market also stimulates the protection of landscapes that provide a carbon sequestration function, for example woodlands and parts of the uplands. The promise of biomass cropping as an alternative energy source becomes ever more realistic due to the twin pressures of reducing carbon emissions and diversifying energy sources. This begins to have a visible impact on the landscape as woodland coppicing starts to become the common practice of producing sustainable wood.

With a strong academic and consultancy presence in environmental sustainability, and a supportive city-region scale governance structure, Manchester finds itself well placed to respond to the changing landscape. A noticeable shift in attitude of the private sector takes place as firms become increasingly aware that they will suffer financially if they do not become more sustainable. Business practices, investment decisions, location choices and the nature of products and services begin to evolve accordingly. Concurrent legislative changes aid this process through the development of incentivised business parks in areas close to public transport amenities. Gradual transformations in consumer behaviour also influence the private sector. There is a move away from intensive consumerism, with social and environmental awareness influencing people’s behaviour and purchasing patterns. Community focused activities and social networks, based around recreation and the natural environment, become more commonplace.

Within the public sector, a Greater Manchester scale framework of legislation, guidance and incentive schemes support and help to maintain forward momentum. Policy action in the city is supported by a national governance system that increasingly devolves decision making to the local level, providing scope for progressive local responses to be taken. Strong spatial planning frameworks tightly define policies and principles for the development and use of land in the city, encouraging re-localisation and a higher quality of life in urban areas. Diverse groups from the public, private and third sector are encouraged to work together to develop strategies that recognise the holistic nature of many of the challenges facing the city. Demand management approaches are also instituted locally, with a congestion charge introduced on the city’s roads (following national level legislation) alongside increased subsidies to public
transport providers. As a result, demand for locations close to public transport hubs, particularly those areas close to rail and tram stations is particularly high. Developers respond to this demand, increasing high density building activity in these areas.

Subtle visible changes to the fabric of Greater Manchester become perceptible. Detailed scientific research illuminates the magnitude of the potential threats associated with climate change impacts. Recommendations are made to effect co-ordinated adaptation responses that respond within different sectors and spatial scales. Policy makers and infrastructure providers respond to projections of increased flooding, storms and heat stress. Adaptation responses range from building capacity in communities (e.g. developing local flood resilience forums) to actions around specific issues such as water conservation (e.g. household grey water recycling). Physical adaptation responses concentrate on securing the benefits that ecosystems provide in terms of reducing the threat of climate impacts and linked environmental change. River restoration to reduce flood risk and increasing green infrastructure are amongst the measures taken to moderate rising temperatures in urban areas. These hard infrastructure responses around flood risk management address the increasing scale and intensity of this threat. Adaptation responses are underpinned by spatial planning frameworks that protect valuable land use types such as floodplain land, absorptive soils, green belt land and areas rich in biodiversity.

5.2 Moving through the bottleneck (2021-2030)

As time passes and the effects of climate change show no sign of reversing, policy makers begin to accept that they are many current policies are ‘sustaining the unsustainable’. Environmental and social problems are intensifying, from damage to ecosystems to increasing poverty and inequality. Economic growth is maintained, yet there is increasing recognition of the limits to such growth on a planet bounded by finite resources. The majority begin to accept that significant and in some cases radical changes are required. Both the public and private sector provide the funds for research into knowledge and solutions that can help the world to move ‘through the bottleneck’. Research is aligned to entrenched strategic policy priorities such as increasing energy efficiency, diversifying energy supplies away from fossil fuels and improving environmental quality. The principles of natural capital and ecosystem services come forward as a guiding framework for business and policy making. Legislation embeds this approach across sectors and spatial scales.
China’s lead in this field, alongside broader recognition of an emerging new growth paradigm amongst other countries, fires an environmental ‘arms race.’ Nations jostle for position within emerging markets. China has an immediate competitive advantage because of the scale of its workforce, an abundance of rare earth metal supplies (that are essential to technologies such as developing hybrid cars and solar and wind energy installations), and an increasingly collaborative political system that also allows for rapid changes in policy direction. Geo-political and economic power shifts eastwards. Alongside the response of individual nation states, concerted collaborative international effort is directed towards addressing the problems associated with population growth and environmental change.

Although it takes a number of years for systemic structural changes to filter through, carbon pricing dramatically affects societies and economies. ‘Transition to a low carbon society’ becomes the defining leitmotif of societies determined to evolve more environmentally sustainable economies. Even though time, resources and policy commitments are made available, Manchester’s economy and infrastructure is still adapting the existing systems that were based around cheap fossil fuels (particularly oil). At a human scale, carbon pricing comes as a shock to many as people are often poorly prepared for the lifestyle changes that they now face. Here, transport is an exemplar case. Rising petrol costs (resulting from taxation and oil supply constraints) price some social groups out of regular car use. More broadly, the value of products and services begins to incorporate the cost of carbon. This raises the price of imports, goods and services with high levels of embodied energy. Although the public widely accepts policies aimed at lowering carbon usage, there is some discontent, particularly amongst people employed in carbon intensive sectors and activities whose jobs are threatened. Government support is provided to manage this transition, even declaring some economic sectors not ‘fit-for-purpose’ in a low carbon world. Equality stands out as a guiding principle influencing many policy decisions in due recognition that it is those individuals and groups with the least resources that are impacted most by changes associated with moving towards a low carbon economy.

Manchester’s economy is vibrant and GDP levels grow steadily. Encouraged by public sector funding, market opportunities and an increasingly responsive citizenry, the private sector expands development of products and services that address environmental problems. This offers important opportunities for jobs and wealth creation. Manchester’s businesses, in common with other places,
employ a ‘triple bottom line’ approach that encompasses ‘people-planet-profit’. Renewable energy, predominantly wind, tidal, and deep geothermal, receives increased attention as the challenges associated with peak oil and climate change take hold. Investment in locally appropriate renewable energy infrastructure helps to secure supplies and keep prices affordable. So, Manchester’s economic growth continues because of the readily available energy to manufacture goods and provide services. In particular, abundant low carbon energy is necessary for processes such as microchip production, enabling high-tech advances to continue. Successfully diversifying energy supply provides Greater Manchester with a competitive advantage over those areas that remain more heavily reliant on fossil fuels.

Significant early investment in Information and Communication Technology (ICT) changes the way Mancunians live and work. Carbon pricing proves to be a key stimulus for business and industry, which look to ICT for different ways of building customer relationships and transacting locally, regionally and internationally. Faster broadband speeds, more effective online communications systems and flexible management models enable higher proportions of people to work remotely. Tele-working initially suits certain types of job (especially the service and administration sectors). With time, however, ICT application within different sectors expands. Consequently, pressure on the capacity of transport networks reduces. ICT aids the transition to a less car dependant society.

Development activity in Greater Manchester continues to respond to strong economic growth and an increasing population. Spatial planning frameworks encourage new developments of housing and commercial premises on brownfield urban land and around existing public transport hubs. Densification reduces urban sprawl and encourages the development of self-contained communities. Out-of-town shopping centres, accessible only by car, are forced to close as people’s shopping habits and travel patterns change. These change use to become centres of food production, for example. However, urban green spaces and woodland areas are protected and enhanced, where possible, in recognition of the benefits that they provide in terms of recreation, climate change adaptation, carbon sequestration and biodiversity conservation. The term ‘critical infrastructure’ is expanded to encompass green spaces alongside transport, water supply and electricity networks. Indeed, the multifunctional benefits of green infrastructure for economy, environment and society are recognised and cultivated. Over time, existing buildings and infrastructure in Greater Manchester are retrofitted to improve their climate resilience, energy
efficiency and water conservation. A clear policy framework is in place to support long term investment decisions in these areas.

5.3 Horizon scanning a sustainable future (2031-2050)

Greenhouse gas emissions pre-2010 committed nations around the globe to an average of around 2°C of warming above pre-industrial levels within the 21st Century. In some regions, particularly the higher latitudes, this now represents a 4-6°C increase in average annual temperatures. The implications of this climatic change on Manchester are significant. Despite strong mitigation and adaptation efforts both globally and locally, extreme weather events do hit Greater Manchester. Localised flooding caused by intense precipitation becomes increasingly prominent. Heat waves and water scarcity increase during the summer months (relative to the situation over previous decades in the north west of England). People’s perception of the value of this essential natural resource is raised. Efforts to adapt the city’s residents, businesses and infrastructure networks to the changing climate are redoubled. Small-scale local renewable energy generation is now much more common. Micro-hydro schemes, deep geothermal and photovoltaic arrays deliver energy to new developments. The existing built environment is also retrofitted to accommodate these new energy sources. Sustainable biomass cropping is now regarded as a mature industry, and the landscape evolves in response. Marginal land within the urban core and Manchester’s hinterlands that is not used for recreation, food production or biodiversity conservation, is often planted with trees suitable for coppicing.

The high cost of international flights, a consequence of the taxes on fossil fuels and a failure to find low carbon substitutes for mass air travel, takes regular foreign holidays out of reach for many. However, trends towards warmer drier summer weather conditions provide a boost to the region’s tourist economy. The diversity of landscapes within the north west of England attracts both domestic and European tourists who take advantage of integrated, high speed continental train travel. They are turning away from overheated Mediterranean resorts that have been scarred by forest fires and drought. Recreation opportunities are provided for in the highly prized natural environment, which is protected by legislation to encourage recreation and biodiversity.

Landscapes within and around the city are required to meet an enhanced role for food production. High grade farmland is strictly protected by planning
regulations. Due to the impacts of climate change and carbon pricing on agricultural systems and practices in countries such as Spain, Manchester’s residents can no longer rely on food imported over long distances. Farming is more sensitive to environmental factors, including biodiversity and water quality, with a lower reliance on fossil fuels and related fertiliser products.

Climate change adds to the typical economic reasons given for migration. Much of the growth in global populations concentrates in Africa and Asia. Despite international efforts, these continents are beset by intense urban problems of poverty and overcrowding. The relatively temperate climate of Greater Manchester and its buoyant economy proves an attractive prospect for migrants, substantially enriching its well-established diasporic community. Population growth clusters in the city’s urban core and satellite towns changing their demographic significantly; ethnically and in terms of the age profile of residents. As in the past, this diversity proves to be a force for innovation and positive change.

The conurbation’s urban centres become more residential and multifunctional, and are noticeably greener as trees planted several decades before begin to mature. Densification leads to demands for higher quality public spaces. Public authorities enact compulsory purchase orders to create a network of small urban parks that form a green web across the city centre. For the first time since the Industrial Revolution, the River Irk is fully cleaned of its pollutants and becomes the focus of efforts to increase recreation opportunities and enhance biodiversity. Land use in the city is influenced by the ongoing energy transition, which has moved economies and societies away from fossil fuels. Long distance commuting by car becomes less viable with rising petrol prices, and people favour living close to their place of work or within walking distance of public transport connections. Developers in Greater Manchester respond to the growing population of the conurbation and the evolving demands of residents and building occupiers. New development (housing, retail, offices) is concentrated in dense pockets around public transport nodes and existing centres of population and commerce.

As Manchester is in a relatively temperate climatic zone, and has taken proactive steps to adapt patterns of growth and development to changing climates, the city holds a distinct competitive advantage over other locations across the globe. The increasing diversity of the city’s population is matched by an urban landscape that now provides a wide range of essential functions from food
production and energy generation to recreation and biodiversity conservation. Battling sea level rise, water supply constraints and high temperatures, other cities are less attractive locations for inward investment and population growth. As a consequence, Manchester absorbs services and functions from cities that have not responded quickly enough to emerging challenges, or are simply not in a location that can be viably sustained in the face of global climate change.
6 Long Descent: Storyline Narrative

I cannot imagine any condition which would cause a ship to founder. I cannot conceive of any vital disaster happening to this vessel. Modern ship building has gone beyond that.

Captain Edward Smith, Commander of Titanic

Figure 4. Visual summary of the Long Descent scenario

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http://www.inet.ba/~admahmut/quotes/Titanic/
6.1 Business as usual (2010-2020)

The world’s major economies struggle to emerge from the recession that started with the global financial crisis of 2008. High unemployment and low economic growth rates continue through the decade, and prompt commentators to announce the arrival of the ‘Greater Depression.’ Emerging markets in Asia and South America find their growth sluggish, although they continue to increase their share of global growth, particularly at the expense of Western Europe and Japan. Small amount of stimulus funding available from governments and international agencies is channelled towards efforts to promote economic growth. Caution dictates that these are focused on the traditionally productive industries, including petro-chemicals and natural resource extraction. Coal mining, industrial agriculture and car manufacture particularly benefit. The values of citizens in many countries remain entrenched within the ‘consume and pollute’ society, with the mass media continuing to champion conspicuous consumption. In countries such as the UK, politics is run increasingly along the lines of an elite leadership model. Public disenchantment with the political process increases with protests, sometimes violent, becoming more commonplace.

Many countries reduce business regulation in an effort to revive economic growth. Taxation systems evolve with the principal goals of encouraging consumer spending and reducing impediments to business growth. Despite fiscal incentives and further government support, private sector investment continues to be constrained by volatile capital markets and financial uncertainty. Impacts are felt locally. For example, in the Northwest England, investment in water supply and waste water treatment infrastructure dries up. Depleted public sector agencies cannot fill this gap due to funding cuts. As a result, water utilities companies struggle to maintain existing services to customers, and curtail the environmental improvement initiatives that they had previously funded. This situation is replicated in other sectors such as public transport and renewable energy generation. Limited private sector capital combined with an under-resourced government response leads to poorer services and shrinking investment.

Critical infrastructure networks across Greater Manchester begin to falter. In the transport sector, a steady increase in car use is driven by government stimulus packages, fiscal policy and worsening public transport provision and infrastructure. Congestion increases; however, only selected strategic routes
receive adequate maintenance investment with roads in outlying areas suffering as a result. This further increases pressure on the main arterial routes. The economic performance of the Greater Manchester conurbation is negatively affected by the mobility constraints that the faltering system imposes on people and businesses. Spatial development patterns also begin to change subtly. Brownfield and greenbelt land that has good access to strategic road junctions and routes becomes the prime target for any commercial and residential development that does proceed. Manchester remains the north west of England’s regional centre for commerce and wealth creation, as much it can be regarded as such an era epitomised by economic recession.

Social divisions and inequalities are exacerbated in the city. An even poorer level of infrastructure quality and employment prospects in its rural hinterland means that Manchester experiences significant in-migration to the city centre and urban cores of the conurbation’s satellite towns and adjoining rural areas. Global drivers linked to urbanisation in megacities and the impacts of climate change add to population growth. Policy makers find this increasingly difficult to manage. The city’s growing population puts pressure on existing critical and social infrastructure networks, which have suffered from under-investment for a number of years. As housing growth is limited by the depressed economy, population densities swell in existing developments. Spatial planning frameworks are weak, and where new developments take place these are often on areas of green space where costs to developers of preparing land for building are generally at their lowest. New housing is typically low in quality yet high in density.

While population diversity is welcomed by some as a potential catalyst for innovation at a time of stagnation, social problems intensify. Sections of the local population feel increasingly alienated by the influx of new residents. Tension is exacerbated by high unemployment in Greater Manchester. Public sector job losses are matched in the private sector as demand for goods and services declines. The grey economy mushrooms, further depressing government tax revenues. Pockets of social deprivation expand around areas with a history of unemployment and associated social problems. Property prices increase in certain affluent areas in the southern commuter belt as a greater premium is placed on comfortable isolation. Inequalities in health, education and income widen further in a society that rewards wealth and privilege.
6.2 Systems failure (2021-2030)

Whilst the previous decade was typified by mounting social and economic problems, the 2020s are a period during which environmental and natural resource issues rise to the surface. In many cases, these ratchet up the systemic socio-economic problems that are now tightly wound into the fabric of Greater Manchester. Climate change is central to many of the emerging environmental challenges, yet governments continue to disregard the serious warnings on this issue that have been posed for more than a decade by scientists. The impacts of climate change are not perceived by decision makers to be a priority and, in some circles, the issue is actively denounced as a threat to resurrecting faltering economic growth. Political action is stifled by the uncertainty around the impacts of a changing climate, the power of fossil fuel lobby groups and public resistance stemming from worries about associated lifestyle changes. Lack of engagement on climate change is mirrored across a range of other environmental problems that are becoming increasingly prominent across different parts of the globe. The loss of soil quality and depletion of fresh water prove to be particularly serious, with negative effects for many millions of people.

Global environmental stress is symptomatic of the situation in Greater Manchester, where associated problems grow in their scope and severity. Ecosystem services continue to be undervalued. For example, most remaining natural floodplains are exposed to unrestricted and largely un-regulated development; green spaces in urban areas are threatened by informal building expansion and poor maintenance; and water courses are polluted by unfettered farming practices. Indeed, in the UK, enforcement of much environmental legislation is limited and in some cases laws are repealed. Legislation relating to water management and biodiversity conservation is targeted by the free market reformers who hold a growing influence over policy making. Spatial planning frameworks from the national to local level are systematically weakened in an attempt to free developers and land managers from any perceived restrictions to their activities. As a result, unregulated development becomes more commonplace, threatening previous efforts to maintain the quality of the built environment, constrain urban sprawl and protect greenbelt areas and sites valued for their recreation or biodiversity benefits.

During this period, the climate of the north west of England remains relatively temperate. Adequate fresh water is available and temperatures remain lower than those in many other parts of the world. Nevertheless, periodic extreme
weather events do occur that have negative impacts for people and infrastructure. The road and rail network is affected by floods and storms. Health and social problems such as theft and public disorder intensify during heat wave events. In Greater Manchester, the combination of these impacts coupled with limited investment leads to a decline in the quality of public transport infrastructure as well as other services. New developments begin to shun public transport nodes because of declining consumer demand. The severity of climate change impacts in other parts of the world aggravates existing challenges in Greater Manchester. Aside from migration, droughts in food producing regions such as Russia and the US raise prices for staple products in Manchester at a time of economic hardship. Within the UK, regional climate disparities are also evident. England’s south east fares much worse than the north west, particularly concerning water availability and high temperatures in urban centres.

Despite continuing economic problems, demand for oil rises inexorably with the growing global population, economic growth in countries such as China and India, and the lack of strategies to reduce fuel consumption and increase fuel efficiency. Supplies, however, fail to keep up with rising demand. ‘Peak oil’ brings with it significant price increases with knock-on impacts felt across many sectors of society, particularly transport, agriculture and tourism. Due to the scant level of investment in renewable technologies, coal once again becomes the energy source of choice for many nations. Carbon capture and storage fail to deliver due to high costs and technical barriers. With limited restraint on coal burning volumes or processes from environmental legislation, these developments have serious implications for climate change. Even though economic growth is marginal, these changes in the energy mix mean that greenhouse gas emissions rise. Some countries invest in nuclear power where financial resources allow. However, the general trend is towards nuclear decommissioning rather than expansion, principally as a result of a lack of investment capital.

Sitting on the periphery of Europe, Manchester becomes increasingly cut off by rising energy costs, particularly the price of oil. Commerce suffers since Manchester-based businesses become isolated from international trading partners by high transport costs. The rapid movement of people over long distances for business purposes is untenable given the prohibitive cost of air travel. Poor quality public transport infrastructure and services, coupled with the higher costs of running private cars, increases isolation at a regional scale. This adds to the problems faced by communities in Manchester’s hinterland, who are
also suffering from the intensification of agriculture. Generally, it is only industrial size farms that can survive due to the economies of scale that they are able to generate. These dominate the rural landscape, producing food principally for local consumption as imports are now much more costly than in previous decades. Smaller rural towns and villages fall into a spiral of decline driven by poorly functioning transport networks and a lack of employment prospects as small farms and businesses fold. This spurs further migration to cities.

6.3 Survival of the fittest (2031-2050)

As time passes, Manchester experiences extremes of weather and climate beyond which the city is designed to cope. Average annual temperatures are almost 4°C above levels seen at the start of the century, with summer maximums 6°C higher. Rainfall reduces by over a third during the summer and increases by a similar amount in the winter. Intense downpours are experienced throughout the year. Severe floods, storms and heat waves become more frequent and damaging as successive events steadily erode capacity to adapt. Inequality remains high, not least relating to those who experience the most severe impacts of climate change. Vulnerable people and communities tend to live in areas at highest risk of these impacts, for example in areas prone to flood. These groups suffer the most, whilst also having the lowest capacity and resources to respond to the challenges that they are exposed to. The gated communities to the south of the conurbation are joined by gated parks. Remaining green spaces that have not been lost to development are, in effect, privatised. These areas provide some comfort from the high summer temperatures experienced by city dwellers in Manchester, at least for those who are able to afford the entrance fees.

The law of diminishing returns afflicts activities across business and policymaking. For example, the limited capital to support infrastructure developments and social programmes is increasingly unproductive. Unwilling to pass legislation to regulate private sector practice or the consumption-focused lifestyles of the public, national governments believe technology is the only viable solution to a myriad of problems from climate change to the depletion of fresh water resources. Yet the high tech sector is in difficulty, hampered by poor access to private capital and public sector funding. Increasing energy prices and signs of the breakdown of Moore’s Law, which divined the approximate doubling of computer processing power every 18 months, make achieving this
technological vision a remote possibility. Nevertheless, within this general pattern of technological decline, a market for energy efficient products develops as people want to limit their exposure to high energy prices. These products are often expensive and affordable only to the affluent. More broadly, where science and technology innovations are realised, they are generally linked to consumable goods and services rather than those offering any societal benefit.

The environment, long been seen as a provider of resources to encourage wealth creation, reaches fundamental limits in many parts of the world. Freshwater aquifers are depleted and, in some coastal areas, are rendered useless by saltwater intrusion. Desertification strips bare previously productive agricultural land. Fisheries are over-exploited. Biodiversity is lost at an unprecedented rate. The implications for businesses and communities relying on these resources are devastating. To Mancunians these events seem remote, yet they have real implications for the city. Climate change negatively impacts on agriculture, increasing food prices and reducing access to expensive food imports. As a result domestic agriculture is relied upon to feed the local population. Land use evolves in response. Pockets of informal urban agriculture emerge across the city, often on derelict or brownfield land. Available high quality farmland is cultivated, although high oil prices encourage a return to traditional methods of horse and man power. Impacts are also apparent in terms of increasing population. Across the UK, large cities such as Manchester continue to absorb rural migrants from their surroundings and beyond. Population distribution in the city evolves towards a pattern that shows a general decrease in density out from the city centre and the urban cores of satellite towns. Service and infrastructure quality continue to deteriorate due to chronic under-investment and increasing demand.

Climate change, the impacts of which are now visible for all to see, is finally acknowledged by decision makers in Manchester as a real threat. However, investment vehicles, institutional structures and electorates have not evolved enough to promote action to encourage the large scale structural changes to the economy and infrastructure that are needed to adapt. The elite leadership in the city are paralysed by the quickening pace of environmental change and their inability to usher in a post-fossil fuel era. Achieving proactive, long term and innovative change is limited by a vacuum of policy and governance structures. They lack the capacity to address the disconnect between outdated socio-economic systems and environmental limits to growth. Greater Manchester’s position on the global stage suffers at the expense of other cities that are better adapted and more resilient to the changing climate and world order. Cities with,
for example, more inclusive governance structures, better access to well maintained agricultural land, and diversified energy systems are able to support their populations more effectively in an era of multiple global crises. Manchester is not one of these places, and as a result much cherished indicators such as levels of inward investment and land prices continue to be trapped in a cycle of decline.

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