UNIVERSITY OF TURKU

ABSTRACT

	Bachelor's thesis
X	Master's thesis
	Licentiate's thesis
	Doctoral dissertation

Subject	Future Studies	Date	10.01.2021
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Title	Integrating strategic foresight processes to improve regional planning: Four intuitive scenarios for Wales' regional futures		
Supervisor(s)	Senior Research Fellow. Maria Höyssä		

Abstract

With national foresight activities gaining widespread use as a means of analysing the long-term perspectives, the potential of sub-national or regional actors are equally a vital component within European modes of governance. It therefore becomes important to support regional foresight processes as regional actors take steps towards harnessing the potentials of activities for developing common visions of futures, for a more robust approach to decision making. Following the successes of the 2015 Futures Well-being Act, increased interest from the Welsh Government to improve planning and foresight activities acts as the case illustration for integrating foresight processes to improve regional planning. Therefore, this thesis acts as a practical guide for regional actors wishing to implement foresight processes drawing from Hiltunen's (2013) 'Building a future proof strategy model'. How to integrate strategic foresight processes to improve regional planning is examined through two questions. Firstly, how to produce high quality scenarios? Secondly, how to secure the use of regional scenarios?

The scenario framework draws upon Dator's (2009) four future archetypes and the theory of path creation, whilst the construction process is built around a threefold quality criteria proposed by Glenn (2003) and the Intuitive logic approach. The scenario construction process utilises a number of methods for the gathering, organizing and sense making of data. As principle examples of what high quality scenarios consist of, the quality criteria in combination with the Intuitive logic approach are applied to guide the research and construction processes. Ensuring the use of the scenarios employs the use of three elements 'transparency, credibility and legitimacy. The implementation of each element plays a vital role throughout the research process as a systematic evaluation frame to ensure the use of scenarios.

The goal of the study was to produce high quality scenarios and ensure their use by regional planners. The results of implementing the criteria for scenario construction demonstrate the need for further research to be conducted on scenario quality criteria. The three elements whilst being a derivative of evaluation frameworks proposed by Piirainen et al. (2012) and van der Steen & van der Duin (2012), contribute to the evaluation of exisiting and ongoing studies. Therefore, increasing the credibility of such future activities.

Key words	strategic foresight, regional foresight, scenario planning, trend analysis, regional planning, path creation, regional futures

UNIVERSITY OF TURKU
Turku School of Economics

INTEGRATING STRATEGIC FORESIGHT PROCESSES TO IMPROVE REGIONAL PLANNING

Four intuitive scenarios for Wales' regional futures

Master's Thesis
in Future Studies

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10.01.2021
Turku

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1 INTRODUCTION

The future is often viewed as a novelty, where goals seem distant and out of reach. Yet we often make choices in the present that shape our future. In everyday life long-term planning is measured by milestones. For example, we set aside money in savings accounts to afford future purchases. These precautions provide individuals with a safety net in case of unanticipated events. This ingrained behaviour has become common practice within business strategy and foresight activity, whilst regaining interest with governments worldwide.

When considering organisations, the capacity to prepare for the future is instrumental to potential success or failure. Through information seeking activities, future trends can be identified. The use of strategic foresight enables organisations to analyse trends and anticipate potential opportunities and threats to their operations. Organisations often associate planning with short-term futures, due to rapid transformations within their environment where there is no guarantee a trend will hold a perpetual presence in the future. Numerous examples of trends coming to an end exist, whilst a number of crises tend to reflect this. "This is often due to the over reliance surrounding the use of increasing trends and the expectation of it to continue as such in the future" (Hiltunen 2013, 53). There are of course trends that hold more significance when studying the future. These trends tend to have anchored their existence within the past and present, so any change or deviation is often slow to develop. However, the importance of these trends does not outweigh weak signals or emerging trends as they can equally be beneficial or harmful to operations. In order to conduct credible and legitimate strategic foresight activity, the individual or organisation must have deepened knowledge of the driving forces and continuously explore any changes within the environment in order to best understand and communicate the dynamic interactions between them.

The use of strategic foresight and other futures methods are also regaining interest and momentum within the political arena. It is by no means ground-breaking but more so a return to its humble roots. The fundamentals of future studies as proposed by Wendell Bell (2003), and its advisory role to decision and policy makers has often been overlooked and side-lined for short-term planning methods or decisions with immediate impact. Given the nature of politics this activity tends to serve individuals or parties best interests, in place of society as a whole. Governing bodies are the key actors within society whose main role is to analyse societal issues and produce policy in reflection. During this process

it is important to consider short-term impacts and how these may affect the journey to achieving the long-term goals. The use of strategic foresight methods allows for analysis of policy implementation by evaluating all strategies and direction; (van Rij 2010) by continually studying or scanning the environment.

1.1 The Welsh Case and Situation

The conduct of futures thinking has already taken root within the Welsh Government, which served as the ideal opportunity for my thesis to highlight the importance of implementing futures methods within decision-making on a regional level. The Welsh Government demonstrating further interest in implementing futures methods, offered the opportunity to design my thesis as a contribution to the development of foresight activities within the Welsh Government by expanding on their 2017 trend report (Welsh Government2018a) and producing a process for constructing scenarios.

In 2007 the Welsh Government commissioned a comparative analysis and evaluation report of the policy planning processes being operationalised by other regional governments (ECOTEC 2007). This acted as a stepping stone towards how it will approach future policy planning activities. The conclusion of the report lists the priorities of given recommendations by rank (importance) and timescale, both of which display a large number of medium to high priority recommendations (ECOTEC 2007, 86). The recommendations mainly focus on the communications of the policy planning process, but little attention is paid to long-term planning.

Interest towards long-term planning was first demonstrated by the introduction of the 2015 Futures Generation Act. Which set out to encourage public bodies to ‘think more about the long-term’, by making sustainable development a requirement to the organisation’s operations. The bodies listed in the Act are required to set and publish ‘Well-being objectives’ (Welsh Government 2015a), which states how their work contributes to the economic, social, environmental and cultural well-being of Wales (Welsh Government 2015a). The framework was constructed in partnership by the New Economic Foundation consulting group and the Futures Generation Commissioner (FGC), who’s role is to provide advice and reviews for public bodies with a long-term view. The framework was developed in order to act as guidance to the public bodies by integrating and aligning strategic considerations of the Well-being goals (see Figure 1.) when undertaking projects and operational change. The objectives are broken down into 7 categories (see Figure 1.)

and serve as an interconnected list of goals to be aimed for in order to bring together various bodies under a shared vision for the future of Wales.

Goal	Description of the goal
A prosperous Wales	An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
A healthier Wales	A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio economic background and circumstances).
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
A Wales of vibrant culture and thriving Welsh language	A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.
A globally responsible Wales	A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

Figure 1. Well-being of Future Generations (Wales) Act 2015. Well-being Goals (Welsh Government 2015a).

Following reported successes in operational changes within public bodies, in continuation of its work the Welsh Government explored six umbrella trends (Population, Health, Economy & Infrastructure, Climate change, Land use & Natural resources, Society and Culture) with the desire to hold stakeholder workshops and develop an online facility that can be used by public bodies to support long term planning. The initial trend report produced in 2017 (Welsh Government 2018a) briefly outlines the aforementioned trends by providing a surface explanation of each one on a global scale. However, I believe the report to be too broad, therefore within my thesis I will conduct a trend analysis focused on Wales. Building upon the trend analysis process for the Future Generation Commissioner's office and Welsh Government, is not only a means of exploring the future but

also to supplement decision making and communicating futures respectively. By doing so my thesis will supplement the long-term planning and regional foresight activities by providing an extension to the previous trend report (Welsh Government 2018a) which acts as an input to my scenarios.

In May of 2019 further steps towards improving planning systems in Wales were made in the form of amendments to the Town and Country Planning Act 1990 (Welsh Government 2018c), and the Planning (Wales) Act 2015 (Winter 2016, 38). Each of which grant additional planning powers to the Welsh Government through strategic planning panels and surveys. However, these must conform to the National Development Framework and strategic development plan (Welsh Government 2018c). Therefore, in order to produce a more robust process for exploring possible futures I was invited to contribute my thesis to the development and use of futures methods within the Welsh Assembly.

The enriched trend analysis will act as the starting point of my thesis, from which other strategic foresight methods are introduced. The analysis will be conducted in the form of an empirical analysis and used in order to produce scenarios for the communication of results. The scenarios and process will be available as a briefing report for stakeholders and those working within the Welsh Government to encourage and support ambitious long-term planning. In an academic context, it serves as an ideal foundation to build upon and contribute to the development and use of foresight activities in a regional context.

1.2 Previous Research

The preceding section touches upon the call for institutionalised foresight activities within the Welsh Government. Information regarding how to conduct foresight activities is readily available to actors and decision-makers within the futures toolkit (UK National Government 2014) produced by the UK National Government. But a lack of resources or experience of conducting these activities can appear unappealing or unachievable. Thus, the majority of foresight activities are conducted or commissioned on a national level and policy planning tends to take a top down perspective where regional actors are included in the process. However, in order to best actualise regional capacity and role within a national context it is best to begin from the ground up (Higdem 2014, 43). Additionally, regional issues are intrinsically different to those on a national level therefore foresight

conducted on a regional level has different outcomes (Dufva, Könnölä & Koivisto 2015, 102–103). Despite focusing on a regional context, it is important to highlight that regional planning practices differ from regional foresight activities. Long-term planning plays a role within regional planning, but these practices would best benefit from the incorporation of methods from future studies (Zali 2019). Therefore, it is important to consider the differences between disciplines before discussing how they can be used in synergy to enhance regional future capabilities.

1.2.1 Regional Planning

Historically regional planning can be defined as an integrated form of management for the allocation of economic and social resources (Johnson 2001, Gavigan & Scapolo 2001). Often aimed at analysing the economic potential of developing countries (Sdasuk 1976, 193–201), its utilization within developed countries places emphasis on "allocation of resources with respect to fixed objectives" (Gavigan & Scapolo 2011, 3). Regardless of its economic geographical location, one of the core principles of regional planning is its bottom up approach that highlights regional disparity (Gavigan and Scapolo 2011). Similar to the plurality of foresight, regional planning has many branches which explore different aspects of regional planning such as sub-national, urban and open regions. Through these categories further lenses are applied to explore aspects of spatial distribution of social and economic behaviour (Huxley 2009). More recently sustainability has become a dominant approach amongst decision-makers and academics alike when analysing a regions capacity. However, Johnson (2001, 12925–12930) argues that despite their intentions such projects are often constrained due to the dominance of short-term planning and lack of consensus of future visions. Johnson (2001) concludes that there is a growing need to improve regional planning practices through further integration of resource management. Such claims are by no means current concepts as Higdem (2014) points out that collaborative work with stakeholders has been at the core of regional planning practices. What is needed however, is the adaptation of practices to place stakeholders and decision-makers within the process to improve knowledge creation and futures thinking (Uotila & Melkas 2007, Higdem 2014, Dufva, Könnölä & Koivisto 2015). Thus, highlighting the need to incorporate methods and practices from future studies to improve regional planning capabilities.

1.2.2 Regional Foresight

In a corporate environment, foresight activities allow decision-makers to better anticipate possible environmental uncertainties and act accordingly. At present a large amount of research and literature exists surrounding corporate foresight and management practices. However, as previously stated (Bell 2003) the advisory role of foresight activities is not only limited to the corporate environment as social action creates futures. Fuller and Loogma (2009, 14) expand on the role of social action or the constructionist perspective theory of foresight methodologies writing "foresight activities is both a social construction and a mechanism for social construction". Thus, foresight methodology is best defined as a systematic, participatory, intelligence gathering process aimed at advocating action by decision makers (Koschatzky 2005, 622–629). Foresight theory alone may not captivate decision-makers to stimulate future change as practical implementation is needed. However, it does highlight the importance understanding changes within the social sphere and how decision-makers need to consider the change when considering long-term plans. Such examples of social changes range from population changes to social inequalities, all of which greatly impact regional planning and development. These theories encompass foresight activities as a whole and apply to regional foresight and therefore should actively be considered in its processes. Higdem (2014, 42) defines what constitutes as regional foresight by adding that in a sense it is "foresight methods applied to a territorial defined context". These territorial regions are often seen as economic regions or public authorities in a position of social responsibility (Hanssen, Nergaard, Pierre & Skaalholdt 2011, 39–41).

Higdem (2014, 42) draws attention to the issues that 'haphazard connections' between national foresight activities and the actual decision-making process. By concluding foresight activities conducted on a regional level have a different outcome than those on a National level. National foresight activities tend to focus on solving global challenges through use of regional capacities. This stems from how national foresight activities view regions as sites of economic development contribution who adhere to a national strategic framework. As part of the United Kingdom, the Welsh Government hold autonomy over devolved powers that would benefit from regional foresight activity. By doing so regional actors and decision-makers are able to focus "on creating system structures favourable to innovation and analysing the dynamics and functioning of the system" (Dufva, Könnölä & Koivisto 2015, 104). The multi-layer approach serves as an interesting concept for

regional foresight and understanding the relations between actors. The approach proposed by Dufva, Könnölä & Koivisto (2015, 103) discuss the importance of exploring the broad perspective or the landscape layer within regional foresight. The proposed landscape layer places more emphasis on external and global developments, making it best suited to regional decision-makers as it can enhance their foresight capabilities and become more proactive through the production of knowledge (Dufva, Könnölä & Koivisto 2015, 103). This landscape layer becomes increasingly important within this thesis as it allows for decision-makers to understand global development and Wales' position within the system. By conducting foresight processes on the landscape layer, avoids the "danger that results are not absorbed into the regional-strategy making process" (Uotila & Melkas 2007, 1119) through the creation of networks.

As briefly discussed regional foresight tends to focus on regional capacity in a national perspective. In these cases, more emphasis is placed on the creation of innovation systems and policies to improve multi-actor networks (Uotila & Melkas 2007, Dufva, Könnölä & Koivisto 2015). As a subcategory of foresight, technology foresight explores the potential external developments to support regional innovation creation. Of course, technology foresight and policies that favour innovation can act as a key driver for the competitiveness of a region. However, as previously discussed a broader perspective is required in regional foresight that considers a regions capacity not only in terms of innovation but also integrated resource management (Johnson 2001). Through conducting foresight on a regional level that draws from elements of regional planning. It is possible to improve the effectiveness of both disciplines by closing the gap of short-term over long-term decision-making through imaginative planning and a shared consensus of future visions (Johnson 2001). As scenarios have become increasingly recognisable tool for envisioning and establishing knowledge of the future, they will be used to present regional decision-makers and stakeholders with alternative futures from which strategic discussions can be elicit (Johnson 2001).

Expanding on what constitutes as regional foresight, the definition of regional is inconsistently used in existing research. The definition varies from political autonomies (city/local governments) to regions of Europe. Regional foresight activities in these dimensions tend to focus on a key theme or issue related to the area (Gavigan & Scapolo, 2011, 3). Throughout this thesis I will define the term regional as a governing body which has devolved power from the National Government, this is to avoid any ambiguity with regards to the study. As the research is being conducted for the Welsh Government it will

mainly focus on constructing the landscape layer as proposed by Dufva, Könnölä & Koivisto (2015, 103). However, this does not limit the possibility of the study but more so creates a platform that transforms strategic conversations and tacit knowledge into group knowledge (Uotila & Ahlqvist 2008, Hanssen, Johnstad, Klausen & Erling 2009).

1.2.3 Purpose and Aim

By introducing and integrating foresight processes within regional planning, this thesis aims to address the issues raised within the previous sections. When considering the integration of foresight processes within regional planning, it is important to consider that stakeholder involvement is not only derivative of regional planning. As previous research in the field of regional foresight is not without its limitations. The purpose and aim of this thesis is not to provide one answer to solve issues from both disciplines. But more so to demonstrate how foresight conducted in a broad regional context is able to improve planning capabilities through the production and communication of scenarios.

The use of scenarios throughout foresight activities is often to provide decision-makers with alternative futures that different courses of action can be taken (Johansen 2018, 116). However, presenting decision-makers with a set of scenarios with the idea of setting course for desirable futures whilst mitigating the impact of the undesirables is not the sole purpose of its implementation. As countless studies highlight the spill over effect that they have on knowledge creation and improving futures thinking of those involved in the process (Uotila & Melkas 2007, Higdem 2014, Dufva, Könnölä & Koivisto 2015). This secondary notion of knowledge creation becomes equally important as the scenarios themselves. Therefore, when bridging the gap between foresight processes and regional planning it is important to consider guiding principles for scenario creation. The use of principles is used throughout future studies in both the design and evaluation of a study to improve the quality of research through credibility and legitimacy (Piirainen et al. 2012, van der Steen & van der Duin 2012, Johansen 2018). These elements of evaluation stem from the challenges presented by foresight activities, where by subsequent studies aim to build and improve on the limitations of the previous one. However, as previously discussed when considering the elements, it should be noted that they should be utilised throughout the process so that it can be communicated among stakeholders and actors effectively.

Therefore, in the subsequent chapter I will address the challenges related to integrating foresight activities to regional planning through scenario creation criteria and the

framework for evaluating foresight studies (Glenn 2003, Piirainen et al. 2012). The incorporation of both act as implementation practices for those who wish to conduct foresight activities or regional scenarios.

1.3 Research Questions and Thesis Structure

The overall aim of this thesis is to contribute and improve regional strategic foresight activities using the Welsh Government as a case. The process used throughout can be used as a model and applied to other countries and regional governments. As previously discussed, research surrounding regional foresight is often aimed at one issue or conducted on a national level where information is fed down and regional involvement is limited within the process (Gavigan and Scapolo 2001, 3; Higdem 2014, 42). In the case of the Welsh Government each area of policy planning is delegated to ministers, each of which report their policy recommendations and strategy. This creates the issue of dissected strategies that focus solely on the minister's area of interest, where conflicting and joint interests may be overlooked. The process of cohesion in this case remains key to developing a process that includes aspects from all actors and stakeholders to produce more robust strategies.

In order for regional foresight activities to become more effective, there is a need to improve the communication and inclusivity of its processes to involve key actors and decision makers. This not only increases the chances of foresight activities being implemented but also encourages futures orientated thinking. Based on the preceding discussion, the main research aim can be achieved by formulating and answering the following research question through two sub-questions:

How to integrate strategic foresight processes to improve regional planning?

1. How to make high quality regional scenarios for Wales?
2. How to secure the use of regional scenarios?

In order to answer these questions, this thesis will first establish a process for constructing regional scenarios drawing elements from organisational foresight. For this Hiltunen's (2013, 149) 'Building a future proof strategy' process will be used whilst incorporating the criteria discussed in section 3.1.1. The purpose of this is twofold. Firstly, despite being aimed at corporate organisations the uncomplicated structure of Hiltunen's (2013) model

can also be applied within a regional governance context. Secondly, a scenario criteria act as active reminders of what *high quality scenarios* should consist and how to ensure their use. As discussed in the proceeding sections, the quality of scenarios also relies on quality of input and methods chosen to do so. Thus, the need for the combined approach of process and criteria.

The thesis utilises the 8-step process adapted from Huss and Honton's (1987) for intuitive scenario construction process. This will begin by further analysing the trends previously discussed which are input into a futures table. From this table pathways(futures) as highlighted by Gáspár (2011) and Martin (2010) are constructed through 'structural relationships' (Johansen 2018, 118). As this activity is often conducted in cooperation with decision-makers and stakeholders the scenarios within this thesis have been generated by the author using a combination of *'self-transcending knowledge'* (Uotila & Melkas 2007, 1120) and case specific knowledge.

2 REGIONAL THEORETICAL PERSPECTIVE

As a multidisciplinary field, future studies benefit from the theoretical perspectives that is offered by different disciplines. As the nature of futures work is inherently political and economic (Bell 2003, Dator 2019), this thesis will incorporate the concepts of path creation and path dependency (Martin 2010, Gáspár 2011). Utilising the works of Martin and Gáspár, within this thesis I will first explore how path creation in contrast to path dependency is inherent to foresight processes before discussing how it will be implemented as a theory within scenario creation. Before examining each concept, it is important to first consider the difference of definitions of the term paths within the field of future studies and other disciplines. As the future is not tangible, paths are often viewed as desired visions of the future that are used to guide organisations (Gáspár 2011, 99). Similarly, in other disciplines path concepts are often used as predictive tool for understanding the possible directions or breaking free from an undesirable one. Traditionally modes of governance often follow the concept of path dependency (Martin 2010, 17) where policy is often reactive to changes. Particular historical Welsh case examples exist in the regional context as the transition between economies, from industrial to service. However, there is now a need for the development that considers a more balanced and sustainable option.

Therefore, within this section I will explore the relations of the path concepts more notably path creation to future studies. Fuller and Loogma's social constructionist perspective is drawn upon to clarify the "way in knowledge of the future is produced and used" (Fuller & Loogma 2009, 1) for the creation of futures. Being utilised in multiple disciplines, both concepts are by no means isolated to their use within the fields of social sciences or economic geography as their ideas are relatively applicable to future studies. Through contextualising these concepts from a regional perspective this thesis will contribute to the debate of path creation over path dependency. Particularly contrasting Gáspár's (2011, 106) notion of their combined utilisation within futures studies.

2.1 Path Creation vs Path Dependency

Both path dependency and path creation are frequently used concepts in the fields of social sciences and economic geography (Martin 2010, Gáspár 2011). Both disciplines theorise the path models as concepts for analysing regional development or the lack thereof.

More recently path creation has gained more traction for its potential for changing systems through the analysis and recombination of resources and components for the transformation of a path (Martin 2010, 14). Path creation as a concept, preferably lends itself to its utilisation within future studies for exploring how we shape our future (Maisini 1993, 32). The general definition of path dependency can be conceptualised as, historic or current events will affect how events transpire in the future. This is often determined by institutional patterns and properties (Gáspár 2011). Martin (2010) regards path dependency as the historically dominant mode for regional planning. Originating from the social sciences, Martin (2010, 1) takes a staunch approach against the use of path dependency models as he claims they "stress continuity rather than change". From a futures perspective Gáspár (2011, 93) advocates for a balance between the two, expressing them as the "two pillars of strategic activity". When considering the contrasting nature of the concepts, it raises the interesting question of 'can they be used in balance' as Gáspár (2011, 94) claims or is one more valuable than the other. With this in mind it therefore becomes important to first consider the differences between both concepts and their relation to future studies.

In a bid to "rethink" the concept Martin (2010, 3) draws from the sociological approach that considers change alongside continuity. This message is somewhat synonymous with Gáspár's (2011) proposal of balancing both path concepts, as a discipline one of the core principles of future studies is that events of the past are tied to the future (Slaughter 1997). This is often the frame used when studying the future directions of mega-trends, with particular emphasis being placed on the use of historical data. With this in mind path dependency in its raw form is severely constrained by its "history-dependant equilibrium" (Martin 2010, 9). However, futures studies is not bound by past events and a number of possible futures is a derivative outcome, as systems face change both incrementally and[or] drastically. Therefore, it is possible that path dependency can be used for the formation of dynamic models (Martin 2010, 8) or more justifiably proposed by Gáspár (2011, 94), the "dynamic linking" of path dependency and path creation. In contrast to this Garud, Kumaraswamy & Karnøe (2010, 761) claim the linking of both concepts is relative to the needs and understanding of actors for the creation of paths. For those who implement path dependency, Garud et al. (2010, 760) highlight how involved actors such as corporate management often utilise the concept to break free from vicious cycles. Whereas path creation is more of a performative perspective that cultivates management and stakeholders to shape processes and explore emergent phenomena. With this

definition of path creation, it becomes apparent that as a perspective for scenario creation it lends itself well as it allows actors to "emplot themselves into emerging narratives" (Garud et al. 2010, 769). Therefore, path creation suits the ideals of socially constructed futures as it benefits from the cultivation of futures thinking.

Martin (2010) further criticises path dependency for its limitations to development through the notion of lock-in. Expanding on this Martin (2010, 3) defines the notion of lock-in as a combination of historical patterns and the emergence of "self-reinforcing effects" that guides the direction of regional development into a singular path. As futures are not "strictly fixed" (Gáspár 2011, 104) the lock-in concept tied to path dependency, can be problematic within the field as Martin (2010) claims it lacks agency for change. Within the field of future studies lock-in carries negative connotations that are linked to the creation of single desirable futures. The notion of lock-in or narrowing one's perspective can be harmful as it fails to consider changes both desirable and undesirable, and how they can affect decision making. Although, in place of disregarding the concept altogether it is best to approach it with a 'what if' attitude to understand its connotated issues. From one perspective Gáspár (2011, 104) discusses how lock-in is easily applied when concerning futures work as people can find it "difficult to accept that the usual rhythm and pattern of processes are suddenly broken". This claim becomes justifiable if you consider changes to be made instantly. However, more often than not change within the field is not instantaneous as changes can cause a shock to operations within systems. Additionally, Garud et al. (2010, 765–766) highlight how lock-in can be used a lens for examining how undesirable cycles can be broken or ensuring that a steady course is maintained. However, as discussed in subsequent chapters the act of conducting futures work is not only to orchestrate change but to examine what change can bring and the dissemination of knowledge amongst actors (Uotila & Melkas 2007, Higdem 2014, Dufva, Könnölä & Koivisto 2015). From a futures perspective the notion of path dependency and lock-in share similarities with the surprise free or business as usual scenario (Glenn 2009, 1–2) as it often provides decision-makers with a comfortable platform to plan strategic operations. This is often demonstrated by a lack of willingness to change or a delayed reaction to events. As discussed in previous chapters, the challenges related to regional planning and the integration of foresight activities is to move from short term planning and overcome the barriers of path dependency (MacKinnon, Dawley, Pike & Cumbers 2019, 116). Therefore, the role of future studies in regional planning is not only tied to developing

pathways for change or shared visions. But to encourage agency amongst regional economic and social actors, or more eloquently expressed by Fuller and Loogma (2009, 12) "action produces futures and also knowledge about futures, knowledge about futures produces action".

From an economic geography perspective, Martin (2010, 19) advocates for a change to path dependency models for their failure to consider the "creation and renewal of paths". Despite the discussion of the need for the development of alternative paths, he does not explicitly refer to the use of path creation in place of path dependency. Gáspár (2011, 99) proposes that both concepts should be viewed as '*pillars of strategic activity*'. However, within the field of future studies path creation may seem the more attractive of the two alternatives for its emphasis on creation and its similar perspective or mindset it offers. This becomes somewhat true when examining the possible directions that transpire when producing futures that concern dynamic systems based on historic data and events (Fuller & Loogma 2009, Gáspár 2011). By this definition, path creation is not too dissimilar to path dependency as both are tied to the past and present. However, in the case of the path creation the future is not narrowed by decisions made in the past but also the attitudes and actions of actors towards the future that are driven by "hopes, fears and expectations" (Gáspár 2011, 95). From a strategic foresight perspective, the exploration of dynamic spaces requires a more empirical approach for the consideration of quality criteria when producing scenarios. Thus, the path creation concept is best utilised for exploring alternative futures, whereby "decreasing the number of locked-in processes opens up the power of decision making in the long run" (Gáspár 2011, 98). Such processes in the Welsh regional context exist as continued use of coal power plants or lack of contingencies to support economic shifts. By moving away from such locked-in processes power is generated through action and knowledge creation activities (Fuller & Loogma 2009). Both of which as Gáspár (2011, 99) claims "mutually strengthen each other this results in room for manoeuvre" when conducting foresight activities and creating scenarios.

Path dependency and path creation are often discussed as two sides of a coin, as both of which can be used to highlight the dynamics that are implicit within strategic foresight and futures activities (Gáspár 2011). This becomes particularly important when dealing with decisions being made that not only affect economic systems, but also include other aspects such as sociological systems. Through linking both concepts, it is possible to reveal dynamic interactions to best understand social development as "foresight is both

a social construction and a mechanism for social construction" (Fuller & Loogma 2009, 14). However, if we are to focus on improving regional planning activities through the integration of foresight processes it is best to apply the notion of path creation for it allows an empirical assessment to cultivate alternative paths and narratives (Garud et al. 2010, MacKinnon, Dawley, Pike & Cumbers 2019). Therefore, by contextualising the notion of path creation in a futures perspective we are able to implement it as an element within the scenario creation process.

2.2 Path Creation for Scenario Creation

Path creation as a concept alone is difficult to define as a theoretical frame for the construction of scenarios for its number of alternative paths. Similarly, in future studies it has become common place that there are a number of alternative futures (Dator 2009, Heinonen, Kuusi & Salminen 2018). Therefore, for path creation to be operationalised as a concept this project will incorporate Dator's (2009) alternative futures to construct a frame for scenario creation.

The process for scenario creation within this project relies on the use of multiple methods for the gathering, organizing and sense making of data. As discussed in section 3.1.2, the criteria used for quality and ensuring the use of scenarios act as practical components for the patterning of actors and artefacts that are characterised by constant change (Garud et al. 2010, 768–770). Whereas, the theoretical foundations that regional path creation offers in the form of alternative paths needs to be translated and contextualised for use in future studies. This is uncomplicated when the notion behind path creation is similar to that of foresight activities where envisioning the future mobilises present actions (Garud et al. 2010, Martin 2010, Gáspár 2011, MacKinnon et al. 2019). As highlighted by previous research, the purpose and aim of strategic foresight activities is to support the development of organisational change by utilising several methods. In the case of this project scenarios are utilised for displaying the results gathered throughout the process. However, one of the issues shared between path creation and futures remains to be the number of possible alternative paths or futures. Therefore, through the analysis of trends Dator's (2009) alternative futures act as a concept for focusing the number of alternative paths as communicative "generic" images of the future (Dator 2009, 7). As can be seen below the four alternative futures are depicted by classic growth curves which can be used

to classify key elements from the trend analysis process into reoccurring groups depending on the effects of change on the scenarios.

Dator's four futures from Advancing Futures publication as defined by Smart, (2017)

1. Continuation (continued growth can be gradual or rapid growth)
2. Limits and Discipline (saturation point of the S-curve)
3. Decline and Collapse (decline of growth)
4. Transformation (super-exponential growth)

The four alterative futures are often constructed by conducting participatory activities within an organisation with the aim of moving towards the preferred future. They are also used as a stand-alone exercise in consulting activities with the intention of highlighting the preferred future for the organisation (Dator 2009). The possibility of examining four futures of the same category exists. However, in the case of this thesis the alternative futures act as a means of demonstrating the process of limiting the endless number of futures(paths) through tangible and causal links. Once completed, the results of this project require stakeholder input for the creation of new paths by evaluating the scenarios and reproducing them. By doing so improves the preparedness and futures consciousness of those involved (Garnett, Lickorish, Rocks, Prpich, Rathe & Pollard 2016). The four perspectives based on S-curves are used in combination with a futures table to provide a frame to construct scenarios. MacKinnon et al. (2019, 130) discuss how path creation acts as an "empirically grounded basis" for long-term planning, in this context it fits almost seamlessly with the alternative futures proposed by Dator (2009). Therefore, once the initial research has been completed. Through the combined application of both Dator's futures and path creation stakeholders are able to make causal connections that act as pathways through dynamic problem spaces, or in this case the futures table (Johansen 2018). Thus, acting as a theory for modelling and analysing the "structural relationships" between parameters within the futures table for scenario creation (Johansen 2018, 118).

3 METHODOLOGY AND RESEARCH PROCESS

3.1.1 Research Approach

In order to produce good scenarios an approachable and transparent process should be utilised. Drawing from strategic foresight methods the proposed process is based on the four phases of building a future-proof strategy by Hiltunen (2013, 149). As discussed in the preceding chapter transparency is not only obtained through evaluation of one's work. It is also an element that should be considered proactively during the design and execution of a study. By doing so this allows for a replicable research process. The model was selected for its clear step-by-step process for the construction of scenarios which allows for transparent practices that contributes to generating credibility (Piirainen et al. 2012, 472). The four phases depicted in the model, their relation to the study and how they are implemented within this thesis is expanded on in Figure 2.

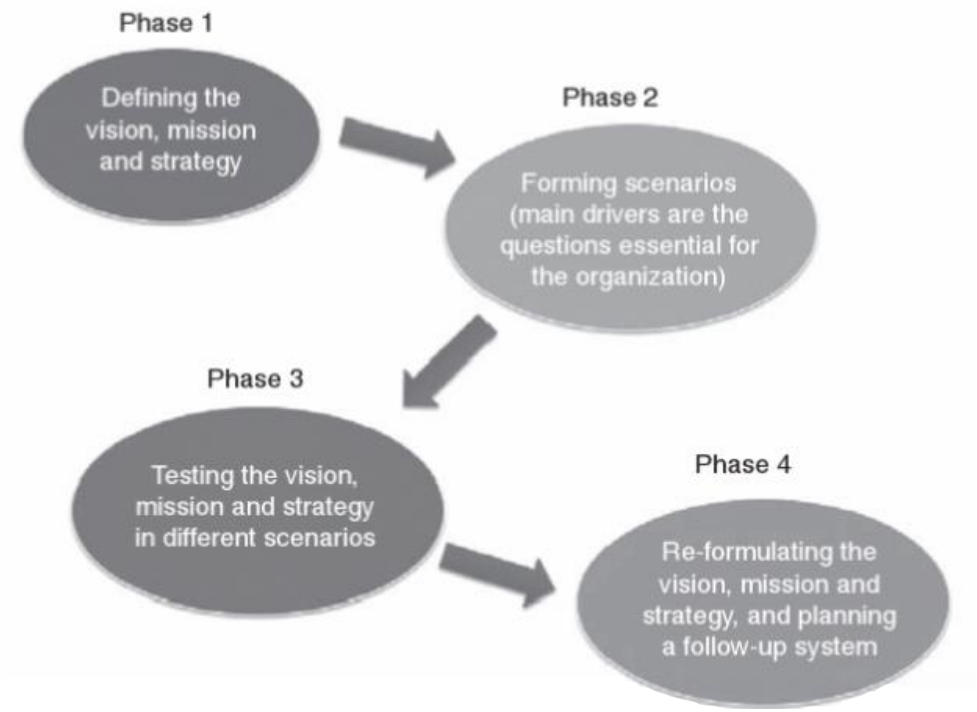

Figure 2. Building a Future Proof Strategy (Hiltunen 2013, 149).

Phase 1 within this thesis the vision is to produce four exploratory scenarios for Wales for 2030 based on assumptions of how trends may influence the future. As discussed within the introduction, the current work by the Welsh Government remains broad. Therefore, the additional mission of this thesis is to focus on the future position of Wales and not the global situation. Within the political arena, the purpose of policy is to change the

future. Therefore, within this thesis the scenarios are used to illustrate actions that require attention.

Phase 2 utilises three methods in order to produce high quality scenarios. Trend analysis, the first of which acts as the data gathering process where the selected trend areas will be examined utilising a variety of sources (see section 3.2.1). In order to compile the gathered data for scenario creation a futures table will be used to highlight key findings. Finally, the intuitive logics variant of scenario creation was chosen for its adaptability and its relation to credibility (Huss & Honton 1987; Amer et al. 2013).

Phase 3 involves the testing of the mission/vision (i.e. the values and purpose) and strategy under the conditions of the different scenarios - this is done according to the table proposed by Hiltunen (2013). The table acts as a form of wind tunnelling where each scenario can be tested by calling attention to the functional and weak elements, before highlighting forewarning signals and recommendations of what to do if the future takes this course. Other methods for analysis of scenarios exist, such as SWOT analysis (Hines & Bishop 2007, 184). However, Hiltunen offers a more condensed summary of scenarios within the strategy testing table. Additionally, as the scenarios will be handed to the Welsh Government the table allows the reader to quickly become familiar with the scenarios and test them against different policies or long-term plans.

Phase 4 includes the creation of an organisational follow-up system. Presently the National Government produced Futures Toolkit (UK National Government 2014, 4–5) recommend the usage of the policy planning cycle. However, as my thesis is not directly involved in the creation and revision of policy the Observation, Orientation, Decision and Action model has been adapted as a substitute. The follow-up system has been developed from the OODA loop as proposed by O'brien and Meadows (2013, 652–653). But as futures work is not linear it has been adapted to include a reorientation phase to account for additional input to scenarios by stakeholders and decision-makers. Additionally, the follow up system discussed in section 7.2 acts as guidance for further replications of the study.

3.1.2 Scenario Quality Criteria

Producing high quality scenarios presents itself as a complex question that is difficult to provide a single solution. Therefore, it is best to consider past literature that provides descriptions for the fundamentals of scenarios and the issues related to producing them.

Scenarios have been developed and implemented by both the public and private sectors for a variety of different purposes. Depending on the issue, topic or industry at hand the means and methods in which scenarios are produced can also vary in order to best reflect the end user. The fundamentals of scenarios are largely based on the economic, social, political, and in more recent developments environmental factors. However, further factors have been included and input when implementing a PESTEC table as frame for scenario development (Johansen 2018, 117–118).

Scenarios act as a tool that enable those who implement them to foster a more futures conscious mindset, or as described by Schwartz (1991, 200) "rehearsing the future, running through simulated events as if you're already living them" in order to understand the requirements of their own analysis. In order to achieve reliable and the most from one's scenario work it is important to consider how the analysis is conducted. It should be kept in mind that scenarios are not projections created by changing the inputs to a model, as this in turn would change the output model. Scenarios are more so, a plausible explanation of possible events and how they can transpire from the present, essentially a description of trends as they could evolve or the impact of weak signals or sudden event.

The preceding statement, in a way is reinforced by Herman Kahn's definition of a scenario, 'where no scenario is probable' as the chances of it being fulfilled are little (Glenn 2009, 1). As a result, scenarios are often criticised or rejected by planners on this basis, but once again it is important to stress the significance of how the scenario is presented and how many of them there are, especially if they are used to explore a broad subject. It becomes evident that the scenario planning method is ambiguous depending on its user and audience. Jerome Glenn (2003) writing for the Millennium Project provides an example of what constitutes as 'good' scenarios. They are by no means complicated and act as an adequate foundation for the development of scenarios within this thesis. The guidelines are as follows (Glenn 2003, 3):

1) Plausible (a rational route from here to there that make causal processes and decisions explicit)

2) Internally consistent (alternative scenarios should address similar issues so that they can be compared)

3) Sufficiently interesting and exciting to make the future real enough to elicit strategic responses

The plausibility factor plays an extended role within the scenario creation criteria. Garnett et al, (2016) consider an alternative criterion for scenario creation, where plausibility is not included. The plausibility factor is used within this project to accommodate possible futures, by including the possibility of wildcards and pre-determined elements such as Brexit. The impact/importance factor is evaluated similarly to the scenario quality criteria and applied when evaluating scenarios. However, as it is difficult to measure the impact of the scenarios as this activity is often completed by decision-makers. Therefore, the impact factor will be used to measure the possible impacts of the trend within scenarios when constructing the futures table. Preferable futures are left from the scenario criteria to avoid goal setting towards a single scenario.

It is also clear from the reviewed literature that there is more than one approach to the development and use of scenarios. Therefore, a quality criterion is required to improve the legitimacy and impact of scenarios. The criteria act as a frame on which scenarios should be constructed. Criteria such as this is often used as a means of evaluation and not for scenario design (Piirainen et al. 2012). Of course, in reflection of a study it becomes easier to highlight the issues encountered and match qualities to criteria. However, by selecting a sound criteria the development of scenarios has a path to follow whilst the process remains flexible (Johansen 2018). Both of which are important elements used in conjunction that allow those using them to manoeuvre dynamic problem spaces. Expanding on the third criterion proposed by Glenn (2003), Hanssen, Johnstad, Klausen & Erling (2009, 38–57) add that the production of scenarios should avoid becoming a "conventional consultant report about the economic prognoses of the region" where a balance between visions and reality is needed. Despite taking a flexible approach, upon reflection Higdem (2014, 48) discusses the issues encountered when presenting scenarios for stakeholder input. Tensions arose during workshops that were held as a means of gathering knowledge to produce alternative scenarios. As participants did not understand the intention of the workshops they viewed the presented scenarios as a finished product or prediction of the future. Such issues can arise when the there is a lack of involvement within the scenario process or the poor communication thereof. If such issues arise then it is important to evaluate the quality of input and ensure that it is consistent with Glenn's (2003) criteria. As more often than not the end users are not directly involved in the process and are required "to develop -rapidly- a good level of familiarity with the scenarios" (O'brien & Meadows 2013, 651). Therefore, by utilizing data gathered from sources that

are familiar to stakeholders and decision-makers it becomes easier to communicate. Additionally, by utilising and being transparent of the criteria it allows for the end users to understand the mentality and role of futures research.

3.1.3 Criteria for Ensuring the Use of Scenarios

The preceding discussion introduced the quality criteria for producing scenarios, it is equally important to consider how the quality of the written scenario does not equate to their ensured use. Despite being a crucial aspect in the process, the quality of input and output can only be measured by how the scenarios are implemented. The importance of communicating scenarios was briefly touched upon in the previous section where Higdem (2014) raises the misunderstanding by participants to the intent of holding workshops. This issue is by no means individualistic to Higdem's (2014) study. As Glenn (2009, 18) raises this as a weakness belonging to the use of scenarios as a method, where those who do not participate in the creation of scenarios accept them as an "official set of possible futures". In reflection of a study issues such as this can be easily ascribed to poor communication between researcher and reader. However, more underlying issues need to be acknowledged and addressed.

In order to limit communication issues of scenarios, three interconnected factors need to be considered. Firstly, transparency or the documentation of research and processes used is important for the understanding of methods chosen and the aims of the research. Piirainen et al. (2012, 472–473) stress the impact of futures research can only be increased by making the process more transparent which in turn generates more confidence in the results and practices of foresight activities. Transparency in the broad sense can be problematic due to its subjective nature. In this sense transparency relies on the experience of the researcher to decide not only what information is relevant and important to the study but also the end user. Therefore, with this in mind "transparent judgements are considered to be extremely valid and above all valuable for action" (van der Steen & van der Duin 2012, 491). Transparency of research may seem like a long process at the beginning, but its fundamental purpose is a precondition for trust and credibility (van der Steen & van der Duin 2012, 490–491). As stakeholder involvement is limited, transparency as an element for scenario construction can be ensured through the process of rigorous documentation and transparent data use as stakeholder involvement is limited. This promotes good research practices for building confidence in results and credibility in the

long run (Piirainen et al. 2012, 472–473). Additionally, this diligent approach will allow for a more technical evaluation of results and chosen methods.

Secondly credibility in its definition acts as an element of relatability or believability. Where those involved need to be able to conceive the future as plausible (Glenn 2009, 5). As a factor relies on transparency and strong communication of the research. Therefore, credibility is built on the trust and understanding between researcher and organization (van der Steen & van der Duin 2012). However, the researcher must consider their presentation of results and scenarios. Glenn (2009, 18) brings to attention that scenario authors should be bold in their work by including surprises and "not fear they will lose credibility with decision makers" for scenarios that seem too "far out". Therefore, scenario processes should allow for flexibility that allows decision-makers to understand alternatives and develop anticipatory awareness. With this in mind it should be considered that scenarios remain credible and convincing to encourage strategic responses. Similar to transparency, credibility should be viewed as a twofold process that is developed during the study and as it is evaluated. During the study credibility is raised through involvement of decision-makers (Piirainen et al. 2012, 472). Due to the nature of foresight activities credibility in the evaluation stage is difficult to measure "as foresight is inevitably destined for obscurity" (van der Steen & van der Duin 2012, 489). As the scenarios are written from the perspective of 2030 it is difficult to measure their accuracy and success. Therefore, the evaluation of credibility will be based on the quality of data used and how it contributes to the quality of the study (Piirainen et al. 2012).

The underlying issue presented by the communication of scenarios is not only related to their presentation or quality, but also ensuring their use. Therefore, the final factor legitimacy plays an integral role in connecting the research to the decision-making process. Legitimacy within this project is defined as the ability to encourage action from the target audience through the use of convincing processes and outcomes (Piirainen et al. 2012, 464). Gavigan & Scapolo (2011, 11) propose the main challenge of developing processes for regional planning is demonstrating how foresight methods enhance current established processes. The challenge of failing legitimacy stems from "haphazard connections between foresight activities and the decision-making process (Higdem 2014, 42). From this it is clear that legitimacy as an issue of communication, requires the researcher to produce 'provocative' scenarios that promote discussion. Only by challenging the happy medium can tight connections between "knowledge creation, strategy development and decision-making increase" (Higdem 2014, 42). Legitimacy as a factor is enhanced

over time and is not enduring. For a study to achieve legitimacy it requires the end user to be comfortable with the process and understand that they must be monitored and reproduced by "organizations in actual settings on an ongoing basis" (Gephart et al. 2010, 299). Therefore, continuity between researcher and organisation is required. Legitimacy is also called to question particularly in the context of decision-makers in the government, as the agenda and role of the researcher can often be misconceived. Legitimacy requires a foundation of transparency and credibility.

The use of these elements combined present a frame for scenario creation and orientation. Furthermore, it is possible to implement each during the planning phases of a project and once again during the evaluation. Therefore, the intent of these elements is not only to serve as a 'how to guide' but also act as a process for organisational learning to become more agile and proactive.

3.2 Methodology

In the preceding chapter the theoretical approach and application of criteria within scenario creation have been discussed. However, as this is no singular methodological approach to scenario creation the subsequent chapter will delve deeper the chosen methods introduced within the research approach section. Each method has been chosen to build upon the last. As this project is primarily desk research the methods highlighted within Hiltunen's (2013) process have been selected for the collection, analysis and communication of data gathered from various sources.

3.2.1 Trend Analysis

The key trend themes have already been explored within the Future Trend Report (Welsh Government 2018a). However, they remain ambiguous and a more detailed level of discussion is needed of their relation to Wales. Therefore, further analysis of these trends using historical and additional data is required. In order to obtain further data surrounding each trend the use of horizon scanning method was used to examine the environment and identify further emerging patterns within the selected trends and potential issues (Schultz 2006). The scanning and data gathering process was conducted by:

1) Analysing and comparing current projections that exist within policies and supportive materials
2) Studying research and reports produced by the Welsh Government and additional sources surrounding the trends
3) The use of big data gathered by the Office for National Statistics for Stats Wales

When operationalising the above gathering process it became apparent the abundance of data available on both a national and regional scale. The process provided somewhat of a systematic approach to the data research process as sources would often all lead back to the same reference point. In this case it the statistics made available by the Stats Wales are often used within annual reports and reviews produced by the Welsh Government and its stakeholders. The analysis of statistics and data from these sources was primarily conducted as a means of understanding the perspective of stakeholders operating within the trend environment and conceptualising their projections. Thus, providing an insight of how key actors within their field aim to approach future developments through analysing the goals and strategies they use. Due to a majority of the data used stemming from the same source, the reports and reviews were used mainly to provide an understanding of the contemporary environment and therefore reference to these reports was limited to avoid repetition and explore the trends in depth. In addition to this the use of reports produced by stakeholders of the Welsh Government also builds credibility as the information being utilised to produce scenarios improves the stakeholders understanding through the use of 'believable' and 'relatable' content.

The use of web channels for further analysis of the trends was intended to include data gathered from social media and other platforms. However, this presented the issues of reliability and possibly having to introduce further research methods such as questionnaires which would require its own direction of study. Initially the use of web channels would have provided an understanding from the wider environments. News articles from a variety of national and regional sources were used in place of the social media platforms to gather empirical data and gain a moderate image of social perception. However, this required more consideration to discover the source of the data being discussed within the content. The majority of empirical data from additional sources such as the BBC News, Wales online and other media stemmed from public bodies' reports and data gathered by the ONS for Stats Wales. By examining these reports and reviews produced by the Welsh Government and its stakeholders, it was possible to observe possible drivers and future

developments of each trend. Additionally, by tracing the origin of the data also impacts the credibility of the study. By allowing stakeholders to become quickly familiar with the produced scenarios which in turn also improves communication in the long run (O'brien & Meadows 2013). The lack of depth presented by the looping within the data introduced an interesting dilemma during the gathering process. Initially the lack of alternatives could be viewed as a feedback loop, where information outputs would have returned as inputs to the process in turn limiting the study. However, it more so highlighted the need to expand on the analysis of empirical data to consider alternatives (Schultz 2006).

The data being collected can therefore be characterised into two main groups. The first of which being the use of statistics gathered by the Office for National Statistics for Stats Wales and the Welsh Government. The use of these statistics is mainly used for the analysis of large data concerning trend areas, for example but not limited to population change and employment levels. The second group being used is reports produced by the Welsh Government, its stakeholders and external consultancy organisations. The use of these reports provides knowledge of changes within the stakeholder environment and a base from which to build credibility and legitimacy through empirical analysis.

Trend analyses as a method is often criticised for its reliance of researcher experience or pre-existing knowledge of the subject. In the case of this project the importance of the case study is not as important as it is the exercise of the chosen processes conducted according to the scenario quality criteria. Therefore, the process itself can be replicated within different cases utilising data that is case specific. Uotila & Melkas (2007) explore the impact of knowledge and data quality towards studies of which relates to how a study is both conducted and perceived. As this study is conducted without direct input by stakeholders it is heavily reliant on the ability of the researcher to communicate general knowledge or: "knowledge that is easily transferred and possessed by large numbers of people" whilst having specific knowledge which is difficult to communicate (Uotila & Melkas 2007, 1120). Uotila & Melkas (2007, 1120–1121) refer to this form of knowledge as *self-transending knowledge* that relies on the researcher's ability to conduct foresight activities and thus formulate the data into information that can be communicated effectively. It therefore becomes important to utilise the scenario criteria discussed in chapter 3.1.2 alongside the data gathering process discussed above, to ensure that the gathered data is reliable and is processed into credible information. Additionally, through the analysis of stakeholder reports such as the '1 million Welsh speakers' (Welsh Government 2017a) report it was possible to examine the explicit and tacit knowledge expressed in the

form of short-term goals and insights. Tacit knowledge is utilised within this study to gain an understanding of insights expressed by institutional haunches, whilst explicit knowledge provides codified data. Both of which improve the credibility and legitimacy of the study by ensuring the data gathered is reliable and can be processed into relatable information within the scenarios.

As a means of focusing the research scope it is important that I provide a break-down of the key themes mentioned in section 1.1. For this project I narrowed the themes are to 7 trend areas, each of which have overlapping factors to narrow the scope of research. However, these overlapping influencing factors and emerging patterns highlight the need for the production of a proactive approach to long-term regional planning. The key trend areas I will explore are as follows:

Table 1. Table of trend areas and specific trends that are analysed within this thesis.

Trend Area	Specific Trend
Population	*Changes in population size*
	Life expectancy
Economy & Infrastructure	*Employment sectors*
	Employment levels
Climate Change	*CO_2 emissions*
Society & Culture	*Welsh speakers*
Land use & Natural Resources	*Tree/Woodland cover*

Generally speaking an analysis of historic data and past events may display a pattern of development. As briefly discussed, the horizon scanning process will focus on the given trends, but close attention is paid to the emergence of plausible issues from extrapolations of scientific and factual data. The high uncertainty surrounding the UK leaving the EU created a large amount of plausible issues that undoubtedly have and continue to affect how a trend transcends. I encountered this issue when examining population and employment data individually, both of which were highly susceptible to uncertainty as future changes are relevant to externalities, for example the outcome of Brexit (Los et al., 2017; Dwyer 2018; Pollard 2018). Through further analysis of these trends it was possible to spot how they may develop in different directions depending on changes in the wider environment. Thus, allowing decision makers to anticipate the impact of the trend devel-

opment on policy. However, due to its reliance on scientific and factual data it is increasingly difficult to assess developments that have increasing characteristics of uncertainty. Schultz (2006) describes how such disruptive ripples from weak signals or wildcards often mature into trends following a 5 to 10 year period. During the initial phases of this project Brexit was intended to be used as a wildcard event as the outcomes of the withdrawal agreement were still uncertain. However, through the course of the research the Brexit had developed into a thematic area that would guide scenario narratives and be utilised as a driver. Of course, such events often tend to have a higher impact. But it should be considered that such an impact could be positive or negative, which can only be determined by organisational preparedness.

The aim of the trend analysis phase is to subsequently produce scenarios in preparation for change. These scenarios are not created to predict eventualities of an occurrence, but more so build organisational preparedness for their possibility and support long-term planning. As high uncertainty surround some of the trends it can be difficult for stakeholder to form patterns from outside of their area of operation. Therefore, the trend analysis process acts as the construction of the landscape layer by painting a picture of the contemporary situation. The landscape layer proposed by Dufva et al (2015, 103) is utilised for "anticipating global developments, trend and/or wild cards, and enhancing future-orientation of the society". The concept is often used within multi-layer foresight projects to examine developments that affect systems. However, due to the limitations of access to internal data and stakeholder involvement, the construction of the landscape layer as proposed by Dufva et al (2015, 103) is used to emphasise events and trends external to the Welsh Government and its stakeholders within the scenarios. From this it is possible to build upon them in subsequent analyses. Garnett et al (2016, 88) discuss how future scans are able to "build upon previous efforts, thus identifying gaps and highlighting new dimensions". These in turn can lead to further areas of action for exploring how actors within the system interact to achieve a shared future or build capacity to respond to the developments of trends.

3.2.2 Morphologic Analysis, Futures Table

The General Morphological Analysis (GMA) originally established by the Swiss-American physicist Fritz Zwicky (1969) provides a useful starting point for modelling relation-

ships between objects and phenomena, in particular within the social/political environment (Alvarez & Ritchey 2015). Despite being a generalised method of morphological analysis, it has been regarded as a method for non-quantified modelling (Alvarez and Ritchey 2015, 2). GMA has provided a strong foundation from which further adaptations and developments of morphological analysis (MA) methods, of which I will explain further. The use of MA within this thesis provides a platform for assembling data gathered throughout the trend analysis into key themes by utilizing the scenario criteria discussed in section 3.1.2. The scientific modelling actively encourages the parameterizing of a problem space and the process of analysing the connections between them (Ritchey 2009, 9). Additionally, MA's compatibility with other methods serve as the ideal approach for constructing and communicating scenario processes in a transparent manner.

MA methods heavily rely upon collaboration between researcher and stakeholders during the modelling processes. This is usually accomplished through the facilitation of workshops in order to create clarity and understanding of the parameters. This is regarded as a weakness of MA methods as it is often time consuming and relies on long periods of collaboration. In place of this I have decided to implement a PESTEC analysis a variant of the MA method that allows for input from the trend analysis process into six parameters. This in turn supports the scenarios planning process by allowing for plausible connections to be established between fields. As a variant of the MA methods the PESTEC analysis allows scope to produce a vast amount of futures. As there are no designated drivers within the table it is possible to alternate scenario variables and update fields, which supports the idea of 84,000 futures as proposed by Yrjö Seppälä (Heinonen, Kuusi & Salminen 2013). However, the prospect of 84,000 futures seems far too difficult to grasp and is well outside the scope of this thesis. Therefore, the four scenario archetypes introduced in chapter 2.2 (Dator 2009) are used to provide the horizontal parameters within the table.

As for the vertical parameters, I have implemented the standard place holders of the PESTE table as proposed by Cheverton (2004). Cultural will also be added to these place holders, all of which are described in Table 2. This form can be implemented by both business and public bodies when conducting searches for weak signals within environments. Additionally, the X and Y parameters serve as a transparent framework to construct scenarios by; providing pattern consistency ahead of any time frames, thus arriving

at a limited number of futures before assigning any dates (Rhyne 1995, 659). This is conducted by investigating the set of possible relationships between configurations which are guided by the scenario quality criteria. The PESTEC parameters are defined as follows:

Table 2. PESTEC example and description table with description of placeholders (Adapted from Cheverton's PESTLE analysis 2004).

State	Description
Political	*The form and function of the political system and it's relation to policy planning*
Economic	*The form of employment and economic performance*
Social	*The role of population changes and the possible drivers of change*
Technology	*The transition speed and impacts of technological developments, notably automation*
Environmental	*What environmental issues exist and what measures are in place*
Cultural	*The form and function of the Welsh language*

The use of PESTEC within this thesis is not limited to providing a framework to produce scenarios. My further intentions are to discover possible relationships and configurations between variables that may be overlooked or not be so evident. Additional input to the table can be used to uncover weak signals and explore supplementary futures by reconfiguring parameters and placeholders. However, this will not materialise until it has been reviewed by the Welsh Government and its stakeholders. In this instance where stakeholder involvement is limited, the scenario quality criteria are simply not enough as the quality of scenarios cannot be upheld alone. Therefore, producing pathways through the table using causal connections in a transparent manner improves both the credibility and legitimacy of the study. However, this is not accomplished by the table alone as the scenarios build upon the causal connections through the creation of narratives. In the context of this thesis, the criteria used for the gathering of data and its analysed serve as a process for ensuring that input to the table is relevant and internally consistent to the case organisation.

3.2.3 Scenario Construction Process

The Intuitive logics approach was developed in parallel with the work conducted by Royal Dutch/Shell and is currently still being actively used by SRI International in the development of business planning (Huss and Honton 1987, 21–22). As an approach, intuitive logics makes decisions based on elaborate connections between political, economic, social, technological, environmental and resource factors. When considering these factors, it is important to understand each one externally as well as internally to the organisation, in-order to improve decision making by evaluating risks and anticipating change. For this reason, this approach was chosen, as when used in combination the PESTEC it is able to a produce visually transparent frame to construct scenarios. Intuitive logics makes use of an 8-step structure as devices for ordering perceptions of alternative futures or environments (Huss and Honton 1987, 21–22). However, it is possible that the majority of the perceptions can have predetermined outcomes, but intuitive logic scenarios provide various interpretations of the perceptions with the possibility of uncovering additional external factors. The 8-step Intuitive Logics scenario process consists of (Huss & Honton 1987, 21–29)

Step 1 - Analysing the decisions and strategic concerns;
Step 2 - Identify the key decision factors;
Step 3 - Identify the key environmental forces;
Step 4 - Analyse the environmental forces;
Step 5 - Defining scenario logics;
Step 6 - Elaborating the scenarios;
Step 7 - Analysing implications for key decision factors;
Step 8 - Analysing implications for decisions and strategies.

As shown above each step consists of identifying and evaluating internal and external factors before organising (in step 5) any assumptions, principles or themes. Within this thesis steps 1–3 are conducted during the trend analysis and process of completing the PESTEC table. For step 5, the activity of choosing the axes is often determined by choosing the two most significant drivers from an impact/uncertainty matrix (Hiltunen 2013, 149–150). However, it is difficult to implement logics within this thesis as it would re-

quire close work with stakeholders to determine factors from the range of trends. Therefore, in place of scenario logics I will make use of a No-deal Brexit as a predetermined element. As a driver Brexit cites both high and low when considering its uncertainty, whilst impact would be regarded as moderately high (Los et al., 2017; Dwyer 2018; Pollard 2018). Additionally, the applied logics need not cover all possibilities which provide scope to focus particularly on the opportunities and threats of such an event on the scenarios before discussing alternatives.

Step 6 consists of elaborating on the scenarios by combining the logics from the previous step along with the results of the environmental analysis. During this step the scenarios are produced with more focused information for decision making. This can be comprised of analytical techniques or models dependent on the user company. Within this thesis the PESTEC is used to organize key themes into logical from the trend analysis.

It is not until step 7 where the information is presented in a clearer format for decision makers, or as discussed previously a wider audience who is not directly connected to planning or policy development. Finally, step 8 can be regarded as an orientation phase where any uncertainties or issues are addressed. This is often carried out or continued by the end-user organisation, where they can choose to add, remove or make any changes to the scenarios using additional information which was not given at the beginning of the study. In order to incorporate changes and input updates it is possible to combine both step 7 and 8 into a table of scenario results for a summarised evaluation of each scenario.

The utilization of the intuitive approach within this thesis is threefold. Firstly, for its ability to impact the credibility and transparency of the study by adapting an approach that has been tried and tested. Secondly, it is suited to the needs of the Welsh Government to explore alternative scenarios addressing similar issues as highlighted in the scenario quality. Finally, the transparency of the approach allows for the process to be reproduced as the scenarios will be reviewed by the Welsh Government to aid long-term decision making with its stakeholders. The process allows them to update the scenarios input data to reflect any information they see would further benefit the process. However, the level of flexibility offered by Intuitive logics can often be regarded as one of the disadvantages of it. For this purpose, I have clearly outlined the scenario creation process using illustrative tables, so the process can be communicated quick and efficiently.

Table 3. Testing the strategy in different scenarios (Adapted from Hiltunen 2013).

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Functional elements of the scenario				
Weak elements of the scenario				
Forewarning signals				
How to respond if the future takes course towards this scenario				

The scenario testing table proposed by Hiltunen (2013, 151) acts as an interactive example that can be changed to reflect changes within the environment, input data and changes by the end user. The purpose of analysing each scenario to highlight forewarning signals and weak elements is to increase organisational awareness and anticipate how to develop strategy or policy in reflection. At this point it is important to address the issue of continuity as this study is concluded within this thesis. Once the table has been produced it is by no means a fixed and organisations that wish to increase their preparedness should delegate resources to monitoring signals.

4 TREND ANALYSIS

4.1 Population – Change in Size

Through examination of data gathered by the Office for national statistics for Stats Wales, the trend of annual population growth within Wales displays slow growth percentages from 0.45% in 2016 to 0.38% in 2017 (Stats Wales 2014; 2016a). These percentages were calculated from the overall increase of actual population from the previous year. If we continue to use the average of this model and include the population increase for year 2015, it is projected that there will be a population increase of between 0.35% and 0.41% from 2017 to 2018. Using this calculation, it is possible to estimate growth between; 10,938 and 12,813.

In order to further examine the patterns of population growth it is valuable to consider the projections produced by the ONS and Stats Wales using the same data. Despite the statistics being updated yearly, a full consensus is conducted once every two years with the next being published in June 2019. Despite being after the data collection data for this thesis it is possible to examine previous population projections alongside actual population data. This allows us to examine the accuracy of the original population projections produced in 2014 and 2016, which estimated:

Table 4. Produced using data from; 2014-based national population projections for Wales, 2014-2039, 2016-based national population projections for Wales, 2016-2041 (Stats Wales 2014; 2016b).

Year	Population Estimation		Population Actual	Difference	
	2014	2016	-	2014	2016
2015	3,101,265	-	3,099,086	-2,179	-
2016	3,110,815	-	3,113,150	+2,335	-
2017	3,120,379	3,126,220	3,125,165	+4,786	-1,055
2018	3,129,855	3,139,308	-	-	-

The projections in Table 4 are calculated by adding natural change, net migration and other attributable changes (accounts for small adjustments for population size for example prison populations or armed forces). The calculations proposed in Table 4 at the beginning of this section, the data provides estimations to population changes with no impacts

of changes in the wider environment. These statistics may provide some possible projections for the future of population growth, but as stand-alone data it provides no context as to the driving forces that impact patterns (Roser 2013).

It is interesting to consider the different aspects of population figures within the data set series, as these provide an insight to possible changes of the population of Wales in the Future. Setting aside the natural changes for a moment as birth and death figures in Wales has demonstrated a history of stabilisation (Stats Wales 2014). The largest areas of population changes are presented by the internal and international migration figures. The areas that are the most susceptible to change in the regional environment are related to employment prospects and higher education, or wider environmental issues such as Brexit.

Changes in demographics are vulnerable to these aforementioned factors, particularly the effects of Brexit. The economic uncertainties tied to Brexit have been explored by Los et al (2017) who consider the possible effects. These being simultaneous unemployment within various industries as a result of discontinued trade agreements, or multinational companies that may pull out of Wales or the UK as a whole (Pollard 2018). The levels of employment and employment sectors are analysed in section 4.3. However, the displacement of unemployed would definitely indirectly contribute to fluctuating population figures through inward and outward migration.

4.2 Population – Ageing Population

The second trend area related to population is the ageing population, as a trend it is by no means individualistic to Wales as a number of European countries face similar futures (Roser 2013). Therefore, the issues related to an ageing population play an integral role that requires attention when considering long-term planning. However, following the previous analysis of change in population size, an ageing population is the second most influential trend that can negatively impact the future of Wales. At present the largest population age group within Wales is those aged 16 to 64, which as of the 2016 census stands at 61% of the overall population (Stats Wales 2016a). The following projections have been produced by the ONS following the 2016 census with regards to the change in demographics by the year 2030.

Table 5. Projections 2016-based national population projections for Wales, 2016-2041 figures updated 31 October 2018 (Stats Wales 2016b).

Year Age	15 and under	16 to 64	65 and over	All ages
2016	557,079	1,921,434	634,637	3,113,150
2017	558,731	1,924,544	642,945	3,126,220
2018	562,459	1,924,023	652,826	3,139,308
2019	566,177	1,922,830	662,562	3,151,569
2020	569,352	1,922,565	671,002	3,162,919
2021	571,358	1,921,759	680,041	3,173,158
2022	572,050	1,919,215	690,267	3,181,532
2023	572,228	1,915,561	701,219	3,189,008
2024	570,915	1,912,944	712,572	3,196,431
2025	570,101	1,909,489	724,145	3,203,735
2026	568,457	1,905,538	736,821	3,210,816
2027	565,787	1,901,330	750,390	3,217,507
2028	563,507	1,896,310	763,906	3,223,723
2029	562,116	1,888,877	778,319	3,229,312
2030	561,182	1,880,850	792,257	3,234,289

Despite the 10-year timeframe, according to the ONS projections the 16 to 64 age group will remain to be the largest portion of the Welsh population (Stats Wales 2016b). However, these projections estimate a 19% increase to the population aged 65 and over, which equates to 24% of the total population (Stats Wales 2017). The historical data surrounding the natural change figures for each year is almost balanced, but this is by no means a dismissal of the possible issues that higher percentages of aged population may entail. This highlights an area of concern when considering demographical changes in the future.

On inspection of current discourse regarding the ageing population in Wales, according to Baxter and Boyce (2011**)** it becomes apparent that there is an increase of expectations surrounding the quality and flexibility of social services. This could lead to the adoption of a similar service path as England where there is a rise in personalised services offered by the independent sector of formal care services. A move towards this has already began and is evident through the Ageing Well in Wales 2014 (Welsh Government 2016) scheme. Implemented by the Older People's Commissioner the scheme aims to improve the lives of older people by improving the access to and availability of social services. The program forms part of the European Innovation Partnership for Active and Healthy Ageing. Whose strategies are aimed at empowering older people by addressing

some of the aforementioned issues such as strains on health and social services by; providing ad hoc solutions such as limiting the financial burden for home care (Welsh Government 2016). Despite highlighting and addressing the possible issues presented on a governmental level, it is also important to consider the informal care. This is the care that is provided by families and other social networks. Observing such patterns can also serve as an indicator as to the future of social care, opening opportunities in the form of re-education programs and employment within the social service sector.

4.3 Economy and Infrastructure - Employment Levels and Sectors

As the nature of employment levels and sectors share a number of qualities this section is compiled of both trends, but it has been divided by industry sectors.

4.3.1 Construction, Productions and Agriculture

Historically the Welsh economy has relied upon heavy industry and agricultural sectors for employment. Both sectors have shown a steady decline in employment figures between the 2015 and the 2017 consensus', with an almost 5% decrease within the production sector (Stats Wales 2018a; 2018b). Additionally, there was also a decrease within the employment figures within the construction sector between consensus. However, the construction sector has displayed a history of fluctuation within its figures over the past 7 years of recorded data. These fluctuations in the construction sector are widely influenced by a combination of factors from the economic environment, other employment sectors and population levels, as increase or decrease is based on the need for construction projects.

Table 6. Workplace employment by broad industry, figures updated 31 October 2018 (Stats Wales 2018a; 2018b).

Year		Agriculture, forestry and fishing	Production	Construction
2015	United Kingdom	403,400	2,835,200	2,158,600
	Wales	40,700	172,300	92,600
2017	United Kingdom	392,700	2,894,000	2,296,000
	Wales	40,500	164,500	90,500

In keeping with the historical data presented by the ONS, the decline of the production sector seems to be the main risk to the future of Wales' employment levels. The key drivers behind the uncertainty of employment within the production sector in Wales is owed to automation, the continued growth of Asian economies and a rise in emerging economies. All of which are by no means a new topic for concern to the production sector. However, rising economies present future risks not only for Wales but also the majority of western economies (Welsh Government 2018a). As a mean of mitigation to the future risks of high unemployment caused by a decline in the production sector, the Welsh Government would have to consider the current issues that present themselves. These issues could be highlighted as; the disproportionate supply and demand of working skills, both of which combined with other factors contributing to economic weakness such as poor resource allocation and reduced investment in capital/innovation (Barnett et al., 2014).

In contrast to the decline of the production sector, it is possible that the influence of sustainability as a driver will provide future opportunities and positively impact employment figures within the agricultural and forestry industry (Stats Wales 2018a; 2018b). Despite the decline displayed within Table 6, it is possible that more emphasis will be placed on these industries resulting from the need to re-establish international trade agreements or support the UKs market. However, there is a possibility that this may have the opposite effect where within the short-term future agricultural market collapse or struggle to supply the market (Dwyer, 2018). Dwyer's (2018) scenarios exploring the possibilities of the agricultural industry and the impact of Brexit on the sector, provide a valuable insight to the conditions that would disadvantage the competitive position of Welsh agriculture, most notably the changes in trading conditions. The future of growth and employment within this sector is heavily reliant on its adaptability towards events in the wider environment or capitalizing on the opportunities it presents.

With regards to the future of the forestry industry, there are a number of possible directions it can take. In the contemporary landscape, there has been a rise in the use of Forestry Commission owned land as host to other nascent businesses, mostly related to tourism. The further uses and potential for forest cover is discussed in section 4.6. However, the increase in attraction to these nascent businesses, have spill over effect into the regional economy and provide medium term employment within different sectors.

4.3.2 Other Sectors of Employment

With regards to current employment sectors, public service remains the largest sector within Wales employing 27% of its workforce (Stats Wales 2018a; 2018b). Data gathered by the ONS regarding workplace employment by broad industry in the last 20 years, displays a history of fluctuation within its employment figures. This raises the question of the nature of the employment within this sector and its relation to contract work and or budget cuts as there is no dramatic disparities between years. With regards to the future of work in Wales the public sector has and will have a pivotal role to play, not only within the context of long-term planning and policy, but "also as an employer, standard setter and purchaser" (Froy et al., 2012, 66). As there are no projections available with regards to future employment sectors it is difficult to claim that the public sector will remain the dominant employer. However, using the population projection within the population trend section, it is possible to assume of two directions it could take. Analysis of the historic data would suggest continued patterns of fluctuation in order to balance or stimulate dynamism within other sectors, or vice versa (Stats Wales 2018a; 2018b).

Table 7. Workplace employment by broad industry by Welsh local authority 2015 and 2017, figures updated 31 October 2018 (Stats Wales 2018a; 2018b).

Year		Agriculture, forestry and fishing	Production	Construction	Wholesale, retail, transport, hotels and food	Information and communication	Finance and insurance activities	Real estate activities	Professional, scientific and technical activities; administrative and support activities	Public administration, defence, education and health	Other service activities	All industries
2015	United Kingdom	403,400	2,835,200	2,158,600	8,287,200	1,360,700	1,055,600	552,600	5,680,100	7,943,100	1,868,700	32,145,200
	Wales	40,700	172,300	92,600	357,600	24,000	30,800	19,100	166,200	423,100	77,100	1,403,400
2017	United Kingdom	392,700	2,894,000	2,296,000	8,445,500	1,452,300	1,053,800	561,200	5,856,400	8,028,600	1,934,700	32,915,200
	Wales	40,500	164,500	90,500	331,500	58,600	31,900	18,100	174,100	422,400	83,000	1,414,800

With regards to other service sector employment, there is a juxtaposition between traditional service roles (retail, transport and hospitality) and professional service activities. Between the 2015 and 2017 ONS census displays a reduction to those employed within the traditional service sector by almost 8% (Stats Wales 2018a; 2018b). Impacts within this sector are highly influenced by the broader economic environment, making them susceptible to risk in the face of uncertainties. It is also a possible indicator that there is a current change within the nature of service-based work in regard to skilled labour and requirements. The service industry can be divided into 6 sub sectors as sectors of possible growth within the service economy:

-Wholesale, retail, transport, hotels and food
-Information and communication
-Finance and insurance activities
-Real estate activities
-Professional, scientific and technical activities; administrative and support service activities
-Public administration, defence, education and health

A number of the above listed sectors share a number of interconnected qualities that make it difficult to identify one sector as the dominant employer of the future. Excluding the public service sector as this has been discussed, the most notable current growth sectors appear to be those related to technical skills. On the surface level this indicates a higher percentage of skilled workforce and hints towards potential impacts of digitalisation and a technological lead on the future of employment in Wales (Welsh Government 2018a). Nevertheless, issues arise from a sectoral despite the promising growth. This stems from the increasing unemployment figures that derives from other failing sectors. When such events take place decision-makers should consider contingencies in the form of retraining and education programs that provide those displaced by unemployment with the opportunity to re-enter the workforce.

At present permanent and full-time contracts remain the main form of employment. But in the contemporary landscape there has been a shift to forms of non-traditional employment such as zero-hour contracts, and more recently a rise of a gig economy. Despite not having reliable data on the increase of these forms of employment (Bell 2017) it stands as an example of the new types of work and labour markets that technological

change leads to, which policy makers need to address. Bell (2017) expands on the current issue posed by the lack of reliable data, addressing the need to improve the regulation and legislation surrounding the nature of gig employment. This would serve as an interesting point for further study into the changing nature of employment and employment status, as the definition of self-employed is becoming increasingly fluid. Additionally, an interesting aspect of this shift raises the question of what effect does flexible work have on the overall availability and access to job security. The gap in the available data also raises a cause for concern with regards to employment figures across the board. If there is an increase in these forms of employment within Wales it presents a number of issues that can impact other trends both positively or negatively, but this is dependent on economic and political preparedness.

4.4 Climate Change – CO_2 Emissions

Climate change as a trend is by no means unique to Wales, it is a broad topic that connects countries on a global scale (Welsh Government 2018a). However, through analysis of the trend it is possible to highlight the risks and opportunities from the impacts of climate change to the future of Wales. The extent of CO_2 emissions as a trend also stretches beyond the parameters of legislation proposed by the government with regards to the limiting emission produced by a country or economic sector (Stats Wales 2018c, Welsh Government 2018a). As each trend has elements that contribute either directly or indirectly to CO_2 emissions. Due to the uncertainty of these elements a flexible risk-based approach is required.

The first interlinkage between trend areas to consider is the emission released by industry type within Wales (Stats Wales 2018c). The data gathered by the ONS over the last 6 years provides the basis for observation on the key contributors to the overall emissions production in order to tackle or limit further growth through carbon offsetting policy. In theory the interlinkages between the future of employment sectors and emission output go hand in hand (Stats Wales 2018a; 2018b; 2018c). As discussed in section 4.3, an increase within the business sector for example will undoubtedly have reflective effects on the output of emissions. However, when considering developments in energy efficiency and increased usage of renewable energy, Wales has the potential to meet energy demands entirely through the use of these. It is possible that this would result in an 80% reduction of emissions (in comparison to 1990 levels) related to energy production

(Wyn Jones, 2015). The projections proposed by Wyn Jones (2015) are set for the year 2050 which is outside of the scope of this thesis. However, interim targets have been agreed by Ministers of the Welsh Government under the Environment Wales Act of 2016 (Committee on Climate Change 2017). The Act was designed alongside the Wellbeing of Future Generations Act 2015 (Welsh Government 2015a), which as previously mentioned acts as guidance for sustainable development which public bodies must consider in their decision-making process.

Table 8. Emissions of greenhouse gases within Wales 2010 to 2016, figures updated June 2018 (Stats Wales 2018c).

Emissions of CO_2 equivalent	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Total (Kilotonnes)	46,680	43,334	45,344	50,406	46,027	45,604	47,788
Agriculture	5,353	5,366	5,331	5,375	5,622	5,469	5,729
Business	10,044	9,009	7,910	9,688	9,563	9,330	8,896
Energy Supply	16,926	16,061	19,439	21,230	17,398	17,616	20,288
Industrial Process	2,093	1,936	1,438	2,843	3,033	2,778	2,010
Land Use Change	-939	-1,065	-874	-791	-841	-996	-773
Public	397	323	366	369	307	321	338
Residential	4,848	3,897	4,205	4,242	3,559	3,652	3,730
Transport	6,291	6,203	6,034	6,013	6,093	6,186	6,312
Waste Management	1,667	1,605	1,495	1,437	1,294	1,248	1,258

The Committee on Climate Change assessment concerning the challenges of reaching the interim targets, identified the key driver of emissions output as the Aberthaw coal power plant. Within the Building a low-carbon economy in Wales report (Committee on Climate Change 2017), the Aberthaw coal power plant and its potential closure played a pivotal role within the recommendation of the initial emissions budget. As the baseline budget data has not currently been gathered, the targets for the interim periods are set as: Building a low-carbon economy in Wales report 2017, 8)

- 2020: 27% reduction against baseline budget of the 2016-20 period

- 2030: 45% reduction
- 2040: 67% reduction

The incremental changes agreed by ministers of the Welsh Government and provide an interesting point of reference towards the effects of climate change on the future of employment and energy production. The current pathway adopted by the Welsh Government under the 2016 Environment Wales Act serves as a driver to test innovative technologies in the energy sector when aiming to tackle the issues of climate change (Committee on Climate Change 2017, Welsh Government 2018a). However, the vision of transitioning to a low carbon future is not met without its challenges. These challenges have been identified in a number of different trend areas such as; industry sector and population changes (Stats Wales 2018c). Nevertheless, challenges are also presented by social equality issues such as; those who have a limited ability to adapt may affect the rate of transition.

In order to stimulate social action towards a low carbon future the Welsh Government will have to consider policies from across a number of sectors. Some policy areas are devolved under the Welsh Government and others that would require cooperation with the UK National Government. This becomes increasingly important in light of the EU referendum, as the number of climate change challenges or the difficulty of governing them may increase as a result of funding cuts from the EU (Pollard 2018). In contrast to this, it is possible that UK develop stronger policy measures and support networks in comparison to the EU equivalent.

4.5 Society and Culture - Welsh Speakers

The vision of a million Welsh speakers by the year 2050 marks the 50th anniversary of the first Welsh language act (Welsh Government 2017a). The number of those speaking Welsh has experienced a fluctuating pattern throughout its recorded history (Welsh Government 2017b). The vision however, aims to reach a point where the language is an integral part of society. In light of the increase of Welsh speakers over the last decade, the main challenge faced by the Welsh Government remains to be the retention of young Welsh speakers post compulsory education. In order to achieve the goal of a million Welsh speakers the Welsh Government have identified three key areas highlighted by Figure 3.

The strategy is set for the whole of Wales, but there are potential growth sectors for the percentage of Welsh speakers that the strategy addresses. This is the high-density population, low Welsh speaking areas (Welsh Government 2017a). In addition to this, the strategy acknowledges the need to ensure the continuation of Welsh speaking communities as systems that make use of the language in all aspects of life. However, the idea is to consider each region of Wales as its own entity as each region present both its own qualities and challenges. In order to explore the strategy further it would be best to summarize each parameter of Figure 3. Each possesses interconnected and cross impacting factors on one another, all of which combine to produce the 2050 vision.

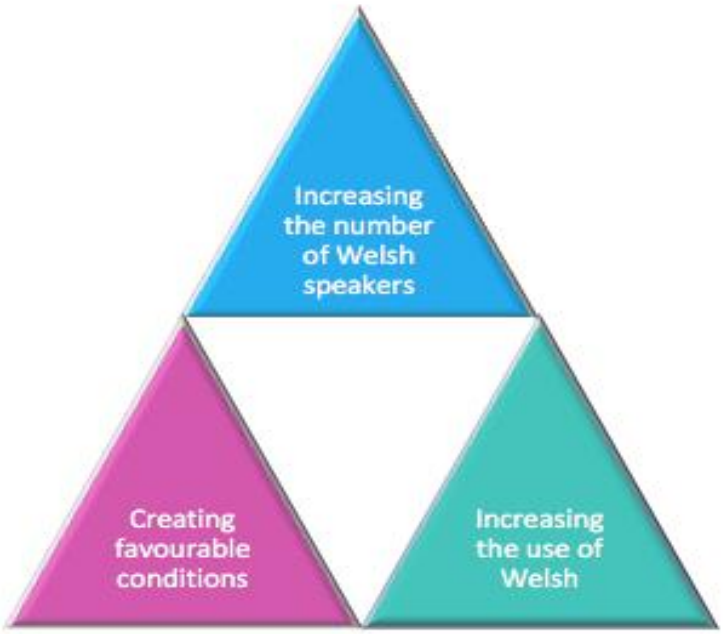

Figure 3. Three Strategic Themes Identified by the Welsh Government for achieving the 2050 vision (Welsh Government 2017a).

4.5.1 Increasing the Number of Welsh Speakers

This strategy is based on the contribution played by transmission of language within the home that provides a continued vitality for the prolonged usage. Additionally, the Welsh Government acknowledges the limitations that the transmission of language present. This strategy highlights the importance of the education and training systems as the principle means of increasing the number of Welsh speakers. This strategy is centred around increasing the numbers of those who speak Welsh and ensuring the continued use of the

language when transitioning from statutory education into work or higher/further education (Welsh Government 2017a; 2017b). In order to achieve the overall vision, the implications of this strategy would need to focus on educational reforms and an increase of resources to transform the contemporary systems in place. This includes setting up provisions for the workforce in the form of education and training. With regards to the transmission of language through families and other social groups, there is a need to extend support to parents and carers (Welsh Government 2017a).

The transmission would in theory increase overtime and its impacts would not be reflected in the near future. However, it does offer a strong foundation from which additional challenges can be focused on. This claim is further supported by Gathercole et al. (2007) whose research that proposes transmission factors as the most significant in influencing language spoken by young children. Despite the study being centred around the effects on children, it is possible that transmission-based learning will have effect on the wider community over a period of time.

4.5.2 Increasing the Use of Welsh

Increasing the use of the language would require further research of language practices and developments within the wider society. However, within this case the Welsh Government's focal aim is the social use of Welsh within both formal and informal opportunities. In the case of the formal opportunities, current legislation ensures that public bodies within Wales and some regions of the UK are able to provide bilingual services (Welsh Government 2017a; 2017b). However, the workplace also provides a strategic location for facilitating an increase use of Welsh language. This has been identified within the Welsh Language Use Survey 2013-2015 (Welsh Government 2015c), where a number of participants responded yes to speaking Welsh at work (see Figure 4). In order to encour-

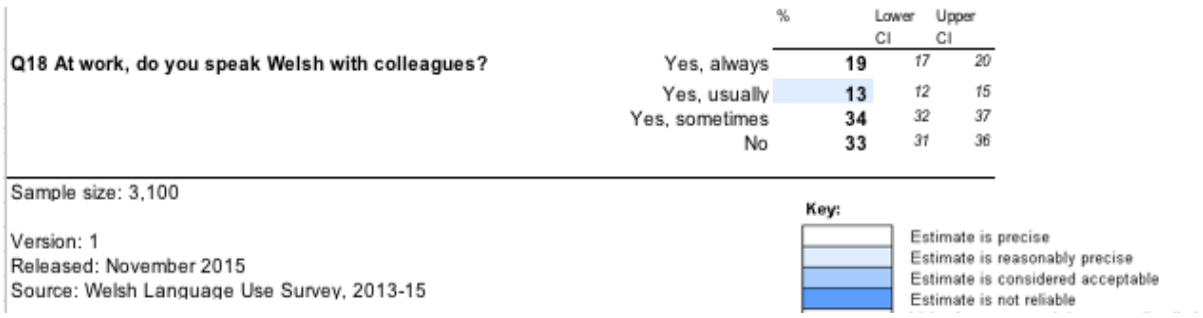

Figure 4. Results from question 18 of the Welsh Language Use Survey 2013-2015 (Welsh Government 2015b).

age a smoother transition from education to work, more value needs to be placed on bilingual skills. Additionally, improved emphasis and understanding regarding the opportunities that the Welsh Language can offer is needed. As one of the dominant employers in Wales, the Welsh Government will lead by example in order to promote the use of Welsh language in the workplace.

Embedding the use of the Welsh language from an early age is an important practice (Gathercole et al. 2007). Increasing numbers of speakers from one generation to the next acts as a potential for sustaining steady growth towards the vision and beyond. This theme closely relates to the theme of creating favourable conditions for the use of Welsh, as it relies on the development of the wider environment. External factors are difficult to control. However, through support from the actions of the Welsh Government and communities it is possible. Examples of areas where government can impact were identified within the Welsh Language use in the Community report (Welsh Government 2015b; 2015c). The lack of activities that included the use of or conducted through the medium of Welsh present a risk to the overall development. Such activities not only provide the opportunity for transmission-based learning but also acts as an opportunity for new speakers.

4.5.3 Creating Favourable Conditions

This strategy includes several aims, all of which share interconnected themes with the previous strategies. However, this strategy focuses on improving the linguistic infrastructure of Wales which in turn acts as a foundation for the previous strategies. The three main themes of this strategy emphasise the integral role of Welsh language within contemporary culture and media from a socioeconomic standpoint. These themes focus on embedding the language on the Welsh national scale by increasing the development of the language infrastructure (Welsh Government 2017a; 2015c). This is done by targeting multiple areas that are seen as opportunities of using the language. Examples of such areas are work, as discussed in the previous strategy. Despite having interdependent factors, the aim of this strategy is to produce a support network around the aforementioned opportunities for growth that allow the continued usage of the language. In addition to this, it is possible that a well-developed language infrastructure creates an environment that increases economic or employment opportunities. In theory an increase in any area would have positive results on the overall scheme. However, in order to reach this state consideration should be paid to language planning. Effective language planning in this case

would have to consider the number of different circumstances that exist on a regional and Welsh national level. The Welsh national level planning has already taken place in the form of language within the workplace, predominantly employment within public bodies (Welsh Government 2017a; 2017b). However, this provides an example of expectations for local authorities and private companies.

4.6 Land-use and Natural Resources – Tree and Woodland Cover

The use of natural resources in Wales is a constantly changing. However, following research of Wales and the UK as a whole it is clear that the forestry commission is adapting new management processes for forested areas. The main aims of the Forestry commission and Natural Resources Wales have already been aligned with the Futures Generations Act (Welsh Government 2015a) within the State of Natural Resources Report (Natural Resources Wales 2016). From this report key risks to the resilience and sustainability of Wales' natural resources were highlighted. In order to tackle these risks, the Forestry commission and Natural Resources Wales have set out a science and innovation strategy. The strategy is aimed at achieving long term goals by tackling short term issues such as pests and diseases (Natural Resources Wales 2016, Welsh Government 2018b). As the forestry management is devolved under the Welsh Government it is an area that will play a growing role in impacting the economic and environmental future of Wales, with the latter being interlinked with the 2050 emissions target discussed in section 4.4.

At present the main challenge for the Forestry commission is the tree and forest coverage of Wales. The historic industrial land use of and policies from previous governments have caused impacts that would need to be addressed before building towards scaling the industry. The Welsh Government currently possess a large share of coniferous woodland which require attention of its management, as it has the potential to stimulate the future economy. The current strategies issued within Woodlands for Wales: The Welsh Government's Strategy for Woodlands and Trees (Welsh Government 2018b) paints a picture of the contemporary actions that are being pursued in order to build the capacity and resilience of the forestry industry and other nascent opportunities related to it. The main employment opportunities associated with the industry are often related to the raw materials, this potential area will enhance the employment levels of Wales (Welsh Government 2018b). However, woodland management and land-based contracting businesses play a large role in the near future as strong foundations would need to be created.

Despite being an industry that requires maturation of the base product (trees), forestland also provides additional opportunities for nascent business (Natural Resources Wales 2016, Welsh Government 2018b). These exist as a broad range of businesses and other downstream economic growth opportunities for communities (Pollard 2018). The most notable of which being the tourism industry which have spill over effects into localised economies. At present the higher density of woodland areas exist within or near to the national parks which act as the ideal host potential for enterprise growth. These areas would require further support on a Welsh national and regional level in order to develop sustainable in place of sporadic or seasonal growth (Bell 2017). These factors can have negative effects on the local economy where irregular patterns of growth create instability, and the infrastructure would need to be improved in order to support the increase of tourism and other industry related activity (Dwyer 2018). The environmental impacts to these areas due to an increase of activity would also need to be regulated in order to safeguard the climate targets for the future.

The wood and timber industry within Wales is highly dominated by imported products, this means that the current industry operates in a competitive environment (Dwyer 2018). The future role of the industry as an employment sector and the development of environmental policies is highly reliant on building a robust system that supports the industry well into the future. The current strategy within the Woodlands for Wales report (Welsh Government 2018b) regarding woodlands for the timber industry focuses on two key areas. The first of which is maintaining woodland productive potential at current levels, as gradual growth is expected from the increase and expansion of woodland areas. The second of the key areas concerns the increased competitive environment which the industry is facing (Natural Resources Wales 2016, Welsh Government 2018b). Both aspects of this strategy are heavily reliant on one another in terms of financial value. As a means of value creation, there is significant potential to increase utilisation of home-grown timber and develop a more resilient system in the process. This would rely on developments to the current system in order to best integrate local supply chains to the overall process. Additional means of improving the woodlands and timber industry within Wales would require further cooperation to be done on a UK national level in order to compete on a global scale.

As the Woodlands for Wales (Welsh Government 2018b) report highlights the ambitious approach to the use of forestry land. However, as previously discussed the highly competitive industry presents major challenges on a global scale. Therefore, the

use of land for forestry use requires further research by decision-makers and its stakeholders concerning the future directions of its management process. As a resource, the management of private and public forestry land becomes increasingly important for the nascent opportunities that it can create (Natural Resources Wales 2016). Therefore, the focus of woodland cover should not only be evaluated in terms of raw material and resources but also the additional opportunities that can also benefit other areas of sustainable economic growth.

5 FUTURES TABLE – PESTEC

As can be seen in the Table 9, the first step in the process of morphological analysis consists of inputting variables or future states from the trend analysis without any dependencies or causal connections. With the exception of the political parameter, these states have been extrapolated during the trend analysis stage of this thesis. Despite being a non-quantifiable method by nature, the key drivers act as starting points to the number of possible directions a trend may develop in the future. Additionally, the analysis of inter-dependencies and causal connection was conducted in accordance with the four scenario archetypes as previously discussed.

Table 9. Futures table with scenario placeholders and mixed variables.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Political	Cooperation with UK government	Adherence to pre-EU referendum	Focus on de-volved legislation	Rise of populist based governance
Economic *Form of Employment*	Decline in low/un-skilled employ-ment sectors	Stable growth across sectors (Excluding industrial)	Decline in all sectors	Stagnant em-ployment across sectors
Societal *Changes in population*	Rapid growth of population levels	Natural changes to population change the main factor	Steady growth of population levels	Inconsistent growth of population
Technology *Transitions*	Disruptive	Pre-planned	Rapid	Moderate
Environmental *Emission level/policy*	Decarbonisation /Carbon neutral	Increase of CO_2/GHG emis-sions	No notable change to emis-sions levels	Climate neutral
Cultural *Welsh language*	Number of Welsh speakers increase	No notable change to numbers of Welsh speakers	Number of Welsh speakers decrease	Sporadic growth of Welsh speakers

The second step utilises the empirical data and a manual form of analytical hierarchy process proposed by Saaty (2001) to discover possible, plausible and preferable relationships between states. As a method, analytical hierarchy process allows for the systematic comparing of alternative states in the context of goal criteria. In this case the goal criteria exist in the form of the 4 futures archetypes and the synthesis of solutions has been depicted by scenarios. This process actively encourages investigation of causal connection between states and identifying the limits or extremes within the table (Álvarez et al, 2015, 30). By conducting the process of revisiting states from different parameters this ensures compatibility to the scenario archetypes. Thus, the scenarios become plausible and internally consistent as a causal route between parameters can be made. With regards to the criteria of securing the use of scenarios, the process of illustrating a problem space increases transparency and consequently credibility through rational connections of gathered data. Of course, it is important to keep in mind that the parameters are based on the data analysed within the trend analysis. Therefore, credibility can be further improved through the involvement of decision-makers and stakeholders, consequently increasing legitimacy.

Table 10. illustrates the completed parameters into the scenario archetypes. The presented table is by no means finalised as each parameter can be adapted to reflect changes in the environment or simply placed within another scenario type to produce additional scenarios. Currently Table 10 provides a brief overview of the possible directions the trends can take. As a frame the tables alone are not sufficiently enough exciting to illicit any responses or stimulate proactive changes. Part of the scenario quality criteria is to ensure that the scenarios address an issue or theme, so they are comparable. Therefore, more context is required to construct a shared situation for the scenarios. Thus, as previously discussed Brexit has been chosen as a predetermined element as at this point we understand or believe it to be inevitable. How this will be implemented is discussed in the subsequent chapter so that the scene is set for the scenario

Table 10. Futures table with variables organised to fit scenario the four scenarios.

	Continued Growth	Discipline (saturation point)	Decline of Growth	Transformation
Political	Focus on devolved legislation	Rise of populist based governance	Adherence to pre-EU referendum	Cooperation with UK government
Economic *Form of Employment*	Stable growth across sectors (Excluding industrial)	Stagnant employment across sectors	Decline in low/un- skilled employment sectors	Stable growth across sectors
Societal *Changes in population*	Steady growth of population levels	Natural changes to population	Inconsistent growth of population	Overall growth in population
Technology *Transitions*	Pre-planned	Moderate	Disruptive	Rapid
Environmental *Emission level/policy*	Decarbonisation /Carbon neutral	No notable change to emissions levels	Increase of CO_2/GHG emissions	Climate neutral
Cultural *Welsh language*	Number of Welsh speakers increase	No notable change to numbers of Welsh speakers	Sporadic growth of Welsh speakers	Sporadic growth of Welsh speakers

6 SCENARIOS

Future overview: The UK have exited the European Union without negotiating any form exit deal. The negotiation has deep rooted impacts across all UK regions. The following scenarios are but four futures of what may emerge from the data gathered throughout. The exploratory scenarios are not discussions or projections of the future, but illustrations of the conditions and dynamics that emerge from the current trends. Each scenario explores the plausible causal links between states highlighted in the PESTEC table through the illustration of key events, consequences and decisions through narratives (Glenn, 2003).

The produced scenarios are written from the perspective of a reflection report written in the year 2030. The purpose of the scenarios is to display just four of the countless future possibilities from the given variables. The aim of the scenarios is not to provide a definitive future, but to encourage the reader to engage and become comfortable with the process of scenario creation.

6.1 Continued Growth

Table 11. Continued growth scenario with descriptions of each state for context.

State	Scenario context description	Impacting trend
Focus on devolved legislation	The main focus of the Welsh Government is related to the devolved powers as outlined in Government of Wales Act 2006	Expansion of the Well-being of Future Generations (Wales) Act 2015 (Welsh Government 2015a) to cover private entities to promote sustainable business development
Stable growth across sectors (Excluding industrial)	Stable growth across sectors. Where the future employment of Wales moves away from traditional industries	Transition from manufacturing/production industries begins with the staggered introduction of automation and the retraining of those considered low/unskilled
Inconsistent growth of population	Population levels are inconsistent in reflection to employment opportunities and causal natural changes	Population growth fluctuates across the decade where some years break the pattern outlined in Table 5. Lower levels of migration as a result of Brexit
Pre-planned	Legislation surrounding technology transition within devolved areas is supported by the Welsh Government to ensure it complies with emissions targets or does not impact other states negatively	The prioritisation of renewable energy technology is utilised as both a form of future employment and as a means of producing clean energy (Building a low-carbon economy Wales report 2017)
Decarbonisation /Carbon neutral	Emissions targets previously set face no changes due to industry shift and increased uses of green technology	Emissions targets set under the 2016 Environment (Wales) Act remain in place
Number of Welsh speakers increase	Increase of Welsh speaking population following success of the 2050 language strategy	Employment retraining schemes and inconsistent population growth allow for inception of the three language strategies

Following the UK's exit from the European Union, the Welsh Government directed their attention to powers devolved to them in the 2006 Government of Wales Act. With the main focus on the devolved powers, the Government began building on the foundations of the Well-being of future generations Act (Welsh Government 2015a), by expanding the implementations of the 2015 Act beyond that of public bodies. The short-term success outlined within the Future Generations Report 2020; building capacity for long-term positive decision making was well received. Thus, wider scopes of investigation concerning the future visions of Wales were opened. Across the decade, transition was by no means a simple journey, but the increased proactive approach steered Wales through what some regarded as another turbulent period of its economic history.

The first area of concern that was most susceptible to the uncertainty of Brexit was the levels and sectors of employment (Pollard 2018). With large amounts of cut backs across the UK adding to unemployment figures, Wales as a nation was by no means protected against its repercussions. In accordance with the goals of the Well-being Act (Welsh Government 2015a) the Welsh Government staggered the implementation of automation within different employment sectors. The act placed emphasis on human capital, allowing time for those in low/un-skilled employment the opportunity to undertake the necessary lifelong training in preparation for industry shift and transformation. However, the legislation was aimed at safeguarding the future of employment by offsetting impacts and to not create further reliance on traditional industries for future employment. This was by no means a bold move, but more so a step of preparation towards supporting viable economic change.

The main obstacles of economic change did not suddenly emerge following the exit from the European Union, they were underlying factors present in the form of regional inequalities and economic activity. In order to uniform Welsh economy, focus was made on producing a regionally focused development model. The model was aimed at enhancing regional voices and building on the strong areas of their economy. This was completed by introducing the economy futures fund, which acted as a consolidated fund that reflected Welsh priorities through additional streams of funding. The first round of investment focused on the energy sector, most notably renewable energy. With its abundance of untapped renewable resources, the Welsh Government set focus on fostering business opportunities around renewable energy and forestry organisation through calls to action. This initiative supported business growth on a number of levels by producing a support network for existing businesses and growing businesses alike. Through the use of policy

interventions, the government created conditions of security and prosperity by challenging businesses potential in accordance with the Well-being goals (Welsh Government 2015a). The successes of the imitative were not only displayed through measures of combating climate change, but also by the emergence of nascent businesses attracted to regions across Wales.

Fostered growth of the economy despite being linear, was not reciprocated equally by population growth patterns. As the economy was slow to build capacity the population levels experienced fluctuating patterns, but more so towards the end of the decade. Following the no deal exit from the European Union, migration from outside of the UK almost ground to a halt as a result of economic uncertainty coupled with new immigration legislation produced by the UK National Government. The natural change factors of population growth took precedence over other forms of change. The historic pattern of neither birth nor death rates outweighing one another, the levels of population growth remained sustainable. The manageable population size permitted the Welsh Government take a microeconomic approach to governance, with particular successes in the form of the Welsh speaking populous. The 2050 vision of 1 million Welsh speakers provided a solid foundation for systematic changes across all levels of life in Wales. With the 3 strategy areas targeting different key aspects, the Welsh Government were able to focus on the inception of them into social policy as a form of preparation for the next generation.

6.2 Discipline (Saturation Point)

Table 12. Discipline scenario with descriptions of each state for context.

State	Scenario context description	Impacting trend
Rise of populist based governance	The policies and legislation implemented reflects popular societal values	Continued support for populist politics as a result of unemployment and resentment following Governments response to Brexit
Stagnant employment across sectors	Lack of employment opportunities in all sectors both new and existing	Companies withdrawing major operations from Wales and the UK as a result of failure to negotiate EU exit terms
Natural changes to population	Natural changes to population related to births/deaths, this does not include migration/immigration flows due to lack of employment opportunities	Employment levels remains one of the key drivers for population change across the decade
Moderate	Utilisation of technology is limited not to saturate employment sectors with automation	As a means of combating rising unemployment levels automation technologies are held back through government incentives
No notable change to emissions levels	Continued reliance on traditional energy production and transportation methods due to opposition to change of current systems	Continued use of Aberthaw coal plant as a means of generating electricity
No notable change to numbers of Welsh speakers	Lack of usage when leaving education and entering the working world	Failure of the language strategy due to lack of incentives for continued use and impact on employability

In retrospect the European Union membership referendum in 2016 followed by the European Parliament elections of 2019, were both overwhelming oversights on a national level for both the Welsh and UK Governments. The uncertainty surrounding the lead up to both the referendum and election highlighted the reactive approach utilised by governments. The events displayed a rise in populism, where political parties from both spectrums would hinder the government's attempt to improve the UK's position and the continued implementation of the Well-being of future generations 2015 Act (Welsh Government 2015a). This became evident in the beginning of the decade following the UK's exit from the EU, when the Welsh Government consolidated its grasp over the devolved powers. Despite having initial successes prior to the 2021 Assembly elections the Brexit party received little to no support for its failures of improving the economic situations in Wales. This resulted in a return to the traditional majority of the Labour party across constituencies. In addition to this, the falling rates of voter turnout places responsibility on the Welsh Government to openly involve citizens within the decision-making process. Through increased involvement of its citizens the Welsh Government hoped that the increased transparency would help alleviate growing economic and employment concerns.

Employment throughout the decade had experienced a period of stagnation as a result of deterrence as global companies continue their reluctance to expand operations or begin new ventures in Wales. At the beginning the uncertainty caused by Brexit played a large role in initial backlash of companies threatening to pull out of Wales and the UK. However, a number of these companies did not cease to operate in the market but chose to scale back overall operations. The ripples of this deeply impacted regions of the UK but making use of its control over devolved powers the Welsh Government set about competing for funding announced in the UK national Government's industrial strategy. The ambitions of which were to stimulate the Welsh economy to a point of stable growth. Despite not reaching the desired goals, the attempt did stabilise the economic situation and employment levels. This was ameliorated by the moderate use of technology within employment sectors that generally rely on human capital. Additionally, the moderation of technology impacted the implementation of renewable energy due to a rise of opposition to wind, solar and hydro energy. As its perceived effects on the natural landscape coupled with ideas of not being able to sustain current energy consumption.

Despite the 2050 vision language strategy, the Welsh language also experienced no notable change throughout the decade. It is difficult to provide a single point of failure within the strategy as it was a combination of external factors that contributed to its lack

of success. The most notable was the lack of continued usage between leaving education and entering the working world. This was by no means a new issue that has faced the language as the skill was not recognised as necessary by employers and employees outside of the public sector. Additional factors such as population stagnation were less recognizable but became more apparent when considering the regional inequalities that existed. It is highlighted by the Mid- and North Wales areas, which demonstrated continued usage of the language following completion of education. These regions historically acted as favourable conditions similar to those highlighted by the language strategy. However, due to slow growth and lack of internal migration, these conditions did not support continued use and eventual growth of the Welsh language outside of these regions.

6.3 Decline of Growth (Collapse)

Table 13. Decline of growth/collapse scenario with descriptions of each state for context.

State	Scenario context description	Impacting trend
Adherence to pre-EU referendum	The Welsh and UK government are slow to react to the effects of Brexit on Wales, the Welsh Government continue to operate unchanged	Continued adherence to pre-Brexit strategies such as the Well-being of future generations 2015 Act (Welsh Government 2015a)
Decline in low/un-skilled employment sectors	Decline of traditional industries places pressure on funding for education and training programs to increase the skilled workforce	Industry shift and automation leads to an increase of unemployment in industrial and production sectors placing pressure to improve education and retraining contingencies
Inconsistent growth of population	Population changes change depending on employment opportunities	Employment levels impact overall population level. However, Welsh regional levels susceptible to change
Disruptive	High levels of automation in manufacturing and other low/un- skilled employment sectors	Increased introduction of automation within the industrial and production sectors
Increase of CO2/GHG emissions	Continued utilisation of Aberthaw coal power plant beyond the original projected closure date	Continued use of coal generated power to support an increase of energy demands from industrial sectors
Sporadic growth of Welsh speakers	Growth and use of Welsh language is isolated to regions but occasional growth in other areas	Growth and use of Welsh language impacted by Welsh regional migration

Despite the extended period provided to the UK government to negotiate a leaving deal, Wales failed to organise contingencies for a no deal Brexit. The high levels of uncertainty that built during the run up to the exit had long lasting impacts on the capacity to restore confidence in private companies and the public alike. This did not mean there was a lack of preparation for exercising control over devolved powers but the looming exit from the EU fuelled levels of uncertainty. The focus on devolved powers was by no means without its issues. As a lack of cooperation between the UK National Government and the Welsh Government allowed for continued activity as though equal amounts of financial support was still being received. However, the challenges that faced Wales in the decade ensuing Brexit were only amplified by the broad nature of pre-existing and globally ubiquitous issues (Pollard 2018). As these challenges were and continue to be impactful across different economic and geographic areas, they were addressed as the following:

- Automation and artificial intelligence (most notably within the industrial sector)
- Demographic changes and pressures (movement of people in search of employment)
- Decarbonisation and energy requirements (slow to introduce alternative energy and improve infrastructure)

Within the 2022 Welsh Government strategy report, these areas devolved to their governance required immediate attention in order to acquire control over their future development and policy implementation. The increased usage of automation in the manufacturing industries and low/un- skilled sectors of employment drastically affected the levels of unemployment in regions that traditionally rely on human capital to drive economic growth. With new technologies being employed within industries the consumption of energy also increased. In turn this increase in demand drove the additional need for continued use or a return to traditional energy sources. In this case the foreclosure of the Aberthaw coal power plant was postponed from its original expectation of 2022 until the later end of the decade until further nuclear treaties were negotiated following the exit from the EU. Renewable alternatives were rolled out across the country, but they did not seem sufficient enough to support the increased demands of consumption. Thus, resulting in a ripple effect to the last challenge, decarbonisation and energy requirements which bore witness to a contrasting turn in respect to continued adherence to pre-referendum mandate.

The challenge of demographic changes and pressures has been a long-standing issue for the Welsh Government. Since the situation improved up until 2019, the uncertainty within the political and business spheres had repercussions on the regional inequalities. These factors have existed as a one of the most important structural issues in the Welsh economy, slowing any progress of prosperity and increasing sentiments of isolation. Traditionally support from EU funding allowed for investment into isolated areas in order to produce a more level playing field. However, since funding ceased, the UK Government introduced austerity measures. Pressures on public finances increased, as more impact was required to justify spending. This pressure heightened following increasing numbers of redundancy across low/un- skilled employment. The impacts of which forced the Government to increase public spending on the welfare system and explore options of training a displaced workforce. The further consequences of unemployment have been the inconsistent movement of population in search of work, which certainly effected the number of Welsh speakers. Despite the 2050 vision strategy making initial impacts following its proposal, the economic climate created isolated areas of Welsh speaking population. These areas continued to grow at a slow pace, however the levels were outweighed by the lack of usage in other regions of Wales. This came as a result of a limited budget and a failure to incentivise the continued use of the Welsh language outside of secondary education. These regional issues were by no means relative to the decade, as a larger percentage of usage of the language has traditionally remained within the northern regions of Wales despite demographic differences.

6.4 Transformation (Rapid Growth)

Table 14. Transformation/rapid growth scenario with descriptions of each state for context.

State	Scenario context description	Impacting trend
Cooperation with UK government	Increase of cooperation between Welsh Government and UK national government concerning devolved areas	Welsh Government able to utilise devolved powers to work cooperatively towards national goals
Stable growth across sectors	Stable growth in employment figures most notably within the service sectors	Economic shift receives full support through re-education and training programs
Overall growth in population	Overall population increase from a combination of increased birth rates and inward migration/immigration	Improved economic situation leads to increase of natural growth and migration levels
Rapid	Technology employed across the country to support energy demands and autonomous roles	Implementation of training programs for new technologies improve employment prospects
Climate neutral	National support for green tech and strict regulation implemented on GHG emissions	Focus on the widespread use of renewable energy sources and reducing GHG emissions
Sporadic growth of Welsh speakers	Increase of Welsh speaking population is often slowed by population increase factors, but Welsh Government strategy is extended	Due to economic migration the growth of Welsh speakers is limited. Therefore, additional incentives are added to the language strategy

The cooperative work undertaken by the UK Government and the Welsh Government in the years ensuing the EU exit, alleviated pressure from challenges both longstanding and those that occurred as a result of the referendum. Despite not having negotiated a leaving deal, the UK Government worked closely with its regions in order to consolidate their economic capacity on first a national and subsequently a global scale. The first major developments involved the preparation for further industrial shifts and an increase of reliance on a skilled workforce. In order to prepare for the shift, the National Government granted further powers to the Welsh Government regarding the devolved areas. This was by no means an act of creating a wild west environment allowing the Welsh Government free reign over Wales. But one that granted further control of Wales to the Welsh Government whilst the UK National Government focused on national issues. Additionally, measures and strict guidelines remained in place to ensure structured development and budgets were not exceeded.

As for the Welsh Government, focus was turned to the Prosperity for all Economic Action Plan (Welsh Government 2017c). The action plan targeted five areas of priority which were seen as detrimental to Wales' future. The Welsh Government set about tackling them by enacting the following strategies:

- Provide the necessary skills for developing workplaces
- Create a modern infrastructure to support current and future needs
- Drive sustainable growth as a means of operating (all levels)
- Combat climate change

The first area of focus targets the training of essential skills to equip the current and future workforce of Wales for a change in the economic environment. It is most notably aimed at the soon to be redundant workforce (particularly those in the traditional industries). However, the strategy is extended to cover different industries whilst providing secondary successes of tackling regional inequality issues by promoting fair work. It became evident that the further aims of this strategy were somewhat interlinked with the second. As a developing infrastructure coupled with the improved educational system acted as an encouraging incubator for new business opportunities. The third strategy acted as a governing standard throughout the decade in order to foster development. The fourth and final strategy, combating climate change was by no means individualistic to Wales or the UK. But the foundations set by the previous strategies created conditions that allow for Wales

to set course for a climate neutral future. The changing nature of the economy and the newly trained workforce played an instrumental role in the introduction and an increased implementation of renewable energy across multiple regions. This was further assisted with the importance of creating a sustainable and secured economy, where the potential of natural resources was geared for maximum capacity.

With the economic and employment situation gradually improving across the decade, the population levels also displayed signs of growth in reflection. The majority of growth continued to be a combination of economic migration from both; other regions of the UK and Europe, despite the exit from the European Union. This was not expected prior to the exit, but the economic potential of Wales had now reached global proportion. However, the increase of population through migration did not come without its challenges. The most notable of which being its effects on the 2050 vision of one million Welsh speakers. For the first part of the decade Wales observed a stable increase of Welsh speakers. But this was often hindered by the increase of inward and outward migration, this meant that language figures would often fluctuate to reflect these. Fortunately, the language strategy issued in 2017 acted as a solid foundation for additions to be made in order to create a socially inclusive Wales. The Act was not introduced until 2026 but its aims were to extend the initial language strategies to include those who have migrated to Wales for 2 years or longer. Despite receiving initial criticisms of forcing a language upon people, it was received with open arms by the public as it allowed for social integration and inclusion of groups that would often feel marginalised. The act was by no means aimed at boosting numbers in such a short period, but more so at fostering an inclusive environment whilst highlighting the importance and inclusivity of the Welsh language and culture.

7 REFLECTION AND RESULTS

With the scenarios constructed utilising the quality criteria, it is important to address the issue of securing their use. However, quality criteria alone do not ensure the use of scenarios. Therefore, credibility and transparency have both been introduced systematically through the use of data collection and chosen methods. However, the element of legitimacy remains. To address this element the scenarios will are first illustrated utilising an adapted version of Hiltunen's (2013, 151) strategy testing table. This further improves the credibility and transparency of the study by providing recommendations based on elements of the scenario. The second issue related to legitimacy that needs to be addressed is continuity. As previously stressed, conducting foresight activities is not a linear process, there is a need for a culmination point for it to become useful for decision-makers. Therefore, a follow-up process is required to ensure continual activities (Lindgren & Banhold 2003, Hiltunen 2013, O'brien & Meadows 2013). Within this thesis I propose a planning cycle to replace the current policy planning cycle presented by the UK National Government.

7.1 Scenario Highlights

The adapted version of Hiltunen's (2013, 151) strategy testing table serves as the final steps for constructing scenarios and the fourth phase of Hiltunen's (2013, 149) model. The main uses allow the organisation to test specific strategies within scenarios and anticipate how a scenario can develop over time. In this form it serves as a summary of highlights from each scenario that can communicate signals quickly. When being used within an environment that relies on information to be concise, this form of representing results can be used to catch the attention of its readers and the information can be amended as necessary. Such actions later improve the legitimacy of the study as the results are communicated, internalised and later adapted by the decision-makers.

Table 15 acts as a summary of highlights for the scenarios produced by the researcher. As the scenarios are produced for regional decision-makers and their stakeholders the table can be tested against stakeholder strategies or regional policies. However, as previously mention this is often conducted by actors from those environments. Therefore, as this project has no direct communication with these actors Table 15 focuses on the

broader economic, environmental and political perspectives of the scenarios. Of course, the table can be amended to reflect additional perspectives such as themes of sustainability. Although, in order to improve the credibility and legitimacy of its use the table can be cross tested against the goals outlined in the Well-being of Future Generations Wales Act (Welsh Government 2015a) discussed in section 1.1. By testing the scenarios against the Well-being Act (Welsh Government 2015a) allows stakeholders to envision how their long-term strategy achieve the goals. In cases such as this Glenn (2009) proposes that the decision-makers and stakeholders become familiar with both the scenarios and the materials that will be tested, from which a number of alternative actions can be prepared. Therefore, as this project will be shared with decision-makers and stakeholders these activities will be split into two groups. Firstly, the stakeholders who will interact with the scenarios by reconfiguring the futures table, so the scenarios incorporate their knowledge. Once completed the scenarios and testing table will be re-configured to reflect these changes improving the credibility. Once re-configured the scenarios will be presented to the second group, the decision-makers who then test policies and alternative actions. Once a policy is tested against all scenarios and produces desirable results it is then possible to plan contingent policies (Glenn 2009).

Furthermore, as there is no perfect strategy or policy that fits all scenarios it is important that the weak elements and forewarning signals of the scenarios should be focused on (Hiltunen 2013, Higdem 2014). Within a regional context this would be the creation of strategies and contingencies to limit the impact of negative developments. Higdem's (2014) study concludes with the proposal of embedding an action researcher who understands case specifics within the organisation to monitor the trends as they develop. The action researcher approach further builds the credibility and legitimacy of foresight activities through understanding the connections and communication between strategy production and the decision-makers (Higdem 2014, 49). Within the case of this thesis as the ONS data bases are updated every two years the study can be replicated to include updated figures and to adjust strategies accordingly.

Table 15 summarises the important aspects of each scenario. The table should be viewed by decision-makers stakeholders both before and after their involvement, so they are able to review the scenarios and adjust their strategies accordingly. Through conducting these intersubjective activities legitimacy and credibility reinforced as scenarios are reviewed and adjusted to reflect the insights of those involved in the processes.

Table 15. Testing the strategy in different scenarios. Completed with input of scenario highlights (Adapted from Hiltunen 2013).

	Continued Growth	Discipline	Decline/Collapse	Transformation
Functional elements of the scenario	Strong focus on environmental issues and emissions targets	Attempts at improving employment situation	Continue to follow EU guidelines and legislation whilst seeking alternatives	National support for implementing 'green tech' supports economic change
Weak elements of the scenario	Transition from traditional industries and time of economic recovery	Lack of employment causes spill over issues	Decline of traditional industries places pressure on education and training programmes	Developing an economy based on environmental goals side-lines some industries
Forewarning signals	Decline of traditional industries through decreasing subsidies and companies pulling out	Turbulent recession causes change in politics on national level	Lack of urgency to prepare for the UK's exit from the EU	Increase of national funding or regulation for environmentally focused business
How to respond if the future takes course towards this scenario	Adopt a microeconomic approach to governance	Safeguard Welsh interests utilising devolved powers	Prepare contingencies despite the postponement of Brexit	Allocate resources and policy to ensure a smoother economic transition

7.2 Scenario recommendations

Following the scenario highlight table, it becomes important to identify key themes to produce scenario recommendations. Within Table 15 it becomes apparent that the key thematic drivers highlighted are related to economic and environmental factors. More specifically, employment and emissions targets. As discussed in the preceding section this activity is often the responsibility of decision-makers (Hiltunen 2013, 151). However, to ensure transparency and credibility it is important for the researcher to contribute to the mutual learning by expanding on the scenario highlight table. Higdem (2014, 47-49) proposes that by strengthening the connections to the processes of knowledge creation and strategy production the overall foresight capacity is improved. This is done by demonstrating the knowledge gathered from the study and applying a strategic analysis to the results. Therefore, in the subsequent sections each scenario is given recommendations for decision-makers and stakeholders to focus their attention to key areas.

7.2.1 Continued Growth

The utilisation of devolved powers outlined in the Government of Wales Act 2006 will allow for a microeconomic approach towards developing regional specific policy. With an industrial shift being driven by the effects of Brexit, the main focus of this scenario outcome is the retraining and education of those transitioning from the manufacturing and production industries. Harnessing renewable energy and sustainable management of land and resources allow for nascent employment opportunities whilst adhering to pre-Brexit emissions targets. The main areas of focus of this scenario is the handling of industry shift to ensure a smooth transition and the creation of employment within renewable energy and clean tech industries.

7.2.2 Discipline (Saturation Point)

The economic turbulence throughout the decade caused by the failure to negotiate a leaving ‘deal’ and attract new employment opportunities. The political impact of these events sees a rise in populist following where the utilisation of the devolved powers is used to create a protectionist state where Wales’ interests are put before those of international and

environmental significance. As a means of ensuring lower levels of unemployment, the utilisation of automation in manufacturing and production industries is limited. The lack of new employment issues generates a generation divided by low/un-skilled workers and those who have completed further education. Those that belong to the latter seek employment opportunities outside of Wales. Despite seeming a negative scenario, the main areas of focus should be used to build resilience against such future directions. As a means of improving the situation contingencies should be made where the goals of the 2015 Well-being Act (Welsh Government 2015a) are implemented outside of public bodies to promote sustainable development, economically and environmentally.

7.2.3 Decline of Growth (Collapse)

The environmental and economic impacts of this scenario are predominantly based on the slow reaction to negotiations of Brexit. With higher levels of automation being deployed across industries, the demands for energy and employment retraining increases. The increased consumption of energy places a strain on the energy infrastructure which is supplemented by the continued operation of the Aberthaw coal plant beyond its projected closure date. The environmental impacts of which exceed previous emissions targets proposed by the EU and later the UK National Government. However, these issues are sidelined as the Welsh Government deal with a strain on retraining and education systems. The main focus of this scenario is the present reaction to Brexit negotiations. As the UK continues discussions with the EU, it would benefit the Welsh Government to review current policy to ensure support to different sectors. Areas that are of future importance within this scenario are education; to ensure employment retraining to increase the populations employment opportunities, and investment into renewable energy resources to meet current emission targets.

7.2.4 Transformation (Rapid Growth)

The cooperation between the UK National and Welsh Governments is key to the successes of this scenario. With the failure to negotiate a favourable leaving deal, the governing of regions, in this case Wales is left to regional authorities. Through this the devolved powers are utilised to improve the Welsh economy through the introduction of

green and renewable technologies. Through increased national funding the energy infrastructure can be improved to support current and future demands. The industrial sector still faces challenges in the way of increased use of automation and operation costs. However, the national funding should not only be allocated to the integration of renewable technologies, but also for the re-training and education programmes to ensure that employment opportunities are created. With this in mind it is also important to consider the weak elements of the scenario which are the impact on Welsh speakers and the ensuring of other business opportunities outside of the renewables/green tech sectors. To ensure that Wales does not become focused on a single industry type further support should be given to nascent business opportunities. Through the implementation of the 2015 Well-being Act being extended beyond public bodies, it is possible to improve the sustainable development of the Welsh economy.

7.3 Cycle for Future Planning

Presently the UK National Governments Futures Toolkit (2014, 4–5) propose the use of the policy cycle. As part of the Futures Toolkit (2014, 4–5) policy cycle serves as a method for the continual consideration of the impacts a policy may have or is required to address. The cycle consists of five steps for formulating, analysing and modifying policy. However, as the nature of this thesis is not directly involved with policy creation, a planning cycle that is best suited to the process is required. Therefore, the Observation, Orientation, Decision and Action (OODA) model as displayed in figure 5 was chosen. The planning cycle began as method used to measure the mental processes of fighter pilots within the US Air Force. However, the planning cycle has since been implemented by Lindgren and Banhold (2003, 7–11) to identify high performing organisations who are quicker to react to wider societal events that can impact the industry. They further add that the OODA loop is aimed at addressing the balance between flexibility and stability within dynamic environments (Lindgren & Banhold 2003, 7–11), thus making it a malleable model suitable to be developed for strategic foresight and planning within my thesis.

Within this thesis the *Observation* stage of the cycle will initially be begin alongside the horizon scanning and data gathering process. However, it is a process that should be returned to if any changes develop following the initial research, or should the Welsh Government wish to include any information gathered during later reviews. The *Orien-*

tation stage involves the interpretation and analysis of the information through trend analyses and the production of scenarios. The conventional process for the *Decision* stage consists a decision planning process which making choices from the information presented, resulting in the *Action* stage. The *Action* stage is simply the implementation of the decision(s) made.

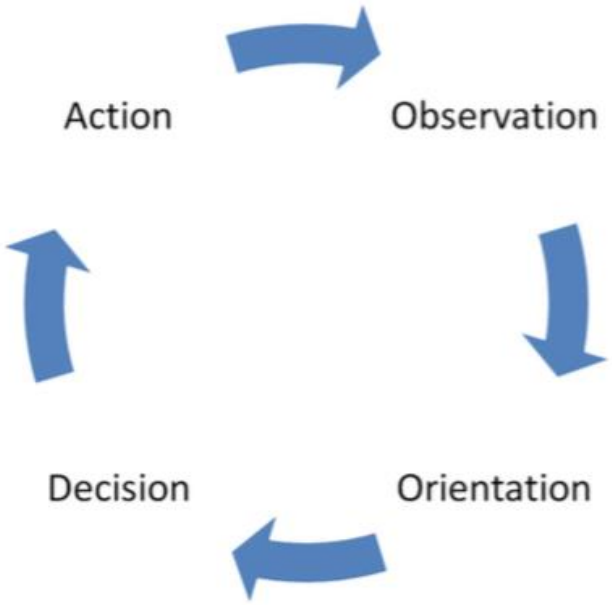

Figure 5. Scenario orientation and use to support strategy development (O'brien, & Meadows 2013, 652–653).

In its current form the OODA model stands as a rigid guide for exercising a simple planning cycle. However, it does not account for the lapse in time between the scenario planning, stakeholder involvement and implementation phases. In its simple form I will include an additional stage between the *Orientation* and *Decision*, that accounts for any time lapse between scenario development, orientation and its implementation. In order to address the issue of lapse in time or account for additional information within scenario planning process I will introduce the *Reorientation* stage. The *Reorientation* stage becomes particularly important for this thesis due to one or more of the following factors:

1) Allows for the Welsh Government to become familiar with the scenarios and development process. This provides the option to produce additional scenarios from reviews, stakeholder meetings or workshops

2) The produced scenarios will be released into the public domain where there is potential for others to make use of them

3) There is a lapse of time between the scenario development and implementation; or if this exorcise of scenario planning is to be run over longer periods of time

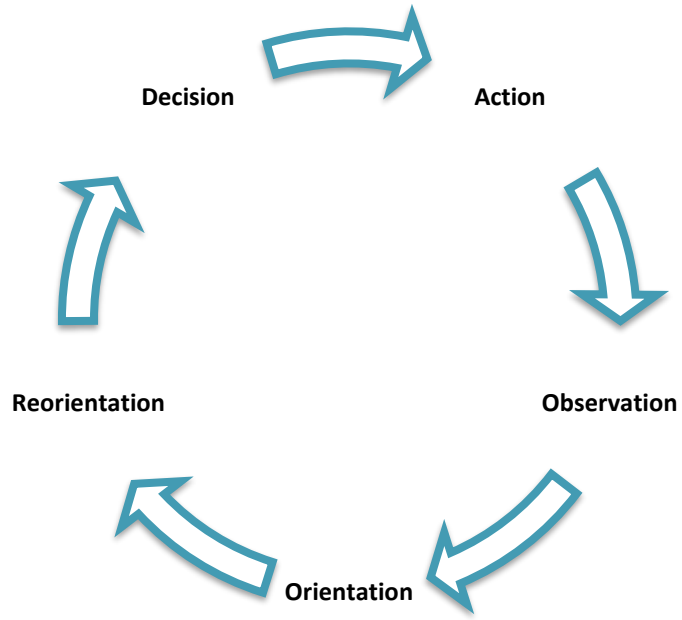

Figure 6. Model adapted by the author from the OODA proposed by O'brien, & Meadows (2013).

The OORDA is produced, keeping in mind the ethos of future studies, which is education of the future and not its prediction or to dictate it. As briefly discussed, the original model is often used by practitioners from other disciplines in order to evaluate the strategic flexibility and performance of organisations. However, it is possible to utilise the developed model as a more proactive approach within future studies. Bettis and Hitt (1995, 13–14) explored the importance of strategic flexibility within corporate environments through the concepts of robustness and strategic response capability. The latter of which served as the main influence on the development of the OORDA model. This is defined as; the ability to "(1) sense change in the environment; (2) conceptualise a response to the change; (3) reconfigure resources to execute the response" (Bettis & Hitt 1995, 16). This definition provides a brief summary of strategic activities, whilst the language used im-

plies involvement of both researcher and end user within the process. By doing so intrinsically improves legitimacy through the inclusion of those who can provide additional credible data. From this I derived the need for an additional stage. The main aim of its implementation is to address issues related to continuity and trigger strategic response through the encouraged participation of individuals from various fields in the scenario planning process, this essentially acts as a means of communicating the futures.

8 DISCUSSION

8.1 Methodological Considerations and Limitations

The main objective of this thesis was to contribute to the implementation and use of foresight activities on a regional level. The research within the thesis is centred around Wales and the Welsh Government as I had the opportunity to directly contribute to their foresight and decision-making processes. The research intent is based on implementing and improving the existing 'future proofing strategy' organisational model as proposed by Hiltunen (2013). I believe this model as discussed in section 3.1.1 to be a competent systematic approach from which to base and develop regional foresight activities. Despite providing a comprehensive guide on how to conduct strategic planning within a business environment, the model by itself lacked depth and failed to consider the inclusion of alternative futures methods. The ambiguity of the base model is understandable as the nature of futures related research allows for a variety of multi-disciplinary methods to be applied. If we consider the first research question of "How to integrate strategic foresight processes to improve regional planning?" there is no singular method, model or process that is able to provide a conclusive answer. Therefore, Hiltunen's (2013) model was chosen to be developed for use in a regional foresight context. By introducing methods of data collection, analysis, organisation and communication the goal of developing the model was not to introduce another type of foresight, but instead help visualise the process of foresight activities and clarify its contribution. Throughout this chapter I will evaluate the key results of each aspect by discussing its relation to the methods used.

8.1.1 Trend Analysis

The objectives of the trend analysis were to explore the trends covered in the 2017 report (Welsh Government 2018a) further by using empirical data from additional sources. The intention of this was to identify potential contemporary signals that could indicate how the trend may develop in the future. This task required extensive research into the individual trend areas using the Horizon Scanning criteria, which uncovered an abundance of material surrounding each trend. This presented the challenge of returning a substantial amount of empirical data that required screening to ensure it was relevant to the study before processing it into communicative information. This was addressed by firstly limiting the number of trends to those that have overlapping qualities or were highlighted as

areas of interest throughout my communications with the Welsh Government. Secondly, by making use of the tacit knowledge expressed as goals within stakeholder reports.

The uses of the method on its own did not answer a specific research question. Its intended use was part of a process that allowed for a descriptive foundation of the trends in the contemporary environment. In relation to Hiltunen's (2013) model, the trend analysis is part of phase 2 the scenario construction process, as it provides contextual information. The broad range of trends discussed in the Trend Report (Welsh Government 2018a) can be viewed as both an advantage or a weakness as it covers a number of topics. Therefore, this method is often criticised for its reliance on the experience of the researcher or pre-existing knowledge on the subject to gather and implement the relevant data. However, through transparent communication the end-user gains a strong understanding of the expected probability of events and their impacts (Huss & Honton 1987, 24–25). This presented an issue not in the form of experience or lack of knowledge but more so the abundance of data, as the number of trends threatened to spread the research thin. In order to avoid this the PESTEC table was chosen beforehand as a means of consolidating the data into manageable and understandable future states.

In reflection the number of trends analysed created a broad research field, despite my aims being to narrow the focus. In theory the method was applied to provide a qualitative analysis of each trend, but restrictions of time in relation to the abundance of data made for a selective study. The data and documents analysed within this study largely stemmed from annual reports produced by public bodies and stakeholders for the Welsh Government. When considering the scope of their long-term individual goals and their attitude to meet them, it is possible to conclude that futures can only be understood by the information given. Therefore, it becomes beneficial for future reports to also include more ambitious goals. To avoid this limiting the study a selective approach supplemented the data being analysed in the trend analysis process, by including information that was not included in the government reports. In some cases, this was regarded as common knowledge or openly available information such as news articles and bulletins. It is possible that this approach would be criticised by some for lacking to spot and consider signals from the wider environment. But the trend analysis conducted focused on the contemporary situation of a particular trend and what expectations have been set. By analysing both it was possible to understand what challenges they faced from both internal and external forces. Therefore, the additional empirical data was utilised within the trend analysis to produce provocative scenario examples.

8.1.2 Futures Table - PESTEC

The use of the PESTEC table within this thesis have been outlined within the methodology chapter as a frame to categorise data into states from which to construct scenarios. This was conducted by objectively analysing the information gathered within the trend analysis process, and producing scenarios based on the possible and plausible interconnected qualities of the variables and organising them within the four futures. In some cases, gaps analysed within the trend information presented the challenge of inputting variables to the political perimeter. As the materials used were produced or commissioned by the Welsh Government and their Stakeholders, political agenda and bias was avoided. Thus, the political variables derived from empirical data concerning possible future directions.

Returning to the aim and positioning of the table within the thesis, which was to supplement transparency by allowing the reader to visualise key drivers within trend areas. Additionally, it is important to consider that the chosen variables are not absolute as they can and should be amended by decision makers in this case the Welsh Government. In brief, table 10 portrays four possible futures of which many exist. The table is produced from my knowledge and synthesis of the trend analysis data which of course would benefit from stakeholder involvement to improve accuracy. However, the aim of the PESTEC is twofold as it also acts as an example exercise familiarise oneself with the process of constructing a futures-oriented table and implement it within scenario creation. Therefore, the implementation of PESTEC did not yield results in and of itself as it was chosen as a method for organising my findings into clear states to causal connections.

8.1.3 Scenario Planning

The use of intuitive logic approach lends itself well to the scenario development process of this thesis as it is able to incorporate the implementation of both methodologies and processes. However, applying all eight steps as directly proposed by Huss and Honton (1987) was not possible within the scope of my thesis. The eighth step; Analysing implications for decisions and strategies, presented itself as the main issue as it essentially signifies the termination of the researcher's involvement. Despite Slaughter's (1997) bold but rational claim of foresight activities being a process without a beginning and an end. There is a need for a study to reach a culmination point for it to become functional for decision making purposes. This was addressed within the scenario planning chapter,

where the intuitive logic approach accounts for this by including the end user within the process. Additionally, the method fits well to the needs of the Welsh Government as it allows for the process to be replicated should they want to revise any data inputs. Additionally, as discussed in section 3.2.3 this was addressed by adapting the instructions given by Huss and Honton (1987) to include the scenario results and recommendation table.

As this study is constructed around Dator's four scenario archetypes (Smart 2017) it is important to consider how they predicate the desirability of the produced scenarios. This becomes particularly crucial in context of decision makers being governing bodies where preferable futures can become a means of domination. This issue is by no means individualistic to the four scenario archetypes, but it is possible to argue they tend to harbour subjectivity towards more desirable futures. It therefore becomes important to consider two possible alternatives. The first of which would be to exclude the archetypes to avoid the creation of success scenarios that exclude issues that could potentially have negative consequences for regional decision makers. The second recommendation is to position regional action that focuses on the transformative scenario archetype. Both changes provide possible beneficial outcomes towards producing good scenarios. From a methodological standpoint a more complete understanding of how to develop good scenarios only becomes possible when engaging with stakeholders to develop a process of shared refinement. This process of improved visions encourages intersubjectivity and joint ownership of scenarios, and consequently strategies, subsequently improving legitimacy and securing their use.

8.2 Directions for Future Research

There are a number of possible directions to build upon and improve the study and its impact within an organisation. The first step in extending the research would to hold workshops with key actors and stakeholders. This would allow for the communication of the scenarios and receive additional input, similarly to the work of Higdem (2014). The intention of these workshop will be to gain additional knowledge that did not come to light during the desk research, from which alternative scenarios can be produced. These actions further improve the credibility and legitimacy of the study and allow the researcher to create more realistic alternative futures through communication with; and in context of the stakeholders and actors.

Secondly, Wales within this study is regarded as a region under the UK National Government. Therefore, it would be both beneficial and interesting to conduct the study on a Welsh regional scale. Of course, this would require a focused research into a specific area. An interesting example of which would be analysing the impact of the '1 million Welsh speakers' strategy to explore its successes and failure on a regional level. This would allow for an exploration of the role played by systems on a micro level.

Thirdly, the study highlights the role embedded researcher would play within an organisation conducting foresight activities. The limitations within the research process mostly arise from the lack of direct communication and input from the case organisation. As the study is a diligent process and not a product that can be handed over following its publication. An active researcher or team of researchers could be embedded within the organisation to partake in the process with the aim of making improvements.

Finally, further research into the three elements used to ensure the use of the scenarios would also benefit the discipline as a whole. This study utilises the evaluation methods proposed by Piirainen et al. (2012) and van der Steen & van der Duin (2012) to explore how to ensure the use of scenarios. However, by conducting a follow-up study regarding their use, it is possible to study if they were used and why. With further evaluation being conducted into if they used as intended or did the case organisation adapt the study.

8.3 Conclusion

With global issues such as climate change, overconsumption and overpopulation affecting different areas, it is important that change begins on a regional level. Despite playing a small role in such issues, it is equally important for the impact and role of regional change to be recognised.

The increasing amount of information available in the modern world, it is becoming increasingly difficult to make use of data to its full potential. In contrast it is also becoming more important and invaluable to delegate resources and consideration to the ever-changing wider environment. When considering these factors, it is important for organisations who consider long-term planning activities to best utilise the data and resources available to them. In cases such as this study it becomes apparent that long-term planning and the activities that are tied to it can be conducted at a base level and subsequently built upon.

This study demonstrates the activities related to conducting and implementing strategic foresight methods within a regional planning context. This however, does not mean that the study is a concrete guide for conducting a foresight project. As there are a number of methods that can be implemented to explore potential issues in a broad or narrow sense. In a disciplinary context the study highlights that high quality does not ensure the use of foresight activities. This can only be achieved through the active evaluation of one's work. Through implementation of the three elements it is possible to ensure the use of the research by meeting the requirements of credibility, legitimacy and transparency. Additionally, it is important to consider that through the implementation of such processes that the aim of futures research is not to provide a definitive answer or serve the interests of an organisation. But more so to act as intermediate for learning and to encourage decision-makers to become more agile, proactive and robust.

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