ESPON

ECR2
Economic Crisis: Resilience of Regions

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This report presents a more detailed overview of the analytical approach to be applied by the project. This Applied Research Project is conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

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The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Cardiff University:

Gillian Bristow

Adrian Healy

HTWK-Leipzig

Rudiger Wink

Aristotle University

Grigoris Kafkalas

Christina Kakderi

Tartu University

Kerly Espenberg

Johanna Aasamets

Gdansk University

Iwona Sagan

Grzegorz Masik

Manchester University:

Marianne Sensier

Alan Harding

Experian Plc:

Adam Swash

Heather Carey

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[1] The listing of the elements included here should serve as a reminder of the standard elements that need to be covered by an Inception Report. The concrete content might vary from project to project. The level of detail to which these standard elements need to be addressed also depends on the quality of the project proposal and the level of detail to which some of these elements might already have been addressed there. Therefore the table of content for the report can be devised by the TPG, taking into account the elements that are requested to be dealt with in this report.

Figures

Tables

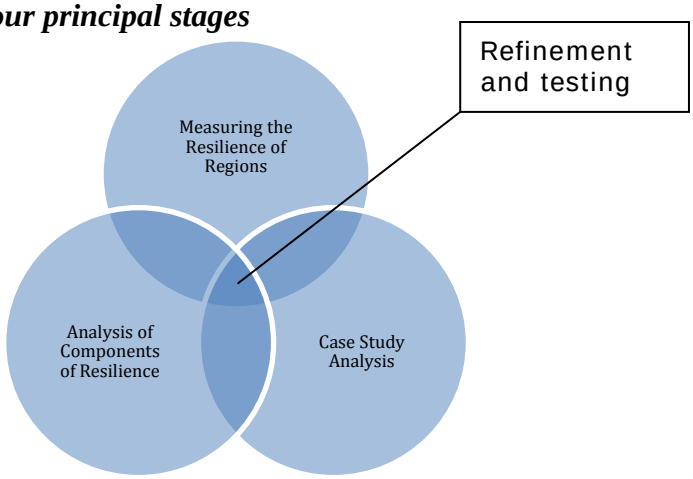
1. More detailed overview of the analytical approach to be applied

1.1 Approach

Our approach is built around four principal stages (Figure 1.1):

- A comprehensive review of territorial indicators relevant to measuring regional resilience and the mapping of these across the European territory.
- A deeper analysis of the potential components of regional resilience exploring a number of key themes
- A testing of the components and exploration of policy application, constraints and options through detailed regional case study analysis
- Testing and refinement of the findings through participative review and wide dissemination

Figure 1.1: The four principal stages



1.2 Measuring the resilience of regions

Our analytical approach begins with an assessment of where past economic shocks have occurred and where the impacts of these have been felt. These are not uniformly distributed, either spatially or temporally. Using GDP data we will map the economic performance of regional economies (defined as NUTS 2 statistical units) across the ESPON space and for additional identified economies. Our GDP analysis will be supported through the use of employment and unemployment data sets for the same statistical units for the purposes of comparative analysis. Annualised data will be used owing to data availability. This analysis will enable the study to assess where dips in economic performance have occurred, the scale of any changes and the speed of the response.

Where feasible this analysis will be undertaken for the period 1990 to the current day. This will enable an assessment of comparative performance over time, taking in a number of recessionary events (see Annex 1 as an example of this). There are some limitations to the availability of comparable data for all regions from 1990 onwards (see Section 3.3 Data Audit) and the study will seek to address this issue prior to the Interim Report. Our approach includes an innovative consideration of asynchronous business cycles which enables a more nuanced analysis of recessionary patterns (see Annex B – methodological approach).

1.3 Analysing the components of resilience

Having identified the regional pattern of recessionary events across the study area our approach then seeks to understand the features of regional economies which make them more or less susceptible to these events, and so informs our assessment of resilience.

There is a wide literature on the potential components of resilience (see Section 3.1 Literature Review). Our work will build upon this through examining the responses of economies to past recessions and, more especially, to the current economic crisis. In our analysis we distinguish between the roles of business, individuals, public bodies, the wider community and the place itself in developing resilience.

Our approach here is led by the theory as to the potential features of a resilient economy but is also informed by our audit of available data. Whilst, substantive data sets exist at a national level covering different components of resilience they are less extensive for the ESPON territory as a whole (see Section 3.3 Data Audit). In consequence we intend to focus on the following core indicators for a higher level analysis:

1. GDP/GVA
2. Sectoral employment
3. Total productivity
4. Total workforce
5. Employment rate
6. Participation rate
7. Number of enterprises
8. Business in highly exporting sectors
9. Qualification levels
10. Net migration

We will then supplement these with a wider range of indicators, such as household income, when considering the current economic crisis enabling a deeper assessment of the components of resilience. A range of potential indicators will be tested, based on the literature as to potential components of resilience, and this will be fully

reported in the Interim Report. Our analysis techniques will focus on econometric analysis and components analysis (see Annex B – Methodological Approach).

1.4 Case Study Analysis

Undertaking case study analyses will enable the study to focus on the (scope for) policy responses to economic crises and assess how regions have responded to the current and past economic shocks. Our case studies will also contribute to understanding the components of resilient regions through developing a stronger qualitative evidence base.

Eight case studies have been identified. These draw upon regions identified in the call for proposals together with suggestions from the TPG to develop a strong mix of different cases through which to explore the territorial evidence for resilience and the potential role for policy makers in supporting regional resilience.

The eight case studies provide a mix of key characteristics, particularly:

- A mix of regions exhibiting stronger and weaker resilience in the face of the current economic crisis
- A mix of regions within the eurozone and those outside of the eurozone
- A mix of regions which are in Member States in receipt of support from the European Financial Stability Facility and those which are not
- A mix of regions which are reviewed as gateway regions and those which are less strong in this regard
- A mix of industrial/sectoral structures
- A mix of development paths, including regions which are seeking to adopt greener paths to future economic growth
- Regions from a mix of governance contexts
- Regions from a mix of new Member States and Old Member States

Short fiches on the eight cases are included in Annex C, together with an outline template.

1.5 Refinement and testing.

The final element of our approach is to engage in the refinement and testing of the initial results obtained from the above three components. There are three elements to the refinement and testing phase.

- Ongoing analysis through our qualitative and quantitative approaches in light of the initial findings reported in the Interim Report

- External peer-review through two expert seminars. A list of potential invitees is included in Annex D
- Practice review through engaging with regional practitioners in two practice seminars. We have entered discussions with ERRIN and INTERACT as to how we might engage with their networks as a means of raising interest in attending such events.

1.6 Terminology for Resilience

In examining Economic Crisis: Resilience of Regions it is important that there is a common understanding of the terminology involved. We draw out the principal dimensions of this below:

Economic Crisis is understood to imply a significant economic shock. For the purposes of this work this is understood to mean a recessionary event, either at a European, national, or a regional level. A recessionary event is defined as negative GDP growth for two consecutive quarters (or 6 months). However, data will often only be available at an annual frequency for the number of regions considered for this study. In consequence we will take the position that one year of negative growth in the GVA/GDP of a region constitutes a recession.

A region is understood to relate to a territorial area for which a formal governance structure exists. The physical scale of such areas may differ across the ESPON space. For statistical purposes a region is defined as a NUTS II area or, for smaller states, the NUTS 1 area definition might be more appropriate. In particular cases we may consider a region to exist at a NUTS III unit however this would be by exception.

Resilience is defined in terms of economic resilience – this does not underplay other forms of territorial resilience (to natural disasters or other hazards for example) but acts as the focus for this study. For definitional purposes it is defined in terms of a regional economy's ability to withstand or overcome a recessionary event in the wider economy. It is measured in terms of GDP. Extending from this, our working definition of resilience for this project is:

The ability of a regional economy to withstand, absorb or overcome an external economic shock.

So, what makes an economy resilient to economic shocks? Writers suggest that the resilience of an economy is dependent upon:

- Inherent, or innate, capabilities (such as the structure of an economy, or its autonomous response functions)

- Adaptive capabilities (the sum of purposeful decisions made by agents whether they are individuals, corporations or other organisations including public sector actors)

The unique mix of these capabilities within each region and their interaction with the wider economic system will determine the resilience of the regional economy.

2. Methodology and hypothesis for further investigation

The proposed study resonates strongly with the territorial challenges identified for ESPON 2013 projects. That the current economic downturn is having an asymmetric impact on regions and cities is explicitly recognised as one of the seven mega-trends facing the European territory. Whilst this is often mostly related to the national context and the particularity of the local economic base, there remains the case that some territories prove more able to 'weather the storms' than others. What makes some regions more resilient in the face of economic crises, and others less so, is a question which has strong traction in the present economic circumstances.
We understand that the objective of the project is:

"To expose territorial evidence that supports policy-makers at different administrative levels in making the economic structure(s) in Europe and its countries, regions and cities more resilient to economic crises and a sudden economic downturn."

Our aim for the project is to deepen our understanding of:

- The impact of the current economic crisis and other recent crises such as the one in the early 1990s;
- The resilience of economic structures;
- The capacity (of regions and territories) to adapt to new socio-economic realities.

The Brief for the study sets out a number of key policy questions and a related series of research questions under three common headings. We set these out below:

	Policy questions	**Research questions**
Territorial impact of the last economic crisis	What is the territorial impact of the last economic crisis? What economic activities/sectors were particularly impacted by the crisis and where are these located in Europe? How could this be mapped?	**How can the territorial impact of the economic crisis be measured at different levels of geographical scale?** **What are good indicators?** **What is the territorial impact of the economic crisis (situation before and after) in different parts of the European territory and have specific types of region been more affected?**

		How do economic crises impact territories in Europe in terms of spatial distribution and in terms of time (sequence of events – spatial cause-effect-relationships)?
Resilience of regions	What quantitative and qualitative factors allow regions to move faster out of economic downturn? What elements in economic structures and policy responses made a difference for territories in order to be able to recover from the crisis? What (types of) regions and territories turn out to be more resilient and successfully adaptive to the latest economic downturn and why?	**What regions tend to resilient to crises and which are not?** **What territorial and other characteristics make regions resilient and why?**
Policy responses	What can regional policymakers do to complement macro-economic measures stimulating economic recovery? How can policymakers enhance the resilience of regional economies for future economic downturn? Is part of better resilience to be found in integrated and place-based policy action?	**Is or can territorial development policy impact on regional resilience and economic recovery and increase economic resilience?** **How is and how can this be achieved?**

We have grouped these questions into three broad objectives for the study and a series of associated subsidiary objectives. These are:

1. To identify the territorial impact of the last economic crisis
   - To identify indicators which present a robust measure of the territorial impact of the economic crisis.
   - To measure the territorial impact of the economic crisis at different geographical scales, to identify and map the distribution of these impacts across the European territory and to identify whether specific types of region have been more affected than others.
   - To identify whether particular economic activities/sectors were particularly impacted by the economic crisis, and the location of these effects
   - To identify the spatial and temporal distribution of the territorial impact of economic crises across the European territory.

2. To estimate the territorial resilience of regions
   - To identify what elements in economic structures and policy responses made a difference to regions' ability to recover from the economic crisis.
   - To identify the qualitative and quantitative factors which form territorial characteristics enabling some regions to resist, or move out of, economic downturn more effectively than others.
   - To identify which regions and which types of territories tend to be more resilient and adaptive to economic crises in Europe.

3. To understand the role of territorial policy responses in promoting economic resilience
   - To identify the potential role that territorial development policies can play, and are playing, in promoting regional resilience and economic recovery.
   - To estimate the contribution that integrated and place-based actions can play in complementing macro-economic measures aimed at stimulating economic recovery.
   - To consider how policy-makers can enhance the resilience of regional economies for future economic downturn.

It is intended that the project results will provide knowledge support and examples to policymakers at different territorial scales, particularly European, national and city and regional levels.

To address these research questions the study adopts three types of methodologies.

- a group of descriptive methodologies, demonstrating the distribution (temporal and spatial) of economic crises across the study area

- a group of interpretative methodologies (i.e. econometric exercises) to understand and interpret the components of regional economic resilience

- qualitative methodologies to explore the components of regional resilience, or non-resilience, in different spatial contexts.

3. Review of the main literature, data sources, etc.

3.1 Literature review

Economic shocks are a recurrent feature of our economy, of which the current economic crisis is just the most recent, but also arguably is one of the deepest for over 70 years. This crisis has stimulated interest in the notion of the economic resilience, which holds significant analytical potential to help address what Hassink (2010; p. 45) describes as 'one of the most intriguing questions in economic geography ... why some regional economies manage to renew themselves, whereas others remain locked in decline'. A review of the literature pertaining to this topic is contained in Annex E.

At a macro-economic level Duval and Vogel (2008) identify that three 'types' of economy can be broadly identified:

- those which tend to witness short sharp reactions to shocks but with a rapid recovery
- those with cushioned reactions to shocks but slower recovery times
- those which cushion the initial shock and quickly return to baseline.

Extending this research to the regional scale is the challenge facing this project. The resilience of regions to economic crises has been an important issue in the EU since the start of the current global economic crisis. However, there remain considerable questions around how regional resilience is defined, measured and ultimately facilitated or achieved. What is needed is a comprehensive assessment and synthesis of what makes some regions more resilient than others to economic crises and what regional policy makers can do to enhance their resilience to future shocks. This is thus the principal objective of this study.

There are numerous (but not unrelated) interpretations of the term 'resilience' which have each shaped the emerging definitions of resilience in regional and territorial studies (Martin, 2012). Some draw analogies from engineering, others from ecological studies and others from theories of complex adaptive systems.

We draw upon each of these, but most particularly on notions of complex adaptive systems thinking - a broad body of work that studies the underlying principles that are manifested in all kinds of system regardless of those system's particular components (e.g. ecologies, the internet, social networks, global society, gene networks etc). It provides a rich and useful framework for the cross-pollination of academic disciplines and indeed, there is a developing body of work applying complex adaptive systems thinking to a range of social sciences including economics (see, for example, Beinhocker, 2007).

Our thinking is also strongly influenced by the traditions of evolutionary economic geography. This holds that the economy is never in equilibrium but is constantly beset by perturbations and disturbances. A potential analogy here could be in terms of seismology whereby the earth is continuously rocked by small scale earthquakes and occasionally subjected to much more powerful earthquakes. In the economy there are similarly numerous small scale disturbances, occasional medium-scale events and, more rarely, significant economic crises.

Alongside the burgeoning literature on the meaning of resilience, there is a developing body of work on the factors shaping it. What is clear from the literature is that there is no one road to resilience. The available research suggests a combination of factors all contribute to resilience but that these factors combine in different ways which vary by place and context and may also vary over time.

To date, the literature has primarily focused on factors pertinent to the structural features of regional economies. These structural factors might usefully be labelled as the 'inherent' or 'innate' components of resilience in economic systems i.e. those factors which shape intrinsic capacities to react, or the autonomous responses to shocks (Rose, 2004).

Less emphasis has been placed upon understanding the agency of actors in the system. The role of individual choice in the resilience of economies is an important addition of our work to the emerging body of literature in the field of economic resilience, and represent the emergent properties of the system. This includes actions and responses at the micro-economic scale, as well as meso- and macro-economic scales.

There is increasing recognition of the role specific territorial and regional policy initiatives may play in building resilience, with a number of studies highlighting the importance of the actions of regional and local authorities in encouraging territorial adaptation to new socio-economic realities (e.g. Brookings Institute et al, 2010; Hervas-Oliver et al, 2011). Two sets of questions around the role of policy-making emerge from the literature. Firstly, if regional economies are complex and self-organising adaptive systems with often unpredictable dynamics, what scope exists for intervention and policy influence? Secondly, if policy-makers have a role in managing resilience, precisely what can they do?

Understanding of the institutional and policy dimensions of resilience remains an underdeveloped area of theorising and empirical research, and the literature on this is disparate and somewhat fragmented. This therefore constitutes one of the main gaps in knowledge to be addressed by this research.

Currently, the theoretical literature suggests the following regarding the potential role of policy-makers:

- Firstly that governance bodies can, and do, act as purposeful agents of change to promote and shape resilience, but that the results of this action will be an emergent property of the economic system
- Secondly, as such, governance bodies are internal to the system and should not be regarded as external agents of change, particularly as in complex systems there is no overall controller of the system,
- Thirdly, governance bodies can act as 'unique connectors', particularly as they are one of the few agents in a regional economic system which is 'territorially-tied'.

There is however a need for more research on how these ideas might be translated into practical policy action and for evidence on whether and where sub-national policy intervention is facilitating or constraining resilience.

3.2 Data Review

Attempts to measure the resilience of regional economies are a relatively recent phenomenon. Broadly, two aspects to this can be identified. Firstly, those approaches which measure the extent to which an economy has proven resilient to economic shocks and an assessment as to why this was so. Fundamentally, this is an ex-post approach which explores historical events. Secondly, those approaches which try to assess the current resilience of an economy. This ex-ante style approach is conceptually and methodologically challenging, but is a key interest to policy makers. It is the reason this study seeks to explore the components of resilience.

An added complexity for this study is the scale at which the assessment is being undertaken. The availability of comparable datasets over a suitable time-series will influence both the geographical scope of the study and the indicators identified as being most significant for analysing the components of resilience.

Our audit of data availability is thus critical to the study as it will inform the final selection of indicators for initial analysis. Our approach seeks to ensure that we have a good selection of indicators covering our chosen components of resilience. Initial analysis suggests that for some components a suitable range of data is available for quantitative analysis across a wide number of countries (common datasets) whilst for others the assessment will need to be based upon observations for identified regions (place-based analysis). We summarise this in Table 3.1 below.

Table 3.1 Summary data review

	Innate capacities	***Adaptive capacities***
Business	Common datasets available	Common datasets available
People	Common datasets available	Common datasets available
Community	Place-based analysis only	Place-based analysis only
Place	Place-based analysis only	Place-based analysis only

On the basis of our assessment of what might be features of a resilient economy coupled with the audit of data availability the following indicators appear to be suited to measuring economic resilience at a regional scale.

- Employment by sector (FTE)
- Total productivity
- Workforce numbers
- Employment rate
- Participation rate
- GVA
- Number of enterprises
- Businesses in highly exporting sectors
- Qualification levels
- Net migration

3.3 Data audit

As part of the inception phase of the research, the Experian project team has undertaken a review of data sets and availability of potential indicators across the ESPON territory. This sought to ascertain the availability of key indicators of economic performance and resilience, across three categories:

- **39 European territories** – EU27 (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom); Candidate countries (Croatia, Former Yugoslav Republic of Macedonia, Iceland, Montenegro, Serbia, Turkey); Liechtenstein; Norway; Switzerland; Bosnia and Herzegovina; Albania; Kosovo
- **National, regional and local level** data – NUTS1, NUTS 2 and NUTS3
- **Time series data** - from 1990 to the present

The audit considered the following fields for each indicator:

- Sources of data
- Indicator definition
- Geographical availability
- Geographical disaggregation
- Time series availability

The output of the data audit is summarised in Annex F.

The overarching finding of the data audit is that there exists sufficient data to undertake the proposed econometric analysis of economic performance and resilience. However, gaps exist in terms of territorial and temporal coverage.

In terms of measuring the resilience of regions, data availability is generally good. For 31 countries the analysis can be conducted at the NUTS 2 level. For 8 countries the analysis is only possible at NUTS 1 level. As most of these are small states this is not perceived to be problematic.

Data availability for assessing the components of resilience is less comprehensive. This will limit the available indicators and the geographical scope of the study. Sufficient data points do exist to enable a robust assessment of the territorial evidence which might support policy makers in strengthening the resilience of regional economies. This is particularly so for: Austria; Belgium; Finland; France; Italy; Luxembourg; Netherlands; Portugal; Spain; Sweden; and Iceland.

Indicator availability suggests that the following aspects should form the focus of the analysis of the components of resilience:

1. GDP/GVA
2. Sectoral employment
3. Total productivity
4. Total workforce
5. Employment rate
6. Participation rate
7. Number of enterprises
8. Business in highly exporting sectors
9. Qualification levels
10. Net migration

4. Use of existing ESPON results relevant for this project

Existing ESPON projects provide a wealth of results on which to draw. We have requested a list of indicators held by the ESPON M4D project in order to assess existing data coverage. We are informed that this information will be available from a revised web-portal shortly. Once this is available we intend to build it into our data acquisition strategy.

Individual projects, particularly those funded through Priority 1, also provide valuable insights into how resilience might be considered and useful inputs to this study. The Vulnerability concept developed by ARTS (which itself is based on work of the IPCC) is one that we will consider further. This suggests that vulnerability is a combination of: levels of exposure, sensitivity, potential impact and adaptive capacity.

The work of GEOSPECS, with its identification of 8 types of region (based on their physical characteristics) provides a valuable context for considering whether the physical character of a territory affects its levels of resilience. Similarly, the SGPTD study poses the useful question as to whether second tier cities are more (or less) resilient than capital cities. The SGPTD study argues that capital cities are likely to pull ahead in an economic crisis as they "generally are better placed to withstand the recession" (p.5 draft final report).

Similarly, the TIGER study has provided a valuable assessment of the openness of economies and one which raises useful questions as to the implications of this for the economic resilience of regions. This is a complex consideration as openness may confer both resilience and vulnerability. It is an important theme for the Resilience study. The TIGER study has also provided evidence which suggests that connectivity does not correlate with GDP performance. On this basis this is a concept which we will not need to progress further in our own work.

The territorial governance categories identified by the SGPTD study: namely Federal; Unitary Northern; Unitary Regulated; Other Unitary Old Member State, and Other Unitary New Member State may also provide a useful categorisation for our Resilience study.

In addition some projects provide results which offer a window into a particular dimension which might influence levels of resilience. Examples include (relevant dimension in italics):

- DEMIFER - *Demographic and Migratory* Flows Affecting European Regions and Cities
- KIT - Knowledge, *Innovation*, Territory
- ReRisk - Regions at Risk of *Energy* Poverty
- TERCO - European Territorial *Cooperation* as a Factor of Growth, Jobs and Quality of Life
- TRACC - *Transport Accessibility* at regional/local scale and patterns in Europe

This will be considered during Activities 2, 3 and 4.

5. Distribution of work packages among partners, the break down of the project's budget on the individual partners per budget line

The distribution of work packages amongst partners is as follows:

LP– the lead partner will lead Work Package 1 (Management and Coordination). They will also contribute to Work Package 2 (Project Activities) with a focus on Activity 1 and Activity 4. The Lead Partner will lead the dissemination activities (Work Package 3).

PP2 – Project Partner 2 will focus on Work Package 2, Activity 4 and 5. They will contribute to Activity 1 in WP2 and to WP1 and to WP 3.

PP3 – Project Partner 3 will focus on Work Package 2, Activity 4 and 5. They will contribute to Activity 1 in WP2 and to WP1 and to WP 3.

PP4 – Project Partner 4 will focus on Work Package 2, Activity 4 and 5. They will contribute to Activity 1 in WP2 and to WP1 and to WP 3.

PP5 – Project Partner 5 will focus on Work Package 2, Activity 4 and 5. They will contribute to Activity 1 in WP2 and to WP1 and to WP 3.

PP6 – Project Partner 6 will focus on Work Package 2, Activity 1, 3 and 5. They will contribute to Activity 2 in WP2 and to WP1 and to WP 3.

PP7 - Project Partner 7 will focus on Work Package 2, Activity 1, 2 and 5. They will contribute to Activity 3 in WP2 and to WP1 and to WP 3.

The breakdown of the project's budget on the individual partners per budget line is reported below in Table 5.1.

Table 5.1 Breakdown of project by budget line (€)

	LP	**PP2**	**PP3**	**PP4**	**PP5**	**PP6**	**PP7**
Staffing	281,000	42,500	20,000	16,625	23,100	73,166	50,000
Administration	56,200	8,500	4,000	3,325	4,620	14,633	10,000
Travel and accommodation	68,000	10,000	10,000	10,000	15,000	7,000	
Equipment							
External expertise and Services	19,600					7,200	
TOTAL	**424,800**	**61,000**	**34,000**	**29,950**	**42,720**	**101,999**	**60,000**

6. Project specific part

Integration of Europe 2020 and the Territorial Agenda

The study has reviewed Europe 2020 and the Territorial Agenda and notes the importance of this policy context for this study. Territorial Agenda 2020 provides a particularly useful reference point given its emphasis on place-based 'integrated territorial development'. Its argument that multi-level governance formats are required to manage different functional territories, and that recognizing the territorial dimension to EU and national sectoral policies are important principles form foundational arguments for future action and are of value to our study as considerations. Our consideration of how policy-makers are able to support the formation of more resilient regional economies will take into account not only the scope for action of regional policy-makers but also national and European scales.

Case Study selection

The case study selection has been agreed with the ESPON CU. Our selection respects the wishes of the ESPON Monitoring Committee. The justification for the selection is set out in Section 1.4 above.

Working definition of Resilience

A working definition of Resilience has been developed for this study. That is:

The ability of a regional economy to withstand, absorb or overcome an external economic shock.

Practical policy recommendations

The study recognises that it should work towards deriving practical policy recommendations. These will be developed during Activity 4 of the study and will be set out in the draft Final Report. The practical policy recommendations will be developed for regional actors, national governments and the European authorities.

7. Overview of more detailed deliveries and outputs envisaged by the project

The following deliverables and outputs are envisaged by the project.

Interim Report (31 January 2013)

This will set out the main results of the initial data analysis. It will provide

- the results of the recessionary analysis
- maps and figures illustrating these results
- initial hypothesis of a potential typology of regions
- preliminary findings of the analysis of the components of regional economic resilience.
- Report on data collection achieved
- Preliminary results of the case study analysis
- First indications of emerging conclusions and policy relevant recommendations

  The Interim Report will also include a slideshow explaining the assumptions, methodology and interim findings of the project and a selection of 5 to 10 draft maps for communication purposes.

Draft Final Report (30 November 2013)

This will take into account feed-back on the Interim Report from an ESPON seminar and the Sounding Board. It will include a main report setting out the main findings, guidance for multi-level and cross-sector territorial governance and future policy options (for EC Cohesion Policy, and national, regional and local authorities); an Executive Summary; a Scientific Report, and communication materials.

Final Report (30 April 2014)

A Final Report will be produced on the basis of comments received on the draft Final Report.

The project recognises the importance of disseminating the results and findings of the study at various stages. To this end it has already issued one press release on the launch of the study, contributed to a Steering Committee on an ESRC-funded study of recessionary impacts on regions in the UK (with a range of policy and practice stakeholders), and has committed to present at an RTPI event in the UK. Wider activities outside of the UK will be encouraged once the project is further advanced.

In addition the project will:

Produce *10 Maps* (Responsibility: Lead Partner) At least 10 maps will be produced to assist with the wider communication of project results. These will be suited to the creation of posters, postcards, and exhibition materials as well as being appropriate for web-based display and dissemination. The maps will also be produced in the form of a slideshow which illustrates project progress and findings.

Hold *2 Expert and 2 Practitioner Seminars* (Responsibility: Lead Partner). These seminars will be held as part of the testing and refinement of results. They will have the dual purpose of testing emerging findings and raising awareness of the results realised to date. The expert seminar will be comprised of academics with an expertise in the topic. We are in currently in consultation with representative bodies regarding the practitioner seminars.

A dedicated email address has been established for the external relations with the project: ECR2@cardiff.ac.uk. A website has also been established for the project, hosted by the Lead Partner. The site is subject to further development over the Summer of 2012 with the intention of improving its content. The site is accessible at: http://www.cardiff.ac.uk/cplan/research/economic-crisis/economic-resilience/index.html

8. Indication of likely barriers that the project implementation might face

The major barrier facing the study relates to the availability of data for the 'community' and 'places' categories of resilience. We will seek to address this through the targeted case study analysis in order to develop practical recommendations for policy-makers at different scales.

The availability of data for the selected indicators under the 'business', 'people' and 'public-sector' components of resilience are less significant barriers. There are some gaps in the data but these are regarded as manageable for the purposes of the analysis.

A potential barrier for the study is failure to secure participation in the qualitative aspects of the case study research. We have sought to minimise this risk through developing initial contacts with key stakeholders in each case study region. However, it is a risk which we will continue to monitor. One mitigation measure is to ensure a range of stakeholders are available for engagement should one or two decline the invitation to participate.

9. Orientation of the project previewed towards the Interim report

A meeting of the TPG, ESPON CU and Sounding Board is scheduled for September 18th, 2012 in Gdansk, Poland. This will provide an opportunity to develop the orientation of the project towards the Interim Report. The TPG will also participate in the ESPON Seminar in Cyprus in December 2012, which will provide an opportunity for reflection on the content of the Interim Report.

Inter alia, the Interim Report will include the following elements:

a) Main results on the basis of available data, developed indicators, typologies, and European maps, including:
    a) An overview on concepts and methodology on analysing European gateway regions and possible final results;
    b) A detailed presentation of a hypothesis on the typology;
    c) Preliminary results of the case studies;
    d) Preliminary conclusions from the case studies;
    – First indications on the conclusions and policy relevant options that could be the outcome of the project;
    – Data collection achieved, including an overview on statistical and geographical data collected by EUROSTAT, the Joint Research Programme and national Statistical Institutes etc.
b) Plan for the applied research towards the Draft Final Report as well as the Table of Contents envisaged for the Final report.
c) Additional material to contribute to the ESPON 2013 capitalisation and communication strategy

Annex A Identification of Recessionary Episodes

As a benchmark we can look at national business cycle dates as produced by the reputable Economic Cycle Research Institute[2]. Dates from this for a selection of ESPON states are given in Table 1.

Table 1: ECRI Business Cycle turning points for European Countries

Turning Point	UK	Germany	France	Italy	Spain	Austria
Peak				1970m10		
Trough				1971m8		
Peak	1974m9	1973m8	1974m7	1974m4		1974m8
Trough	1975m8	1975m7	1975m6	1975m4		1975m6
Peak	1979m6	1980m1	1979m8	1980m5	1980m3	1980m2
Trough	1981m5	1982m10	1980m6	1983m5	1984m5	1983m1
Peak			1982m4			
Trough			1984m12			
Peak	1990m5	1991m1	1992m2	1992m2	1991m11	1992m4
Trough	1992m3	1994m4	1993m8	1993m10	1993m12	1993m6
Peak						1995m5
Trough						1996m3
Peak		2001m1	2002m8			2001m1
Trough		2003m8	2003m5			2001m12
Peak	2008m5	2008m4	2008m2	2007m8	2008m2	2008m2
Trough	2010m1	2009m1	2009m2	2010m1		2009m6

Note: from http://www.businesscycle.com/.

We can see that since 1970 Spain has experienced the least number of recessions, it is currently experiencing its third (though very prolonged) downturn. The UK has experienced 4 major recessions, Italy and Germany have had 5 recessions with Germany suffering a particularly long downturn after re-unification with East Germany. The ERCI has dated 6 recessions for France and Austria since 1970.

This is the headline story at the national level but looking beneath the surface we find that many regional differences exist. In Artis and Sensier (2009) the classical business cycle dates are obtained for NUTS 1 (or Government Office Regions) monthly employment data using a mathematical algorithm. Table 2 shows the resulting dates between 1988 and into the middle of the last recession in 2009. The UK employment series only experiences two downturns along with the East Midlands and the South West of England. London, Yorkshire and Humberside, the North West and South East of England all experience 3 recessions with the southern regions having an early 2000s downturn that was also experienced by Germany and France.

[2] see: http://www.businesscycle.com/business_cycles/monitoring_business_cycles_today for an overview of their methodology

The West Midlands, Northern Ireland, North East and East of England all had 4 recessions with Wales and Scotland both experiencing 5 recessions. Undertaking a comparable regional level analysis across the study space lies at the heart of this study.

Table 2: Classical Business Cycle turning points for UK and Regional Employment data

Turning Point	UK	Wales	Scotland	London	SE	Northern Ireland
Peak	1990m6	1989m3	1989m10	1990m6	1990m8	1990m11
Trough	1993m3	1993m5	1993m1	1993m10	1993m4	1993m10
Peak		1997m6	1995m7			
Trough		1998m6	1996m2			
Peak		2000m11	1997m12			1999m8
Trough		2001m8	1998m8			2000m3
Peak		2004m4	2000m12	2002m6	2002m3	2003m2
Trough		2005m4	2001m12	2003m2	2003m10	2004m4
Peak	2008m4	2008m3	2008m4	2008m12	2008m6	2008m4

Sample: 1988m1-2009m5, from Artis and Sensier (2009)

Table 2: continued

Turning Point	NW	NE	East	YH	East Midlands	West Midlands	South West
Peak	1990m10	1990m4	1990m7	1990m5	1990m6	1989m12	1989m7
Trough	1995m10	1994m12	1993m7	1994m5	1994m8	1993m1	1993m2
Peak	1997m2	1997m8	2002m3	1995m11	2000m4	1998m8	
Trough	1998m4	1999m3	2002m12	1996m10	2000m12	2000m10	
Peak		2002m3	2005m5			2002m11	
Trough		2002m12	2006m4			2003m10	
Peak	2006m8	2007m8	2008m12	2008m1		2005m3	2008m10

Annex B Methodology

1. Overall Approach

1.1 Context

The objective of this project is to expose territorial evidence that supports policy-makers at different administrative levels in making the economic structure(s) in Europe and its countries, regions and cities more resilient to economic crises and a sudden economic downturn. The project will address the theme of resilience and economic recovery from the perspective of the regional/territorial policymaker. It will not investigate macro-economic measures, although these will form a context for assessing the regional/territorial condition.

The project will provide robust evidence and analysis to support policy-makers in understanding how the economic crisis has impacted upon European Territorial Development and Cohesion Policy objectives (i.e. for balanced and harmonious development) and what specific adaptive capacities help some territories to achieve smooth recovery. The project results will thus provide knowledge support and examples to policy-makers at European, national and (city-) regional level to help them adapt their territorial development and cohesion policies.

Empirical issues lie at the heart of the project and require the integration of selected empirical methodologies. The key challenge here is to disentangle the complex transversal impacts of movements in business cycles, and the specific structural and institutional variables shaping the dynamic resilience properties of regions. Moreover, as resilience is a dynamic, path-dependent process, it requires longitudinal observations. Understanding the components of resilience, and the role of territorially-specified policy actions, requires deeper qualitative observations.

Drawing upon the specialist expertise of the project partners we shall combine quantitative and qualitative techniques as a mechanism for identifying historic and current patterns of regional resilience; the factors underpinning this, and the role and scope of sub-national territorial actions in promoting resilience. We adopt a nested approach to this research, testing patterns of resilience across the EU as a whole using available indicators; undertaking targets empirical analysis in a smaller number of EU, ESPON and wider territories to test components of resilience using more detailed longitudinal datasets; carrying out innovative exploratory analysis of the dynamics of resilience in a subset of EU Member States and associated ESPON territories, and undertaking qualitative case study research in 8 regions.

The three key components of the study are:

- Identifying regional resilience, and
- Analysing the components of regional resilience
- Understanding the role of territorial policies in promoting resilience

Together these will enable us to make robust policy recommendations.

1.2 Identifying Regional Resilience

At the heart of this project is the collection, synthesis, and analysis of pan-European economic data relating to the territorial impacts of recent (and previous) economic crises and recession, and the revealed resilience of regions to these shocks. Our method provides:

- a descriptive approach that will illuminate and map annual changes in key economic indicators across European regions over successive business cycles;
- interpretative approaches to analyse spatial patterns in key indicators across different geographical scales and different types of territory.

We currently operate a bespoke model of regional resilience. This is publicly available and has been applied for national clients in the UK. In this we break resilience down into 4 key areas: Business, People/ Human Capital, Place and Community; the last 2 of these themes being those which drive the long term ability of an area to attract and retain businesses and the human capital. In this model we rank local areas in terms of their resilience, and detail which factors influence these rankings. The research takes a holistic view of local areas and ranks them in terms of their ability to respond to economic shocks, including aspects such as public sector cuts.

This research is useful in understanding how areas will respond to economic shocks, and the positive and negative factors that underpin performance across different local areas

For this project we would construct a new index which can be applied on a pan-European basis. This would reflect the information availability across Europe keeping the key themes, which were built upon current academic thinking. The key stages of this process will include:

Assessing available evidence:

The project will assess the availability of existing quantitative and qualitative data sets by conducting a thorough review of available literature and data sources, reports and analyses. This will include:

- Existing literature on regional resilience, economic crisis and recovery, such as sources cited within this bid.
- Material published by international and national authorities, particularly the OECD (such as their Territorial Reviews), and the European Commission (such as Regions 2020)
- Data available from statistical bodies and commercial owners of data. This will include Eurostat amongst others. Sources to be considered will include the standard annualised dataholdings and more occasional sources such as the Community Innovation Survey.
- Data collated from the current ESPON Applied Research Projects such as ‘European Regions: Potential Contribution to the EU 2020 Strategy’, ‘ARTS’, ‘Europe in the World’, ‘INTERCO’ and ‘TIGER’
- Other sources such as the EU’s Framework Programmes, INTERACT and the Joint Research Centre in Seville.

Identification of key indicators of economic crisis and recovery and their availability:

We will identify the availability of relevant indicators for the all EU Member States, Iceland, Norway, Switzerland, Croatia, Turkey, Montenegro, the Former Yugoslav Republic of Macedonia, Bosnia and Herzegovina, Serbia, Albania and Kosovo. Annual data will be collated from 1990 onwards at NUTS2 (or where possible NUTS3) level (or statistical equivalents) for successive business cycles.

We will do so using the close contacts Project Partner 7 has with statistical offices around the world. This is based on their network of offices which both inform their work within individual countries and the global, regional and national economic models that inform much of their client work. These contacts will allow us to obtain more detailed information, as needed, to fill emerging gaps in data for this project.

Coverage for the EU 27, Norway, Switzerland, Lichtenstein and Iceland is strong at the NUTS 3 level. In other areas, such as Montenegro and Croatia, we will use our standard data protocols to obtain data from the local statistical agencies. It should be noted that many of these additional countries will not have data in either the time series or sub-national detail that exist in other areas.

Once we have obtained all of the relevant data for compiling the index we will go through a process of:

Checking for gaps: an initial Delphi style group will debate the relevance of the indicators and whether there are any key gaps in any of the themes suggested by academic literature that we need to investigate. We will also consider whether using absolute variables (such as output) or relative variables (such as output/ per capita) or even a combination will provide the result that best meets the objectives of this project.

Investigating new data sources / dealing with missing information: In this stage we will investigate the existence of wider data sources that may provide coverage in themes not covered by standard data sources: this might be information from in-country business databases or European wide surveys. We will also investigate what the impacts of missing data points maybe on the model and make decisions on the most appropriate method for filling them: whether this be by looking at an average figure, a regional / country figure or tying to some other proxy variable.

Gaps in the data sets will thus be addressed through:

- the use of proxy measures
- the use of estimation techniques
- the use of substitute sources (such as wider studies)
- the use of qualitative data

Variable cleansing/ correlation & normalisation: In this stage of the project we will ensure data compatability between areas and significance and confidence of variables are understood. We will make recommendations on whether to keep or reject variables on this basis (looking for proxies where necessary). We will also run

regression and correlation analysis at this stage to ensure that no variables are inadvertently 'double counted' in the final index these correlation results will feed through into the final weighting processes. Finally, in this analytical stage we will normalise the data so that the index can be comprised of variables on the same basis.

We would investigate the types of normalisation to use and comment on the appropriateness. In the past we have used a rankpercent approach as this flattens the impact of wild outliers but would consider whether a standard normalisation (Standard Deviations away from the mean) or a different non-normal approach may be more appropriate and within this, what impact the normalisation method will have on updateability.

Draft Index: At this stage we will pull together a draft index for consideration by the wider consortium. Box 1 illustrates a number of potential indicators of resilience. The weights for the index will be driven by the results of the correlation analysis and the results of other streams of this research around factors influencing resilience. This draft model will then be considered by the wider Delphi group within the context of recent economic performance to interactively refine the weights and, if necessary, the variable to finalise the overall European index.

Box 1 Potential indicators of resilience

Business

- % vulnerable sectors
- % resilient sectors
- % high-growth (knowledge) sectors
- Business start-up
- Insolvency Rates
- % workforce self-employed
- Adaptive companies
- Foreign-owned businesses (Foreign Direct Investment)
- Exports
- Highly exporting SICs
- % employment in vulnerable sectors
- % employment in resilient sectors
- Business Density
- Credit (interest) rates
- GVA

People

- Working age population (growth)
- NVQ4+ APS
- Low qualifications
- % employed as corporate managers
- % employed in elementary occupations

- Earnings
- Employment rate

Community
- % vulnerable to declines in disposable income
- % vulnerable to LT unemployment
- CC rate of unemployment
- Social cohesion/do neighbours look out for each other
- Life expectancy at birth female
- Life expectancy at birth male
- % wards amongst 10% most deprived
- Net migration rates

Place
- Achievement at school
- Crime rates
- House prices
- Previously developed land
- ERV commercial office space
- Greenspace as a % of total land

Typology development

A key part of the project will be to relate the data to key territorial typologies. *A priori*, we intend to develop a 5 category territorial typology:

- Regions not affected by economic crisis
- Regions affected by economic crisis but with swift recovery rates
- Regions affected by economic crisis but with slow recovery rates
- Regions affected by economic crisis and unable to regain past growth rates
- Regions affected by economic crisis which have switched to new development paths

We will do so using cluster analysis techniques. This will cluster regions according to common characteristics. Our regions will be based on statistical regions as this is the basis of the data available. We will test different approaches but one approach will be to use the k-means clustering technique included in SPSS.

We will relate the typologies developed both to existing ESPON typologies and to the nine standard ESPON territorial typologies: urban-rural; metropolitan regions; border regions; island regions; sparsely populated region; outermost region; mountainous region; coastal regions; regions in industrial transition.

Mapping of key data sets

The TPG will collate and map all available data according to ESPON mapping procedures. This will identify the regional impacts of economic crises and highlight those regions with slower or faster recovery rates. Alongside static data mapping, dynamic mapping will be utilised to identify 'waves' of crisis, possible 'contagion' effects and recovery rates over different business cycles. Maps will illustrate the territorial typology work.

Maps will be created using ArcGIS version 9.2, a suite of geographic information systems (GIS) software produced by ESRI. The ArcGIS software allows the user to compile, analyse and map geographic data in a variety of ways. It is envisaged that the maps produced for this project will be created using a range of techniques, including: chloropleth mapping, where areas of the map are shaded with predetermined colours which represent different proportions or attributes of the variable being measured; proportional symbol mapping, where symbols and symbol sizes are used to represent different proportions and attributes of the variable being measured; and dot density mapping, where dots are used to show the geographic location on a map where an attribute of the data occurs.

1.2 Analysing Regional Resilience

Our approach utilises various quantitative (econometric) techniques to test the significance of various identified components of regional resilience. This will consist of a longitudinal analysis; a components analysis, and an innovative analysis of the role played by asynchronous business cycles.

Dynamic longitudinal analysis

In the first instance we will undertake a longitudinal analysis of the revealed resilience of regions. This will investigate the extent to which a disturbance to the regional economy (such as the 1990s recession in the UK) permanently affects the path of the economy by changing the rate of growth of key variable (such as GVA, employment or other identified indicators of resilience). Our approach builds upon that of Martin (2011) and particularly takes into consideration the notion of hysteresis, and that of Davies (2011) who analyses a European cross-section of data to gauge if regions 'bounce-back' after the most recent recession.

Our first measure will gauge if we have positive or negative hysteresis. Does the economy return to the same rate of growth after a recession or does its growth rate increase or decrease? We will calculate a measure of resilience as the difference between the gradients of the growth path before and after the recession – the 1990s downturn. To compare the growth path before and after the recession we will estimate the linear regression model as follows:

$$GVA_t = \alpha_0 + \alpha_1 Trend + \varepsilon_t \qquad (1)$$

To assess this we will identify the peak and the trough of the business cycle for each region and for the national output and employment series. In Figure 1 we provide an

example using GVA (factor cost) data for two of our case study NUTS 2 regions in the UK.

We first date the peaks (P) and troughs (T) of the business cycle by selecting the maximum or minimum points in the level of the series. We then estimate the linear regression of the natural log of GVA on a constant and trend for the period of one year after the trough (T+1) to the peak date. We then compare the gradients of these lines (so the estimated coefficient on the trend). In this example West Wales demonstrates less resilience with shallower gradients after the recession but East Wales demonstrates stronger resilience with steeper rates of growth following the 1990s recession.

The sensitivity index suggested by Martin (2011, p. 16) is a simple way of measuring the resistance aspect of resilience of regions to the recession which is the ratio of decline of output or employment with respect to the country as a whole. The sensitivity index is calculated as follows:

$$\beta_r = \frac{\left(\Delta E_r / E_r\right)}{\left(\Delta E_N / E_N\right)} \qquad (2)$$

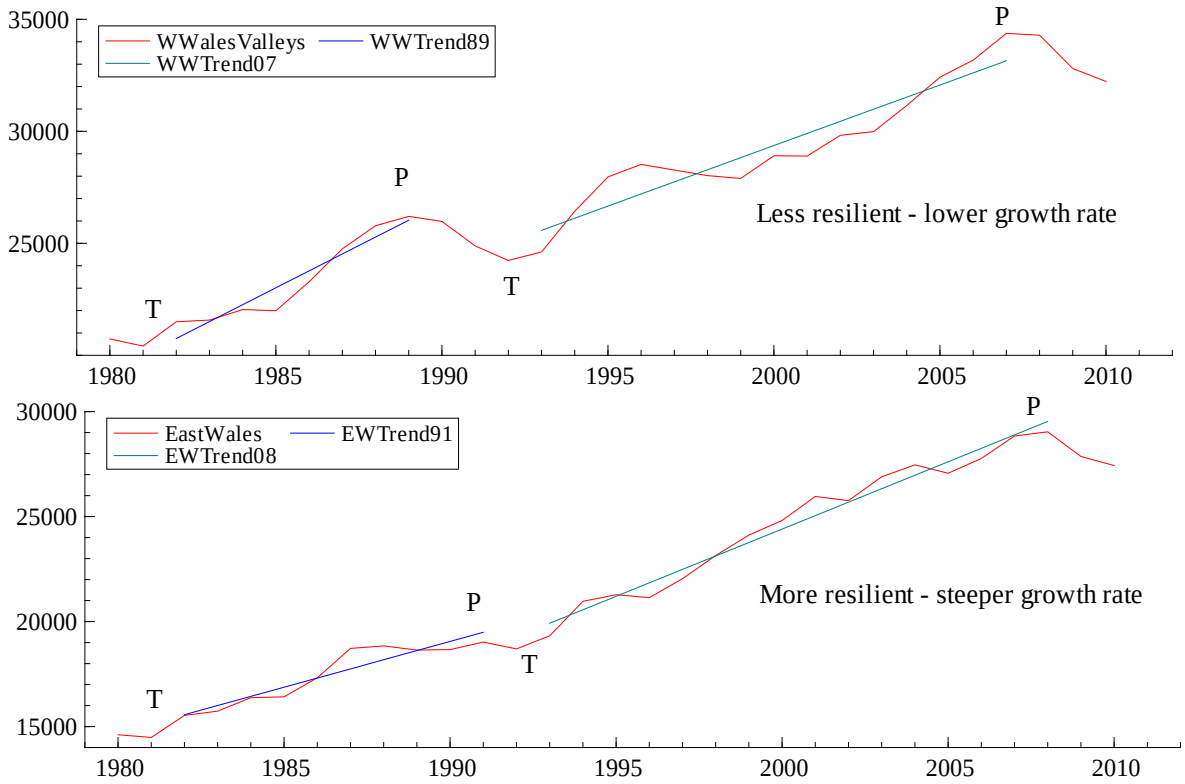
Where $\Delta E_r / E_r$ is the percentage change in employment from peak to trough of the recession for the region (r) compared to the nation (N). This measure could be calculated for both the 1990s downturn and the most recent recession over 2007-9. The following table shows the sensitivity index with a lower number meaning the area is more resilient being closer to the national fall in the growth rate of GVA peak to trough.

Comparing the regions with Martin's sensitivity index we get:

Region/ Country	Peak	Peak GVA	Trough	Trough GVA	dGVA/GVA % fall P-T	Sensitivity index
East Wales	1991	19023.302	1992	18696.448	1.718	1.676
West Wales	1989	26202.917	1992	24239.068	7.495	7.309
UK	1990	1049905.866	1991	1039139.4	1.025	1

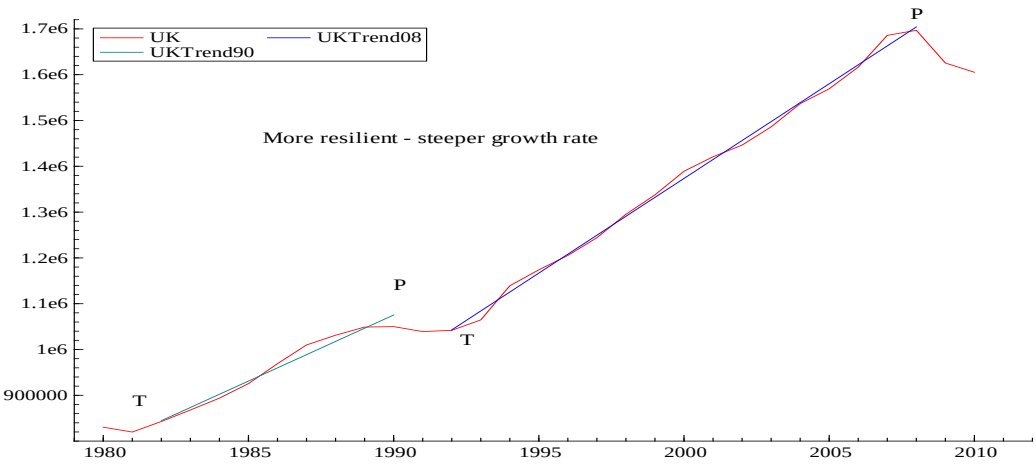
Note: GVA (€m)

Figure 1 Historic growth trajectories



The regional picture can then be compared with the national picture to provide a measure of relative resilience.

Figure 2: National UK trend



We will then use our measure of resilience as the dependent variable in a cross section regression across European regions and test the extent to which indicators contained in our resilience index significantly describe regional resilience.

Understanding the components of resilience

Through an analysis of historic patterns of recession and recovery in a sample of core regions we propose to provide innovative testing of a range of components of regional resilience. These components will be identified from a number of key sources:

- Our case study material (see below) which will, in particular, provide important policy and institutional variables for consideration, as well as key variables associated with new green economic paradigms;
- A literature and practice review. This will draw upon the comprehensive literature review and conceptual paper produced as part of the inception report. We will also draw upon the emergent findings from the Open Research Area (ORA) transnational project on territorial resilience which the LP is involved in. This will provide important insights into the key sectoral, technological, structural and network properties enabling certain regions to avoid being 'locked-in' to declining paths of development. This will include variables such as sectoral specialisation; diversification through adoption of key technological fields and innovative / growth sectors; and adaptive capacities in relation to the development of new paths of development in related technological and sectoral fields ('related variety'). Other critical sources here include the ESPON 2013 Project on 'Territorial Governance' and the work of the LSE (2010) which highlights actions taken by regional authorities to encourage adaptation to new socio-economic processes.
- Two focused, expert seminars with a small invited audience of academics and policy-makers. These seminars will draw upon academic expertise in regional economic resilience.
- Data analysis based on the identification, testing and selection of core variables.

In each case we will test for relationships with regional resilience using cross-sectoral regression analyses. In exploring the components of resilience we will also make use of wider qualitative date obtained through non-standardised datasources – such as relevant ESPON studies or the Community Innovation Survey. The components to be tested will include:

- Significance of variation vs specialisation – Using data on regional industrial structure we will explore the extent to which concepts such as related variety, economic diversity and sectoral specialisation can help to explain revealed levels of regional resilience
- Significance of agglomeration – various studies have suggested that the intensity of urban agglomeration in a region may positively influence the resilience of that region. Drawing on existing studies we will test the relational strength of this factor with regional resilience.

- Significance of demographics/skills mix - using ESPON data and other sources we will examine the implications of different demographic structures and endowments of skills on regional resilience.
- Significance of accessibility – using ESPON data and other sources we will examine the role that accessibility plays in regional resilience, with particular attention paid to the concept of gateway regions. The interesting point here is to check whether there are significant correlations between any 'gateway' specific aspects (i.e. hubs, intermodality, networks) and the features of the regional response to crisis as for example those referring to policies aiming to attract new investment or to upgrade innovative capacity.
- Significance of entrepreneurship/innovation – using data drawn from the Community Innovation Survey we will explore the extent to which levels of entrepreneurship and innovation help to explain patterns of regional resilience.
- Significance of 'adaptability' – this is a complex notion and one that we will explore through the use of qualitative data, particularly that drawn from our case study analysis. In particular we will explore the extent to which regions are able to develop new development paths, particularly exploring how some regions are adopting new 'greener' economic development strategies as a means of promoting economic recovery and resilience.
- Significance of institutional context – drawing on existing ESPON data on governance we will examine how notions of positive governance, learning and associational regions might contribute to regional resilience.

Testing components and controlling for asynchronous business cycles

A critical innovation in our approach will be our proposal to take into account how business cycles within and across countries of Europe are synchronised. We will use cross-sectoral regressions identifying variables of interest that tell us something about this synchronisation and in turn can explain critical aspects of resilience. We will then use our datasets to explain interactions between countries – such as trade, financial and industrial specialisation. The synchronisation measure can be calculated as cross-correlations between regions or a measure of how much regions lead/lag other regions or the nation.

The model proposed is based on that developed by Imbs (2004) and links business cycle synchronisation, trade in goods, financial openness and sectoral specialisation. Imbs applies this model to a cross-section of business cycle correlations for 24 countries and then in his sensitivity analysis to American gross state product data.

$$\rho_{i,j} = \alpha_0 + \alpha_1 T_{i,j} + \alpha_2 S_{i,j} + \alpha_3 F_{i,j} + \alpha_4 I_{1i,j} + \varepsilon_{1i,j} \quad (1)$$

$$T_{i,j} = \beta_0 + \beta_1 S_{i,j} + \beta_2 I_{2i,j} + \varepsilon_{2i,j} \quad (2)$$

$$S_{i,j} = \gamma_0 + \gamma_1 T_{i,j} + \gamma_2 F_{i,j} + \gamma_3 I_{3i,j} + \varepsilon_{3i,j} \quad (3)$$

$$F_{i,j} = \delta_0 + \delta_1 I_{4i,j} + \varepsilon_{4i,j} \quad (4)$$

Where *i*, *j* are country (or region) pairs, ρ is bilateral business cycle correlations, *T* is bilateral trade intensity, *F* is bilateral financial integration and *S* is the specialisation index capturing how different the sectoral allocations of resources are between countries *i* and *j*. Business cycle correlations, bilateral trade, financial integration and specialisation are all endogenous variables and I_1, I_2, I_3 and I_4 contain vectors of their exogenous determinants, respectively.

The dependent variable, ρ, in (1) is prominent in the list of optimal currency area criteria and the UK being out of phase with the Euro area was the first of Gordon Brown's five tests to decide whether the UK was going to join EMU, Treasury (2001). It is generally the case that regions within a country are more synchronised than business cycle correlations across countries as they share the same monetary policy, governance structures, etc, see Barrios et al (2003) where we compare NUTS 1 GDP data for regions of the UK with countries in Europe and Martincus and Molinari (2007) who analyse regional gross product data in Argentina and Brazil.

The trade variable in equation (1) is empirically examined by Frankel and Rose (1998) who show that macro demand shocks propagate more rapidly among countries with closer trade interdependencies. They reason that if currency unions affect trade and trade in turn boosts cycle correlations, then currency areas can become endogenously optimal (also we see with the current crisis that the downturn is synchronised across Europe).

The specialisation variable in equation (1), argues Imbs (2004), can be the result of trade, financial integration or have its own dynamics reflected by changes in the economy.

In the sensitivity analysis Imbs (2004) applies of the above model to American gross state product data but removes equations (2) and (4) from the simultaneous estimation and instead fitted equations of proxies of intra-national trade and financial integration are given.

$$\hat{T}_{ij} = -29.834 - 1.355 * \ln(\text{Distance}) + 1.057 * \ln\left(GSP_i.GSP_j\right) - 0.635 * \ln\left(Pop_i.Pop_j\right) \quad (5)$$

Where *T* represents the (log) trade implied by a gravity model estimated on cross-country data of the distance between state capital cities, gross state product (GSP) and state population (Pop). For the regional data Imbs (2004) constructs the specialisation index using Bureau of Economic Analysis data on sectoral value added at the three-digit level of the North American Industrial Classification index. Imbs industrial dissimilarity index is calculated as:

$$S_{i,j} = \frac{1}{T}\sum_t \sum_n^N \left| s_{n,i} - s_{n,j} \right| \quad (6)$$

Here $s_{n,i}$ is the GSP share of industry *n* in region *i*. The specialisation index is the time average of the discrepancies in the industrial structure of regions *i* and *j*.

As bilateral financial integration is difficult to measure Imbs (2004) uses a proxy measure of effective bilateral capital flows as used in Kalemli-Ozcan et al. (2003) who compute a state-specific index of risk sharing by estimating:

$$\ln gsp_t - \ln dy_t = \alpha + \theta \ln gsp_t + \varepsilon_t \qquad (7)$$

Where *gsp* is gross state product per capita and *dy* is state disposable income per capita. θ is then interpreted as an index of risk sharing with θ=1 if interstate risk sharing is perfect and θ=0 if there is no risk sharing. A measure of cross-region financial integration is then given by pair-wise sums of the region-specific estimates of θ:

$$\hat{F}_{ij} = \theta_i + \theta_j \qquad (8)$$

The resilience of regions can be tested by the variables (or components) used as instruments entering in equations (1) and (3). In the literature there are a number of different variables that have been included. Magrini, et al. (2011) for example develop the Imbs (2004) model by including the share of employment in high-tech industries in the United States as a further equation and an equation with a variable that is an average of turning points that states lead/lag the national business cycle. Within their high-tech industry equation Magrini, et al. (2011) include an amenity index as an instrument as the link between greater amenities of an area and a greater concentration of high-tech workers is identified by Partridge, et al (2008). It is our intent to test our models of resilience in this manner.

1.4 Role of territorial policies in promoting resilience

To complement the top down approach of our trend data and components analysis, we will also utilise a bottom up approach to build up our understanding of regional resilience through selected, in-depth case studies of 8 case study regions. Case studies will be applied to gather data within their naturally occurring contemporary context. They represent a research approach in which multiple sources of evidence may be used, and in which differing forms of qualitative and quantitative methods may be employed. The added value of a case study, organised as an integrated collection of different methods, is that it aims to retain the holistic and meaningful characteristics of phenomena investigated. In this project case studies will also be used to understand phenomena that are not well documented and place them within a wider context, be that economic, environmental, political, or social, or combinations of these.

The focus of the case studies will firmly be to examine the role of territorial policies in promoting resilience. They provide a tool for the analysis of specific policy and institutional responses to crises. However, as described above, our case studies will also provide critical insights into key variables influencing regional resilience to inform our 'Components analysis'.

The general approach in this facet of the project is not to attempt to have eight directly comparable cases, but to enable comparability on specific aspects that will be produced from different combinations of cases. In carefully choosing the combinations of case study characteristics, we propose that the project will deliver

much more comprehensive and in-depth analysis and knowledge of the resilience of different European regions to economic crises.

Our selection of case studies is based upon a purposive sample of case studies ensuring we capture a spectrum of regional types and experiences. Key criteria shaping our matrix have included:

- Different extremes in relation to the impact of the current economic and financial crisis;
- Historical economic development trajectories
- Evidence of interesting resilient properties from literature, expert advice and trend analysis;
- Economic size
- Governance, financial and institutional structures and contexts (including euro-zone and non euro-zone nations)
- Current fiscal conditions (Member States in receipt of support from Stability Fund, and those at 'risk' of 'contagion');
- Extent to which Regions form 'gateways' into wider economies
- The development of the green economic paradigm and other path diversification strategies;
- Geographical distribution (in respect of the ESPON territory and regional typologies).

We have also taken into account the examples set out in the Specification and used these as points in our sampling design. Our initial case study matrix is set out below. There will be opportunities to adapt this at the Inception Stage should other cases be seen as compelling in the light of emerging evidence. The territorial scale of each case study will vary depending upon the prevailing governance context. In principle, NUTS 2 regions are identified except in Wales where the NUTS 1 is regarded as more relevant. Where relevant, analysis will also take into account territorial policy approaches at the NUTS 3 level.

Country	*Territory*	*Economic performance in crisis*	*Development path*	*Gateway*	*Eurozone*
Germany	Stuttgart	S	Red-green	S	Y
Finland	South Finland (focusing on Uusimaa)	S	diversified	S	Y
Poland	Pomorskie (focusing on Gdanski)	S	transitioning	S	N
Estonia	Pohja Eesti (considering national context)	M	diversifying	S	Y
Greece	Western Macedonia (considering	W	deindustrialising	W	Y

	Kozani)				
Ireland	South Eastern (focusing on South West)	W	mixed	W	Y
Italy	Apulia (focusing on Brindisi)	W	Greening	W	Y
UK	Wales (focusing on West Wales and the Valleys)	M	Greening	W	N

S=strong, M=mixed, W=weak

The design of the case study will depend on the specific objectives that will be developed during our research, whilst being firmly guided by the ESPON call specification. Critical and common parameters for data collection will be determined by the project co-ordinators and will emphasise the following:

- The historical evolution of institutional and policy responses to the current early 1990s crises and thus the collection of time-series data matching the period of the quantitative trend analysis (i.e. 1990 – 2010);
- The role of different economic and social structures (employment rate, age structures, influence of migration/social openness) in dampening or enhancing the transmission of economic shocks
- Biographies of particular territorially resilient processes (whether they be related to the role of institutions, policy-makers, innovators / businesses; networks of industry-intermediary knowledge interaction);

These avenues will be pursued by administration of semi-structured interview schedules tailored by industry and intermediary targets. Questions pursued here will probe more deeply into the firm and industry knowledge dynamics; the recognition of risks and possible rewards of various alternative development strategies; degree of freedom of institutions and actors to pursue innovative development opportunities; the legacies of historical development pathways, structures and institutions; the varieties of public policy support available to facilitate adaptive change. *Inter alia*, we will be particularly interested in:

The structure of the regional economy – level of dependence on individual sectors, adaptability of the economy, stress response of economic sectors
The urban structure of the region – extent to which this enables or constrains the more efficient use of regional endogenous sources
Social structures – extent to which these dampen or enhance transmission of economic shocks
Consumer behaviour - The role of media in the process of shaping consumers' behavior together with entrepreneurs' attitudes toward the investment activity.

2. Analytical approach

Five activities lie at the heart of our approach to this study. Activity 1 has been the Inception Stage, which this report is the culmination of. Activities 2-5 are outlined in

more detail below. Their relationship to the three components of this study is illustrated below:

	Activity 2	Activity 3	Activity 4	Activity 5
Identifying regional resilience	X	X		X
Analysing the components of regional resilience	X	X	X	X
Understanding the role of territorial policies in promoting resilience		X	X	X

2.1 Activity 2: Data collation and mapping

Tasks

There are four levels to this Activity. Firstly, a broadly based dynamic longitudinal analysis covering the ESPON territory. Secondly, a targeted analysis of a subset of regions which have experienced recessions in the past. Thirdly, the collation of deeper data sets across the territories of this study appertaining to the current crisis. Finally, the collation of a consistent current and updateable dataset to illustrate the resilience of European regions.

1. Dynamic longitudinal analysis: Collation of territorial data relating to indicators of resilience and recession 1990-current. Comparative broad based indicator sets at NUTS 2 and NUTS 3 where available. Difficulties of compiling retrospective datasets mean that historic datasets will be restricted to those territories for which indicators are available (broadly the ESPON territory).
2. Historic recession analysis: Collation of deeper territorial indicator sets for key countries which experienced recession in the 1990s and early 2000s. Data will be collected at a NUT2 (or NUTS3 level where feasible). This will facilitate the Components Analysis to be undertaken under Activity 3 and will assess the recovery paths undertaken.
3. Current crisis analysis: Collation of deeper territorial indicator sets for testing of resilience significance. Data set to be collated from 2005 to current for all ESPON territories at NUTS 2 or NUTS 3 scale plus other identified territories where available.
4. The compilation of updateable datasets relating to measures of resilience for the current period. This will be applied across the whole of the ESPON and other areas considered by the study.

We are confident about the general availability of core datasets and of our ability to assess the availability of wider data. Data that we have currently have access to at NUTS2/3 scales for some 29 of the ESPON territories includes:

- GDP
- Components of demand
- GDP per capita
- Headcount employment by sector

- FTE employment by sector
- Value added output by sector
- Total productivity
- Total population
- Working age population
- Workforce
- Residence based employment
- Unemployment rates
- Unemployment level
- Employment rate
- Participation rate
- Household disposable income
- Residence based consumer spending

Output:
The outputs will include:

- Testing robustness and validity of indicators
- Collation of key data sets (filling any gaps where possible). This will provide data sets for the scientific platform.
- Mapping of key indicators (not just static analysis but enabling dynamic analysis to identify potential 'contagion' effects and 'waves' over time). This will provide Territorial maps illustrating facets of resilience and recession
- Initial typology development characterising 'resilience-types' of regions. The links to existing ESPON typologies and to different types of territory (such as mountainous or coastal territories) will be explored.

Our initial typology is based around the following five types:

- Regions not affected by economic crisis
- Regions affected by economic crisis but with swift recovery rates
- Regions affected by economic crisis but with slow recovery rates
- Regions affected by economic crisis and unable to regain past growth rates
- Regions affected by economic crisis which have switched to new development paths

Lead responsibility for this Activity lies with Project Partner 7, supported by Project Partner 6 and the Lead Partner.

2.2 Activity 3: Estimating the resilience of regions

Task
An essential part of the study will be to assess the 'resilience' of regions to economic crisis. There will be three elements to this work.

Firstly, using the output of the dynamic analysis data we will explore the territorial impact of previous economic crises. We will do so through adapting models recently developed by Martin and by Davies (see Section 3). This will provide a strong guide as to where in the EU impacts have most strongly been felt and whether (and what) particular types of region have been most significantly affected.

Secondly, we will undertake an analysis of the components of resilience, using data collated through the historic recession analysis activity. This will be based on analysis of the data collated for the study, as well as building upon existing studies as reviewed in the Inception Phase. Building upon the review of this material this will seek to identify those regions that appear to be resilient, or to recover efficiently, and explore the factors underpinning this.

This analysis of datasets to assess the potential components of resilience will include consideration of factors such as the:

- Significance of variation vs specialisation (related variety concept)
- Significance of agglomeration
- Significance of demographics/skills mix
- Significance of accessibility (+ global position)
- Significance of entrepreneurship/innovation
- Significance of 'adaptability' – ie move to new economic paradigms
- Significance of institutional context

Additional data sources will include regular surveys such as the Community Innovation Survey, as well as material drawn from existing ESPON studies. Analysis of the data will also be undertaken in light of existing regional characteristics as demonstrated by previous ESPON studies.

Finally, we will seek to extend our understanding of the resilience of regions through applying new modelling approaches. In particular we wish to understand not only the significance of particular variables. but also the influence which asynchronous business cycles might have on our understanding of regional resilience. Here we seek to apply the work of Imbs in a European context (again see Section 3 for a full explanation). This is a particularly novel exploratory approach which we feel provides significant added value and connects to our understanding of the need to understand systemic cycles of growth, accumulation, restructuring and renewal and their temporal and spatial dimensions (see section 1.1.3).When selecting regions for analysis we will be data-led but we will also cover the types of regions used by ESPON. We will also distinguish between affected and resilient regions, affected and non-resilient regions, and non-affected regions. We will also differentiate between resilient regions which increase their strengths during the crisis, regions with a very dynamic upward-downward movement, those regions which adopt new development paths, and regions with a stable pathway. We will feed this evidence back into our typology development.

Our analysis will also examine the extent to which processes of shock transfers may occur (from regions with direct exposure to macro-shocks), and explore possible contagion effects and the potential for new pathways. Linkages to our case studies will then seek to explore the extent to which particular structures or policies act to dampen or to exacerbate shock transmission mechanisms.

We set out the scientific approach to be adopted in Section III. The primary responsibility for this aspect of the work will lie with Project Partner 6 supported by

Project Partner 7. All other Project Partners will contribute through review of material.

2.3 Activity 4: Case studies:

Task

The examination of regional resilience and recovery will be grounded through analysis of practice in 8 regions. These are drawn from some of the more 'extreme' cases of the EU and are intended to examine the opportunities, and limitations, of regional policy responses as well as to provide a test-bed for some aspects of the Components Analysis. It will provide an important qualitative dimension to the study. The case studies will also provide a valuable opportunity to explore the extent to which regional authorities are capable of providing the territorial development conditions sufficient for regional economies to adapt to new socio-economic conditions. The case studies will further serve to explore the manner in which different regions are seeking to exit from the current crisis, including the pursuit of new development paths such as through promoting innovation, green economic paradigms and/or SME support.

A matrix approach has guided our selection of case studies. This has given the following territorial mix (a fuller explanation is set out in Section 3):

Country	***Territory***	***Responsibility***
Germany	Stuttgart	PP3
Finland	South Finland (focusing on Uusimaa)	PP5
Poland	Pomorskie (focusing on Gdanski)	PP4
Estonia	Pohja Eesti (considering national context)	PP5
Greece	Western Macedonia (considering Kozani)	PP2
Ireland	South Eastern (focusing on South West)	LP
Italy	Apulia (focusing on Brindisi)	LP
UK	Wales (focusing on West Wales and the Valleys)	LP

All the regions selected have experience of recessions in the past, enabling their recovery paths to be explored. Three of the regions (Wales, Stuttgart and Apulia) have made strong statements towards developing new 'green' development paths, enabling the study to explore the challenges of reorienting regional strategies towards new development paradigms. Some of the regions have been relatively less affected by the economic crisis, whilst others have been strongly adversely affected. The regions are located in Member States which have also had mixed experiences under the economic crisis and exhibit diverse territorial characteristics. This provides a rich resource for territorial analysis, particularly the scope for undertaking regionally initiated policies aimed at promoting resilience and recovery.

This stage of the work programme will commence with a Virtual team meeting to discuss the agreed case study approach. The case studies will be carried out through a mixture of documentary review, strategic interviews and focus groups. Our approach is set out in more detail in Section III and includes interviews of main actors, including leading firms, and their adjustments and turning points during the last two decades. Key aspects will include:

- Review of policy documentation

- Collection and testing of local data and indicators
- Strategic interviews (governmental, business, Civil society, HE)
- Expert perspectives
- Focus group of key stakeholders

Through the case studies we will make an assessment of the role of territorial policy responses to current economic crisis. In doing so we will examine:

- The nature of the policy response in each region
- The efficacy of the policy response.

The case studies will also provide an opportunity to contribute to the Components Analysis by making an assessment of the 'resilience' of the region to current economic crisis. In doing so we will test a number of key propositions including the:

- Significance of variation vs specialisation
- Significance of agglomeration
- Significance of demographics/skills mix
- Significance of accessibility (+ globalisation)
- Significance of entrepreneurship/innovation
- Significance of 'adaptability'
- Significance of institutional context

Our focus will not only be on the current economic crisis (although this will lie at the heart of the analysis) but we will also examine responses to past economic crises. We focus not only on the shocks and reactions to these but also explore the broader picture of the territorial cases - allowing perspectives on creativity and entrepreneurial strategies in the regions, which helped to reduce the exposure or increase the adaptability within crises, but were more long-term and not crisis-specific activities.

Outputs:
Regional resilience report for each case study region, provided in a comparable format
Initial findings will be developed in time for the Interim Report of the study. This will provide a basis for further refinement and testing in Activity 5 of the study.

2.4 Activity 5: Refinement and testing

Tasks
The starting point for Activity 5 will be the synthesis and review of material developed in Activities 2, 3 and 4. This will provide the Interim Findings to be reported in an Interim Report. The work will be led by the Lead Partner but all project partners will contribute. This will include:

- Initial synthesis of Case study material
- Initial synthesis of case study findings and components analysis
- Testing of synthesis: Team meeting with external expert inputs.

The external experts will consist of up to three leading academics with international reputations in the fields of regional resilience. This will provide an opportunity for the project to gain the benefit of external perspectives, to test the robustness of the findings, and to gain new insights.

Following the delivery of the Interim Report the study team will continue the further refinement and testing of the findings of the study. This will involve:

- Assessment of the extent to which widely available indicators are good barometers of resilience and consideration of additional desirable indicator sets
- Follow up work in each case study region to test the wider findings of the study in the context of different regions. This will involve engaging with key regional actors in an iterative process. In particular we will seek to assess the relevance of the components analysis undertaken to the practical case study context.
- Refinement of the Components Analysis in the light of the initial findings of the case study results.
- A seminar held in each of the case study regions to test the validity of the case study results, to explore the potential for regional responses and to disseminate early findings. Each seminar will be lead by the respective Project Partner with involvement by the Lead Partner to bring the wider project context to the seminar itself. Some 10 to 20 participants are anticipated.
- Two practitioner focused seminars to test the applicability and validity of the emerging findings with leading practitioners and policy-makers. One would be held at the outset of Activity 6 to discuss the emerging findings and to explore areas for follow-up action. The second would be held late in Activity 5 and would be used to explore the findings emerging from the testing exercise. This would contribute to the final report.
- A second expert seminar to explore the academic relevance of the work undertaken and to challenge the findings and to explore its place in the wider academic literature. This would be held late in Activity 5.
- A dynamic and contextual analysis. This will review relevant material to consider how the wider political, institutional and economic context in which regions operate affects their potential for resilience.
- Strategic interviews. A series of strategic interviews will be held with selected EU and national policy makers. This aspect of the work will be to test, refine and sharpen emerging policy recommendations. In particular we would wish to consider how our findings relate to wider policy contexts. Interviews will also be held with selected representative bodies operating at the European scale.

Outputs

The outputs of this phase of the work will include a testing of key propositions in case study regions together with the testing of key propositions in a wider context. It is from this stage of the work that the Working Papers identified in Work Package 3 will

be drawn. Working Papers will be the responsibility of identified Project Partners, with the Lead Partner providing a quality assurance role.
The Lead Partner will take responsibility for the overall coordination of this phase, including the 2 expert and 2 practitioner seminars, Project Partners 2-5 will be responsible for the regionally specific elements and Project Partners 6 and 7 will lead on the Components testing elements.

2.5 Participative approaches.

We adopt a number of participative elements in our approach to this study. These occur at various key stages and contribute to the case study activities, to the components of resilience analysis. Most occur during the refinement and testing phase of the work programme (See Section 2).

We will refine our cases study analysis through a participative seminar held within each region. Using boundary spanning techniques we will test, refine and share emerging findings with key regional players. Up to 12 key players drawn from governance, civic society and business interests will be invited to participate in each case. Each event will last a half day. The event will be facilitated by the responsible partner with contributions by the Lead Partner.

Boundary spanning techniques will also be employed to energise two practitioner seminars. These will include creating a 'fishbowl' during the meeting in order to test the ideas emerging as part of the study, and the use of 'powerful' questions to unlock discussion. Up to 12 practitioners will be invited to contribute to these events. Consideration will be given here to developing a temporary community of practice to shadow the study during the refinement and testing phase.

A more traditional seminar approach will be adopted for the two expert seminars proposed. These will involve the invitation of three academic experts to peer review material, to challenge the findings and conclusions drawn and to share wider perspectives and insights. Relevant procurement rules will be followed. Consideration will also be given to inviting a wider audience of interest who could attend at their own cost.

2.6 Dynamic contextual analysis

This element of the work will contextually examine key policy documents such as Europe 2020 and Territorial Agenda 2020, alongside previous studies undertaken by ESPON, particularly the reports on 'Territorial Futures' - referring to the internal dynamics of Europe and defining three scenarios (trends, cohesion, and competitiveness) - and 'Europe in the World' – which explores the relative position of Europe in global context and focuses upon three possible visions about its role: archipelago, centre-periphery, and regional.

For example, following the general orientation of the 'Europe 2020' a key idea is to understand how the regions use their available resources at the different geographical levels and administrative tiers in order to achieve the most effective integration of structural policies and the promotion of spatial development without additional public expenses in order to cope with global competition and fiscal restraints within a

context of generalised instability. As has so painfully been realised even in the Eurozone countries such as Greece, the fact that the European Union retains a dual character, being simultaneously a Single Market and an Intergovernmental Institution, triggers outcomes that could somehow be investigated from the point of view of their impact upon regional resilience: as a Single Market it both affects and depends upon the performance of its constituent regions but as an Intergovernmental Institution is extremely sensitive to the balance between the relative strength of the national economies.

Thus, the restructuring triggered by the crisis and the response of the regions, reflecting the resilience capacity of regions, is mediated on the one hand by the existing regional unevenness and on the other hand by the scale of national strengths and weaknesses. By combining the findings of the two reports, and other sources, we may consider possible combinations that could provide a sound background for future policy formulation e.g. the 'competitiveness' scenario with the 'archipelago' vision and the 'cohesion' scenario with the 'centre-periphery' vision. This would provide a solid context against which we may try to visualize how regional economies will respond in the event of crisis or other external disturbances. The insights gained can then be supported and/or tested with data sets and indicators plus additional documentation gathered via the selected case studies.

In this analysis we will thus explore regional resilience through the combination of indicators that reflect its internal dynamics consisting of its productive and institutional elements, but also take into account the hybrid character of regions as simultaneously national and European territorial units.

2.7 Activity 6: Final Reporting

The final elements of the project (Activity 6) will consist of updating and finalising the work undertaken. A key role will be updating the data collation exercise and updating the mapping related to this. This will be the responsibility of the Lead Partner and Project Partner 7. They will review the data sets and collate the most recently available data for each of the indicators identified in Activity 2 using their existing network of contacts.

As part of the final reporting the project will set out the findings appertaining to the research objectives for the project (as summarised in Section I). In particular it will address the following key questions taken from the Specification:

- The territorial impact of the last economic crisis
    - How can the territorial impact of the economic crises be measured at different levels of geographical scale?
    - What are good indicators?
    - What is the territorial impact of the economic crises (situation before and after) in different parts of the European territory and have specific types of regions been more affected?
    - How do economic crises impact territories in Europe in terms of spatial distribution and in terms of time (sequence of events – spatial cause-effect-relations)?
- The resilience of regions

    - What regions tend to be been resilient to crises and which are not?
    - What territorial and other characteristics make regions resilient and why?
- The policy response
    - Is or can territorial development policy impact regional resilience and economic recovery and increase economic resilience?
    - How is and how can this be achieved?

The outputs of the study will respect the requirements set out on page 12 of the Specification. It will include a main report with Executive Summary and a Scientific Report (including the detailed findings of each case study). It will also include:

- European maps showing regional impacts of the economic crises
- European maps showing regions with fast recovery
- Typology of different economic structures throughout Europe
- List of success factors and barriers for recovery strategies including potentials for place-based approaches
- A European index of resilience (and associated themes)
- Identification of models adopted, underlying variables and supporting data
- A full methodological document allowing updates to be calculated
- Reports on each of the case studies
- Guidance for multi-level and cross-sector territorial governance
- Results and conclusions formulated in the context of Europe 2020 and Territorial Agenda 2020
- Avenues for further applied research.

Through positive dissemination activities (and contributions to the capitalisation and communication efforts of ESPON), the results of the project will provide knowledge-support and examples of practice to policymakers. It will provide results relevant at the European, national and (city-)regional scales, in ways that help to inform the adoption of smart territorial development and cohesion policies. Overall, the analysis undertaken will provide a deeper understanding of why some territories have been hit harder by the current crisis than others, why some are more able to 'bounce-back' and develop new development pathways, and the implications of this for the future development of the European territory.

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Annex C Case Study Fiches

PUGLIA, Italy

Puglia is a region in south-eastern Italy bordering the Adriatic Sea in the east, the Ionian Sea to the southeast, and the Strait of Otranto and Gulf of Taranto in the south. Its southern portion known as Salento, a peninsula, forms a high heel on the "boot" of Italy. The region comprises 19.345 km² (7.469 square miles), and its population is about 4 million. It is bordered by the other Italian regions of Molise to the north, Campania to the west, and Basilicata to the southwest. It neighbours Greece and Albania, across the Ionian and Adriatic Seas, respectively. As with other parts of the Mezzogiorno, Puglia is a convergence region which has been dependent on traditional sectors, especially agriculture, tourism and manufacturing. However, in recent years it has displayed some very positive trends, especially in its priority sectors, one of which is "energy and environment" (ie renewable energy).

In governance terms, Puglia is one of the twenty Regions of Italy which, together with the municipal and provincial government bodies, constitute the administrative infrastructure of the nation. Established in 1970 as part of a new system of de-centralized government, the regional administrations have acquired an increasing level of autonomy over the years and have effectively become local governments with extensive regulatory powers in a great number of areas. The 2001 reform of the Italian Constitutional Law increased multi-level governance, granting to councils all the administrative functions that are not otherwise reserved to higher levels of governance. Regional administrations are now responsible for policy making in the area of scientific and technological research and support to innovation for industrial sectors but have to observe some fundamental principles set by national law.

The focus of this case study will be the renewable energy sector, within which we aim to focus on the solar PV sub-sector, where Puglia is believed to be one of the key regions in Italy despite its status as a convergence region. Along with its reformed regional governance system, and reputation for more efficient policy-targeting, Puglia raises the fascinating question as to whether a poor region can achieve a measure of economic resilience.

Interviews:

- Regione Puglia
- Dept of Economic Development, Employment and Innovation
- Regional Agency for Technology and Innovation (ARTI)
- InnovaPuglia
- PugliaSviluppo

- Local universities
- Business association/Chamber of commerce
- Civic Society groups

North-Estonia (Põhja-Eesti), Estonia

Estonia gained independence from the Soviet Union in 1991, and transformed into a fast-growing small open economy quickly after that. While 1990's were characterized by fast transition and restructuring of the economy, a strong growth emerged since 2000's, which was further accelerated by the changes resulting from joining the EU in 2004. However, as in several other countries, the growth was strongly led by changes in the asset and labor markets. With its currency fixed to Euro, there was little that could be done to prevent the overheating of the economy. As a consequence, Estonia was strongly hit by the global economic crisis, experiencing double-digit fall in GDP in 2008. Instead of increasing public spending to stimulate growth, Estonia chose to pursue tight fiscal austerity as a way of regaining its competitiveness, and experienced what has been called an "internal devaluation". As a result of complying with the Maastricht criteria, Estonia successfully changed its currency to Euro in the beginning of 2011. While one could not claim that Estonia has fully overcome the consequences of the crisis, the small Baltic country is definitely considered a success story internationally.

Estonia is divided in 15 counties, which is the largest territorial division in Estonia. The counties are further divided in municipalities. The scope of this case study is Harjumaa, the largest county in Estonia and also the location of capital Tallinn. The county is comprised of 24 local municipalities and approximately 530 000 people live in the county (out of 1.3m of total population).

Case study approach:

In order to capture the indicators that might characterize the resilience of the North-Estonian region, interviews with the regional actors are planned. First round of interviews is planned to be held with the local municipalities (county councils or city councils) as well as regional enterprise boards, in order to get an understanding of the overall situation and recent developments. Based on their suggestions, interviews will be organized with local entrepreneurs to discover the most interesting case studies. It should also be kept in mind that while the local public sector authorities have a role in the local developments, the state-level authorities might give a valuable insight to the wider understanding as well as have a better knowledge of the EU-funded projects. Taking this into account, a few government-level interviews will be most probably needed. In this round also some interviews with university experts will be performed.

Interviews:

Round A:

- county council and local municipalities – 5 interviews
- Enterprise Estonia
- Tallinn Enterprise Board (Tallinna ettevõtlusamet)
- Raplamaa Development and Entrepreneurship Centre (Raplamaa Arendus- ja Ettevõtluskeskus)
- Ida-Virumaa Entrepreneurship Centre (Ida-Viru ettevõtluskeskus)
- Some other local centers might be considered

Round B

- Interviews with universities
- Interviews with local entrepreneurs
- Interviews on governmental level – Ministry of Economics, Ministry of Finance

Round C

- Focus group (if needed)

South-Finland (Uusimaa), Finland

Finland is a small open economy that is part of Nordic countries and strongly dependent on the international trade. At the beginning of 1990's Finland experienced rough economic crisis, during which their GDP dropped for about 14% and a strong increase in unemployment rates were seen. However, after a series of timely devaluations, the country managed to recover successfully and was recognized internationally for their strong economy, especially the state-led R&D based knowledge economy. In recent years, one of the most important Finnish electronics companies, Nokia, has experienced troublesome times that add to the effects of the global financial crisis. Finnish GDP fell by 8.35% in 2009 and is forecasted to show modest growth rates in the next few years. However, when compared to some other European countries (the Baltic countries, Southern-Europe), Finland is considered to have managed quite well throughout the crisis thanks to following the "Nordic model" – keeping fairly balanced budgets throughout economic growth and providing fiscal stimulus in times of crisis, combined with the continued benefits of the welfare state. As a result, the unemployment peaked at 8.38% during crisis (compared to 6.37% pre-crisis level) and has already decreases substantially.

Finland is divided into 19 regions and 70 sub-regions. Uusimaa county is part of South-Finland and is comprised of 28 local municipalities, including Helsinki, the capital of Finland. In total 1,5M people live in Uusimaa (approximately 28% of total population).

Case study approach:

The issue of resilience in Uusimaa will be investigated by interviews with the regional actors from different levels – local municipalities and entrepreneurs, as well as development and entrepreneurship agencies and government agencies, also universities. Tartu University will develop the final list of interviewees with the help of Aleksanteri Institute in Helsinki in August. Once the interviews have started, the snowball approach will be used to gather other potential interview contacts.

Baden-Württemberg/Stuttgart, Germany

Germany went through a severe structural crisis, in particular in labour market organisation, during the last decade to maintain its global competitiveness. Due to its high export ratios, Germany found itself vulnerable to the global financial crisis considering the GDP development. Despite the fast and drastic decrease of GDP growth in 2009, Germany succeeded in recovering fast in 2010 and faced almost no negative impact on the labour market during the crisis. In 2011, the German Federal government announced to close down the last nuclear power plants until 2022 as a major cornerstone of transition processes towards an efficient, less carbon-intensive and environmentally-friendly energy provision. With its Federal structure and long tradition of regional policies, many structural adjustment processes are guided by specific institutional structures in the 16 Länder (NUTS I regions).

Baden-Württemberg as third biggest NUTS I region in Germany (considering area and population) and EFRE competitiveness and employment region mirrors these specific economic resilience aspects in a peculiar way. Here, the export ratios and shares of (medium-high-tech) industry are particularly high. Consequentially, GDP growth went from 3.3% in 2007 to minus 7.1% in 2009 back to plus 5.5% in 2010 but kept the lowest unemployment rate in Germany. Baden-Württemberg has the highest share of nuclear energy as source for electricity in Germany and will be particularly affected by the German energy transition policy. In 2011, a major political shift occurred in the region, when a Green-SPD government was elected with the first Green regional minister president in Germany. Before this election, the Christian-Democratic party was continuously in governmental power for more than fifty years. The study will take a look at this region with a specific focus on the NUTS-II region of Stuttgart (DE 11). With its automotive cluster and high share of machinery industry, Stuttgart shows the same economic characteristics as Baden-Württemberg. As far as statistical data are available, Stuttgart will be the case study region with Baden-Württemberg as the reference region for those data not available on NUTS II level in Germany. All interview partners will be experts for Stuttgart.

Interviews:

Round A:

- Department of Finance and Economics Baden-Württemberg
- Department of Environment, Climate Change and Energy Baden-Württemberg
- Chamber of Commerce Stuttgart Region
- Labour Administration Stuttgart
- Regional Association Stuttgart
- Institute for Applied Economic Research Tübingen
- Centre for European Economic Research Mannheim

Round B

- Cluster Initiative Automotive Industry CARS
- Stuttgart Region Economic Development Corporation
- Competence Centre Environmental Engineering Stuttgart
- University of Stuttgart
- IG Metall Stuttgart Region

Round C

- Revisits
- Regional workshops

Western Macedonia, Greece

The Region of Western Macedonia is the most significant lignite and electric power producing area covering around 80% of the country's total demand for energy.

The large scale open-pit lignite mining and the operation of thermoelectric power stations generate intense pressures on the environment and land uses as a result of which the region undergoes continuous transformation parallel to the impacts of past and current waves of economic crisis. In this context, the economic and ecological resilience of the region constitutes a great challenge for both theoretical analysis and policy making.

After the crisis of the early '90s the region was hit by a wave of de-industrialization that changed its economy and led to the closure of a number of large companies and the subsequent loss of many jobs. The recent more severe fiscal crisis generates pressures for further changes including the privatization of assets of the Public Power Corporation, which is a major factor in the regional economy.

Over the years, a number of policy measures and local initiatives have been undertaken to strengthen the region in order to cope with the consequences of the crisis. An example is the decision in 1995 to include a large part of the region in the program for the 'declining industrial areas'. Other, most recent policies/initiatives include the establishment of the University of Western Macedonia in 2003, the promotion of a Regional Innovation Pole of West Macedonia and the proposal for re-using the installations of an abandoned large industrial plant. The case study will try to examine the way in which these policy measures

and initiatives have affected the ability of the region to adapt in the changing economic environment. It will also try to assess whether any previous aspects of resilience affect the region's ability to deal with the current crisis.

Under the recent administrative reform (Law 3852/2010) the Region of West Macedonia became a self-governed region consisting of four regional units (formerly prefectures): Kozani, Florina, Kastoria and Grevena. Together with the Region of Epirus form the Decentralized Regional Administration of West Macedonia and Epirus. The focus of the case study will be on the NUTS III statistical area of the Regional Unit of Kozani including the two main cities of the region (Kozani and Ptolemaida).

Interviews:

First Round

1. Self-Governed Region of Western Macedonia (General Directorate of Development Programming, Environment and Infrastructures, Regional Unit of Kozani)
2. Decentralized Administration of Epirus – Western Macedonia (Directorate of Environment and Spatial Planning of Western Macedonia, Intermediate Managing Authority of the Region of Western Macedonia)
3. Municipality of Kozani, Municipality of Ptolemaida, Municipal Enterprises
4. West Macedonia Development Company (ANKO)
5. Public Power Corporation (DEH)

Second Round

6. University of Western Macedonia, Technological Educational Institute of Western Macedonia
7. Social partners and civil society (e.g. Commercial and Industrial Chamber, Ecological Movement of Kozani)

Third Round

8. Revisits and additions
9. Regional Workshop with selected stakeholders

Pomorskie Region, Poland

Pomorskie region (voivodeship) is located in the northern part of Poland by the Baltic Sea. It is one of the sixteen regions of Poland, which correspond to the nomenclature of the EU NUTS 2. The regional authority NUTS 2 level, elected in self-government elections, is responsible for the regional development and distribution of the EU funds). For statistical purposes the above mentioned Polish regions are divided into the sub-regions (NUTS 3). There are four sub-regions in Pomorskie voivodeship: trojmiejski, gdanski, slupski and starogardzki. Trojmiejski subregion forms the core

of the metropolitan area, but has no power to form any elected and administrative structures. The Pomorskie region is divided into 20 districts (Local Administrative Units 1 called poviats) and 123 municipalities (LAU 2 called gminas). Both local levels of government have elected local authorities.

Region is populated by over 2.2 million inhabitants. The largest cities are Gdańsk (0.45 million) and Gdynia (0.25 million). Altogether with Sopot (40 thousand) they form the so-called Tricity (which constitutes the trojmiejski subregion). Large differences in the economic potential within the region is reflected by the population's distribution which is directly linked to the market availability. About 60% of the region's population is concentrated in the metropolitan area which covers about 29% of the region's territory. Pomorskie voivodeship occupies 18 thousand sq. km, its population density is about 122 persons per sq. km, urban population is about 67%. The last two ratios have similar values for the whole Poland.

Pomorskie region is a relatively rapidly developing region with diversified economy. The changes in the political system and beginning the transformation-oriented market economy in the early 90s resulted in an economic downturn and an increase in the unemployment rate. During this period, the shipbuilding industry collapsed, but the service sector was developing slowly at the same time. Nowadays, the high-tech, logistics and transport sectors are becoming more and more important for the economic development of Pomorskie voivodeship. What is more, the global economic crisis started in 2008 has only a small impact on the economic development of Pomorskie region.

The research that is to be conducted in Pomorskie will be carried out among representatives of regional authorities (NUTS 2) and representatives of the major cities (LAU 1 - Gdańsk, Gdynia and Sopot) of the metropolitan area, which belongs to the second-class metropolitan regions in Poland (the first is Warsaw region). Some selected representatives of business, science and NGOs are going to be interview during the research.

Planned interviews:

Government:

- The Marshal's Office of Pomorskie Voivodeship
- City Hall of Gdansk
- City Hall of Gdynia
- City Hall of Sopot

Business:

- Chamber of Commerce
- Employers of Pomorskie

Pomorskie Development Agency
Science and Technology Parks

Civil society:
NGOs

Higher education:
University of Gdansk
University of Technology
Medical University of Gdansk
Gdynia Maritime University

South West Ireland, Ireland

Ireland itself is a small open economy which exhibited significant growth in output and prosperity during the 1990s and early years of 2000, earning itself the title 'Celtic Tiger'. It was badly affected by the global economic crash of 2008, with the closure of many export-orientated activities, and has suffered significantly from the exposure of its banking sector to bad debt. This has led to the substantial bail-out of the sector by the national Government, through support from the IMF and the EU, and the imposition of strong austerity measures.

Governance in Ireland is sub-divided into 8 Regional Authority areas, with responsibility for promoting the co-ordination of public service provision and monitoring the delivery of EU Structural Fund assistance in the regions, and 34 County and City Councils. For statistical purposes Ireland is divided into two NUTS 2 Regions: Border, Midland and Western (BMW) and South and Eastern. These form 2 Regional Assemblies, comprised of representatives from the constituent Regional Authorities.

The focus of this case-study shall be the Regional Authority area of the South-West. A NUTS III statistical area this is comprised of the Counties of Cork and Kerry and of Cork City, Ireland's second largest urban area. The area provides a valuable mix of urban and rural contexts whilst illustrating the role of gateway regions (owing to the role of the Port of Cork and Cork Airport) in economic resilience.

Interviews:

Round A:

- Department of Jobs, Enterprise and Innovation
- South West Regional Authority
- Cork County Council

- Kerry County Council
- Cork City Council
- IDA Ireland
- Enterprise Ireland
- Enterprise Boards (South Cork, West Cork, North Cork, Kerry)

Round B:

- University College Cork
- Business Association (eg Skibbereen and District Chamber of Commerce)
- Civic Society

Round C:

Revisits

Regional workshop

Wales, UK

The Welsh economy was traditionally dominated by heavy industries such as coal, steel and agriculture. The decline of these industries has largely run its course, but it has left an enduring legacy of an under-performing economy characterized by relatively low rates of economic activity and wages. It thus entered the current recession in an already weakened state and whilst was somewhat buffered from the recent crisis by virtue of its relatively small financial services sector, it is suffering from the subsequent austerity measures owing to its heavy dependence on the public sector.

It represents an interesting case for studying resilience for at least three reasons:

- It is a region which since 1999 has had its own devolved government with powers over economic development;
- It has a unique statutory obligation to deliver sustainable development and has progressively developed a strategy for 'green' business and employment growth as a consequence;
- It has emergent clusters of novel cross-sectoral knowledge exchange and business development around green businesses (such as renewable energy).

The focus of this case study will therefore be threefold: to explore whether and how the current crisis has speeded up the turn to a green economic development paradigm in Wales; to identify in the role of the devolved government and its interventions in facilitating this; and to explore the scope for these development to enhance the resilience of the regional economy as a result.

Interviews:

- Welsh Assembly Government – business , strategy and environment departments;
- Business representatives (e.g. Quiet Revolution, Pembs;)
- Business in the Community
- CBI Wales
- Federation of Small Businesses Wales

Outline Case Study Template

Key Research Questions

What makes some regions more resilient than others to economic shocks

What can (regional) policy makers do to enhance the resilience of their region to economic shocks

Role of case studies

Examine how resilient the region has been to economic crises (present and past)

Examine what features influence the resilience of the region

Explore opportunities and limitations of regional policy responses to economic crises (present and past).

Examine extent to which policy-makers have provided the conditions for their regional economy to adapt to new socio-economic conditions

Explore how the region is seeking to exit from the current economic crisis

Case Study Approach

- Review of policy documents
- Collection and testing of local data and indicators
- Interviews with key actors
    - Government
    - Business
    - Civil society
    - Higher Education
- Expert perspectives
- Focus groups of key stakeholders

- Regional Seminar

We cannot undertake a full economic history of each region. Rather we are looking for examples which serve to illustrate key features in the response of the region to past economic crises, and – more particularly – the response of the region to the current economic crisis. If there is a particular point to bring through in the case study, please put this forward to the Project Management Team.

Capturing resilience

Martin's model of regional resilience forms a useful starting point for our assessment. What we are interested in is what features lead to the observed response. (Martin, R. Regional Economic Resilience, Hysteresis and Recessionary Shocks. Plenary Paper Presented at the Annual International Conference of the Regional Studies Association, Newcastle, 17-20 April, 2011)

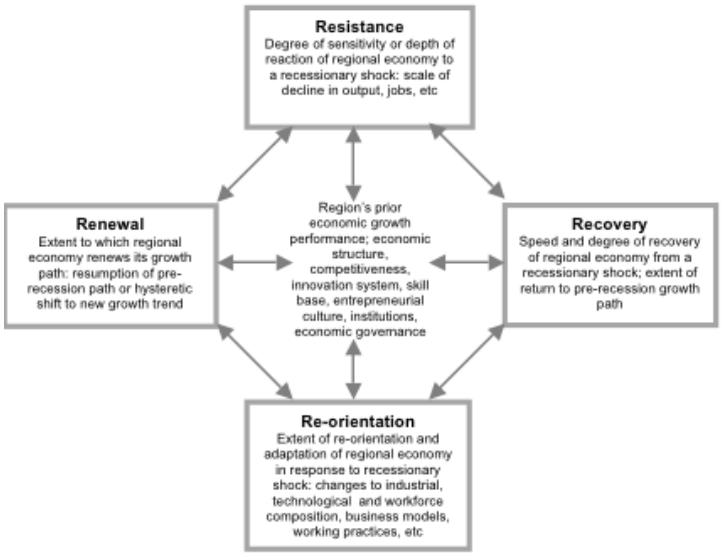


Figure 4: Four Dimensions of Regional Economic Resilience to Recessionary Shock

Survey tool

Current regional situation (economic crisis in regional context)

Key facts and figures in a comparative setting.

What has been the impact of the present economic crisis in the region?

- How does this compare to the national situation?
- Have particular parts of the region been more strongly affected than others, or less affected?
- Have particular economic sectors or types of economic activity been more strongly affected than others, or less affected?

Explore the nature of the regional response

- Resistence – ie degree to which economy has resisted the economic downturn
- Recovery – ie speed and degree to which economy has recovered from an economic downturn
- Re-orientation – ie extent to which economy has re-orientated to new growth sectors
- Renewal – ie extent to which economy regains it pre-shock growth path (annual rate of growth)
- Legacy effects – change is constrained/facilitated by existing structures
- Search for new growth patterns (policy-led or systemic) – there has been a conscious effort to identify new paths for economic growth

Analysis of particular policy and institutional responses to crises

Historical evolution of institutional and policy responses - from the 1990s to the current economic crisis

(include key sources of funding and associated strategy/programmes)

Biographies of particular territorially resilient processes identified

(eg role of institutions, policy makers, innovators/businesses, networks of industry-intermediary knowledge interaction)

Assessment of role of key variables in influencing regional response to crisis

What aspects of the regional economy have enhanced (or weakened) the ability of the region to respond to/recover from the current economic crisis?

What has been the effect (if any) of the following on the resilience of the region, such as through the dampening or enhancing of the transmission of economic shocks

Social structures

Prevailing employment/unemployment rates (and composition)

Demographic structure (including net migration patterns)

Savings ratios and consumer behavior

Property ownership

Levels of social cohesion and social networks

Economic structures

Economic structure – specialization vs variation (and related variety)

Attractiveness to inward investment

Accessibility and global trade

Levels of entrepreneurship and investment and/or innovation and creativity

Firm and industry knowledge dynamics (spillovers etc)

Skills and qualifications in the labour force

Urban structures

Level of urbanization

Significance of agglomeration

Institutional structures

Recognition of risk and rewards of alternative development strategies

Degree of freedom of institutions and actors to pursue innovative development opportunities

Legacies of historical development pathways, structures and institutions

Varieties of public policy support to facilitate adaptive change

'Adaptability' of governance and policy structures

Have there been noticeable changes in the ability of the region to respond to this crisis compared to past crises (since 1990)? If so, why is this?

The role of territorial policies in promoting a resilient regional economy

What is the potential role that territorial development policies can play, and are playing, in promoting regional resilience and economic recovery.

What is the contribution that integrated and place-based actions play in complementing macro-economic measures aimed at stimulating economic recovery.

How have policy-makers enhanced the resilience of the regional economy through their past actions

How are policy-makers enhancing the resilience of the regional economy for future economic downturn.

Special features specific to the regional case study

Where a particular element has been identified for a case study specific questions should be drawn out here…….
eg Apulia – Towards patterns of green growth

To what extent has the current crisis been a stimulus to develop a green economic approach in the region?

Where has the stimulus for this come from?

Role of business
Role of civil society

Role of government
- Local
- Regional
- National
- EU policy

Role of education sector

What are the main features of this ‘green economic paradigm’?

How does this new paradigm build on existing activities in the region?

To what extent does it represent a new development path?

What are the adaptive changes which are occurring to facilitate this?

Are there constraining factors? If so, what are they?

How will this new path influence the resilience of the regional economy in the future?

What more can be done?

Summary

How would you summarise the evolving economy of the region:

Stable
Slow transition
Rapid transition
Growing
Declining

Please explain your response with reference to qualitative and quantitative evidence

Annex D Potential experts for Panel

Ron Boschma	University of Utrecht
Ron Martin	Cambridge University
Jerome Vicente	Toulouse University
Costis Hadjimichalis	University of Thessaloniki
Yannis Psycharis	University of Thessaly
Jim Walsh	Maynooth University
Grzegorz Gorzelak	University of Warsaw
Krystyna Gawlikowska-Hueckel	Gdansk University
Jiri Blazek	Charles University

Annex E Literature Review

1. Introduction: why resilience?

The concept of regional resilience is developing widespread appeal owing to 'the generalised contemporary sense of uncertainty and insecurity' (Christopherson et al, 2010; p. 3). Reggiani et al (2002) produced one of the first discussions on the possible application of the notion of resilience to the dynamics of spatial (local and regional) economic systems, arguing that resilience could help understand how such systems respond to shocks, disturbances and perturbations. Since this time, a number of urban and regional analysts have explored the applicability of the concept to cities and regions (for example, Rose and Liao, 2005; Foster, 2007; Hill et al, 2008; Newman et al, 2009; Christopherson et al, 2010). Resilience thus appears to hold significant analytical potential to help address what Hassink (2010; p. 45) describes as 'one of the most intriguing questions in economic geography ... why some regional economies manage to renew themselves, whereas others remain locked in decline'. However, there remain considerable questions around how regional resilience is defined and ultimately facilitated or achieved.

The resilience of regions to economic crises has been an important issue both in the UK and the EU since the start of the current global economic crisis. As the Brief for this study indicates, "the current picture of the economic situation in Europe looks rather asymmetrical and diverse with regions that were not or hardly touched by the crises at all, with regions that were touched but that seem to recover rather progressively and with regions that still suffer quite a lot from the crisis. The fast and successful recovery of some particular regions strikes the eye and raises the question of what is behind this success" (p.4). What is needed is a comprehensive assessment and synthesis of what makes some regions more resilient than others to economic crises and what regional policy makers can do to enhance their resilience to future shocks. This is thus the principal objective of this study.

2. What is resilience?

Core concepts: system shocks and change

Most people have an intuitive notion of resilience - the capacity to sustain a shock, recover, and continue to function and, more generally, cope with change (Walker et al, 2004). Within the literature that focuses on interactions between people and the environment, 'resilience' has evolved into an intellectual framework for understanding how complex systems self-organise and change over time. Carpenter and Brock (2008; p.40) have described resilience as a 'broad, multifaceted, and loosely organized cluster of concepts, each one related to some aspect of the interplay of transformation and persistence'. In short, resilience has at its core a focus on continuity through change.

Resilience has become one of the leading ideas of our time for dealing with uncertainty and change and is a concept which features in scientific and practice-oriented debates in a wide range of disciplinary fields and domains including engineering, ecology, psychology, critical infrastructures and mega-planning, as well as organisational studies. It features particularly strongly in the literature on natural hazards and disasters such as flood risk management, as well as climate change adaptation research (see, for example, Hutter et al, 2011; Pelling, 2011). This literature usefully highlights how resilience is helping reinforce understanding that uncertainties are inherent for any management strategy, and that both resilience and anticipation are important for dealing with the consequences of natural hazards. This is a literature which, coupled with that from psychology, has not been extensively mined to date in the development of thinking around economic resilience (see section four below). What this highlights above all else is that resilience is concerned with the disturbance that impacts on a system and its effects on functional processes within this system. Two immediate challenges to be addressed in defining resilience are thus firstly to identify the 'system' or scale of analysis (whether individual, region, society, coupled socio-ecological system etc), and secondly, to define the characteristic shock or disturbance under analysis (its source, severity, temporal dimensions etc). In short, in order to utilise the resilience concept, one must first answer the question '*the resilience of what to what?'*(Carpenter et al, 2001).

In the burgeoning literature on territorial resilience, some studies take a broad approach and seek to analyse the social, economic and environmental resilience of 'places' and the communities within them. This thus sees places as part of larger systems, including their ecosystems, and defines them as interconnected territorial systems which embrace the relationships and feedback processes between, *inter alia*, topography, the built environment, use functions, economy and people (see, for example, Resilience Alliance, 2007; Foster, 2007; Lang, 2010; Muller, 2010; Bristow, 2010; CLES, 2010). This allows for a breadth of analysis of potential risks and shocks that may embrace natural hazards and disasters as well as economic crises, and slow-burn challenges such as long-term deindustrialisation, depopulation and demographic change (Pendall et al, 2010). Thus, here 'resilience is about understanding the ability of a place to respond to the challenges that it faces; what enables some areas to respond effectively from shocks, whether they be economic, social, political or environmental, whilst other areas falter and decline' (CLES, 2010; p. 6). This literature usefully highlights that place and context create cultural, institutional and social contingencies which shape territorial development trajectories and create key path-dependent effects (further discussed in section 4 below).

More recently, a number of studies have focused attention on understanding the spatial impacts of specifically economic shocks and disturbances (e.g. Martin, 2012).

Hill et al (2011) suggest shocks to an economy can be of three kinds: shocks caused by downturns in the national economy; shocks caused by downturns in particular industries that constitute an important part of the region's export base; and other external shocks such as a natural disasters, movement of an important firm out of the area etc). These shocks are not mutually exclusive such that a regional economy may experience more than one simultaneously.

National economic downturns or recessionary shocks are of particular interest not least because they appear to be an inevitable feature of the global economy and, moreover, since the early 1990s there have been a series of economic slumps and crises which have had widespread and often serious consequences. Indeed, as one authority reported in the late 1990s, the only real certainty with economic crises is that they will occur: "Crises are a recurring phenomenon. In spite of every effort to prevent them, I fear that crises will continue to occur" (Speech 15 July 1998, Lars Heikensten, Vice Governor Sverige Riksbank). As such there are clear analogies with the understanding from studies of natural hazards and seismology whereby the earth is continuously rocked by small scale earthquakes and occasionally subjected to much more powerful earthquakes. In the economy there are similarly numerous small scale disturbances, occasional medium-scale events and, more rarely, significant economic crises. Studies suggest short-term economic shocks are often closely intertwined with unfolding broader slow-burn processes of structural or sectoral change (Pendall et al, 2010). This suggests that recessionary shocks (such as the recent financial and economic crisis) need to be contextualised or understood within evolutionary processes of economic change and that resilience needs to be analysed in longer-term perspective over a number of economic cycles (Lang, 2010).

Across the ESPON space, the most notable amongst these past economic slumps are those of the early 1990s; the early 2000s, and most particularly the global economic crisis which emerged in 2008 as the financial 'credit crunch' adversely affecting the private sector and, in Europe, has mutated into a crisis of public sector expenditures and significant austerity measures. In practice, the effects of economic downturns are rarely distributed uniformly between nations or indeed different sub-national economies (see, for example, Davies et al, 2010). At a national or macro-economic level Duval and Vogel (2008) identify that three 'types' of economy can be broadly identified:

- those which tend to witness short sharp reactions to shocks but with a rapid recovery
- those with cushioned reactions to shocks but slower recovery times
- those which cushion the initial shock and quickly return to baseline.

Extending this research to the regional scale and developing an understanding of why certain regions are more adversely affected by shocks than others is the challenge facing this project.

Conceptualising resilience: dominant framings

Martin (2012) draws attention to three different (but not unrelated) understandings of 'resilience' which have become particularly prominent in shaping the emerging understanding of economic resilience in regional and territorial studies.

The first is 'engineering resilience' which focuses on the resistance of a system to shocks and the speed of return to a pre-shock state. This focuses on the stability of a system near its equilibrium. The faster the system returns to equilibrium, the more resilient it is (Holling, 1996). In popular terms, this is often understood in terms of 'bouncing-back' to some notion of what is a 'normal' state of affairs. This raises numerous questions around what normality entails and whether indeed a return to normal is a desirable state of affairs (Pendall et al, 2010; Davoudi, 2012).

The second is 'ecological resilience' which focuses on the role of shocks or disturbances in pushing a system beyond its elasticity threshold to a new domain. Here, resilience is thus defined not just in terms of how long it takes for the system to bounce back after a shock, but also how much disturbance it can withstand and remain within critical thresholds (Davoudi, 2012). This draws on the ecological sciences and Holling's (1973) work where resilience is conceived as the capacity of a system to withstand and respond to major external disturbances and shocks such as forest fires, and to adapt and respond to these rather than simply to wither and die (see also Levin et al, 1998). Resilience from this perspective is thus typically defined as 'the capacity of a system to absorb disturbance and reorganize while undergoing change, so as to still retain essentially the same function, structure and feedbacks' (Hopkins, 2008; p. 54; also Hudson, 2008). The key difference from the engineering definition is that ecological resilience rejects the existence of a single, stable equilibrium, and instead acknowledges the existence of multiple equilibria.

The third definition is 'evolutionary resilience' which derives from the theory of complex adaptive systems (CAS). These are systems which are characterised by complex non-linear dynamics and perpetual uncertainty and change such that they are never in equilibrium (Berkes and Folke, 1998). Complex adaptive systems thinking is a broad body of work that studies the underlying principles that are manifested in all kinds of system regardless of those system's particular components (e.g. ecologies, the internet, social networks, global society, gene networks etc). It provides a rich and useful framework for the cross-pollination of academic disciplines and indeed, there is a developing body of work applying complex adaptive systems thinking to a range of social sciences including economics (see, for example, Beinhocker, 2007). Indeed, it

is this definition and body of work which has particular resonance for studying the economic resilience of regions.

Complex adaptive systems

Complex adaptive systems are comprised of groups of heterogeneous individuals or 'agents' (such as cells, consumers, nations, atoms, etc) which are inherently dynamic and inter-related. The agents in complex adaptive systems are constantly reacting to what the other agents are doing and to the environment, and are thus continually evolving through feedback and learning. As a result of their interconnected structure, these systems exhibit unexpected emergent properties – these are structures or patterns that cannot be reduced to the properties of the agents themselves. One such emergent property is self-organisation i.e. organisation that has no leader but is generated spontaneously from the 'bottom-up' by the individual decisions and interactions of the agents themselves. Influence thus tends to be dispersed and decentralised. Furthermore, the dynamics of complex systems are non-linear, which generates path dependency or local rules of interaction that mean history shapes how the system evolves and develops into the future (Holland, 1992). Furthermore, these complex self-organising systems are *adaptive* and have the ability to balance themselves on the boundary between order and chaos: too much order and they rigidify into stasis, too little order and they dissolve into chaos (Waldrop, 1992).

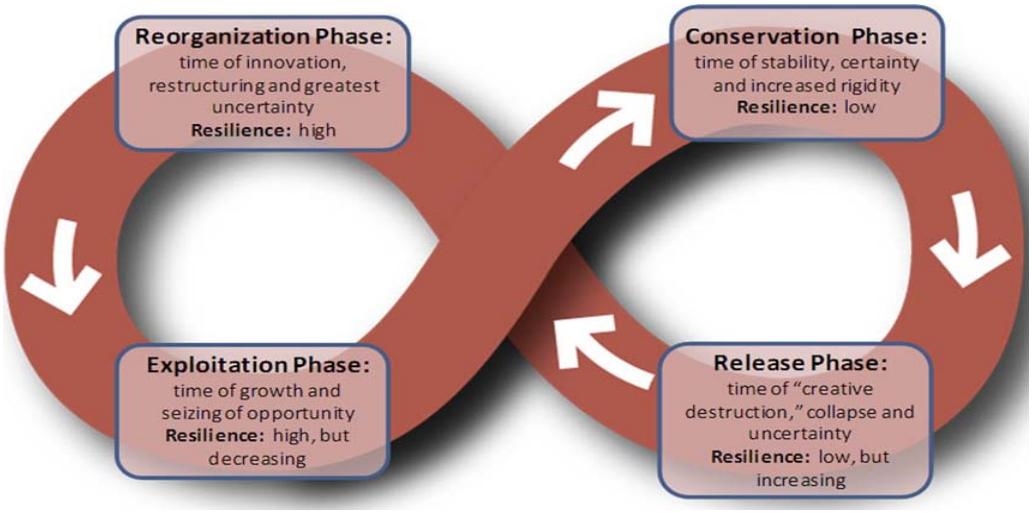
This adaptive capacity is not simply adaptation or change in response to conditions. It is the ability of systems—households, people, communities, ecosystems, nations—to generate *new* ways of operating, new systemic relationships. Hence in complex adaptive systems, resilience is best defined as the ability to withstand, recover from, and reorganise in response to crises**.**
The CAS or evolutionary notion of resilience challenges the whole idea of equilibrium and instead asserts that the seemingly stable states of nature or society can suddenly change and become something radically new, with profoundly different characteristics. Self-organisation is related to novelty and innovation: it generates inherently new ways of operating, ones
that previously may not have been considered or predicted. Thus, resilience is not viewed as a return to normality, but rather as a dynamic, evolutionary capacity to adapt in response to stresses and strains. In other words, there is no 'normal' but there are certain functions that are either deemed critical to system survival, or are perceived to be desirable for the system to maintain. Thus, functions may be maintained after a shock, but system structure may not be (Carpenter et al, 2001).

The panarchy model

Much of the theorising around resilience from a complex adaptive systems perspective has focused on understanding how changes in system structures and

functioning occur over time. Most notable here is Gunderson and Holling's (2002) work on panarchy which accounts for the dual characteristics of all complex systems – stability and change. The panarchy model has provided an important set of ideas framing resilience thinking across disciplines (including economic geography, see below) including its emphasis upon multiple equilibria, tipping points, adaptive cycles of renewal and re-organisation and cross-scale interactions.

Figure 1: The Panarchy model of System Change (adapted from Pendall et al, 2010).



Panarchy identifies four distinct phases of change in the structures and function of a system: growth or exploitation; conservation; release or creative destruction; and reorganization (see Figure 1). Thus, as systems mature they experience firstly, phases of system development and stability, and then progress into phases of rigidity and decline. It is in these latter phases when crises can be turned into opportunities and which can thus trigger a phase of renewal and reorganization.

Panarchy has typically been used to understand the functioning and resilience of complex ecological and social systems. The degree to which an ecosystem can maintain a particular identity as it faces disturbances and as it proceeds through the phases of the adaptive cycle depends on the resilience of the ecosystem. Gunderson and Holling assert that an ecosystem's resilience expands and contracts throughout the four-phase cycle as slow variables change. Resilience is thus not a fixed asset but a continually changing, dynamic property or capacity (Gunderson and Holling, 2002). For example, from the release to reorganization phases, when connectivity among species is loose, and when a particular stable state is not yet strictly regulated, resilience is high. As such, 'this is the time when exotic species of plants and animals can invade and dominate future states, or when two or three entrepreneurs can meet and…turn a novel idea into action' (Gunderson and Holling, 2002, p.46). At this

juncture, unpredictable critical events can determine the future trajectory of the ecosystem.

The panarchy model usefully highlights that growth and change do not happen in a step by step or linear way. Periodically, there are critical transitions or regime shifts when normal cyclical processes are stressed creating 'tipping points' - moments when structures collapse and innovations or new developments take off. These are not continuities, nor are they predictable phenomena (Holling, 2001; Scheffer, 2009; see also Birkmann et al, 2012; p. 9 for further discussion of the influence of the panarchy model).

The panarchy model also asserts that systems typically function in a series of nested adaptive cycles which operate and interact at multiple scales and in various timeframes. Thus there are overlapping hierarchical structures of complex ecosystems, human systems and combined socio-ecological systems (Holling, 2001). It is to the increasing interest in understanding the resilience of human systems (specifically regional economies) that this review now turns.

3. What is regional economic resilience?

Different conceptions exist

Within the developing literature on economic resilience, different conceptions of the term exist. Pendall et al (2010) posit two separate, although not necessarily unrelated, concepts. The first is based on the engineering or equilibrium conception of resilience (as described above). Here economic resilience is construed as the ability to return to a pre-existing state in a single equilibrium system. This is deployed by Duval and Vogel (2008) in their study of national economic resilience which they define as the ability to maintain output close to potential in the aftermath of shocks. Hence, they argue, resilience comprises at least two dimensions: the extent to which shocks are dampened, and the speed with which economies revert to normal following a shock. This conception is also deployed by Hill et al (2011) in a study of regional economic resilience in the US which they define as the ability of a regional economy (defined in terms of US metropolitan areas) to maintain or return to a pre-existing state (typically assumed to be an equilibrium state) in the presence of some kind of exogenous (i.e. externally generated) shock. In their analysis, a region that is adversely affected by shock is considered resilient if it returns to at least its prior growth path within a relatively short period of time (i.e. within four years). If it does not, it is considered non-resilient. When a shock occurs that does not cause the region to be thrown off its growth path, Hill et al (2011) deem it to be 'shock-resistant'. Being shock-resistant is the best outcome for a regional economy followed by being resilient.

The second definition of economic resilience posited by Pendall et al (2010) defines it in terms of the complex adaptive systems conception described above and relates to the ability of a system to adapt and change in response to shocks. This definition is preferred by scholars working within evolutionary economic geography (EEG) since it has clear resonance with EEG thinking on the path-dependent, evolutionary and non-equilibrium nature of regional economic development. Indeed, much of the EEG literature asserts that the territorial economic landscape is a complex adaptive system inasmuch as it characterised by non-equilibrium dynamics and is non-linear, emergent, uncertain and self-organising. Thus, regional economies are seen as being comprised of multiple networks of interacting agents (firms, workers, governments etc), they are faced with constant change, are always evolving and never in equilibrium and have as a core characteristic an inherent and dynamic adaptive capacity which enables them to re-arrange their internal structure and dynamics spontaneously (Martin and Sunley, 2007). It is worth noting that the meaning of 'region' here is typically understood in generic, conceptual terms and does not rely on or presuppose any specific definitions of a 'regional economy' which might guide analysis of particular empirical regions or spatial units under observation (Martin, 2012). Regional economic resilience from this perspective is thus conceived as the ability of a regional economy to either avoid becoming locked into a suboptimal level of growth path of economic performance or to transition quickly to a 'better' one (Hill et al, 2008). This appears to offer a very fruitful body of work within which to base this study, not least because of the understanding of the continuous presence of varying economic shocks and crises and their capacity to effect perpetual upheaval and disequilibrium (see section 2 above).

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Regional economic resilience: a complex adaptive systems perspective

Adopting a complex adaptive systems perspective to conceptualising regional economic resilience suggests it needs to be operationalised in multiple ways. Put simply, if resilience is understood in these complex adaptive terms, then it cannot simply be defined in terms of the regional economy's speed of recovery or capacity to 'bounce-back'. Regional economic resilience must instead be regarded as a multi-dimensional property embracing not only *recovery*, but also *resistance*, or the ability of regions to resist disruptive shocks in the first place; *re-orientation*, or the extent to which the region adapts its economic structure; and finally, *renewal*, or the degree to which the region resumes the growth path that characterised its economy prior to the shock (Martin, 2012).

The latter two dimensions of resilience are distinct from the first two inasmuch as they capture the notion that in dynamic systems, resilience is more than simply an obdurate property of persistence and adaptability: it also has a transformative element. Crises may in fact often provoke or encourage the transformation of systems and the formation of new system structures and dynamics or the development of new, related

or alternative trajectories or niches (Pike et al, 2010). Transformation is thus comparable to second-order change where some of the rules that govern the system change in response to the disurbance, hence spreading its impact. This understanding of resilience resonates closely with the Schumpeterian notion of gales of creative destruction. These serve to destroy some outmoded or unproductive activities and to create opportunities for the development of new sectors and phases of growth (Simmie and Martin, 2010). As such, regional 'systems' may be viewed as being characterised by complex adaptive cycles of growth and decline characterised by both stability and change, with shocks and disturbances having both temporary and lasting impacts on system functioning (Simmie and Martin, 2010; Martin, 2012).

Simmie and Martin (2010) have explored the applicability of the panarchy model to develop a four-phase adaptive cycle model of regional economic resilience. This postulates that adaptation in regional economies follows a sequential cycle of innovation and restructuring, growth and the seizing of opportunities, stability and increasing rigidity, followed by a release phase and eventually the periodic repetition of the cycle over time. As previously however, this model is open to critique inasmuch as it provides an overtly deterministic view of how regions respond to, and evolve following, shocks. In short, a key question becomes how and why do adaptive cycles vary between regions?

Martin (2012) explores the economic notion of 'hysteresis' as a means of illuminating this debate and seeking to understand the different ways regions respond to recessionary shocks. Hysteresis is here defined as a situation where (following Romer, 2001; cited in Martin, 2012) one-time disturbances permanently affect the path of the economy. Hysteresis invariably involves structural change in the economy and, if the shock is severe enough, may alter the behaviour of economic agents, change the sectoral composition of the economy and set the economy on a new trajectory of path-dependent development. Martin (2012) posits that several different possible 'hysteretic' outcomes of a recessionary shock on a region's growth path may be identified, some negative and some positive. Thus, for example, in some cases a recession may permanently lower the level of output or employment with either a resumption of the pre-recession growth path evident or a permanently lowered growth rate emerging. In contrast, positive hysteretic effects may occur where there is either recovery of the region's pre-recession growth rate or recovery to a sustained higher growth rate. Regional economies that exhibit positive hysteretic effects of either type would be regarded as highly resilient.

This raises further questions around why different regions experience different hysteretic effects (see section 4 below) and when, where, how and why downturns in economic cycles might prompt the search for new development paths in regions. For example, questions surround whether and indeed where crises create tipping points in particular development or growth trajectories which may encourage transformation or

'transitioning' to more sustainable or 'green' modes of economic activity (e.g. Folke et al., 2003; Duit et al, 2010; Shaw, 2012).

The existing literature on regional economic resilience also leaves a number of questions to be addressed around precisely what needs to be made resilient in the regional economy i.e. what functions either need to persist or to be maintained, and when instead do regional systems need to transform. Martin (2012; p. 10) defines regional economic resilience as 'the capacity of a regional economy to reconfigure, that is adapt, its structure (firms, industries, technologies and institutions) so as to maintain an acceptable growth path in output, employment and wealth over time' (Martin, 2012; p. 10). Clearly what is an 'acceptable' growth path in these terms is open to interpretation, as is the focus on macroeconomic indicators and growth itself. Dawley et al (2010) take a broader view and refer to development trajectories rather than growth paths, making a distinction between movement back towards a 'pre-conceived development path' and the different kind of resilience that emerges through opportunities or a decision to leave a path that may have proven successful in the past in favour of a new trajectory. This still leaves room for judgement regarding how 'development' is defined, what path or trajectory is perceived as a 'norm' and how these might vary in different spatial contexts. It is worth noting here that some economists and proponents of community resilience have deployed the systems perspective and permaculture (whole system) ideas to build a notion of economic resilience that develops in tandem with the environment and, critically, without continuous economic growth (e.g. Hopkins, 2008; see also Graugaard, J. D., 2012).

In their study of the economic resilience of US regions, Hill et al (2011) conclude that regional economic resilience 'inevitably has a subjective component' and use an example to illustrate that the perceptions of leaders in a region about a region's resilience may differ from measured economic performance. They cite the example of Grand Forks (a small metropolitan region in North Dakota) which their quantitative data revealed to be non-resilient to the industry shock and flood of 1996-97 and which had established a new equilibrium at an employment growth rate considerably lower than its previous one. However, interviewees in the region emphasised its successful recovery and resilience, pointing to the population's general satisfaction with continued growth in prosperity. This serves to highlight the importance of combining quantitative and qualitative data on resilience.

Indeed, the literature to date says very little about the intended state of recovery after a shock, or the required adaptations in regional economies or indeed when relevant crises and transformations can be considered to be over (Hudson, 2010). There are thus inescapably normative and political dimensions of resilience (for example, Duit et al, 2010; Smith and Stirling, 2010). In a case study of the Barnim region of Germany, for example, Rohring and Gailing (2010) observe that 'resilience' goals are the subject of social construction through regional discourses and forms of

governance. Thus in the Barnim region, there are two competing perceptions of resilience which are a product of the different interests of different actors and the different stabilising elements of the development path they choose to pursue. Thus, one supports and profits from suburban growth and continues to stabilise it, and the other seeks to preserve the qualitative and ecological aspects of the landscape region (see also, Kuhlicke, 2010)..

This points to further questions around whether resilience is always a good thing. A resilient regional economy may be undesirable if it is characterised by unsustainable growth or behaviour, widespread inequality or excessive economic fluctuations, or social ills associated with continual upheaval and change. Nevertheless, it may prove very difficult to transform a resilient system from its current state into a more desirable one (Gunderson and Holling, 2002; Walker et al., 2004).

Finally, regional resilience to economic shocks can vary over time not only because of differences in the causes and nature of individual recessionary shocks, but because the features and mechanisms that shape economic resilience may themselves evolve and change (Martin, 2012). A complex adaptive systems perspective again highlights the significance of this dynamism and a need for further understanding of the adaptation, learning and self-organising capacities of the systems in question and the feedback mechanisms they entail (Gunderson and Holling, 2002).

4. What helps build or shape resilience?

Alongside the burgeoning literature on the meaning of resilience, there is a developing body of work on the factors shaping it. To date, this literature has primarily focused on factors pertinent to the structural features of regional economies and the agency of businesses or firms. This is perhaps not surprising given the dominance of systems-based thinking in the conceptualisation of resilience. Much less emphasis has been placed upon understanding issues around the agency of other (notably policy) actors in the system. What the existing literature also highlights is that there are no ‘magic bullets’ that both insulate regions from the harmful impacts of economic downturns and help them recover quickly. No regional characteristics or public policies do everything that one might like with respect to regional income and employment (Hill et al, 2011).

Structural factors – inherent or innate components of resilience

The structural factors shaping resilience might usefully be labelled as the ‘inherent’ components of resilience in social systems i.e. the factors which shape innate capacities to react, or the autonomous responses to shocks (Rose, 2004). In economies, for example, such mechanisms might include automatic fiscal stabilisers and the ability of markets to reallocate resources or substitute inputs in response to

price signals. Building on complex adaptive systems thinking, these inherent components relate to the system's capacities to self-organise.

The emerging empirical evidence suggests that one set of inherent factors shaping regional resilience to economic shocks is their initial strengths and weaknesses (Davies et al, 2010). This seems to affirm the theoretical assertions from evolutionary economic geography (EEG) that regional resilience is likely to be path-dependent and shaped by a region's industrial legacy, the nature of its pre-existing economy (principally what is happening to the product and profit cycles of its key, particularly export, industries), and the scope for re-orientating skills, resources and technologies inherited from that legacy (Boschma and Martin, 2010; Simmie and Martin, 2010). In a study of the impact of the post-2008 financial crisis and recession on several European regions, Davies et al (2010) have found that factors such as the size of the market, access to a larger external market, as well as endowments in natural resources and in physical and human capital play an important role in shaping variable impacts. Those regions which were weaker or suffering relatively poor economic performance to begin with appear to have been typically most severely affected by a crisis. Furthermore, they are more likely to suffer even more damaging long-term effects from the crisis because the loss of even a relatively small number of jobs and firms in such regions leads to a much wider reduction in demand for goods and services from local firms. This is supported by the wider literature on regional or community resilience in the face of natural disasters. A common finding in this literature is that regions with higher incomes or wages (independent of human capital) tend to recover more quickly from economic shocks (see Hill et al, 2011).

Another critical structural or inherent dimension appears to be the sectoral structure of regions. In general terms, a region's vulnerability to adverse economic shocks is correlated with its sectoral specialisation, although the degree of regional specialisation has decreased in Europe since the 1950s not least due to the growth of public services and some private services in all regions (Davies et al, 2010). Again this appears to support theorising drawing on the evolutionary conception of resilience which has highlighted the merits of 'species diversity' for regional economies (Bristow, 2010). Diversity is deemed essential in complex adaptive systems both in terms of absorbing disturbance and in regenerating and re-organising the system following the disturbance (Levin et al, 1998).

Studies suggest that regions which specialise in a narrow range of sectors are particularly vulnerable to sectoral shocks and run the risk of suffering permanent reductions in the numbers of firms and jobs (Davies et al, 2010) – or negative hysteretic effects (after Martin, 2012). A more diverse economic structure provides greater regional resistance to shocks than does a more specialised structure since risk is effectively spread across a region's business portfolio, although a high degree of sectoral interrelatedness may limit this (Industrial Communities Alliance, 2009;

Dawley et al, 2010; Martin, 2012). Studies in the UK suggest deep downturns which lead to the destruction of a significant proportion of a region's production base are particularly damaging for regions highly dependent upon manufacturing industry (e.g. Industrial Communities Alliance, 2009; Martin, 2012).

This is supported by evidence from the US which demonstrates that regions with a higher dependence upon manufacturing are more susceptible to downturns although are more likely to recover quickly from them (Hill et al, 2011). In contrast, those with a more diversified economic base and a larger number of industries that are major exporters (and thus exhibity portfolio diversification) have tended to better weather recent economic storms (see Hill et al, 2008; 2011; also Gordon, 2012). Regions with a larger percentage of employment in health care and social assistance are less susceptible to downturns (since they are less cyclical). However, these regions exhibit slower recovery from downturns once they occur (Hill et al, 2011). There is also emerging evidence to suggest that firm size diversity may be significant in helping regions cope with shocks. Agrawal et al (2012) find that in the US regions with a greater diversity in firm size have an innovation premium and are more likely to generate spin-out developments. Business diversity also appears to be significant at a more micro-scale. For example, Wrigley and Dolega (2011) demonstrate that UK town centres with greater business (retail) diversity have exhibited greater resilience to the recent economic crisis.

Some evidence points to the different effects of some innate regional characteristics on different aspects of resilience. For example, Hill et al's (2011) analysis of the resilience of US regions demonstrates that a poorly educated population makes a region more likely to suffer from an employment downturn but makes it easier for the region to recover. Similarly, a high degree of existing income inequality makes a region's income more resilient to economic shocks, but undermines the recovery of employment levels. Other indicators may also have different resilience effects in different spatial contexts. For example, one particular indicator that is cited as positive for resilience in many US metropolitan regions is the vacancy rate in class A (premium) office space – an indicator of a degree of spare capacity. A higher vacancy rate means that there is room for new companies and expansions, whereas a vacancy rate that is too low is problematic because businesses interested in larger blocks of contiguous space have few options and will often look elsewhere (Gordon, 2012). Martin (2012) suggests a degree of spare capacity to expand output and jobs is also significant in shaping the responses of UK regions to recession. It is of course also possible that spare capacity may be a symptom of decay and decline and deter investors from particular places.

Adaptive capacities – purposeful action and agency

As previously discussed however, complex adaptive systems are also characterised by an *adaptive* capacity (Klein et al., 2003). This refers to the ability of agents in a system to react to crisis situations in positive ways by applying ingenuity and extra effort – in other words, purposive adaptation. In economies, this might embrace actions to increase the input substitution possibilities in individual business operations, or purposive decision-taking to strengthen the market by, for example, providing information to match suppliers without customers to customers without suppliers (Rose, 2004). It is of course also possible that agents act in negative ways to crises and fail to adapt and change and contribute to system lock-in (see Brown, 2011; and Pelling and Manuel-Navarette, 2011; cited in Birkmann et al, 2012). It therefore follows that in social systems, resilience has a strong behavioural element (in contrast to pre-event mitigation which often emphasises new technology and institutions). Resilience thus emerges from the stimulus of private and/or public policy decisions as well as from inherent or innate conditions (Rose, 2004). In short, if resilience is defined in terms of an evolutionary, complex adaptive systems approach, it must embrace an agency as well as a system perspective (Bohle et al, 2009). Clearly quantitative work on regional economic performance can provide descriptive results about the frequency of shocks and those regions which are shock-resistant and resilient. However, it is much less effective at illuminating 'the processes through which regional actors protected their regions from or responded to downturns caused by economic shocks' which remain a 'black box' requiring interrogation through more qualitative, case study work (Hill et al, 2011; p. 61).

There is a developing body of literature (much of it within EEG) examining more specifically the role that industries, sector and groups (often clusters) of firms and their networks might play in building regional resilience. This highlights that individual firms, business leaders and entrepreneurs not only play a key role in effecting the sectoral shifts and diversification noted as important above, but also as collective agents of purposive adaptation through conscious entrepreneurial decisions or by acting as conduits for technological or product innovation. Simmie and Martin (2010) suggest that among the key factors for understanding regional resilience are endogenous sources of new knowledge combined with market driven and conscious entrepreneurial decisions. These shape how places and their relational and technological structures prevent lock-in effects by recombining knowledge in over-lapping technological fields and generating new ones. Thus diversification into areas of 'related variety' is seen to be crucial in providing greater resistance to the damaging consequences of structural change. The most striking example is the pattern of California's Silicon Valley which has recovered quickly from the aftermath of the internet bubble crash by developing biotech and cleantech as a source of continuous growth (Cooke, 2010). In other examples, Cambridge's resilience is ascribed in part to its ability to 'continually branch out of existing specialised industrial sectors

(Simmie and Martin, 2010). Other regions display resilience capabilities by recombining knowledge and reorganising networks and sectors towards emerging technological fields and new consumer paradigms (see, for example, Hill et al, 2011). In this case, resilient processes occur when network structures evolve in such a way that they succeed in disconnecting the regional trajectory to the cycle of technologies, in particular when technologies decline (Suire and Vincente, 2009). [3]

Other analyses suggest regional resilience depends upon the existence of a large number of innovative and well-networked small firms with embedded regional capacities (Clark et al, 2010), whilst others emphasise the role of particular 'pivotal' firms in clusters which act as hubs in the innovation process (Kechidi and Talbot, 2010). Recent work has also suggested there is much to be gained from firms combining external sources of knowledge accessed through so called 'global pipelines' with the 'local buzz' (and vibrancy) that exists within their own geographical region (see Storper and Venables 2004, cited in Hervas-Oliver et al, 2011). This suggests that nurturing relations between resident and other external firms (and bodies) is important for a region's future trajectory; where channels of communication are open and strong links are formed for instance, this can contribute to industrial upgrading.

Whilst there are some interesting and important insights emerging from this developing corpus of work, much less attention has been paid to the adaptive capacities of the other heterogeneous agents that make up the regional economic system – namely, individual consumers, workers or households, citizens, institutions, organisations and policy actors.
The EEG school of thought more generally has been criticised for its tendency to privilege the agency of firms and processes of firm learning over the agency of other actors outside the firm, such as the state, labour and civil society groups (Machinnon et al, 2009; Hodgson, 2009; Pike et al, 2010).

Indeed, both the theorising of and empirical investigation into the role of agency in shaping regional economic resilience is somewhat underdeveloped however and addressing this weakness is thus an important focus for this research. For example, notwithstanding its acknowledgement of the interdependencies of human and ecological cycles, the panarchy model is oriented towards the structures and functions

[3] Some of this work is being brought together and further developed in the form of a major Open Research Area in Europe project involving researchers from the UK, Netherlands, France and Germany - "Territories and technologies in an unstable knowledge economy: an evolutionary framework of regional resilience".. That project is analysing the role of technological variety and network structures in regional resilience processes. There will be positive opportunities to develop complementary knowledge sharing activities between these projects securing a strong element of added value. Other complementary are being developed with a UK-based ESRC project (ES/1035811/1) led by Professor Ron Martin (Cambridge University) on 'How Regions React to Recession'.

of ecological systems rather than understanding the nature of and responses to shocks in social or human systems. Translating resilience thinking from the natural to the social world thus requires that more detailed attention be paid to the role of human agency and behaviour in adaptive cycles and resilience (see Bergmann et al, 2009). The adaptive cycle theory outlined above has been criticised for appearing overly deterministic and paying insufficient attention to human intervention to break cycles through innovation, ingenuity and foresight. In the social context, interventions in processes may diminish, sustain or enhance resilience (Davoudi, 2012). Residents and businesses may come to believe that their regional economies will always bounce back from shocks, while the social organisation of business in a region can at times work to impede planning to mitigate shocks (Hill et al, 2011).

This highlights a particular, identifiable a need for more qualitative (and particularly case study) research on how and why the adaptive capacities of these agents might vary both *between* and *within* different spatial contexts. As Martin (2012; p. 28) puts it, 'regional and local economies are composite entities, made up of numerous heterogeneous firms and workers. Individual firms and workers differ with respect to the ease with which they can adjust to and weather recessionary shocks, their ability to switch into other activities, the range of local constraints they face, the resources available to them and their economic preferences'. A region may therefore be resilient in certain respects (e.g. in relation to its firms), but not in others (e.g. its labour market). Indeed, individuals may migrate in response to a crisis making the region resilient in terms of its labour market (reducing unemployment) but possibly at risk of a downward cycle of 'brain drain' and the loss of its critical human capital and thus reduced future developmental opportunities. Similarly, individuals may develop resilience to economic crises by seeking refuge in the informal or 'hidden' economy, which may hinder the resilience of the regional economy in terms of the fiscal resources available for recovery and renewal. Citizens and civil society more generally are also increasingly understood to play a key role in finding innovative solutions to key development challenges and to helping build place resilience through social innovation (see, for example, McCarthy, 2010; also Magis, 2010). In this way, human agency seems critical to the 'exuberant experimentation' which Buzz Holling deemed so critical to resilience (cited in Homer-Dixon, 2006).

Understanding the behavioural decision-making of these heterogeneous agents is of course challenging and requires further theorising. Some insights into the different types of behaviour that can be expected may be drawn from a number of pertinent sets of literature however. For example, human agency is increasingly understood to be a key factor in determining how individuals and society respond to environmental shocks and change, with research increasingly highlighting that behavioural responses and coping (or resilience strategies) are reflexive and dynamic, as well as differentiated socially and temporally (Brown and Westaway, 2011). Further insights may be drawn from studies examining how households are responding to climate

change as it plays out in different ways (e.g. through changing energy prices). This shows that individual households reactions are a times spontaneous and at other times planned. Furthermore, they often behave in a reactionary way, whilst other times are passive or anticipatory depending on their short on long-term perceptions of local climate conditions (Smith et al, 2000).

What complex adaptive systems thinking also tells us is that the apparently highly variable behaviour of individual agents in a system can appear collectively highly organised. In ecological systems, for example, insects often swarm or birds flock in a manner which suggests they obey micro-level rules that *in toto* somehow produce an emergent phenomenon. Thus, although it may seem as if agency is missing in these systems and that they are structurally deterministic, they are, in fact, exactly the opposite. As Hartzog (n.d) puts it 'swarms are entirely comprised of agency, and yet, coordinated behaviour emerges.' Even when agents are aware and reflexive (as in human systems), emergent system dynamics are still in evidence. For example, studies of crowds have shown that under numerous instances they behave like particles in a fluid, exhibiting what Hartzog refers to as 'perfect Brownian motion'. Perhaps what this highlights is that a complex mix of local norms and material relations, networks and structures shape the capacities of individual agents of change or what Bang (2005) refers to as the 'everyday makers' (Bang, 2005; see also Marsh, 2011). Above all else this highlights that agents are inherently *part of* the complex adaptive systems being observed or interacted with (Bateson, 2000). Furthermore the abilities, opportunities and organisation of social actors are key determinants of resilience (Bohle et al, 2009).

There is also a literature from psychology which may yield insights into human agency in shaping resilience. This literature focuses on individual, family and community responses to a variety of shocks and traumas such as ill-health, war, social disruption and natural disasters. This literature suggests that broadly resilience is a two-dimensional construct produced by the interaction of the nature of exposure to the shock or trauma and the positive adjustment outcomes or protective factors undertaken in response to the shock or adversity such as purpose in life, positive emotions, communication, teamwork and collective efficacy operating at the individual, family, organisation and community levels respectively. It is deemed to consist of an internal salutogenic (which places emphasis on factors that contribute to health and well-being), and an external social-ecological perspective (which takes into account the influences of social context). It is affected substantially by the social contexts in which an individual is embedded and is a function of the quality of relationships among individual, family and institutional systems. It is thus perceived to be a dynamic process operating at multi-interdependent levels and scales (for a review see, Birkmann et al, 2012; see also Elliott et al, 2011).

Much of the pertinent literature here indicates that critical to shaping behaviour, particularly positive anticipatory behaviour, is learning (Folke et al, 2003). What particularly distinguishes economic and human systems from biological ones, is the role played by learning, adaptive management and the deliberate acquisition of knowledge. Each member of the population or entity in the system is continually searching for new ways of adapting to the environment. Thus knowledge about the environment and how it is changing is the key to self-organisation and the ability of entities to understand how and in what ways they need to adapt in order to survive (Cooke, 2012). Economic agents are pro-active as well as reactive in implementing novel plans to access new energy sources or increase exploitation of old ones. In economic self-organisation both physio-chemical and biological limits on economic development can be transcended. The decay of old investments can variously be planned for (through planned depreciation) and overlooked (depending on commitment levels to specialist organisational structures or market niches). In short, economic self-organisation brings immense complexity through acquired energy and acquired knowledge which in combination yield creativity in economic evolution (Foster, 1997). Creativity and innovation thus play an integral role in system dynamics and indeed, may be regarded as the 'evolutionary fuel' of complex systems (Cooke, 2012). Systems with scope for embracing diverse perspectives, more novel ideas and 'exuberant experimentalism' are more likely to find creative solutions to crises (Bateson, 2000). As such, places with highly open networks for learning and knowledge exchange across business, sectors, citizens and institutions have been posited as more likely to display resilience (CLES, 2010; Bristow, 2010).

These literatures also suggest that critical to shaping these behaviours or micro-level rules is context. The contingency of context (e.g. through cultural norms) shapes adaptive behaviours such as business expectations and entrepreneurship / innovation, consumer confidence, labour market flexibility, migration tendencies and so on, and thus shapes how they emerge to effect regional resilience. Regions are shapers and not simply containers of economic agents and their activities. As well as cultural and social context, physical location and neighbours matter too (Hill et al, 2008). However, more needs to be done within existing theoretical contributions such as EEG to examine the relationship between the 'emergence' of macrostructures from lower-level processes and the 'embeddedness' of these microprocesses in broader sociospatial structures and relations (Peck, 2005). Helping to understand how context shapes regional economic resilience is thus an important element of this research.

5. What can policy-makers do to help build resilience?

This discussion of the role of agency in shaping regional resilience inevitably leads to specific questions regarding the role of policy-makers, particularly at the sub-national level, in shaping resilience – a critical focus for this research. Indeed, resilience has quickly gathered credence as a concept with policy-makers and practitioners seeking

to understand both why some places are better able than others to cope with economic change, and what they themselves might do to influence these capacities (Dawley et al, 2010; CLES, 2010; Lang, 2010). However, understanding of the institutional and policy dimensions of resilience remains an underdeveloped area of theorising and empirical research, and the literature on this is indeed disparate and somewhat fragmented. This therefore constitutes one of the main gaps in knowledge to be addressed by this research.

Two sets of questions around the role of policy-making emerge from the preceding review. Firstly, if regional economies are complex and self-organising adaptive systems with often unpredictable dynamics, what scope exists for intervention and policy influence? Secondly, if policy-makers have a role in managing resilience, precisely what can they do?

There has been a pervasive pessimism in much of the literature regarding the effectiveness of policy interventions in complex, evolutionary systems. Within the EEG literature, some argue that scope for policy action is limited for a number of reasons including the unique (often accidental) factors that promote successful economic development trajectories in some places over others; the limited window for effective intervention in a dynamic and constantly evolving system; and the significance of entrepreneurial action, the presence and actions of whom are hard to influence by policy (Boschma and Frenken, 2007). For example, Hill et al (2011) conclude that 'because it takes a long time to change the regional characteristics that affect resilience-related outcomes, policies and strategies that are put in place after a region has experienced an economic shock are likely to be of little value' (p. 65). They do however, suggest that precautionary planning to make regions less vulnerable to shocks may be more beneficial although indicate that more research needs to be undertaken to understand what this might mean in practice. More broadly, other authors have highlighted the potential for resilience to be closely aligned to neoliberal market doctrines which reify fitness to survive amongst people and places and are overtly pessimistic about capacities to manage complex systems (Walker and Cooper, 2011). Davoudi (2012; p. 305) cautions against such pessimism however observing that the translation of self-organisation into ecological systems to self-reliance in social systems is 'misguided' and represents 'a kind of social Darwinism'.

Indeed, other authors drawing insights from evolutionary thinking, and in line with the literature on agency above, have identified 'institutions' more broadly (and those of governance more particularly) as key agents of purposive adaptation (Moore and Westley, 2011). For example, Schmidt, 2011; p. 119) observes, 'institutional context...matters. If 'sentient' (thinking and speaking) agents are the drivers of change, and their ideas (what they think about what to do) and discourse (what they say about what to do) are the vehicles of change, then the institutional context is the

setting within which these ideas have meaning, their discourse have communicative force and their collective actions make a difference'.
Furthermore, others argue that governance, particularly through the state, plays a crucial role in shaping the evolution of the economic landscape (e.g. Hodgson, 2006; also Morgan, 2012, who identifies the state as animateur, innovator and procurer). Martin (2012) also suggests that economic and political reforms may build resilience but does not explore these in detail, while a growing number of empirical studies have highlighted the positive role which can be played by regional and local authorities in encouraging territorial adaptation to new socio-economic realities (e.g. Brookings Institution, 2010; Hervas-Oliver et al, 2011). It is also possible of course that institutions of governance may at times act to prevent positive evolutionary change and thus work against resilience (Markvart, 2009).

In terms of theory, a number of key implications for understanding the role of governance emerge from complex adaptive systems thinking. Firstly, institutions of governance and state must be understood as being *within* the system – they co-evolve with all other agents and with the environment (Berkes et al, 2003). Governance or management is itself part of the system in question – they are internal to the system, one of its component parts interacting with others, and not external to it. We have to then see governance as part of a coupled economic, social and environmental system and something which cannot be separated from the context in which it operates. In short, we cannot study governance in isolation – it has to be understand in relation to its connections with the other parts of the system – firms, the labour force, consumers, advocacy groups, the environment. Governance is however itself often fragmented, multi-level and polycentric (see for example Ostrom, 2005).

Secondly, in complex adaptive systems there is no overall controller. Governance bodies must therefore be understood as entities which may 'manage the emergence that they cannot actually control' (Moore and Westley, 2011; see also Lang, 2010). This is particularly the case at sub-national level where the role of local and regional governance bodies and their resources and remits may be constrained within multi-level governance structures.

Thirdly, governance is a unique connector in the system. The system consists of a network of component systems constantly mutually affecting each other. So the regional economy is a networked economy, formed bottom-up by interactions between people in a highly connected marketplace. Any particular agent can have a link to other agents, which in turn link to others through lines of communication, common tasks, market agreements, or other relationships. This network economy thrives when there is space for experimental evolution, in which new ideas emerge and technology is constantly refined. An open network of connections between agents can help create the conditions for emergence to occur. This can change our view of governance and policy – which are thus influenced by the environment and other

actors as well as influencing them. Governance is also a unique connector inasmuch as in human systems, governance provides collective agency and scope for more complex communication and co-operation between multiple agents (Martin-Breen and Anderies, 2011).

Finally, in complex systems the acquisition of diverse knowledge is the key to effective self-organisation. Every agent in a complex system has a key role to play in mobilising knowledge of the environment and how it is changing and also acting as a source of innovation and knowledge. In governance terms, this means that opening management systems to gain information and perspectives from multiple sources is key (Martin-Breen and Anderies, 2011).

Further insights into the role of institutions of governance may be provided with new institutionalist literature and approaches (see also the literature on organisational resilience e.g. in Birkmann et al, 2012). New institutionalism helps to understand relationships and processes in urban and regional development policy and opens up particular perspectives on the formation of policy responses to socio-economic challenges. In particular, place and time-specific factors (history and cultural environments), which are created as a result of earlier experience, in turn help structure local decision making processes. Institutional dynamics thus occur within and are constrained by the effects of long-term path dependent processes (Lang, 2010). Furthermore, path dependent processes may be reinforced more broadly by the interconnections and interdependencies between and among institutions within the institutional matrix, and the distribution of influence and authority among actors with different interests (Markvart, 2009).

New institutionalist approaches also devote much attention to agency or how people ('institutional entrepreneurs') create, maintain, and change institutions, and how people are, in turn, influenced and constrained by institutions over time (Markvart, 2009). Using such a framework, Lang (2010) posits that resilience could be view as a systemic 'capacity', closely related to an institutional environment being supportive of the constant advancement of the system. Resilience could then be seen as being linked to a particular culture and form of institutional practice and orientation that constantly advances the key properties (or controlling processes) of the system. Developing this literature and building links between it and complex adaptive systems thinking could be a rich vein of theoretical work.
If governance and agency does play a role in shaping resilience, then further questions surround precisely what form this role takes and what specific actions might be desirable or required. As discussed above, this literature remains somewhat disparate and need of further development. It has indeed been recognised that 'recent departures in evolutionary economic geography help us understand better the evolutionary, diverse and multi-level dimension of regional systems, but still fall short in understanding policy design and implementation' (Uyarra, 2010; p. 117).

The complex adaptive systems theoretical framework arguably provides significant insights into the importance of *what* can be done to facilitate resilience as well as, importantly, *how* policy decisions and actions might be made.

In terms of the specific instruments or interventions that work to actively build regional resilience, Berkes (2007) identifies four strategies that have a high probability of enhancing resilience to future changes in couple socio-ecological systems and which provide a useful typology (with some additions) for understanding interventions for regional economic resilience (and indeed which clearly connect with the factors identified in the literature to date as key to shaping resilience). These are: (1) fostering system diversity (whether ecological, economic and/or cultural); (2) planning for likely changes; (3) fostering learning through facilitating feedbacks; and, (4) improving communication. To this list might be added (5) shared rights and responsibility for resource (assets) management (Nelson, 2007 cited in Graugaard, 2011; see also Ostrom's work on polycentricity and governance of the 'commons'); (6) encouraging modularity so that system shocks can be maintained; (7) strengthening connectivity in the network and between different networks and scales); and (8) fostering novelty and innovation (Bristow, 2010; Martin-Breen and Anderies, 2011). (See also Kuhlicke's work).

There has been some, albeit limited, work to date on what sorts of interventions might be required to facilitate regional economic resilience in practice, or how these ideas might be translated into practice. In their work on local economic resilience, CLES (2010) emphasise the importance of strong relationships between the public, private and social economy sectors, governance, institutions and environment; a strongly pro-active and co-ordinating role by local institutions of governance which facilitates and brokers these key relationships; a symbiotic rather than parasitic balance between local and global activities and connections; and flexible governance structures which enable rather than constrain the formation of relationships and networks in an area.

Another study has highlighted the central policy challenge of finding ways to make key interventions to support and guide the development of new pathways of growth and development. This has highlighted the enduring role for public policy activism and agency in stimulating change and developing 'de-locking' mechanisms to help build resilience, particularly in peripheral regions lacking many elements of adaptive capacity (Hervas-Oliver et al, 2011). In a study of the ceramics industrial district in North Staffordshire in the UK, Hervas-Oliver et al (2011) draw attention to the challenges for industrial policy in developing resilience in mature industrial districts. In particular, their study highlights the need for industrial policy to be co-ordinated, particularly in drawing links between firms and institutions. In the North Staffordshire case, industrial policy has generally tended to be ad-hoc and limited, often reacting to

events rather than anticipating them. Menzel and Fornahl (2007) (cited in Hervas-Oliver, 2011) consider that adapting policies at various stages of the cluster's life cycle - such as through selective (small firm) start-up policies - might be useful to militate against decline and facilitate the emergence of new development paths. Others have pointed to the importance of 'platform' policies which facilitate innovation through making and supporting unusual (cross-sectional) connections and the generation of new ideas and novelty (Wolfe, 2010; also Uyarra, 2010; Cooke, 2012).

The complex adaptive systems perspective also provides some further insights into *how* policy needs to be framed and designed for resilience which may prove useful as a framework for analysis. Two particular insights emerge from the literature which has examined adaptive management and governance for resilience in socio-ecological systems (Folke, 2006).

The first critical insight is that resilience and CAS thinking illuminates the framing of the policy problem and focuses attention in particular not on why change happens, but instead why order emerges. Change is thus the constant and to be expected, if not necessarily accurately predicted. Governance systems are thus required to focus on 'responsive adaptation' rather than 'predictive avoidance' (Hartzog, n.d.). Folke (2006) asserts that the implication for policy is profound, requiring a shift away from policies based on steady-state thinking and the design of policies that stimulate adaptive responses to change in the short- and long-term (see also Hill et al, 2011). The development of future-proofing policy development approaches might perhaps be one tangible expression this (Caputo, 2012). In short, what is required in the development of adaptive governance and policies that work with the grain of evolutionary trajectories that were becoming clear before shocks and crises (see, for example, Wrigley and Dolega, 2011). In other words it must enhance capacities for self-organisation (Folke et al, 2003) – or support the DNA of regional economies (CLES blog, 2012).

The second key insight is that what matters is not so much the discrete agents of governance themselves but how and in what ways their actions relate to and impact upon other agents in the system and the environment as a whole. Institutional entrepreneurs play a potentially key role in fostering connections that might not otherwise be made (Moore and Westley, 2011; see also Hervas-Oliver for debate on 'policy enterpreneurs'). The CAS perspective highlights that understanding the various interactions and connections in the system is critical to effective policy design (see Graugaard, 2012). The discussion on resilience as an evolutionary concept suggests that it is thus a challenge to a mechanical and linear approach to place making and shaping. Regions need to be understood as an interconnected system; the policy application of resilience is thus a search for qualities and attributes of the territory which make it adaptable and able to thrive on change (Dawley et al, 2010;

CLES, 2010) – in essence, this calls for integrated, place-based policies (see also OECD, 2009 for a useful discussion). Shaw (2012) suggests a resilience perspective usefully frames policy thinking away from off the shelf blueprints to more bespoke strategies with a defined cognisance of context and place.

But to fully understand the role of governance in facilitating resilience, we have to also recognise that governance structures themselves need to be adaptive. In order to increase the capacity of the system of interacting agents of firms, consumers, civil society etc to engage in collective action to cope with change, governance actors need themselves to develop a diversity of approaches, make connections, adopt the principles of modular policy-making, strong feedback loops and novelty (Martin-Breen and Anderies, 2011; also Kuhlicke in Birkmann et al, 2012). Thus, for example, some approaches will fail when conditions unexpectedly change; having a multitude of simultaneous approaches allows failure to be withstood. Ostrom's work on the governance of ecological systems suggests a need for polycentric forms of governance where as much diversity is built into the governance of the system as exists in the system itself. She also finds that order and high performance are more likely to be achieved in local economies where large, medium and small governmental and non-governmental enterprises engage in diverse co-operative as well as in competitive relationships (Ostrom, 2005).There is some empirical evidence to suggest that this is a principle that applies to the development of regional resilience. Some studies show that there is a positive correlation between diverse, polycentric governance and regional economic performance (Brookings Institute et al, 2010).

Policy should also be built on the principles of decreased interdependencies - the success of one project should not depend on the success of others. Beinhocker talks about the value of layering diverse but complementary policy approaches rather than having siloed policy thinking (Beinhocker, 2007). (See also Martin-Breen and Anderies, 2011 for further discussion of the importance of strengthened policy networks, embracing knowledge and learning from all sources in society, and fostering innovation through decreasing the rigidity of disciplinary, organizational, and social boundaries; see also The Health Foundation, 2010 for broader discussion of the policy lessons from a CAS perspective).

Achieving this new way of framing policy-making may clearly be easier said than done however. Levin et al (1998; p. 228) highlight the challenges in building resilience in complex systems, observing that 'policy should be concerned with more than the immediate consequences of incremental actions. It should recognize the potential for an accumulation of small actions, each on their own perhaps quite harmless, to destabilize important natural and social systems. The difficulty is that, while we can predict with reasonable confidence the immediate consequences of an incremental action, we cannot predict the consequences of an entire sequence of actions without understanding the systems potentially being affected by them.' They

state that trust (in the state, in society and in security) is also critical to the development of resilience in social systems noting that 'reciprocal altruism is an important stabilizing force, and its evolution and maintenance are enhanced by the local nature of interactions' (p. 232). Dawley et al (2010) point to a number of implications for local and regional development strategies. Political leadership is clearly of paramount importance at the time of a disruption or crisis. However, there also needs to be intelligent institutional leadership in framing and articulating the nature of the event or crisis and constructing a discursive narrative of strategic adaptation or adaptability to enrol key local and regional actors (see also Richards, Vorley and Williams work, Sheffield, no reference). (See also CLES, 2010 for insights into the importance of productive and co-operative relationships between the public, private and voluntary sectors).

This suggests a need for further work on understanding specifically what roles governance and governments might play and when. A number of roles may be variously identified. Governance might at times stabilise (perhaps through regulation or sclerosis); it might compensate for failures; assist recovery, provide a source of energy for change (entropy) perhaps through innovation; facilitate knowledge networks and aid social learning. These are themes that we wish to develop and explore further in this study.

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Annex F: Data audit summary

1. Key findings

Overview

The overarching finding of the data audit is that there exists sufficient data to undertake the proposed econometric analysis of economic performance and resilience. However, as anticipated, there does exist significant gaps in the data available, in particular:

- It is not possible to source all of the desired indicators outlined in the proposal and in some cases the research will need to use proxy indicators;
- Some indicators are only available for some countries, aggregate geographies or time periods and there exists issues of statistical reliability and continuity across geographies. Both of these factors will influence the countries that can be included in the analysis, and the time periods for consideration;
- Data for a number of the non-EU countries is contained within pdf files, which will impact upon download time during Activity 2;
- Some indicators are in national currencies for some countries and will require conversion into a common currency, using currency exchange rates or converting all data using Purchasing Power Parities (PPPs) where they exist;
- Some data is provisional and in other cases there exists breaks in the data series which will impact our ability to assess trends over time.

We anticipate that there may also be other issues that emerge once we have collated the data and commence the analytical phase of the research. The full data audit is set out in the accompanying spreadsheets.

Headline performance

Activity 2 proposes a series of econometric analysis concerned with both observed economic performance of European regions (over time, during recessions and during the current crisis), and the components or dimensions of resilience which underpin this.

The table below outlines the availability of data for key indicators – notably GDP, employment and unemployment – that could be used for:

- the dynamic longitudinal and historic recession analysis, which will require a time series of data dating back to the beginning of the 90s; and
- the current crisis, which will require more recent data up to the present.

	Gross domestic product	Headcount employment	Unemployment rates	Dynamic longitudinal	Historic recession	Current crisis	Level of geographical disaggregation
Austria	1988-2009	1988-2009	1999-2009	☐	☐	☐	NUTS3
Belgium	1980-2010	1980-2009	1999-2006	☐	☐	☐	NUTS3
Bulgaria	1996-2008	1996-2008	1999-2011			☐	NUTS3
CYPRUS (KYPROS)[4]	1995-2011	1995-2010	1997-2011			☐	NUTS3
Czech Republic	1995-2010	1993-2010	1999-2011			☐	NUTS3
Denmark	1993-2010	1993-2010	2001-2009			☐	NUTS3
Estonia	1996-2009	1995-2008	1999-2010			☐	NUTS3
Finland	1980-2008	1980-2008	1999-2010	☐	☐	☐	NUTS3
France	1989-2008	1981-2008	1999-2009	☐	☐	☐	NUTS3
Germany	1992-2009	1991-2008	2000-2009			☐	NUTS3
Greece	1995-2009	1995-2008	1999-2009			☐	NUTS3
Hungary	1995-2010	1995-2007	1999-2011			☐	NUTS3
Ireland	1995-2008	1995-2008	1999-2011			☐	NUTS3
Italy	1985-2008	1985-2010	1999-2009	☐	☐	☐	NUTS3
Latvia	1995-2009	1995-2008	1999-2011			☐	NUTS3
Lithuania	1995-2010	1995-2008	1999-2011			☐	NUTS3
Luxembourg	1985-2011	1980-2011	1983-2011	☐	☐	☐	NUTS3
Malta	2000-2011	2000-2009	1995-2011			☐	NUTS3

[4] The exact data coverage for CYPRUS (KYPROS) will be assessed during the data collation process, but we anticipate in most cases the data will refer only to the area under effective control of the Government of the Republic of Cyprus

Netherlands	1987-2009	1987-2008	1999-2010	☐	☐	☐	NUTS3
Poland	1999-2009	2002-2008	1999-2009			☐	NUTS3
Portugal	1988-2009	1988-2009	1999-2007	☐	☐	☐	NUTS3
Romania	1995-2008	1992-2008	1999-2009			☐	NUTS3
Slovakia	1995-2009	1995-2009	2005-2011			☐	NUTS3
Slovenia	1995-2009	1996-2008	2001-2009			☐	NUTS3
Spain	1991-2009	1980-2009	1999-2011	☐	☐	☐	NUTS3
Sweden	1991-2009	1985-2008	2005-2011	☐	☐	☐	NUTS3
United Kingdom	1995-2008	1982-2010	1982-2011			☐	NUTS3
Croatia	2000-2008	2000-2008	2002-2010			☐	NUTS3
Turkey	1995-2008	2004-2011	2004-2010			☐	NUTS2
Norway	1995-2007	1995-2007	1999-2008			☐	NUTS3
Switzerland	1996-2005	1996-2005	2001-2009			☐	NUTS3
FYROM	1995-2010	2001-2010	1998-2010			☐	NUTS1
Iceland	1990-2012	1995-2010	1995-2010	GDP only	GDP only	☐	NUTS1
Montenegro	2000-2009	1995-2010	1995-2010			☐	NUTS1
Serbia	1999-2010	2004-2010	1995-2010			☐	NUTS1
Liechtenstein	1998-2009	2008-2009	x			☐	NUTS1
Bosnia & Herzegovina	2000-2010	2005-2009	1999-2010			☐	NUTS1
Albania	1998-2009	1995-2010	1999-2009			☐	NUTS1
Kosovo	2001-2010	x	2001-2010			☐	NUTS1

Source: Experian Data Audit, July 2012

Components analysis

The data audit also identified the range of indicators available for our analysis of the components of resilience across European Territories. We have supplemented these indicators with potentially relevant indicators contained within the INTERCO

database (these are noted in red in the table below). It must be noted, however, that the final list of indicators to be included in the components analysis may evolve, based on the findings from the conceptual framework which has run concurrently with the data audit, and the econometric analysis to be undertaken during Activity 2. Moreover, in some instances there may warrant more detailed investigation of indicators that can be sourced for individual nations or regions of special interest.

It is clear from the data audit that there is a significant trade off between indicator availability and the degree of geographical disaggregation. The table below illustrates the availability of indicators at different spatial levels for the EU27[5], Norway, Switzerland, Iceland & Lichtenstein.

		Availability for EU27			Non-EU ESPON countries			
		NUTS 1	NUTS 2	NUTS 3	NO	CH	IS	LI
Business	Number of enterprises, total & by sector	✓	✓		NUTS2	x	x	x
	Business birth rate	✓			NUTS1	x	x	x
	Business death rate	✓			NUTS1	x	NUTS1	x
	Self-employed as % of total employment	✓			NUTS1	x	x	x
	Total direct investment	✓			NUTS1	NUTS1	NUTS1	x
	Exports in million of ECU/EURO	✓			NUTS1	NUTS1	NUTS1	NUTS1
	Businesses in highly exporting sectors	✓	✓		NUTS2	x	x	x
	Average size of newly born enterprises	✓			NUTS1	NUTS1	x	x
	Business Density	✓	✓		NUTS2	x	x	x
	Central bank official lending interest rates - Annual data	✓			x	x	NUTS1	x
	GVA by sector	✓	✓	✓	NUTS3	NUTS3	x	x
	Intramural expenditures on R&D	✓	✓		NUTS2	NUTS2	NUTS2	NUTS2
People	Employment rate	✓	✓	✓	NUTS3	NUTS3	NUTS1	x
	Working age/active population (growth)	✓	✓	✓	NUTS3	NUTS3	NUTS1	x
	% with tertiary education attainment	✓	✓		NUTS2	NUTS2	NUTS2	x
	% with lower secondary education attainment	✓	✓		NUTS2	NUTS2	NUTS2	x
	% employed as Managers	✓			NUTS1	NUTS1	NUTS1	x
	% employed in elementary occupations	✓			NUTS1	NUTS1	NUTS1	x

[5] Please note there is a small amount of variation indicator availability within the EU27 countries, which is not shown in this table.

	HH Disposable income	✓	✓	✓	NUTS3	NUTS3	x	x
	Average annual gross earnings FTE	✓			x	x	NUTS1	x
Community	Proportion of early school leavers	✓			NUTS1	NUTS1	NUTS1	NUTS1
	Life expectancy	✓	✓		NUTS2	NUTS2	NUTS2	NUTS2
	Number available beds in hospitals	✓	✓		NUTS2	NUTS2	NUTS1	x
	Crude rate of net migration	✓	✓	✓	NUTS3	NUTS3	NUTS3	NUTS3
	People having a long-standing illness or health problem	✓			NUTS1	NUTS1	NUTS1	x
Place	Crimes recorded by the police	✓			NUTS1	NUTS1	NUTS1	NUTS1
	House price index (2005=100)	✓			NUTS2	x	x	x
	Air pollution	✓	✓	✓	NUTS3	NUTS3	NUTS3	NUTS3
	Accessibility potential by road, rail and air	✓	✓	✓	NUTS3	NUTS3	NUTS3	NUTS3
	% protected terrestrial area	✓			NUTS1	x	NUTS1	x

Source: Experian Data Audit, July 2012 (NO – Norway; CH – Switzerland; IS – Iceland; LI – Lichtenstein)

Working on the assumption that we are looking to undertake the components analysis at the NUTS 2 level, the table below summarises the indicators available across the study territory. It is clear that the level of comparable data availability beyond the EU27 is patchy.

		EU27[6]	Croatia	FYROM	Iceland	Montenegro	Serbia	Turkey	Liechtenstein	Norway	Switzerland	Bosnia and Herzegovina	Albania	Kosovo
Business	Number of enterprises, by sector	☐								☐				
	Businesses in highly exporting sectors	☐								☐				
	Business Density	☐								☐				
	GVA by sector	☐	☐	☐				☐		☐	☐			
	Intramural expenditures on R&D	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
People	Employment rate	☐	☐					☐		☐	☐			
	Working age/active population	☐	☐					☐		☐	☐			
	% tertiary education attainment	☐	☐	☐	☐			☐		☐	☐			
	% lower secondary education attainment	☐	☐	☐	☐			☐		☐	☐			
	HH Disposable Income	☐	☐					☐		☐	☐			
Community	Life expectancy	☐	☐	☐	☐	☐			☐	☐	☐			
	Number available beds in hospitals	☐	☐					☐		☐	☐			
	Crude rate of net migration	☐	☐	☐	☐	☐		☐	☐	☐	☐			
Place	Air pollution	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Accessibility potential by road, rail and air	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Source: Experian Data Audit, July 2012

We recommend only including countries in the components analysis if they can offer a minimum of 6 indicators in total. Indicator availability under the Place and Community headings are particularly weak.

[6] Please note there is a small amount of variation indicator availability within the EU27 countries, which is not shown in this table.

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