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**Barbara Colledge, Leeds Beckett University**

**Growing smart, inclusive and sustainable economies: a complex adaptive eco-system approach – a working paper**

**Introduction**

The legacy of the recent financial crisis in 2009-2010 influenced the development of Europe's ambitious ten year strategy for smart, inclusive and sustainable economies (Europe 2020, 2010). The strategy aims to create the right conditions for competitiveness in Europe with five strategic goals (employment, innovation, education, poverty reduction and climate/energy) for enabling a stronger economy over the long term, supporting high levels of employment, productivity and social cohesion (Europe 2020, 2010).

We know from history that economies and societies evolve bringing with them adaptations and outcomes that do not always integrate these three strands, smart, inclusive and sustainable (Viederman (1993); Shahrokhi 2011, p 199-204; Europe 2020 Stocktaking, 2014, pp 7-11). The most recent financial crisis illustrates the complexity of global financial systems with growing interdependence between countries and regions and shorter lifecycles for products and innovations (Kowalski and Shachmurove, 2011, p 245; King, 2010; Stiglitz 2014).

This paper will provide an exploration of the dimensions of smart, inclusive and sustainable economies and related conceptual theories (e.g. sustainable development, sustainable communities, sustainable business, - see Table 1) to understand how these are formed and delivered. Through an integrated approach the aim is to develop our understanding of the 'ontology' (Scott 2006; Martin 2010) and contribute to the development of the conceptual model.

Firstly the dimensions of smart, inclusive and sustainable economies will be considered with the proposition that these are situated in a wider context of economies, communities, city-regions and societies which need to be understood. The connection of these dimensions to urbanization, sustainable cities/regions and institutions will be explored given their relative global significance. It is proposed that similar dimensions and forces may be in operation at the level of firms/institutions, cities, regions, economies which is considered through the development of a conceptual model. It is argued that these take the form of complex adaptive eco-systems, which co-exist and are interconnected and multi-layered (Martin and Sunley 2014) with people at the core of their development (Roy 2009). It is proposed that greater cognisance should be taken of the agents of this complex adaptive ecosystem, their interests, values and commitment, for smart, inclusive and sustainable economies to be realised (Brenner 2011).

**The evolving nature of smart, inclusive and sustainable economies**

The Europe 2020 objectives for smart, inclusive and sustainable economies are built on historical European Union principles. These objectives embrace social, environmental and economic dimensions including for example "*sustainable development, based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment*" (European Union 2004, Article 1-3).

Europe’s history, over the period 1980-2007, illustrates how challenging this is to deliver in practice with considerable divergence between nations and regions, no consistent economic lead or lag nations, and episodic economic trajectories of acceleration and slow down (Lisbon Council 2013, at page 66). This displays a Schumpeterian example of boom and bust, of creative destruction leading to cyclical acceleration and slumps in the economy (Schumpeter 1942). So whilst the principles and ideals of sustainable development remain the collective European aspiration, their evolutionary creation remains harder to deliver than destroy.

**The dimensions of smart, inclusive and sustainable economies**

The dimensions of smart, inclusive and sustainable economies need further analysis to contribute to the understanding of these concepts and to inform development of policy. Whilst long term aspirations may be understood, delivery of these economies can be more challenging due to the lack of specificity of concepts and temporal factors. Analysis can fail to address significant elements such as spatial, locational or context factors (Martin 1999), socio-institutional contexts and embeddedness of regional economic development (Martin 1998). Political interests and power differentials at a subnational or national level can hinder or influence action (Storper 2013) and cultural contexts can lead to different implementation and outcomes (Storper 2013). Factors of path dependency, adaptation and emergence (Martin 2010), interdependence (Hudson 2007 p1153) and governance (Garretsen, McCann, Martin and Tyler 2013 p179; OECD 2012) are important for evolution of economies over the long term.

A review of dimensions cited in the literature relating to sustainability concepts relevant for smart, inclusive and sustainable economies, (such as sustainable economies, development, communities, societies, or city regions), provides a rich set of interconnections for different levels of applicability. It is argued that these provide the wider context of economies, communities, city-regions and societies in which smart, inclusive and sustainable economies are situated which need to be understood. Similar types of factors appear to emerge from this analysis at each level of applicability (see Table 1).

<b>Table 1: Dimensions of concepts related to smart, inclusive and sustainable economies</b>	
<b>NB analysis for each concept has been undertaken and will be available at the conference</b>	
<b>Economic Dimensions</b>	
<ul style="list-style-type: none"> <li>• Employment Growth</li> <li>• Research and Innovation</li> <li>• Digital Economy</li> <li>• Industrial Policy</li> <li>• Smart growth</li> <li>• Increased productivity</li> <li>• Competitiveness</li> <li>• Green Economy</li> <li>• Sufficiency not efficiency</li> <li>• Economic self-sufficiency at community, national and international levels</li> <li>• Prosperity</li> <li>• Thriving businesses and entrepreneurs</li> </ul>	<p>12 pillars of competitiveness:</p> <ul style="list-style-type: none"> <li>• Institutions</li> <li>• Infrastructure</li> <li>• Macroeconomic environment</li> <li>• Higher Education and training</li> <li>• Health and Primary Education</li> <li>• Goods market efficiency</li> <li>• Labour market efficiency</li> <li>• Financial Market development</li> <li>• Technological readiness</li> <li>• Market size and Business Sophistication</li> <li>• Innovation</li> <li>• Agglomeration and convergence in urban areas</li> </ul>

<ul style="list-style-type: none"> <li>• Business creates competitive advantage and contributes to a sustainable development of the company and society'</li> <li>• Opportunities exist for growth in all types of regions</li> <li>• Entrepreneurialism</li> </ul>	<ul style="list-style-type: none"> <li>• Convergence forces in rural and intermediate regions</li> <li>• Agglomeration influences growth but is not necessary or sufficient</li> </ul>
<b>Social Dimensions</b>	
<ul style="list-style-type: none"> <li>• Poverty reduction</li> <li>• Inclusivity</li> <li>• Modern welfare systems</li> <li>• Social cohesion</li> <li>• Health and vitality of human life</li> <li>• Diversity preserved</li> </ul>	<ul style="list-style-type: none"> <li>• Equity and justice</li> <li>• Meet diverse needs</li> <li>• Equality of opportunity</li> <li>• High quality of life for everyone</li> <li>• Well run</li> <li>• Youth employment</li> </ul>
<b>Environmental Dimensions</b>	
<ul style="list-style-type: none"> <li>• Climate and energy</li> <li>• Resource Efficiency</li> <li>• Green economy growth</li> <li>• And nature's capital</li> <li>• Ecological economics</li> <li>• Sensitive to their environment</li> </ul>	<ul style="list-style-type: none"> <li>• Right environment</li> <li>• Quality of life</li> <li>• Smart city</li> <li>• Low carbon</li> <li>• Value proposition</li> <li>• Measurable ecological and/or social value in concert with economic value</li> </ul>
<b>Temporal Dimensions</b>	
<ul style="list-style-type: none"> <li>• Present needs</li> <li>• Future generations needs</li> <li>• Policy time frames</li> </ul>	<ul style="list-style-type: none"> <li>• Now and in the future</li> <li>• Existing and future residents</li> <li>• Long term</li> </ul>
<b>Spatial Dimensions</b>	
<ul style="list-style-type: none"> <li>• Applies to nations</li> <li>• Territorial cohesion</li> <li>• Importance of right place and locality</li> <li>• Well planned/built</li> <li>• Cities</li> <li>• Place based settlements</li> </ul>	<ul style="list-style-type: none"> <li>• Place based policies</li> <li>• Context matters</li> <li>• Accessibility influences growth, conditional on innovation, infrastructure, human capital and agglomeration.</li> <li>• More indigenous development, which emphasises the building of skills, entrepreneurialism and innovation within region</li> <li>• All regions, nationally</li> <li>• International trade</li> </ul>
<b>Scalar Dimensions</b>	
<ul style="list-style-type: none"> <li>• Importance of right scale</li> <li>• Community, Town, City</li> <li>• Transport distance related</li> <li>• City or region related</li> <li>• Local evidence of the best geographic scale fo reach policy,</li> </ul>	<ul style="list-style-type: none"> <li>• Growth links between regional and aggregate</li> <li>• Fat tail of slower growth regions is important to aggregate growth</li> <li>• Distance to markets has a positive impact to growth.</li> <li>• Regions in periphery growing faster</li> </ul>

<b>Other Dimensions</b>	
<b>Human Capital</b>	<ul style="list-style-type: none"> <li>• Education and skills</li> <li>• Youth</li> <li>• Culture</li> <li>• Community and citizenship</li> <li>• Vibrant places</li> <li>• Leadership</li> <li>• Human capital and innovation positively influence regional growth.</li> <li>• Role of Higher Education Institutions in region</li> </ul>
<b>Governance</b>	<ul style="list-style-type: none"> <li>• Political Security</li> <li>• Governance locally</li> <li>• Local public services and leadership</li> <li>• Joined up services</li> <li>• Access to new technologies, knowledge and skills</li> <li>• Access to finance</li> <li>• Connectivity</li> </ul>
<b>Values and Ethics</b>	<ul style="list-style-type: none"> <li>• Values and ethics</li> <li>• Prevent harm</li> <li>• Justice and Equity</li> <li>• Safe</li> <li>• Local financial controls</li> <li>• Investment</li> <li>• Firms acting together, alliances, relational contracting</li> <li>• Stakeholder informed</li> </ul>
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>• Transport and Connectivity</li> <li>• Services</li> <li>• Housing and built environment</li> <li>• Digital infrastructure; Broadband</li> <li>• Infrastructure influences growth only when human capital and innovation are present. By itself it does not impact growth</li> <li>• Connectivity</li> </ul>
<b>Concepts Analysed</b>	
Sustainable Development; Smart, Inclusive and Sustainable Economies; Sustainable Societies; Sustainable Communities; Sustainable Cities; Sustainable Regions; Corporate Social Responsibility; Sustainable Growth'; Society or Economy; Sustainable Business	
<b>References</b>	
Isard 1956; Brunteland 1987; Agenda 21, 1992; Viederman 1993; Elkington 1997; ODPM 2003; Egan 2004; Academy for Sustainable Communities and; OECD 2007; BIS 2010; Carroll and Shabana 2010; Europe 2020, 2010; Lüdeke-Freund 2010; Garcilazo 2011; Core Cities 2013; World Economic Forum 2013; Bocken, Short, Rana and Evans 2014.	

This analysis suggests that there would appear to be some degree of consensus regarding dimensions of smart, inclusive and sustainable economies (Martin 2003 at p2-32; OECD 2007). Further it is

apparent that similar dimensions are in operation for different concept levels (firm/institution, city, region, economy). So, dimensions for sustainable economies overlap with the dimensions for cities (Core Cities 2013), regions (Garcilazo 2011), communities (ODPM 2003) societies and businesses (Elkington 1997; BIS 2010). Whilst there is some variation in the detail, there is a shared set of dimensions between these levels and it is argued that an integrated understanding is needed rather than an analysis in isolation of the smart, inclusive and sustainable economies.

The position and relative significance of these dimensions is not static but evolutionary over time depending on the starting point (or stage reached) and the factors identified as at work in an evolutionary economic geography model (Martin and Sunley 2014). Evolutionary systems are complex and require an integrated approach, multi-level governance, clear roles of firms, institutions and individuals and a significant degree of interdependence. These systems evolve and adapt to remain competitive and to adapt to other changes in the environment. This evolutionary development is influenced and shaped by actors and agents of the system as well as the forces that operate within them (OECD 2011 p25). Further development of this proposed model is needed beyond the limits of this working paper, but an initial exploration of some of these dimensions is provided in the next section.

### **A multi-disciplinary and multi scalar approach**

The dimensions identified above are connected within a complex evolutionary system. Different dimensions are likely to assume more significance depending on the stage of development and evolution and the level of applicability (firm, city, region, economy). However it is proposed that these dimensions at each of these levels overlap and interact. A detailed development of this proposition and model is needed beyond this initial paper but an exploration of some of these dimensions and forces in operation over time is provided in this section.

### ***Path dependency and adaptation over time***

Path dependency advocates argue that history (and its legacy of present knowledge, skills, capabilities, and resources) informs future outcomes (Hudson, 2013 at p1158), with lock out being the ultimate condition where adaptation or resilience are insufficient to maintain or sustain future operation (Martin 2010, Simmie 2014). The Europe 2020 strategy is intended as a new impetus to address this divergent legacy of growth performance to avoid “lock out” and instead enable a form of “break out” to create “the conditions for smart, sustainable and inclusive growth in Europe”

All regions have the potential for growth with innovation and human capacity being central to adaptation and transformation (Garcilazo 2011). Regional economic trends in the UK evidence similar factors with “innovation” central to enable adaptation and to support regional economic resilience: *“innovation, or the lack thereof, is one of the key driving forces that underlie both these long-term trajectories in regional economic growth and their relative abilities to recover from external shocks such as national and international recessions/depressions.”* (Simmie 2013 at p4).

Historical path dependency informs the present position but it is innovation, people and skills that play a significant role in enabling a different path to be created (OECD 2007). In the case of cities, creating the right environment, including investments in infrastructure and the built environment, have been important for attracting business and people to work in the city (McKinsey 2013). The

sustainable community model based on place making, shows similar dimensions to sustainable cities and regions models (see Table 1). The geography and context of the region will influence the future path (Martin and Sunley 2012) but the wider socio context will also contribute to the nature of the adaptation (Scott and Storper, 2013). The emerging of city-regions as “hierarchies of strategic nodal sites” (Isard 1956) proposes a complex model, supported by geographical location, resource availability and infrastructural transport advantages.

### ***Competitiveness***

Analysis of regional growth in Europe indicates variability, different patterns of success or lags and apparent high sensitivity to innovation and skills factors (Lisbon Council 2013). This episodic trajectory of acceleration and down turn in Europe has been as a result of an interaction of dimensions which impact on economic success, such as external conditions, policies and the current position (Lisbon Council 2013, at page 68) together with the importance of socio-political factors of economic growth (Lisbon Council 2013 at page 67; Scott and Storper,2013).

### ***Governance and leadership***

Local governance and leadership and the ability to develop local and contextualised policies for the delivery of local outcomes is an important element (OECD 2011 p25). It is known that policies are more effective if focused on specific outcomes. The level and extent of devolution of fiscal and other decision making powers is likely to have an impact on the success or otherwise of policy for sustainable growth.

### ***Context***

Different and contrasting city contexts evidence different and contrasting profiles but yet can display similar factors that influence their development namely: temporal and spatial differences produce differential outcomes, the rules and business models influence resource allocation and outcomes, social stratification and structures affect community formation, cultural norms and traditions influence paths followed, and political authority and power shape decision making (Scott and Storper, 2013). Regions evidence a cumulative growth pattern, with apparent economies of scale and agglomeration delivering potential increasing returns or endogenous growth (Martin and Sunley, 1998.) This complex adaptive system evolves dynamically according to the conditions and environment as well as the interdependencies within (Martin and Sunley 2014). This evolutionary process relies on intentional behaviour to support self-organisation and emergence with the way in which agents and actors, institutions and firms operate in this ecological system.

### ***Complex adaptive ecosystems and the Human factor***

Complex adaptive eco-systems co-exist, are interconnected and multi-layered. This integrated evolutionary pattern of development evolves and adapts due to complex interdependencies (Scott 2006, Simmie and Martin 2009, Martin 2010). We know that smart, sustainable and inclusive economies are difficult to maintain over time as their development is subject to constant reconfiguration (Ziemba, 2013). Economies and societies appear to evolve bringing with them adaptations and outcomes that do not always integrate these three strands of smart, inclusive and sustainable.

It is argued that the reality is a complex adaptive eco-system which draws on concepts like evolutionary development and path dependency, with adaptation, emergence and innovation providing new connections and sources of growth (Martin and Sunley 2014). Within this complex adaptive ecological system, it is the Human factor, people and interactions that influence, deliver and engage in these systems as well as the collective forces emerging from this interaction (Storper and Scott 2009; Walker and Avant 1995).

The role of people, firms and institutions within this complex adaptive ecosystem become vital to the long term success of city-regional, national and global economies. Interdependence between people, firms, institutions and their environment will change the operating conditions and initiate new pathways or innovation through a complex web of relationships and networks. *“The key appears to be how assets are used, how different stakeholders interact and how synergies are exploited in different types of regions”*, (OECD 2009). Context specific objectives and policy is more likely to deliver the desired outcomes.

It has been identified that long term business decision making for sustained competitiveness of businesses and regions appears to require a different way of thinking or decision making and different policy environments, (Currey and Chapple 2011, p71) and is frequently guided by organisational and individual values (Barton 2011; Lew, Choi and Wang 2011). Leadership of place and institutions become more significant (Beer and Clower 2013; Ayres 2014). Realising sustainability over the long term is challenging due to changes, adaptation and transitions (O’Toole and Vogel, 2011, p7). which in the lead up to the recent financial crisis did not shape decision making towards a more values based and long term perspective.

With a greater emphasis on the people, firms and institutions within this complex adaptive ecosystem, the way in which people operate within this, to shape and influence long term outcomes becomes central to the delivery of smart, inclusive and sustainable economies. The analysis required is complex, recognising assemblage and the way in which this operates within and outwith geographical and political landscapes (Brenner, Madden and Wachsmuth, 2011; Roy, 2009). It is unclear whether personal or institutional values influence strategy for delivering more sustainable long term outcomes but strategy and policy at firm, city, region and nationally will have an influence. The lack of temporal specificity of sustainability concepts make implementation by these agents hard to grasp. This is relevant for the development of policy and strategy which is seeking to reach an anticipated future goal but which is subject to a range of shifts and changes over time. Adaptation to these will be necessary. Transition points will be crucial and leadership or workforce changes will impact on policy and strategy development and delivery.

The importance of innovation and people in the shaping and adaptation of economies (OECD 2011 p 19) assumes more prominence in the complex adaptive system model. The influence of factors such as leadership, decision making, institutional strategy, policy for long term sustainability, workforce skills and resources, requires greater analysis but could go some way to contribute to explanations of variations in outcomes at the level of a firm or institution which in turn contributes to the city-region economy. It is argued that firms and institutions could be seen as complex adaptive eco systems operating within a larger city/regional and national complex adaptive eco system and as such are important agents and in some instances anchors for the city region economy (The Work Foundation 2010).



## Conclusions

It is argued that a multi-disciplinary and multi-level analysis is needed, economic and ecological, people and place orientated. Complex adaptive eco-systems co-exist and are interconnected and multi-layered at city, regional and institutional/firm level with further analysis needed to understand the way in which these systems operate to support sustainability over time. An integrated approach is needed which draws on concepts of evolutionary development and path dependency but with adaptation, emergence, and assemblage providing new insights to the way in which eco systems evolve over time. Finally, it is proposed that greater cognisance should be taken of the agents of this complex adaptive ecosystem, their interests, values and commitment, for smart, inclusive and sustainable economies to be realised.

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