Regional Economic and Social Resilience: Conceptual Debate and Implications for Nordic Regions

Discussion paper prepared for Nordic thematic group for innovative and resilient regions

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Foreword

Nordregio, on behalf of the *Nordic thematic group for innovative and resilient regions 2017-2020*, under the *Nordic Council of Ministers' Committee of Civil Servants for Regional Affairs,* is undertaking an in-depth study: *Regional Economic and Social Resilience: Conceptual Debate and Implications for Nordic Regions* throughout 2017-2018. The in-depth study explores regional resilience in Nordic countries by studying how regional authorities, companies and the society at large are able to react and respond to shocks and disturbances. The aim is also to identify what measures are regional authorities taking to prepare for shocks and unwanted developments, either to repel them as to facilitate structural change.

This discussion paper reports on the preliminary findings of the first phase of the project: Policy and literature review.

The report is designed to provide a foundation for the remainder of the in-depth study which will include regional case studies in all Nordic countries to be conducted in 2018. Specifically, the report contributes to the project by:

- Developing a common understanding of regional resilience to guide the project.
- Positioning the Nordic Region in a global context with respect to regional resilience.
- Highlighting the key considerations relevant to resilience thinking as a way to anticipate shocks and facilitating structural changes in Nordic regions.
- Providing an overview of academic debate.
- Presenting brief snapshots of selected international and Nordic regions from the lenses of regional resilience to inspire case study selection.
- Presents the methodology developed for studying regional resilience from a research perspective

This report closes with some overall conclusions and an overview of the next steps for the in-depth study in 2018.

This discussion paper has been made publicly available with the aim of encouraging engagement with Nordregio's research while it is still in progress. As such, the findings presented here are preliminary and should be treated as such by the reader. Nordregio welcomes constructive feedback on the paper and hopes that this open process will ultimately contribute to a better result. The final report on the project will be available in late 2018 at www.nordregio.se.

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More information on the Nordic thematic group for innovative and resilient regions 2017-2020: http://www.nordregio.se/en/Nordregio-Research/Regional-Economic-and-Social-Resilience/

Executive Summary

With a growing concern over natural disasters and with the memory of the 2008-2010 financial crisis that hit most regions across the world fresh in mind, policy makers have been provoked to consider the way in which local and regional populations are able to recover from shocks and emergencies. In other words, policy makers are grappling with ascertaining how *resilient* local economies are. Such debates represent a shifting discourse from planning optimism towards preparing for the unexpected and uncertain. This resilience notion is very relevant in the Nordic countries and regions. This is not only because of their susceptibility to major global crises, but also their position when handling local events and day-to-day challenges that can have major implications to the long-term development of regional economies and societies.

Resilience involves both proactive as reactive responses to undesired occurrences. Regional economic and social resilience is not only about regions' ability to resist and repel shocks, but also their capacity to adapt and reorient their structural organisation towards new economic, social and cultural paths. In this light, emphasis is placed in this paper to distinguish between 1) the ecological resilience approach, referred as the ability of regions to resist and react to shocks with the clear purpose of maintaining systems' stability and durability; which stands in contrast to 2) the evolutionary approach to economic and social resilience, which accentuates on regions' ability to adapt to everchanging conditions and to redirect towards new development paths.

This report adopts traditional indicators used to measure economic performance, such as employment and GDP (outcomes). More importantly, it makes a case for the need to explore a broader account of conditions and features (capacities) that can make regions more resilient. The logic behind this, is that looking at outcomes alone does not tell meaningful information about why some regions were able to resist and recover from a shock and others not, or indeed whether those regions would be able to withstand further shocks. This kind of analysis requires a more comprehensive deliberation of the unique contexts and adaptive capacities of regions, as well as to further the understanding of the different types of shocks such as 'policy induced', technological or financial. While some capacities can be comparable across regions, up to date literature suggests that many capacities are context-specific and place-based.

This report provides an overview of the key literature on regional economic and social resilience and is the first step towards gaining a better understanding of 'regional resilience' in the Nordic regions. The aim is to open-up the concept of resilience and illustrate it with a rich and diverse set of international and Nordic examples. This report will also present a methodological approach based on the OECD's (2014) 'Guidelines for Resilience Systems Analysis'. These guidelines will be used to conduct the empirical research on regional resilience into the selected case-studies. **The study identifies ways to both react to, and anticipate, economic shocks**. This overview paves the way for the empirical study on Nordic regional resilience which will be implemented by the Nordic Thematic Group by the end of 2019.

1. Understanding Resilience

The notion of resilience has recently become an imperative in policy-makers' vocabulary at all levels of governance and has been featured in a great number of studies and policy papers. The policy attention given to resilience might be a response to the general sense of uncertainty and insecurity growing in many societies across the world.

The recent succession of major natural and environmental disasters has provoked the question regarding the ability of local and regional populations to quickly recover from shocks and emergencies. Similarly, the deep financial and economic crisis that affected most of the regions across the globe in 2008-2010, along with the austerity policies that followed, have directed attention towards the ability of local and regional economies respond to these events (Martin 2012). Additionally, the EU Commission has pointed out that profound transformations to the existing social and economic systems are emerging due to globalisation, decarbonisation and the emergence of digital technologies (EU Commission, 2017). These transforming trends can be expected to have an enormous impact on employment structures, industrial sectors, business models, the economy and society at large. Therefore, the Commission has emphasised the need to help citizens, organisations and regions to adapt to these transformations (EU Commission, 2017).

Searching for new paths to strengthen social, economic and environmental resilience becomes increasingly important in a world consistently facing unanticipated risk, which is shaking the very core of global contemporary societies.

Anticipating potential crises has a clear consequence on policy and planning. Bonß (2016) notes that because modern societies are confronted by risks, societal planning also needs to change in order to become better at rearranging and adapting, so as to absorb and prevent risks. Whereas planning in the 1960s and 1970s was characterised by 'planning optimism' and expectations of scientific progress eliminating future problems, resilience thinking sees the future as unexpected and uncertain (Bonß 2016).

Regions are affected by global, national and local developments. Economic turmoil at national and regional levels might originate from either major global happenings or from local occurrences. The 2008 financial crisis, for instance, emerged locally in the US due to a housing bubble and subprime mortgages, and since spread internationally due to truly inter-dependent global financial institutions. Additional shocks that affect the local (sub-national) economies are related to internal decision-making processes, for instance in the closure or relocation of key employers (Sensier et al. 2015). However, economic shocks at the local level can be symptomatic of long term struggles in sustaining an economic path which perhaps was doomed to eventually decline. It is in this light that is worth distinguishing between '**slow burns' and shocks**. Regions or systems where conditions have long been deteriorating and their established institutions struggle to cope with transformation and restructuration, can be categorised as undergoing a **slow-burn** (Pendall et al. 2010). In contrast, shocks are events that are abrupt, disruptive and discrete, and may come as a singular or in a series of shocks to the system (ibid.). Moreover, **slow-burns tend to make regions more vulnerable to shocks as the long-term trends or *stress* weaken regions' potential and deepen the vulnerability of its actors** (OECD, 2014).

The Nordic regions, outside of the bigger cities, appear to be notably affected by slow burns. These may have major consequences on the regions' long-term social and economic development, due to for instance, shrinking populations caused by low birth rates and urbanisation. However, regions that

are overly dependent on a single industry or development path may also suffer from shocks, due to e.g. emergence of new technologies and changes in consumers' demand. Nordic regions are particularly susceptible to the closure of major industries, which can lead to rapid increase of unemployment and outmigration.

The Nordic welfare state and governance system, with its strong public institutions and broad participation model with different actors in decision making processes, can be argued to be the Nordic model towards achieving increased resilience. This model is often praised for its gains in societal trust, which may have key implications on resilience. On the one hand, the Nordic perspective on resilient regions can therefore bring about new insights into how to tackle risks and shocks, by building on the strengths of the Nordic societies. On the other hand, the **increasingly deepened, globalised Nordic economy has been made the Nordic region particularly vulnerable to external developments** (Gylfason et al.2010). The 2008 financial crisis is the most recent example of Nordic vulnerability, with Iceland being the prime example of its devastating effects. However, at the same time, Iceland's quick recovery from its deep economic crisis is often highlighted as a Nordic success story (ibid.). Gylfason et al. (2010) note these housing bubbles as worrying developments, as countries both outside and in the Nordic region have been allowing them to grow for several years. Yet, the authors note that the strong stat financial institutions in the Nordic countries 'allow automatic stabilisers to operate in a recession, thereby softening the blow for households and firms and the economy as a whole' (ibid.). Arguably, this could also be said for similar issues in **preparing for carbon-neutrality, and the automation of the labour market**. The strength of the Nordic states, and the trust placed in these institution, plays to their advantage.

This study investigates further the sub-national levels to gain in-depth understanding of what regions can do to become successful in meeting and anticipating shocks, caused by either internal and external events. Current research on regional resilience emphasises the need for place-based and context-sensitive approaches to measuring resilience, which cannot be reached without in-depth understanding of the studied region, its preconditions, context and processes. To do this, it is necessary to use both qualitative methods and quantitative indicators that, based on the qualitative understanding, have been deemed relevant from the region's unique perspective. This paper represents a first step towards that aim by providing a knowledge base and an overview of existing regional resilience examples. Within the Nordic context specifically, the aim during the next phases of the project is to shed new lights on regions' inherent adaptive capacities, which can then help them build up stronger resilience.

2. Conceptualising resilience

Resilience thinking has been widely used in ecology, physics, medicine and psychology, and has only recently been adopted within social sciences. The Latin root *resilire*, to leap back or to rebound, refers to the ability of an entity or system to recover form and position elastically, following a disturbance or disruption (Martin 2012). Thus, be it an individual person, a specific ecosystem (e.g. a forest), a city or an economy, resilience refers to **the capacity to cope with change and continue to develop**. Resilience thinking has offered a new lens from which to consider some of the most pressing societal, economic and environmental issues today. For instance, the ability of a local or regional community to recover from natural disasters, or to anticipate global trends that may present risks to local industries, jobs and communities. This may include automation and decarbonisation of the energy sector; or from a local perspective, trends such as an ageing population and demographic decline.

There is no consensus on a single definition of resilience. For instance, in engineering the resilience concept emphasises the resistance of a system to disturbances and the speed of return to pre-shock state. In ecological resilience studies, the focus lies on measuring the scale of disturbance that a system can absorb before getting destabilised (Martin 2012). The social scientific regional resilience perspective involves both engineering and ecological meanings, and refers to a complex set of economic, social and institutional traits that characterise the ability of regions to respond to a shock. This carries a clear purpose of maintaining system stability and durability, as well as to adapt to structural changes and move to new development paths (Di Caro 2014; Hu & Hassink, 2016).

2.1 Bouncing backwards or bouncing forwards?

Resilience literature identifies two possible ways of recovering from a shock or disturbance: to **'bounce back'** or to **'bounce forward'**. Bouncing back implies returning to pre-shock or normal position by reconstructing earlier parameters. Bouncing forward requires finding a new normal by replacing certain parameters with new ones (Bonß 2016; Muštra et al.2016). The former would occur for instance, when a region is able to absorb a shock without changing its core industrial base and organisation (return to business as usual). Instead, the former would occur when the underlying conditions have fundamentally changed, making it impossible to return to business-as-usual (Bonß 2016; Muštra et al.2016). In such a scenario, the removal of unproductive activities can open new sectors and a new phase of growth, thereby establishing a new normal.

2.2 The evolutionary approach

However, critics challenge the notion of bouncing back to its full extent. Even when a region could preserve its main function, structure, identity and feedbacks, the 'ability to absorb' a shock requires a certain degree of reorganisation, and change (Muštra et al. 2016). Recent literature describes regional economic resilience as highly complex and multi-dimensional (Sensier et al., 2015; Martin and Sunley, 2016). Contrary to the engineering-rooted notion that implies returning to a state of equilibrium, economic geographers advocate for an evolutionary and dynamic understanding of resilience (Sensier et al., 2015). **The evolutionary approach rejects the idea that regional economies can be in a state of equilibrium, and instead it envisions economic trajectories as being complex, non-linear and dynamic.** Market and economic conditions are under continuous change, where unexpected events and even shocks are a commonplace. Yet, it is only when shocks reach a 'certain magnitude, or occur in a particular context, that the effects become observable' (ibid.).

Evolutionary economic geographers also emphasise on the place-based and path dependent aspects of regional economies. They argue that **specific contextual features of regions play a role in their economic performance, while at the same time, decisions made in the past will continue to influence regional development in the future** (Sensier et al., 2015).

2.3 Adaptive Resilience

Assuming an evolutionary approach to resilience, a new concept can be pointed out: '**adaptive resilience**'. This considers a system's ability to withstand market or environmental shocks without losing the capacity to allocate resources efficiently (Muštra et al. 2016 in Perrings, 2006, p.418). From this viewpoint, adaptive changes to regional economic structures, and social and institutional arrangements are an imperative as to be able to maintain or restore regions' 'previous developmental path, or transit to a new sustainable path' (Muštra et al. 2016). Adaptive resilience is understood as a multifaceted process by Martin et al. (2016), which comprises four key conditions: **risk, resistance, reorientation and recoverability** (see following section).

2.4 Deconstructing Resilience: a multifaceted process

Martin and Sunley (2016) provide a categorisation that recognises resilience as a multifaceted process rather than a "singular, static state of affairs or fixed characteristic of a regional or local economy" (see Figure 1). This conceptualisation of regional resilience comprises four sequential steps, including: 1) the *risk* of a regions' key economic players (firms, industries, workers and institutions) to shocks; 2) the *resistance* of those actors to the impact of economic shocks; 3) the ability of regional actors to conduct the necessary adjustments (to *re-orient and adapt*) to resume their main activities; and 4) the degree of *recoverability* of the shock (Martin and Sunley, 2016).

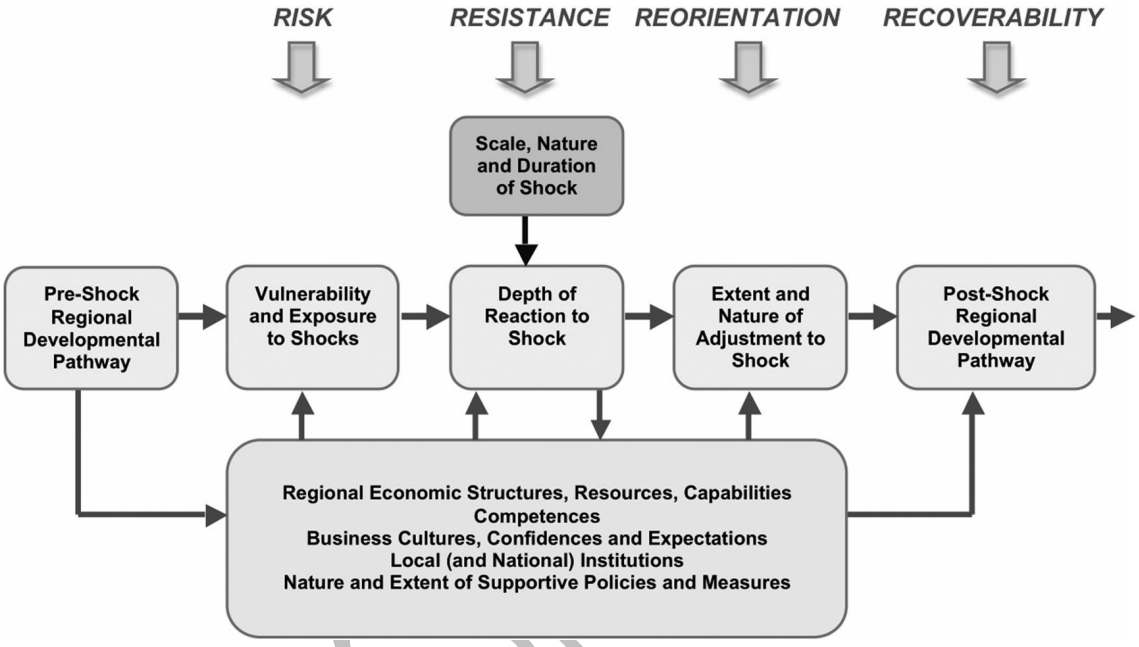

Figure 1: Regional Resilience from Recessions. Source: Martin et al. (2016)

These four conditions: risk, resistance, reorientation and recoverability, are dependent on the scale, nature, and duration of the economic shock (Martin et al. 2016). Likewise, the path dependence or the existing economic path of a region, and many other variables play a role in the process of enduring a shock. These include regional economic structures, resources, capabilities and competences, as well as business cultures and any supportive measures implemented by different institutions at national and sub-national levels (e.g. welfare supportive policies and programmes). Similarly, the OECD (2014) connects a comprehensive combination of factors to regions' abilities to endure shocks, in this case assets or capitals, including: financial, human, natural, physical, political and social capitals (see more in methodology section).

These wide sets of factors determine the degree of resistance of a regional economy to recessions, but also the adjustments made to economic structures in response to shocks (Martin et al. 2016). Thus, Martin et al. (2016) conclude that regional economic resilience depends on the capacity of the regions' firms, industries, workers and institutions to firstly; resist shocks, and secondly; to undertake the necessary adjustments to boost economic performances, including profitability, employment and investment.

3. Types of risks/shocks

In addition to the context specific capacities of regions and its wide range of factors, regional recoverability and overall resilience depends significantly on the types of shocks, their nature and intensity.

Resilience thinking is about anticipating and reacting to risks, shocks and stresses. In this case 'risks' and 'shocks' refer to the same negative events and their consequences. The difference is that risk implies probability, and shock implies the event itself (OECD, 2014). Stressors, rather, refer to long term trends that has weakened the potential of a region and deepen the vulnerability of its actors (ibid.). However, the type, nature and intensity of such disturbances can vary significantly and so does their impact. The OECD (2014) categorises risks and shocks into three types: **1) Covariate Shocks:** infrequent events with an impact on almost everyone **2) Idiosyncratic Shocks:** events that specifically affect individuals and families, and **3) Seasonal shocks:** are recurrent events such as annual floods, displacement of people or market fluctuations. Within these major categories, numerous types of shocks and risks may be identified, from both a macroeconomic perspective and at the local levels, as well as from social, political (and geopolitical), and natural (and environmental) perspectives (Table 1).

Table 1: Types of shocks/risks and stressors

Types of shocks	Examples &	Descriptions
Covariate shocks	Financial shocks	Sudden change in exchange rate or collapse of a credit institution
	Technological shocks	Introduction of new disruptive technologies
	Commodity price shocks	Sudden change of price of a specific good/service
	Demand-driven shocks	Variances in aggregate demand, e.g. due to collapse of consumer confidence leading to drop in spending
	Policy induced and regulatory shocks	Changing 'rules of the game' e.g. interest rate, tax regimes, increasing the money supply abruptly, new prohibitions, creation of free trade areas, etc.
	Other shocks & mixed nature	Accidents, catastrophes (floods, fires, eruptions), terror attacks, wars
Idiosyncratic shocks	Loss of income-generating activity, e.g. closure/relocation of a large industry	
Seasonal shocks	Recurrent events e.g. annual floods or recurrent displacement of people or market fluctuations	
Stressors	Unemployment, market instability, weak institutions, aging population, mistrust among regional actors, isolation, lack of infrastructure, etc.	

At the **macroeconomic level** various kind of economic shocks, albeit mostly covariate shocks, can be identified, including: 'financial shocks; fiscal shocks; exchange rate shocks; commodity price shocks;

productivity/technology shocks; regulatory shocks [policy induced], and, through disasters, shocks to capital stocks' (Sensier et al., 2015; c.f. Table 1). Events occurring at a macroeconomic level have also significant impact on the **local level**. More specifically, shocks that have critical impact respond to decisions made at that level or elsewhere, but these may have a direct relation to the local communities' activities and industries (Sensier et al., 2015). One example is the closure, down-scaling or relocation of major employers or industries (ibid). The dominance of a single firm or industry in a region represents a major risk, as its employment and economic base relies on the success of one or few actors. A different example would be the implementation of a regulation that requires a profound transformation of industries. In turn, this could represent the closure of firms in a region. This is particularly evident in the normative nature of the efforts to decarbonise the energy sector.

Unless there is one dominant player, regional resilience does not depend on all firms surviving shocks. It is normal that new firms emerge, and others disappear, even at high rates. What may be important for resilience is the net 'population' of firms and industries, to maintain a stable, or a net increase in economic activity. The same is true for the resilience of a specific sector or industry. The survival of all firms within an industry after a shock does not determine resilience, but rather, the capacity of the industry as a whole, to adapt to new conditions. For instance, this may happen by introducing innovative products, services, organisation and technology (Holm and Østergaard, 2015). Such an evolution can generate new spin-offs and attract new jobs and opportunities.

In most cases, such events exhibit a combination of different types of shocks and stressors that may or may not be interrelated. Additionally, shocks can be considered either temporary, e.g. when economic activity returns quickly back to 'normal' (e.g. prices, employment levels); or permanent, when the shocks alters the market/society without offering a way back. The sudden collapse of the oil price may for instance have permanent consequences. Likewise, shocks can either be symmetric, affecting all regions or industries in the same way, or asymmetric, affecting a specific region or industry more than others. For instance, the value of the British pound may have different impacts in different Nordic regions as was evident in the wake of Brexit in the summer of 2016, and technological innovations could have caused Nokia's fall, having major economic implications to Nokia's home region of Oulu, but caused no harm to other regions.

4. Regional economic resilience

Economic resilience has been used to understand and monitor how economies react to different types of recessionary shocks, as well as to determine how to build capacity to anticipate economic disturbances. Such a view of resilience is related to the Keynesian theory of business cycles, which implies that periods of recession occur regularly as the economy goes through cycles of economic growth (Martin 2012). This notion characterises long run regional economic growth as a sequence of phases with contractions and expansions, *'with turning points defined as 'peaks' and 'troughs' in activity*' (Martin et al., 2016). However, there is no consensus on how to analyse the reaction of regions to economic cycles.

In their publication, Martin et al. (2016) review the key perspectives found in literature to analyse economic cycles. What all these perspectives have in common is the element of surprise or the unpredictability of the shock that shakes the regular performance of the economy. The authors note that recessions are different in nature, but that they generally involve the contraction of the economy, closure of firms and loss of employment. However, depending on the intensity of the shock, there is a difference on the depth of the economic impact. For instance, a region that experiences a severe economic shock is likely not to recover or return to the pre-shock growth path, but instead be

redirected onto a different path, which is likely to be an inferior one. It is in this context that the notion of resilience becomes relevant, to scrutinise how a system, a region in this context, reacts to recessionary downturns.

According to Sensier et al. (2015), the notion of regional economic resilience offers the possibility to local economies to identify their own capabilities to cope with economic shocks and act upon it to influence the development path. This suggests that **although regions have different capabilities and capacity to react to shocks, they can also actively redirect their development path towards stronger resilience. A deep understanding on regions own adaptive capacities as well as their weaknesses and vulnerability to external developments is necessary for building capacity to anticipate shocks, either by preventing them or by minimising their negative impact.**

5. Local communities and regional resilience

Regional resilience demands local responses to global challenges; therefore, it is logical to envision a key role for the local community in making regions resilient. During the last decade, there has been an increased focus on social resilience in research (Keck & Sakdapolrak, 2013), often with an explicit focus on communities (see e.g. Keck & Sakdapolrak, 2013; Huggins & Thompson, 2015; Mulligan et al. 2016). For example, the OECD (2016) emphasises the role of **inclusive and cohesive societies as an important driver of resilience, together with active citizens' networks, safe neighbourhoods and healthy lives of citizens.**

Criticism towards depoliticising and ignoring the role of human agency in resilience research has led to an increased focus on actors, conflicts and processes (see e.g. Martin & Sunley, 2015; Brassett, Croft & Vaughan-Williams, 2013; Briston & Healy, 2013). Brassett, Croft & Vaughan-Williams (2013) suggest that future research questions on resilience focusing on actors and expert knowledge relevant to the performance of resilience policy and practice, should look at 'who benefits, and what and/or whom is excluded' (Brassett, Croft & Vaughan-Williams 2013, p.225). Similarly, Martin and Sunley (2015, p.12) propose that resilience studies should always specify the 'resilience of what, to what by what means, and with what outcome?'.

Studying agency in local communities brings further attention into how social agents are organised in complex and interconnected networks, which in turn compose the regional social structures and economies (Bristow & Healy, 2014, p.928). In this light, Bristow and Healy (2014) recognise that strengthening resilience can be possible by public, social and commercial actors working together, and by utilising all available resources.

Local generators of resilience are often narrowed down to local economy and entrepreneurship. Simultaneously, local communities are considered to contribute to resilience by promoting entrepreneurship. Huggins and Thompson (2014) identify the following **local generators of resilience: *1) social cohesion; 2) embracement of education; 3) social values and rules.*** In many cases these three aspects of community culture determine the bonding of the community, which may be linked to local entrepreneurship through social trust. Similarly, societies that embrace education as a way of transmitting values between generations are more likely to develop institutions that create prerequisite for regional resilience (Huggins & Thompson, 2014).

However, the **ways in which communities contribute to resilience are complex**. For example, **even if social cohesion can contribute to resilience, homogenous cohesive groups can also be exclusive and exlude ideas coming from the outside, which may have a negative effect on local resilience** (Huggins & Thompson, 2014). Similarly, it is not confirmed whether individualistic or collectivistic

rules and values are better for resilience, since individualistic values may promote entrepreneurial spirits, whilst more collectivistic values may enable, e.g. the pooling of resources, and thereby contribute towards stronger resilience to economic shocks (Huggins & Thompson, 2014).

6. Good governance as a driver for regional resilience

To study resilience, governance bodies and their roles can be of further interest, as they function as connectors between the different actors, and as facilitators of communication between, for example, firms, labour force, consumers and interest groups (Bristow & Healy, 2013; Brooks, Vorley & Williams, 2015).

In studying resilience, it is not sufficient to study traditional economic factors, and there is a need for studies in governance and leadership to understand what makes certain regions resilient (Brooks, Vorley & Williams, 2015). The OECD identifies governance as one of the four areas that drive resilience. According to the OECD, resilience is promoted by clear leadership and management, strategic and integrated approaches, public sector skills, and open and transparent governments (OECD, 2016).

Although resilience is highly dependent on several actors, and no one actor has the capacity to influence or control the overall development, the state and r public sector actors in general, are likely to pay a key role (Bristow & Healy, 2013). In the Nordic context, where the role of the public sector is traditionally strong, it can be expected that different public-sector actors, alongside policies, play a key role in promoting regional resilience.

7. International and Nordic Examples of Regional Resilience

This chapter provides several brief examples of regions in the USA, the UK and in the Nordic countries to exemplify the notion of regional economic and social resilience in a more tangible manner.

These examples were put together with the aim to introduce potentially interesting case studies. The final selection of case study regions, which will be an in-depth empirical research, resulted from a discussion together with the Thematic Group. The in-depth studies should help identify whether there are common features among the Nordic regions approach to resilience. Moreover, the case studies will provide possibilities for joint Nordic learning and benchmarking. See Table 1. for a summary of the international and Nordic examples presented in this report.

Table 2: International and Nordic Examples of Regional Resilience

REGION	SHOCK (TYPE OF SHOCK)	SUCCESS FACTORS/ POLICY RESPONSES	OTHER FINDINGS
BOSTON, USA	**Covariate/technological shocks** Structural changes in the industrial base	Skilled people reinventing the city; sufficiently diverse economic base; government supporting the establishment of knowledge institutions	The city´s attractiveness has kept skilful inhabitants from leaving the city
WEST MIDLANDS, UK	**Slow-burn region, covariate shocks and stressors** unsustainable industrial mix. The 2008-2009 Recession saw a high unemployment rate.	Establishment of West Midlands Regional Taskforce in response to recession. Policies: e.g. loans, support key strategic sectors through different programmes	The Taskforce´s contribution to 5900 jobs through funding and advisory programmes
ARENDAL-GRIMSTAD, NORWAY	**Slow-burn region, stressors** Risk of losing locally operating companies, 1990s	State subsidies, establishment of a technology park, state as a customer, networking	The city´s attractiveness has kept skilful inhabitants from leaving the city
SKÅNE, SWEDEN	**Covariate/technological shocks**: Asian competition, Corporate downsizing in ICT	Open innovation and cluster platforms as long-term responses	Diverse industrial base facilitates the search for new pathways
LIEKSA, FINLAND	**Slow-burns, stressors** risk technological shocks, decreasing the need for human labour, companies moving to low-cost countries	Local re-employment activities benefit from national reindustrialisation policies, post-productivist turn in forest use	The establishment and maintenance of the welfare state created jobs in the region
VEJLE, DENMARK	**Risk of environmental disasters followed by economic shocks** The city to be under water in 2100; lack of social cohesion	Resilience Strategy; 100 resilience initiatives; a position of a Chief Resilience Officer	Implementation from 2017
OULU, FINLAND	**Covariate/technological shocks, slow-burn** Global competition on technology industries, closure of ICT companies and subcontractors	Correctly targeted policy measures (diversification); Nokia´s Bridge Programme for re-education and entrepreneurship; regional social capital	The city´s attractiveness has kept skilful inhabitants from leaving the city
SUÐURNES REGION, ICELAND	**Idiosyncratic and covariate shocks** US Military abandoned. Global financial crisis	Government eased local debts. Regional development agency was established to promote cooperation between entities in the area.	Synergies, proximity with capital area. increased population and construction. Increased tourism.
SIGLUFJÖRÐUR, ICELAND	**Idiosyncratic shock followed by slow-burn** 1960s the herring stock disappeared.	Municipality merged with adjacent town. Major improvements in transportation, tunnels.	Increased tourism. New development paths, largely dependent on single investor.
NORWEGIAN PERIPHERAL REGIONS	**Slow-burn, stressors, idiosyncratic shocks** peripheral regions experiencing long term stress, a**brupt** closure or downsizing key companies	Regional Restructuring Programmes mobilising local and regional actors to counter declining trends and promote employment	Restructuring Programmes have had an influence in diminishing the adverse effects

7.1 Boston, USA: A renowned resilient city for over 400 years

"Reinventing Boston" (Glaeser 2005) tells the story of Boston through more than 300 years, where the city has faced several shocks but been able to overcome them. Currently, Boston is a thriving information technology city of 646 000 inhabitants and is the eighth richest metropolitan area in the USA.

Boston has encountered different types of shocks over time. The first major shock took place in the mid-18th century, when the port of Boston, once the most important on the US' east coast, was overshadowed by the ports of New York and Philadelphia. Boston fell into a steep economic decline, struggling to recover continuing into the latter half of the century. Its population barely grew: from 17,000 in 1740 to 18,300 in 1790. However, the city gradually re-emerged by capitalising on its maritime expertise, and experienced substantial recovery. Further on, Boston was hit once again, this time by a technological shock when its supremacy in the shipping industry collapsed in the wake of the steamship. These were not only better for most longer sailing voyages, but they radically simplified operations, making Boston's sail-specific human capital obsolete. Once again, Boston reinvented itself, undertaking a new development path as a manufacturing city. This time, Boston's rise was made possible by its existing manufacturing skills, and to a large extent the vast inflow of Irish immigrants that provided the labour force needed for the factories. Finally, Boston's last major decline took place during the mid-20th century, because of the growing trends of suburbanisation and mobility towards warmer regions. Technological innovations that came with the rise of the automobile and road infrastructure dragged people out of the crowded industrial cities. A similar path as that of Detroit would have been expected from Boston between the 1980's-2000, however, abandoned its manufacturing path and taking advantage of its existing skills base, it specialised in high technology, finance and education. (Glaeser 2005.)

The case emphasises the evident nature of external shocks and the core assets or adaptive capacities that made it possible for Boston to overcome and reinvent itself repeatedly over time. Such capacities include a **strong base of skilled workers and a sufficiently diversified economic base**. These owe to **city´s attractiveness** where in the times of decline, people innovate rather than flee. Lastly, pro-growth governments contributed to the establishment of a strong institutional base. Although Boston's reaction to shocks was outstanding, **the city failed to anticipate the technological shock that replaced sailing ships industry**.

7.2 West Midlands, UK; Strategic policy interventions for safeguarding jobs and growth

The West Midlands offers a case on a Regional Taskforce´s responses to recession where the Taskforce´s policies safeguarded and created an estimated 5900 jobs. The West Midlands is a metropolitan county in central England containing the second most populous English city, Birmingham. During the 2008-2009 recession, the West Midlands portrayed itself as a mature industrial region (notably within the automotive industry and metals), whilst still suffering from the lack of a diverse industrial base, poor economic growth, and low skills and levels of innovation. The region, which has suffered significantly in earlier recessions, was severely hit by the financial crisis. Most notably, it affected its manufacturing, which accounted for nearly 50% of the region's economic activity, as well as real estate, wholesale and trade. Unemployment spiked with an extra 4.7 per cent during the first 18 months of the crisis, being the most rapid increase in unemployment of all English regions (Bailey & Berkeley 2014).

The severity of the economic impact in the region is said to be linked to the overall sectoral composition of the region, which has been depicted as an unsustainable industrial mix. The downturn however, accelerated the process of structural change in the sector. The West Midlands' Regional Taskforce (WMTF) was established in 2008 with the purpose of addressing the adverse effects of the recession on regional businesses and employment and ensuring business resilience in the long-term.

The WMTF introduced several policy interventions of which two have had a rather small but regionally significant impact: The Advantage Transition Bridge Fund (ATBF) and the Manufacturing Advisory Service Automotive Response Programme (Bailey & Berkeley 2014). While ATBF secured **availability of financing for businesses**, the latter programme served a more strategic purpose of renewal. It funded **strategic programmes** where the receivers were, through capability reviews, considered 'long-term automotive suppliers' and where the businesses had **projects related to diversification** or restructuring. Thus, support was allocated to the businesses that showed best potential. The WMTF interventions emphasised 'leadership, strategy, targeted short-term support, building relationships with stakeholders and communicating with other tiers of government' (Bailey & Berkeley 2014). These interventions allowed the suppliers of some of the key industries to survive, and improved confidence measures such as the Purchasing Managers' Index (PMI), which in turn helped GDP growth and recovering unemployment rates. (Bailey & Berkeley 2014).

The West Midlands humble success can be drawn from the correctly and strategically allocated public resources in the response to this major economic shock, which had underlying long-term slow burn tendencies. The long term slow burn and lack of early measures made the region less adaptive to the changing conditions and was thus more vulnerable to external disturbances.

7.3 Arendal-Grimstad, Norway: Extra-regional inputs accelerating new path development in the periphery

Isaksen & Trippl's paper from 2014 on Arendal-Grimstad sheds light on the critical preconditions and factors that facilitated the rise and development of new industrial paths in this peripheral regional economy. Here, it is argued that extra-regional inputs play a crucial role. Arendal and Grimstad are municipalities in the Norwegian county of Aust-Agder in the South-Eastern part of Norway, about 270 kilometres from Oslo. The region had been struggling with chronic population decline and stagnation for decades until the 1960s. Even though the preconditions for growth (new path development) have been very limited, the region eventually found its new path in the electronics and software industry with the help of external inputs.

The development path for the slow-burn region Arendal-Grimstad has its roots in the establishment of two firms, Elektrisk Bureau (EB) (later taken over by Ericsson) and Stratonic in the 1960s. The establishment of EB in 1962 was supported by state funding from the Development Fund for Rural Areas. Stratonic was founded in 1966 by a local ship owner, with the aim to develop electronic equipment for ships. As the region lacked competence in electronics development, engineers were recruited from other parts of Norway. These firms became the magnets attracting other actors and firms to the region. Up until today, the two firms absorb the largest share of employment in the region. The software and ICT became Arendal-Grimstad's new development path paved up by these pioneering firms, as well as the restructuration of existing manufacturing firms.

In the mid-1990s, a large protest was sparked when Ericsson announced its decision to leave the Arendal region after a long period of low performance. However, very few engineers were willing to move to Oslo, where Ericsson had planned to move. Therefore, Ericsson did not only decide to stay,

but also to strengthen its ties with the region. One of Ericsson's departments moved closer to a local university in the neighbouring municipality Grimstad, whilst still keeping a presence in Arendal. Nevertheless, the company's performance did not improve and in the face of its gradual downsizing, many employees found new employment in the region by establishing new companies, particularly around IT consulting. On a positive note, the residents' strong sense of attachment to the region, prevented the relocation of Ericsson, protecting an important share of employment. For the very same reason, local professionals chose to establish their ICT firms in the region rather than elsewhere.

Public policy has played an important role in reshaping Arendal-Grimstad's development path. State level subsidies had been granted to attract firms from outside of the region, as well as to stimulate regional networking, for instance by **establishing specialised support structures such and a technology park.** The state has also acted as an **important customer for the firms** (Isaksen & Trippl 2014.). Finally, one of the building blocks for resilience can be argued to be **the strong attachment of the highly skilled local workforce to the region.**

7.4 Suðurnes region, Iceland: Outlasted the first shock but hit hard by the second

Two shocks hit Suðurnes in Iceland at short intervals, in 2006 and 2008. The region appeared more resilient to the first shock than the second one, which followed the global financial crisis, which significantly impacted on the region resulting in one of the direst situations amongst the Nordic countries. The subsequent changes to the developmental paths in Suðurnes however facilitated a good recovery. This is evident in e.g. the unemployment numbers: from 12,3% in 2011 to 1,7% in July 2016 (Hagfræðistofnun Háskóla Íslands, December 2015; Byggðastofnun, August 2017).

The resilience of the region has not been studied at any length. Suðurnes has become an extended part of the capital area and has thus been touched by urbanisation. The evidence is in the extensive construction going on in the years before the crisis due to lower real estate prices, which in turn led to population growth. This created a special foundation for dealing with the shocks that incurred with firstly, the disappearance of the US Military base, and secondly, the economic crisis.

Around 600 jobs vanished in 2006, when the US Military left after 55 years (Parliamentary resolution, no. 384, 11. May 2015), but the shock does not appear in the economic growth figures. In turn, the region was hit the hardest in Iceland in the financial crisis of 2008, leading to a 12% decline in production from 2009-2013 (Hagfræðistofnun Háskóla Íslands, December 2015). The overall economic growth for the period from 2008-2015 was however 8%, which was greater than in any other Icelandic region, a time when the financial activities declined by more than half across the country (Byggðastofnun, August 2017).

The explanation given for the good growth in Suðurnes after 2009 is the increase in tourist arrivals at Keflavik Airport (the only international airport in Iceland), and the development of industry and fisheries in the area (Byggðastofnun, August 2017). Worth mentioning are innovative activities such as the Resource Park, focusing on geothermal resources, industrial symbiosis and other biotechnology companies, alongside innovations in relation to the growing tourism industry. Businesses that provided better prospects for the future, than their predecessors in heavy industries, were only in focus after the crisis. Two plants that were built are not in use due to various reasons, but the labour market is nevertheless blooming.

7.5 Siglufjörður, Iceland: Stagnated depopulation due to expanded transportations and development

The depopulation in Siglufjörður have finally stagnated after decades of negative development. Improved road transportation in addition to new investments and innovations have made the town more attractive and relevant. The booming tourism sector in Iceland and the well-known Herring Era-museum inspired further establishment of tourist services in the town.

Siglufjörður was once Iceland's herring capital, but has since the disappearance of the herring stock, and changes to the management of fishing, dealt with a slow burn. In 1969, the herring stock did not reappear as expected, leading to a strong economic downfall dragging with it several other sectors and regions beyond Siglufjörður. These ripples occurred as herring accounted for up to half of Iceland's export income (The Herring Era Museum, n.d., Hamilton and Ögmundardóttir, 2006). The aftermath of the shock prolonged and turned into a slow burn, which led to continuous depopulation. From over 3000 inhabitants in Siglufjörður in the 1950s, its population dropped to around 2000 in the 1980s and to as little 1500 in the early 2000s.

The population has stabilised at around 1200 inhabitants in 2010. In 2006, Siglufjörður and the neighbouring town of Ólafsfjörður merged into the municipality Fjallbyggð. In 2010 a new tunnel connecting the two settlements was inaugurated, cutting the route by 47 km. The tunnel also shortened the way from Siglufjörður to Akureyri, the capital city of Northern Iceland by 44 km. Bjarnason and Ólafsson (2014) argue that the tunnel has increased residence attachment.

Ólafsfjörður is still fighting depopulation. It is not entirely clear what causes the difference between these towns. Potential explanations are more centred around the development of the tourism industry and other employment, in addition to the tunnel opening more additional opportunities and access to services for Siglufjörður (Bjarnason and Ólafsson, 2014). It is also important to mention an investor who moved back to his hometown and devoted himself to the town's development. He opened a new hotel, and a biotech company, the latter providing 27 new jobs of which of twelve demand university degree. His plan is to increase the number of jobs to one hundred in the next five years according to an interview in Kjarninn (February 2017). One barrier impeding population increase is the housing shortage. Even though 16,5% of apartments in the town are second homes, the owners find it more profitable to rent them out through Airbnb to tourists rather than renting it out to permanent residents.

7.6 Skåne (Scania), Sweden: Resilience by continuous innovation

Cooke & Eriksson (2012) study elaborates on Skåne's way to respond to globalisation shocks. Major shocks in mobile technology, most notably the Asian competition and ICT corporate downsizing, have shaken the Nordic predominance in the field, and have forced the region to adapt.

Skåne has been able to absorb these shocks with two resilience 'strategies' that have taken place in the industry. The reaction of the industry to the ICT shock has been twofold: **changing operations** and adopting **open innovation**. Firstly, companies changing their operations have focused on moving from hardware to global service management (e.g. Sony Ericsson). Secondly, adopting open innovation has allowed companies to benefit from intellectual property rights becoming available to the advantage of SME's and start-up's. For instance, the Scanian cluster Mobile Heights are incubating start-ups that have benefited from open innovation. Skåne has also been active in **identifying 'pre-adaptive' innovations** that could be transferred from one industry to another. For

instance, the Mobile Heights cluster identified links between health, games and GIS knowledge that can strengthen the mobile ICT industry. (Cooke & Eriksson 2012)

Lessons from Skåne accentuate on the region's timely response to the global changing conditions for the ICT industry. Skåne has effectively capitalised on local knowledge and skills, enabling innovation processes. Different cluster platforms play a crucial role in boosting collaboration between industries by sharing knowledge and finding common solutions

7.7 Lieksa, Finland: A shrinking peripheral city finding a new role within the national and global economies

Lieksa is a peripheral municipality in Finland situated in the Eastern Finland with a population of slightly above 11 000. Lieksa´s long trend of population decline was amplified by the closure and downsizing of locally operating forestry and rubber industries, which had major repercussions on regional employment. Between 1980 and 2006 the number of jobs in the forestry industry dropped from 1150 to 450 in the municipality (Kortelainen & Rannikko 2010).

In recent decades, regional policy has actively supported the diversification of the local economy with the hope of building up resilience, by relying less on natural resources. The key mechanisms to achieving resilience in the long-run for Lieksa have been **1) local re-employment activities taking advantage of national re-industrialisation policies; 2) the further construction and maintenance of the welfare state in the 1980s resulting in the establishment of new jobs,** and **3) the post-productivist turn in forest use** meaning that new and more sustainable ways to use forestry resources are developed further.

Lieksa's administration understands its unfavourable situation as a peripheral economy greatly dependent on natural resources. They have worked hard to find new paths or indeed, 'its new role within the national and global economies' (Kolehmainen, Eisto & Vatanen 2015.). However, the mechanisms implemented have not being significant enough to reverse the depopulation trend nor to identify a clear growth path, but their efforts have helped cushioning the impacts of economic downturns.

7.8 Vejle, Denmark: Member of "100 Resilient Cities" proactively tackling future challenges

Vejle is a Danish municipality in the region of Southern Denmark. The municipality has a population of around 111 000 inhabitants and is the only Nordic member of the 100 Resilient Cities initiative. The 100 Resilient Cities initiative is a network of cities from across the globe committed to build their physical, social and economic resilience. Vejle adopts the notion of resilience as an overarching key principle for its local development. First and foremost, the city is predicted to be underwater by 2100. Apart from the ecological challenges, public officials are hoping to build stronger social capital (social resilience) in times of 'growing apathy and lack of social cohesion'. (100 Resilient Cities n.d.)

Resilience is a top priority for Vejle, and thus the city is working towards this goal in a number of ways. Firstly, Vejle has a separate **Resilience Strategy** (2016). Its four strategic pillars are: the co-creating city, the climate resilient city, the socially resilient city and the smart city. Secondly, as part of the strategy, Vejle will undertake **100 projects to promote resilience** in the period of 2016-2020. These include ongoing activities that build digital competence among the local youth. Thirdly, Vejle has created the **position of Chief Resilience Officer,** which is financially supported by the 100 Resilient Cities.

Vejle has, in contrast to other cities and regions, not emphasised g the city's capacity to respond to shocks, but to anticipate and prevent them. Vejle's local policy design is forward-looking and situates resilience as an overarching theme in its local development strategy.

7.9 Oulu, Finland: Social capital and smart specialization policies as building blocks for resilience

With some 230,000 inhabitants, Oulu, located in Northern Finland, is the sixth most populous city in the country. Oulu has long tradition of being a technological hub, and host a vast number of ICT companies. The city's industry struggled to adapt to the new demands, leading to a series of technological shocks that fundamentally changed the region's development path. Despite this, Oulu has been able to recover rather fast from the latest economic crisis (2008-2009), and eventually re-emerge with a renovated development path (Herala et al 2017)

In the 1990s and early 2000s, the ICT industry and cluster led by Nokia experienced a rapid and continuous growth. However, in the 2000s, new technologies developed elsewhere replaced Nokia's products, leading to the company's downturn. This dragged with it the cluster's subcontractors and the whole regional economy. By the years of 2008-2012, Nokia´s role in the high technology cluster continued to diminish in the region and numerous jobs were lost. Finally, in 2014, Microsoft´s (former Nokia) unit also closed.

The successful recovery of Oulu in the face of its initial misfortune can be attributed partly to the **correctly targeted policy measures implemented** (Herala et al 2017), but also to the **region's social capital** (Teräs 2017). Firstly, the development policies and the state aid was not targeted towards maintaining the old structures, but to the renewal of the industrial base. The policies aligned with the **smart specialization strategy**, and mobile technology was understood as a multipurpose technology where the skills around the technology could be transferred to cater other fields. In addition, **the re-employment policies** that resulted from the collaboration between firms, public authorities, the state and the education institutes played an important role. The Nokia Bridge Programme finding new career paths and promote entrepreneurship also helped (see Herala et al 2017).

The region's social capital had important significance in re-defining the development path of Oulu. The **'spirit of Oulu'**, can be highlighted by the constant efforts to find joint local solutions and/or cooperation, and by the preference of Oulu's workers to stay in the region and be open to use their skills and knowledge in other fields.

Currently, the once declining ICT and telecommunications sector is returning. There is a positive job creation development and an ongoing successful diversification, for example in the fields of health-related technologies, printable electronics, and cleantech. The former salary levels from the best years of Nokia in Oulu, however, are not met any more.

7.10 Study on 10 Restructuring Programmes in peripheral regions, Norway: Diminishing the adverse effects of company downsizing and closures

Carlsson et al. (2014) have studied Norwegian restructuring programmes (running from 1994-2003) and their long-term effects. Their conclusion is that they have, as a policy instrument, contributed to enhanced resilience. At first, the programmes were to respond to acute shocks in single-industry

towns, but later their nature has shifted to include also slow-burning regions. These programmes are aimed at both diversifying undeveloped but potential sectors (such as tourism in Dalane) and broader mobilisation without keeping a specific sector in mind (such as small municipalities of Vaksdal and Røyrvik).

A case example is the mountainous municipality of Røyrvik, with a low population and limited employment opportunities. In 2009, an important municipal mine closed, leaving 158 workers unemployed. Apart from this abrupt shock, the municipality had been undergoing population decline for longer. However, due to the restructuring programme, the municipality saved an estimated 56 jobs compared to regions without an equivalent programme.

The restructuration programmes have had several positive effects. First, they have allegedly contributed to the less jobs lost in the case regions, and have led to more **diversified economic structures**. Secondly, the programmes have strengthened the **business development capacity**, **mitigated the local sense of 'collective pessimism'** and **fostered local and regional engagement and involvement**. The study conducted by Carlsson et al. (2014) shows that restructuring programmes anchored to regional strategies have contributed to both social and the economic resilience.

8. Measuring regional resilience

Various approaches to studying and measuring resilience exist. Resilience research has mostly centred on ecological resilience; thus, indicators have been developed mainly around environmental issues (OECD, 2016). As the interest in measuring regional resilience from other perspectives has increased, so has the need for identifying new indicators. The aim of this chapter is to identify indicators to measure economic resilience at a sub-national level and to a certain extent, indicators that could benefit the study of resilient local communities.

Resilience can be measured by focusing either on the region's ability to address shocks (by means of the region's own adaptive capacities), or the outcome of their ability to address those (OECD, 2016). The confusion between *outputs* and *capacities* is the main challenge for measuring resilience (Sensier et al. 2015). This means that a region can have positive outcomes (e.g. increased employment), but it may not necessarily mean that the region is resilient to further shocks. A region that coped well with a shock in a given time, may lack capacity building and the ability to address future shocks (OECD, 2016). This means that measuring outputs alone, such as the GDP or employment levels and the speed of recovery of these, does not provide meaningful insights about why one region was more resilient than another, nor whether a region would be resilient to future disturbances (Sensier et al., 2015). This would require more detailed understanding of the inherent adaptive capacities of the region, which can help it resist, respond and recover from a shock (ibid.).

Measuring regional resilience benefits from considering both the revealed resilience (outcomes) and resilient capacities. Outcomes can either be measured in relation to a region's own reference indicators or in comparison with other regions (Sensier et al. 2015). Measuring the adaptive capacity, in turn, is more challenging. The indicators used for adaptive capacity do not reveal resilience directly, but rather, they provide a lead towards those capacities and adaptive mechanisms that give the means to a region to be resilient (ibid.).

Moreover, useful indicators will often differ from region to region. Although indicative lists of possibly interesting indicators can be made, suitable indicators for studying a specific city or region should be

chosen based on local knowledge about the local preconditions. As the OECD emphasises, resilience is context-specific and place-based and thus and regions need to identify their own indicators and analyse the results in a context- and place-based manner. The OECD (2014) 'Guidelines for Resilience System Analysis', suggests an overview of the regional assets or capitals, including financial, human, natural, physical, political, and social capitals (see more Methodology chapter). According to that publication, these sets of capitals should be contrasted with the identified stressors and risks, as to be able to design appropriate counter-measures.

An overarching mapping the different approaches to measuring regional economic resilience, Martin & Sunley (2015) show the benefit of conducting case study research in addition to the various indices and models (Table 3).

Table 3. Alternative approaches to measuring regional economic resilience (Martin & Sunley, 2015).

Method	Focus	Examples
1. Case study based	Mainly narrative based, may involve simple descriptive data and interviews with key actors, interrogation of policies.	Munich (Evans and Karecha, 2014); Cambridge and Swansea (Simmie and Martin, 2010); Buffalo and Cleveland (Cowell, 2013)
2. Resilience indices	Singular or composite, comparative, measures of (relative) resistance and recovery, using key system variables of interest.	UK regions (Martin, 2012); US cities and counties (Augustine et al., 2013; Han and Goetz, 2013)
3. Statistical time series models	Impulse response models; error correction models. These estimate how long it takes for impact of shock to dissipate (how much of the impact is subsequently eliminated per unit time period).	US regions (Blanchard and Katz, 1992); UK regions (Fingleton et al., 2012)
4. Causal structural models	Embedding resilience in regional economic models to generate counterfactual positions of where system would have been in the absence of shock.	US metropolitan areas (Doran and Fingleton, 2013); EU regions (Fingleton et al., 2014)

The common characteristics of the different approaches to study regional resilience is the emphasis on taking into consideration the time- and place-specific nature of resilience. Resilience cannot be measured with the same indicators all over, and there are no one-size-fits-all solutions where high results on certain indicators would always lead to more resilient regions. The highly complex nature of shocks and the complexity of responses and involved actors makes it relevant to approach regional resilience from a place-based case study perspective. In order to identify the right indicators to study a region's resilience, it is important to gain an in-depth understanding of the regional context. **In order to study the process where regional actors build resilience, more qualitative case study approach is needed** (Bristow & Healy, 2013), to complement the economic and demographic indicators. To understand social resilience and how communities and governance bodies adapt to and respond to change, focus needs to put in the specific place and context, emphasising the need for case study approaches (Bristow & Healy, 2013).

9. A methodology for studying regional resilience

The context-dependent nature of both resilience studies and resilient regions poses challenges to the transferability of good practice cases between different regions. Studying resilient regions requires cross-disciplinary expertise and a thorough understanding of current trends. This encompasses all kinds of industries, technologies, politics and the environment, as well as their respective impacts on different levels of governance. The intention of this project is to maintain a wide scope and study a rich sample of regions with different characteristics, industrial bases, social structures and economic paths to determine the different risk typologies that exist in the Nordic Region. By doing this, this study will gain interesting insights into the different types of risks that threaten Nordic regions, and the different types of assets and measures related to those risks that may be important for boosting resilience. However, a comprehensive mapping of the risk landscape in the Nordic regions is beyond the scope of this study.

9.1 Methodology: Resilience Systems Analysis

The methodology designed for the empirical research and case studies in this project (also applicable beyond the Nordic regions) is based on the 'Guidelines for Resilience Systems Analysis' (RSA) developed by the OECD (2014). The RSA methodology was originally designed to support the public administration in programming and providing input into policies and strategies. It does so by 1) analysing the context, 2) exploring scenarios for future changes, and 3) assessing evidence for future change (OECD, 2014). In this case, the approach has been adapted for research purposes, and therefore the length and scope of the study has been restricted. However, the general logic prevails.

The OECD's resilience systems analysis builds on risk management approaches. This approach involves a much wider perspective as it focusses on the system as a whole, instead of one risk alone or a single event. The added value of applying systems thinking is its complex approach, which makes it possible to gain a more comprehensive picture of the interlinkages between different risks; for instance, how disasters can trigger economic shocks. It also makes a connection between long-term trends (stressors) spanning economic, social, environmental and physical perspectives, as well as the nature and impact of future trends (OECD, 2014).

Figure 2 visualises the conceptual framework of the RSA. The RSA aims to tackle the following:

- Understanding the risk landscape in a specific context.
- Consider how risks will affect society.
- Gather information about what elements makes those systems resilient, and what actions are employed to cope with those risks.
- Identify possible measures for boosting resilience; the levels of shock absorption and adaption, and/or preventative measures through systems transformation
  *In identifying measures, it is essential to determine from what layer of society risks are best managed.
- Gaining a better understanding of how the overall context and risk landscape of the system will change after the measures implemented to boost resilience are put in place.

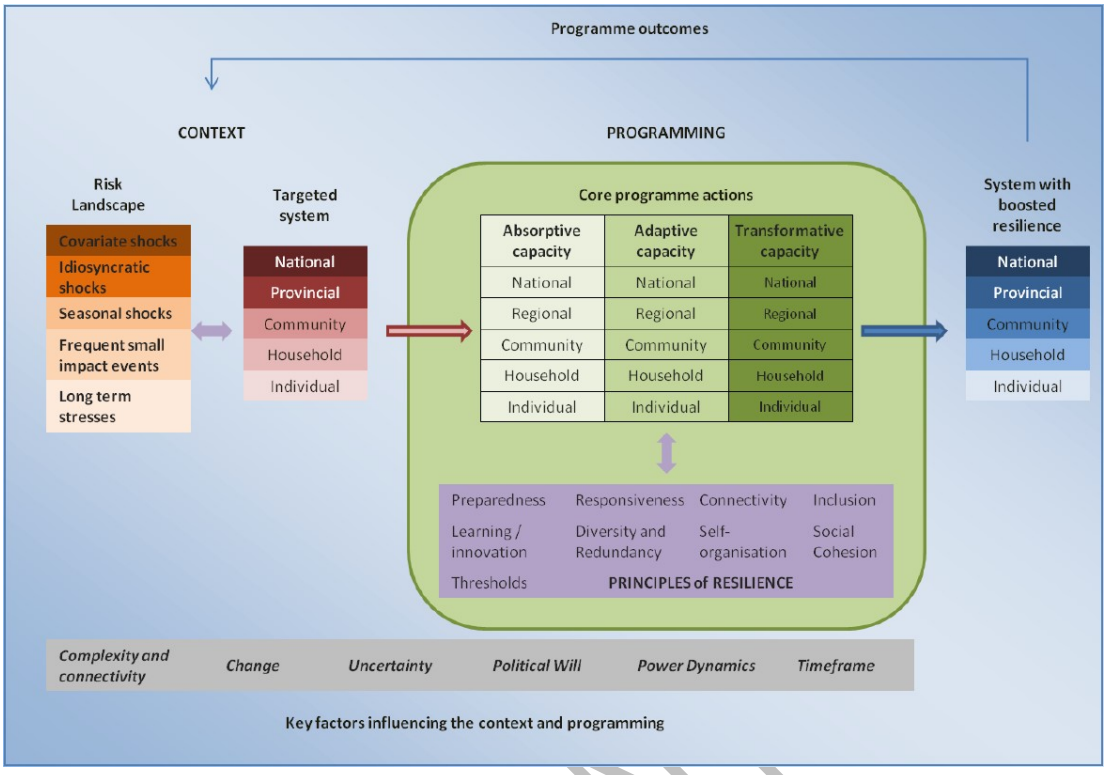

Figure 2: Conceptual framework for the resilience systems analysis. Source: OECD 2014

9.1.1 The Empirical Study:

In line with the RSA, the following steps have been designed to provide comparable information from case to case study region, about 'the system' (a region), its actors, its risks and its historical context, and future trends (Figure 3).

Figure 3: Dimensions of the scoping question for a *resilience systems analysis.* Source: OECD 2014

9.1.2 Understanding the System (the Region)

The overall wellbeing of a community, in this case a region's economy and society depends on a combination of different assets, comprising of six main capitals: the financial, human, natural, physical, political, and social capitals. These capitals may vary significantly in different regions and

context. Having an overview of these capitals is useful for studying resilience. This will help the development of an understanding of the strengths and weaknesses of the overall system, and thus where its vulnerabilities lay.

→ *Informants are asked to provide input on:*

- **What assets/capitals are essential for an economic and social resilience analysis, and which are present or lacking in their region.**

Table 4. Table-questionnaire designed for collecting existing and lacking assets/capitals that are relevant for the regional resilience analysis

Capital	Existing Capabilities/Assets	Lacking capabilities/Assets
Financial	e.g. Functioning/stable markets, emergency funds, savings, credit, banking facilities, etc…	
Human	e.g. vocational skills, attainment of education, knowledge, practices, etc…	
Natural	e.g. forest, agricultural land, livestock, minerals, water resources, etc..	
Physical	e.g. commodities, electricity, transport infrastructure, telecommunication infrastructures, productive land/capital, social infrastructure, etc…	
Political	e.g. functioning institutions, trust in institutions, participatory processes, political participation in community gatherings, community organisations influencing local power structures, etc..	
Social	e.g. community organisations and their capacity to get organised, informal/formal conflict management mechanisms, engaged citizens, minorities participation and integration, trust among actors, security, etc.	

Furthermore, regional resilience is not static, it strengthens or weakens over time depending on numerous variables, both internally and externally. Changing conditions may affect only parts of the system (e.g. one firm and its employees) or fundamentally change it (e.g. remove an entire economic activity), depending on the nature of and intensity of disturbances, and the characteristics of a region. Resilience depends on three "*capacities*" (Figure 4): the region's **1) absorptive capacity**, which is its ability to resist negative impacts of shocks; **2) adaptive capacity**, which is its ability to adapt to new conditions; and **3) transformative capacity**, which is its ability to change fundamental structures to no longer have any impacts (OECD 2014). The mere existence of capitals or assets does not guarantee their effective use in managing risks or enhancing wellbeing, yet their absence may tell us something about the regions' vulnerability (ODI, 2016). Therefore, these capacities may be related to what measures are in place, and how regional actors react to shocks and disturbances.

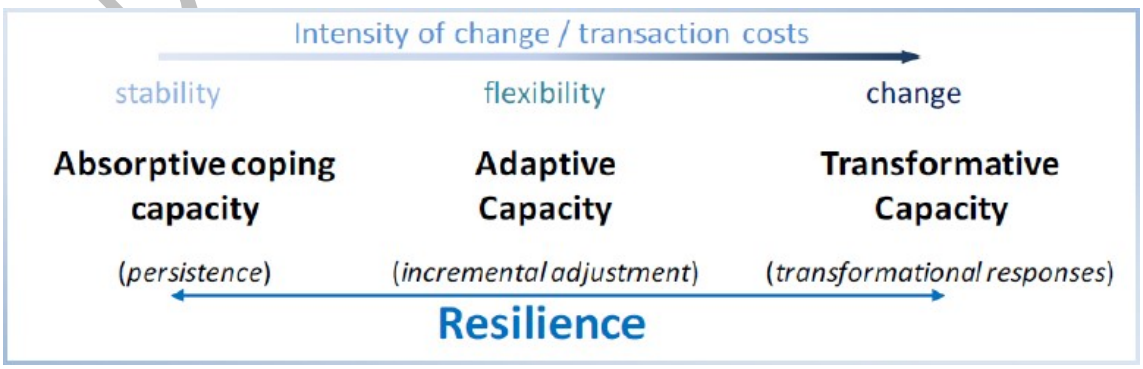

Figure 4. The relationship between absorptive, adaptive and transformative capacities for strengthening regional resilience

→ *Informants are asked to provide input on:*

- **What makes their region able to 1) resist to shocks, 2) adapt to new conditions and/or 3) fundamentally change to strengthen its resilience.**

Table 5. Table-questionnaire designed for collecting information about regions' 'capacities'

What makes a region able to resist, or prevent negative impacts of shocks and stress?	What makes a region able to adjust, or modify its characteristics and actions without major structural changes? (adapt to new conditions)	What makes a region able to change fundamental structures so that a shock will no longer have any impact?
e.g. Diversity of industrial base, contingency plans, savings, safety, reliable infrastructures, long-term vision, sustainable urban development, etc.	e.g. R&D, innovation profile, diverse human resources, inclusive society, active community, good leadership, etc.	e.g. Entrepreneurship, R&D, close collaboration among regional actors, citizen participation, financial resources available for structural change, smooth vertical coordination (national and regional level institutions)

Finally, to paint the full picture of a system's (a region) key components, it is necessary to identify the regional key actors and their role in impacting on regional resilience. Additionally, this will help determine what their respective risks are. The objective of this study is thus to interview 6 to 7 regional and national actors (per case study region). The following categories are used:

- Regional authorities
- City/Local authority
- Industry/Cluster/Private sector informant
- National expert
- Research expert
- Cross-border expert (if applicable)
- Other if appropriate

→ *All informants from all categories are asked to provide their view on the role of different actors and their potential risks.*

9.1.3 Identifying the risks

In line with the OECD guidelines, this project takes a multi-hazard approach to uncovering the risk landscape of the regions studied. This includes a combination of geo-political, economic and natural and environmental risks. Depending on the case study region, the analysis may consider a narrower set of risks.

In addition to risks, this research will attempt to identify what long-term trends or stressors are present in the regions, that may potentially have damaging effects. For example, this could include trends that are weakening the potential of the regional actors to react to shocks, and subsequently their ability to employ counter-measures. The cumulative effects of stressors may also turn into shocks

→ *Informants are asked to provide input on risks and stressors, both existing and expected. The table below lists a number of risks and stressors that may be shared with informants to stimulate a more detailed discussion in relation to the regions' contexts.*

Table 6. Table-questionnaire designed for collecting information about regions' risks and stressors

Risk Categories		Local/Regional	National	Global
Economic	Risks	▪ Advances in technology that threat industries	▪ Housing crisis	▪ Financial Crisis
	Stressors	▪ Lack of income generating activities ▪ Lack of infrastructures ▪ Unsustainable local debt ▪ insufficient funding ▪ Lack of key services ▪ Unemployment ▪ Unfavourable business environment ▪ Overdependency on few exports ▪ Overdependency on natural resources ▪ Inflexibility of the labour market	▪ Fiscal deficit ▪ Inflation ▪ Interest rate changes ▪ Insufficient of funding ▪ Unfavourable trade agreements ▪ Unsustainable external debt ▪ Macroeconomic instability ▪ Market instability	▪ Commodity price fluctuations ▪ Stock market fluctuations
Natural	Risks	▪ Floods ▪ Snow storms ▪ Volcanic activity	▪	▪
	Stressors	▪ Deforestation ▪ Erosion	▪	▪ Climate change
Political/ Geopolitical	Risks	▪	▪ New or changing policies ▪ Change of tax regimes	▪ Brexit; ▪ Souring relations EU-Russia
	Stressors	▪ Weak leadership ▪ Weak preparedness to respond to shocks/crises	▪ Weak institutions ▪ Poor governance ▪ Lack of accountability ▪ Weak preparedness to respond to shocks/crises ▪ Disruptive policies	▪ EU environmental regulations/policies
Social	Risks	▪	▪	▪
	Stressors	▪ Outmigration ▪ Aging population ▪ Mistrust among local actors ▪ Tensions among citizens	▪ Mistrust in authorities	▪ Rise of nationalism ▪ Refugee/immigration crisis

9.1.4 Time-span and historical context

Understanding the system requires a historical overview of the regional economy, its industries and institutions, and how they have behaved throughout the economic cycle, and how they coped/responded to previous shocks or threats. This includes taking into account what measures taken, and how other actors reacted to these situations.

→ *Informants are asked to elaborate on the historical development of the region, or simply to relate their answers to their specific historical context.*

9.1.5 Analytical approach

Following from the OECD guidelines, the analysis will draw on the information collected, to determine the profile created for the identified risks, including:

- Type of risk (idiosyncratic or covariate)
- Hazard type (natural, geopolitical, economic, etc.)
- Related stresses (long term trends, aggravating factors)
- Risk description (summary of what is known about the characteristics of this risk)
- Past shocks and scenarios (examples of past events and shocks, and their impacts)
- Possible impacts (description of possible impact on different system components derived from past impacts and scenario exercises)
- Main sources of information (reference to conducted interviews and reviewed documents)

This study will not measure the probability of risks occurring. To determine with absolute certainty the casual relationship between risk and circumstantial events is thus beyond this study. A study of the causation-correlation binary would require an extensive, comprehensive study of the risk landscape at large. However, this study aims to provide the field of research with a snap shot of the interlinkages and dominant factors that may cause shocks, as well sketching out appropriate counter-measures and determine whether there exists a 'Nordic Model' of resilience. The analysis will highlight some of these connections, between the specific risks with specific assets, capitals and regional capacities. By connecting specific risks with the presence or absence of certain capitals and capacities it may provide insights of how to actively strengthen resilience.

9.1.6 Evaluating preliminary results

Informants will have the chance to comment on the preliminary results (a draft report) as to strengthen the quality, and adjust any potential miscalculation (wrong assumptions).

10 Conclusions

The following preliminary conclusions, are based on desk work conducted in 2017. More complete conclusions and findings will emerge from field work that will proceed throughout 2018.

Resilience as a policy buzzword is increasingly used in the Nordic regional development context, while a shared understanding of what a 'resilient region' is in the Nordic or global context is still lacking. The research overview in this paper highlights that regional economic resilience is primarily about regions' readiness to cope with unexpected shocks or disturbances. Resilience is not only about the regions' capacity to reduce the impacts of recessionary events (such as a drop on employment and closure of firms), but it is also about their ability to adapt and adjust to new conditions and recover the economic performance. In order to anticipate and reduce the negative effects of shocks, it is essential that regional actors have a clear understanding of the potential disturbances (risks and stressors) and the region's inherent capacities, assets and capitals. Such understanding is essential to allow regional actors to build capacity to prevent shocks, and by being ready to react when shocks inevitably strike. Regional authorities need to be ready to provide the right response with policy and incentives to direct development towards the new trends, and measures to prevent unwanted developments. Likewise, industries and firms need innovative products, services and organisation that can respond to changing conditions.

Recent debate has increasingly emphasised the role of human agency, local communities and governance arrangements in making regions resilient. Issues such as social cohesion, public sector skills, cooperation and active citizens' networks have been identified in research as drivers for resilience. At the same time, characteristics that make resilience vary between regions, emphasising the complex place-based and highly context-dependent nature of resilience. Furthermore, shocks come in many forms, intensities and number, and depending on these, the impact varies significantly. The impact of disturbances is geographically uneven and dependent on the regions' unique context, development paths and adaptive capacity. Thus, a deep understanding of regional capacities, strengths and weaknesses, as well as the vulnerabilities or risks, is an essential first step towards preventing different kinds of disturbances and mitigating their impact.

Because of this place-based nature of resilience, it is difficult to make generalisations on what characterises a resilient region. In general, researchers have identified factors such as diversified economy, high level of innovation, active local communities, high level of cooperation between actors, and good and transparent governance as factors that may increase a region's resilience. More empirical research and the development of place-based indicators is needed in order to gain a better understanding of what capacities make the Nordic regions more resilient and how can disturbances be anticipated.

11 Next steps

The remainder of the research by the *Nordic thematic group for innovative and resilient regions 2017-2020,* will be devoted to conduct regional case studies from all Nordic countries.

For the selection criteria, regions in all the Nordic countries were considered. A diverse set of examples (described in chapter 7) were identified, in terms of their industrial base, historical experience in dealing with major shocks. These examples were presented to the Thematic Group in

2017 for discussion and foster a debate on the type of studies that could be conducted. As a result of this debate, a selection of Nordic cases were identified to be further studied in 2018. A decision was made to keep a broad focus on the types of risks and shocks Nordic regions are vulnerable to. The methodology presented in chapter 9 was developed accordingly and will be applied to the field work in 2018.

The empirical data collected will be analysed and combined with the findings of the literature and policy review to develop responses to the following questions:

- Which risks/shocks are the Nordic regions vulnerable to?
- What assets and capacities (e.g. skills, education, financial capital, institutions, trust, etc) are important for regional resilience?
- What is the role of institutions and other actors for both, anticipating and reacting to shocks?
- How to recognise strong and weak signals of changing regional resilience?

As a result, the project will be able to present lessons and good examples of well-functioning policy approaches to improve resilience. Including measures to respond to the different consequences of shocks, and to prepare for future shocks. The analysis will provide regional and national actors with new knowledge on how to design policy approaches that make regions more resilient. **The final report will be launched in late 2018 and will be followed by policy seminars in the Nordic countries.**

12. References

Bonß, W. 2016) 'The notion of Resilience: Trajectories and Social Science Perspectives'. In A. Mauer (Ed.) *New Perspectives on Resilience in Socio-Economic Spheres.* Springer VS. E-book. p. 9-24.

Brassett, J, Croft, S, & Vaughan-Williams, N 2013, 'Introduction: An agenda for resilience research in politics and international relations', *Politics*, 33, 4, p. 221-228

Bristow, G. & Healy, A. 2014, 'Regional Resilience: An Agency Perspective', *Regional Studies*, 48:5, p. 923-935.

Brooks, C., Vorley, T., & Williams, N. 2015, 'The role of civic leadership in fostering economic resilience in City Regions', *Policy Studies*, 37:1., 1-16

Christopherson, S, Michie, J, & Tyler, P 2010, 'Regional resilience: theoretical and empirical perspectives', *Cambridge Journal Of Regions, Economy & Society*, 3, 1, p. 3

Davies, S n.d., 'Regional resilience in the 2008-2010 downturn: comparative evidence from European countries', *Cambridge Journal of Regions Economy and Society*, 4, 3, pp. 369-382

Di Caro, P 2015, 'Recessions, recoveries and regional resilience: Evidence on Italy', *Cambridge Journal Of Regions, Economy And Society*, 8, 2, p. 273-291

EU Commission (2017). Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee, and the Committee of the Regions: Strengthening Innovation in Europe's Regions: Strategies for resilient, inclusive and sustainable growth

Glacier, E. L. (2003). Reinventing Boston: 1640-2003. Working Paper 10166, National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138

Gylfason, T., Holmström, B., et al. (2010) Nordics in Global Crisis: Vulnerability and Resilience. The Research Institute of the Finnish Economy (ETLA), Publisher: Taloustieto Oy, Helsinki, ISBN 978-951-628-495-1

Hamilton, L., Otterstad, O. and Ögmundardóttir, H. (2006). Rise and fall of the herring towns: impacts of climate and human teleconnections. In Climate Change and the Economics of the World's Fisheries. R. Hannesson, M. Barange, and S. Herrick Jr (eds.). Edward Elgar Publishing. http:// www.elgaronline.com/view/1845424476.00009.xml.

Holm, J. R. and Østergaard, C. R. (2015). Regional Employment Growth, Shocks and Regional Industrial Resilience: A Quantitative Analysis of the Danish ICT Sector. Regional Studies, volume 49, pages95-112, Routledge, doi:10.1080/00343404.2013.787159,

Hu, X, & Hassink, R (2015) 'Overcoming the Dualism between Adaptation and Adaptability in Regional Economic Resilience', Papers in Evolutionary Economic Geography

Huggins, R, & Thompson, P 2015, 'Local entrepreneurial resilience and culture: The role of social values in fostering economic recovery', *Cambridge Journal Of Regions, Economy And Society*, 8, 2, p. 313-330

Keck, M. & Saklapolrak, P. (2013) ' What is social resilience? Lessons learned and ways forward", *Erdekunde*, Vol 67, No. 1, 5-19.Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016) How Regions React to Recessions: Resilience and the Role of Economic Structure, Regional Studies, 50:4, 561-585, DOI: 10.1080/00343404.2015.1136410

Martin, R n.d., 'Regional economic resilience, hysteresis and recessionary shocks', *Journal Of Economic Geography*, 12, 1, pp. 1-32, Social Sciences

Martin, R. & Sunley, P. (2015) 'On the notion of regional economic resilience: conceptualization and explanation', *Journal of Economic Geography*, 15 , p. 1-42.

Mulligan, M., Steely, W., Rickards, L., & Fünfgeld, H. (2016) 'Keywords in planning: what do we mean by 'community resilience'?' *International Planning Studies* Vol 21 2016, Issue 4

Muštra, V, Šimundić, B, & Kuliš, Z (2016) 'Effects of smart specialization on regional economic resilience in EU',

First SMARTER Conference on Smart Specialisation and Territorial Development: Changing Patterns of Territorial Policy: Smart Specialisation & Innovation in Europe

OECD (2016) Resilient Cities – Preliminary Version. http://www.oecd.org/cfe/regional-policy/resilient-cities-report-preliminary-version.pdf

OECD (2014) *Guidelines for resilience systems analysis,* OECD Publishing

Pendall, R., Foster, K. A. & Cowell, M. (2010) Resilience and regions: building understanding of the metaphor,

Cambridge Journal of Regions, Economy and Society, 3, 59–70.

Sensier, M., Bristow, G., & Healy, A. (2016) Measuring Regional Economic Resilience across Europe: Operationalizing a complex concept, Spatial Economic Analysis, 11:2, 128-151, DOI: 10.1080/17421772.2016.1129435

Websites:

Byggðastofnun (August, 2017). Hagvöxtur landshluta 2008-2015. Retrieved 5. November 2017 from: https://www.byggdastofnun.is/static/files/Hagvoxtur/hagvoxtur_landshluta_2008-2015.pdf

References Examples:

Economics Online. Global Shocks. Website: http://economicsonline.co.uk/Global_economics/Global_shocks.html Access: 19/10/2017

Hagfræðistofnun Háskóla Íslands (December 2015). Hagvöxtur landshluta 2009-2013. Retrieved 2.November 2017 from: https://www.byggdastofnun.is/static/files/Skyrslur/hagvoxtur-landshluta-2009-2013.pdf

Kjarninn. (February, 2017). Róbert stefnir á að skapa 100 ný störf í líftækniiðnaði á Siglufirði. Retrieved 7. November 2017 from: https://kjarninn.is/frettir/2017-02-23-robert-stefnir-ad-skapa-100-ny-storf-i-liftaekniidnadi-siglufirdi/

Parliamentary resolution, no. 384 (11. May 2015). Efling atvinnu og samfélags á Suðurnesjum. Retrieved 2. November 2017 from: https://www.althingi.is/altext/raeda/144/rad20150511T194602.html

Kortelainen & Rannikko (2010). Lieksan elinkaari ja uusiutumiskyky. In Kotilainen & Eisto ("toim.") Luonnonvarayhdyskunnat ja muuttuva ympäristö – resilienssitutkimuksen näkökulmia Itä-Suomeen. Joensuu: Kopijyvä Oy.55-68. http://epublications.uef.fi/pub/urn_isbn_978-952-61-0210-8/urn_isbn_978-952-61-0210-8.pdf

Kotilainen, J., Eisto, I. & Vatanen, E. (2015). Uncovering Mechanisms for Resilience: Strategies to Counter Shrinkage in a Peripheral City in Finland, European Planning Studies, 23:1, 53-68, DOI: 10.1080/09654313.2013.820086

Vejle´s Resilience Strategy (2016) Retrieved from https://www.vejle.dk/media/4823/vejles_resilience_strategy_webquality_160316.pdf

100 Resilient Cities (n.d.) Retrieved from http://www.100resilientcities.org/cities/vejle/

Cooke, P. & Eriksson, A. (2012) Resilience, "white spaces" and cluster platforms as a response to globalization shocks. In Cooke, P., Parrilli, M. D. & Curbelo, J. L. (2012) Innovation, Global Challenge and Territorial Resilience. United Kingdom: Edward Elgar Publishing Limited./USA: Edward Elgar Publishing Inc.

Glaeser, E. L. (2005) Reinventing Boston: 1630–2003. Journal of Economic Geography 5 (2005) pp. 119–153. doi:10.1093/jnlecg/lbh058 http://www.csus.edu/indiv/c/chalmersk/econ180fa08/glaeserboston.pdf

Herala, J., Karhinen, S., Orenius, S., Simonen, J. & Svento, J. (2017) LUOVA TUHO – TIE ETEENPÄIN: Oulu äkillisen rakennemuutoksen alueena.

Teräs, J. (2017) What is hiding in the shadows? Resilience and industrial transformations in Oulu. Presentation at the American Association of Geographers (AAG).

Isaksen, A. & Trippl, M. (2014) New Path Development in the Periphery. Retrieved from http://wp.circle.lu.se/upload/CIRCLE/workingpapers/201431_Isaksen_Trippl.pdf

Bailey, D. & Berkeley, N. (2014) Regional Responses to Recession: The Role of the West Midlands Regional Taskforce, Regional Studies, 48:11, 1797-1812, DOI: 10.1080/00343404.2014.893056

Carlsson, E., Steen, M., Sand, R. & Nilsen, S. K. (2014) Resilient peripheral regions? The long-term effects of ten Norwegian restructuring programmes. Norwegian Journal of Geography. Volume 68, pp. 91-101. Retrieved from http://www.tandfonline.com/doi/citedby/10.1080/00291951.2014.894565?scroll=top&needAccess=true