Comparing the flood resilience of Southwell with the Dutch MLS approach

What can be learned from comparing flood resilience in Southwell with the Dutch MLS approach?

Research group: Ridas Asmonas Justin't Hart, Max van Beek, Ben Pieterse, Daniel Friederich
Date: 20-01-2017
RESEARCH ASSIGNMENT, CU04143
J.M. Buijs
HZ UNIVERSITY OF APPLIED SCIENCES

Interreg
North Sea Region
FRAMES
European Regional Development Fund
EUROPEAN UNION

Table of Contents

1. Introduction

1.1 Problem description and demarcation

"The southern half of the Southwell is crossed by the Potwell Dyke, a statutory main river that flows from west to east through the urban area. Multiple ordinary watercourses are also present within the catchment, including the Halam Hill watercourse which is culverted extensively through the northern part of Southwell." (James, 2015)

Southwell has experienced major floods in 2007 and 2013, but is not limited to those – a bunch of smaller scale surface floods happened in the meanwhile. This means that the area is very prone to coping with excessive water. Amount of imperturbable surfaces, urbanized areas, lack of green space and other factors prevent water from absorbing, dealing with the situation. Lack of hard defences, such as barriers is also apparent, since most of them are easily overtopped with a larger rainfall, which occurs rather frequently.

On further research, it was shown that the city is definitely lacking coping mechanisms for the floods that are only going to get more intense with the increasing pace of global warming. Therefore, an idea came up for a mutual benefit – to find out the differences between the Southwell approach to flood safety and to compare it with the Dutch MLS system. By doing this, lessons can be learned and experience shared in between the countries and their ways of dealing with water safety issues.

Our goal is to find out the fundamental and minor differences in the water safety approach of both countries in order to compare them with each other. This would prove beneficial to both countries, since there is always room for improvement or at least, consideration of different measures and policies. Reaching out for different ideas and approaches can be quite handy tool to share experiences, discuss problematic areas and find mutual benefit in all of this. This research is seeking out the aspects between the approaches of the UK and the Netherlands – the hierarchy of institutions, power levels, similarities and differences, etc.

1.2 Ethics

The ethical requirements for this research proposal are somewhat general. The transparency and objectivity are by far the most important ones. Transparency is key because it means that people know what you mean and there are no cover-ups, which makes the report more trustworthy and reliable. Objectivity is important because every scientific report should have an objective approach. A researcher can never use opinions of other people or his own, unless appropriate. Furthermore, there is another ethical requirement that is less relevant for this research, but still worth mentioning; confidentiality. The information that is used to compile the report is sometimes confidential and it is important to be careful when using information from sources other than your own.

1.3 Feasibility

Determining the feasibility is vital when conducting a report, because it proves whether a research can be conducted or not. If there is simply not enough money, time, willingness of subject and the approachableness of the subjects or the material is hard to retrieve or is of low quality, the research cannot be conducted. When applying this rule to this particular research, all of the above mentioned factors can cause a setback. However, the current scope and approach of this educational research is entirely feasible, considering the time given, resources allocated and all other issues considered. There is enough information available for a holistic comparison between the differences and similarities of the two previously mentioned countries. An issue might be getting experts of the field help, considering their busy schedules and the scale of our requests for support. There are no financial

needs to conduct this research and it costs nothing to implement or reflect on the results, too. In overall, the research project is feasible in all ways, but potential setbacks still exist.

1.4 Relevance

Extensive research regarding the topic has already been conducted in the area. The major reason for this effort were the two great floods in 2007 and 2013, proving the issue of fluvial flooding to be a real threat. Due to climate change the risk of fluvial floods is only increasing over the next years, especially in regions like central England, where levels of precipitation are already high. The issue is being treated very seriously by the local government and the public to a certain degree, that a NGO has been founded specifically to address the increased risk of flooding. In general interest in the topic is very high and in the immediate future the area is in a transitioning phase to increase security. Any new additional information will be welcome, to the local government and its partners. The impacts of this research could be helpful for the people, economy and integrity of Southwell and provide different insights on Dutch MLS approach. A lot of valuable lessons can be learned from both approaches to benefit these location

1.5 Innovation

This research is innovative in a particular way. There are numerous studies done on the UK and MLS approaches to flood safety already. However, there have been no studies that compare the two policies
objectively and look for differences in order to benefit both perspectives. Therefore, this research is innovative for the field. Considering different aspects that are being compared, tools used and research design itself, the innovation comes from the unique issue that the project is looking into – comparison of UK approach and the Dutch MLS for water safety.

1.6 Research objectives

Our goal is to find out the greatest differences in hierarchy of institutions, who and how controls the flood risk management, establish corresponding power levels in the countries and in the comparison between them. It is in our interest to find an objective way in which the two approaches could be compared, which would lead to productive results and conclusions, which also could lead to valuable lessons and possible consideration for changes in their respectful perspectives and approaches.

1.7 Central question and sub-questions

Main research question - What can be learned from comparing flood resilience in Southwell with the Dutch MLS approach?

This question was selected because of its possible benefits that would be the results of the research. The time and resource feasibility is also fair, considering the scope is quite precise and not too wide to be successfully accomplished. In overall, the main research question is divided into smaller parts which go into detail of specific comparisons of different aspects of MLS and UK water safety approaches regarding different areas of developments.

Sub-questions

- **What can be learned from comparing the role of the community in flood resilience in Southwell with the role of the community in the Dutch MLS approach?**

This question was selected in regard for third layer of Dutch MLS approach – crisis management. The UK relies heavily on this layer and the protection it provides, but the Dutch seem to provide much less care about it than other layers. Therefore, lessons can be learned in order to achieve better experience in crisis management for both countries.

- **What can be learned from comparing spatial planning practice within flood resilience in Southwell with spatial planning practice within the Dutch MLS approach?**

  Spatial planning practices are somewhat different in UK and Dutch approaches, therefore, they need to be compared to see the fundamental differences, which would lead to conclusions about their similarities, contradictions, different views and angles.

- **What can be learned from comparing prevention of flooding in Southwell with prevention of flooding within the Dutch MLS approach?**

  Primary flood defense practices are completely different in both countries. While Dutch MLS tends to focus on this layer to prevent the issue of floods all together, the UK approach chooses to deal with consequences instead of prevention. Silver lining can be reached in this topic, however, comparison and examination of situations are needed to accomplish this.

2. Summary

The main research question being researched is "**What can be learned from comparing flood resilience in Southwell with the Dutch MLS approach?**" By researching this question, the topics of spatial planning, crisis management and primary flood defences are discussed in order to get findings on this topic.
The objectives that we are trying to achieve with this research are to find differences and similarities in order to learn from each other to enhance both the Dutch MLS and the UK water safety approach in various aspects covered with sub-questions. Seeking silver lining between the two approaches lead to valuable lessons in regards of water safety related topics.
This research also uses various tools to achieve its results, such as SWOT analysis, stakeholder analysis and matrix, relationships between actors, power pyramid and some other comparison methods.
The research concludes the findings, such as – Southwell has more bottom-up approach than the MLS method, which is top-down; UK national government has much less power over spatial planning in regard of water safety than in Netherlands; development strategies have to be different, especially in initiation stage, due to water safety related calculations; both countries are trying to encourage communities to participate more, but UK is doing that more successfully;
Respectfully, the recommendations covered would be to implement the green belt in Southwell, clear up the hierarchy of governmental institutions responsible for different areas of developments, focus more on first layer than the third one in Southwell, and finally increase attention to third layer of MLS in Netherlands.

3. Area analysis Southwell

To get a good understanding of the issues regarding the multi-layer safety in Southwell it is important to obtain in depth knowledge about the area itself and its surroundings.

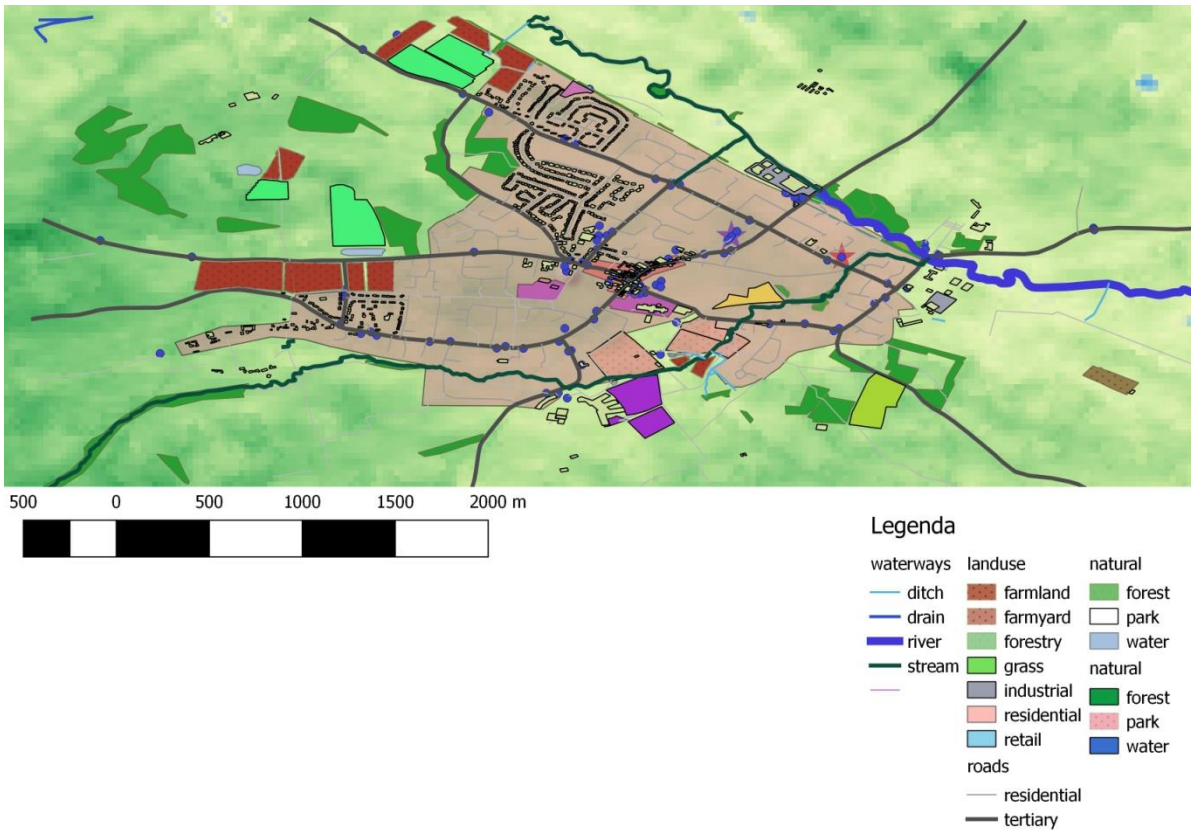
3.1 General information about the area

Southwell is a small market town in the county of Nottinghamshire in England and is known for its historical and architectural character. Southwell has a total surface of 2393 km2 and an estimated population of 7297 inhabitants. Within the neighbourhood area 3069 dwellings have been recorded and the further outside the urban boundary the more rural its character gets, with few minor settlements (Southwell Town Council, 2014).

In town of Southwell a large amount of historical buildings can be found, moreover Southwell has received formal recognition as being one of four towns in Nottinghamshire to have 'outstanding historic quality'. A large number of buildings in the historic town centre are listed as being of local and national interest which give the town a rich built historic landscape. To ensure that the town maintains its historical quality an extensive conservation area (The Southwell Conservation Area Appraisal) has been set up in 1968, which is divided into six zones; Westhorpe, Westgate, Town Centre, Minster, Burgage and Easthorpe. The Southwell Conservation Area Appraisal states that significant development pressures make the area vulnerable to damage and puts an emphasises on the importance of ensuring new developments within the area are contextually responsive to the designation.

3.2 Geographical Information

Around the town of Southwell the landscape is mainly rural and agricultural. on the northern side of the town the River Greet is located which flows in a south-easterly direction moving past Rolleston where it meets the River Trent at Fikskerton. The land rises from the River Greet at under 50m above sea level up till over 80m on the western slopes. The river has a catchment area of 46.2km2 and an average flow of 27.65 million litres per day. This river is highly affected by rainfall, which causes the river to rise and muddying the water. On the southern side of the town Potwell Dyke Grasslands are located, which are a series of small wetland meadows trough which a small creek runs. The grasslands have been designated a site of importance to nature conservation and so are managed as a nature reserve. The water level in the creek running through these grasslands is also greatly affected by the amount of precipitation. On the eastern side of Southwell the underlying geology is mainly Sherwood and Merica Sandstone. Below Southwell the geology is predominantly mudstone, siltstone and sandstone (Stephen Parry, 2013).



Furthermore it is important to state that the impressive Minster church serves as an important and iconic landmark in the area. The Minster church and many other different sites are of both of great historical and archaeological importance. In 2008 a community group dedicated to the exploration and preservation of the archaeology of the ancient Minster town of Southwell and its surroundings was formed (Southwell Archaeology, n.d). The towns rich archaeology therefore is also of local and national importance.

3.3 Demographics

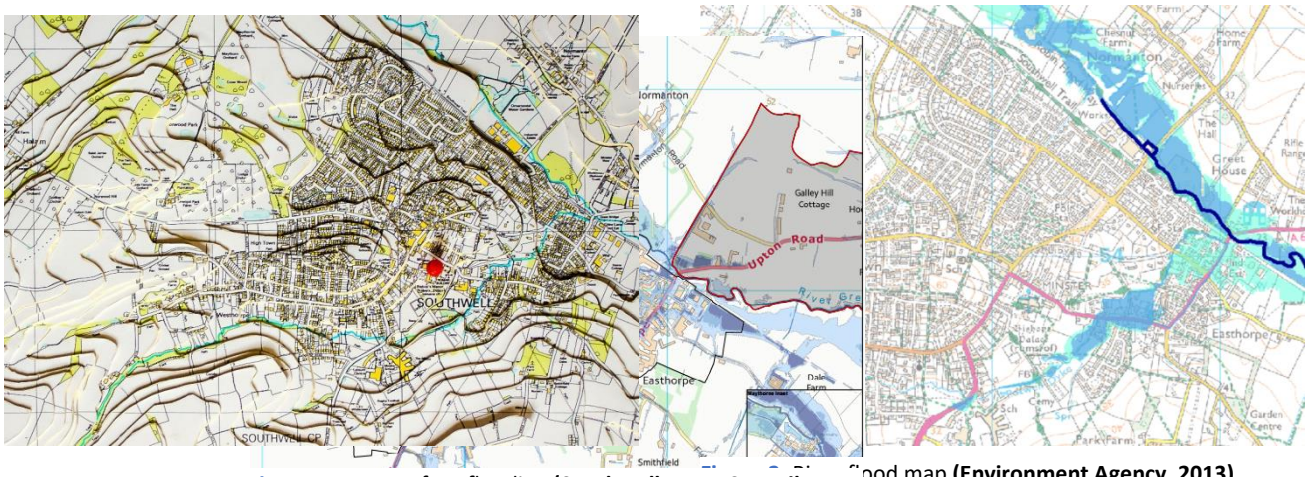
Southwell is divided into three wards (administrative divisions), Southwell East, Southwell North and Southwell West. The average division between gender is approximately 53% females and 47% males, furthermore around 60% of the population is married. The average age of the people of Southwell is 44 with the median age being higher at 47. Around 92% of the people living in Southwell were born in England and almost everyone in the town (98%) speak English. The biggest religion in Southwell is Christianity with 65% of the population being Christian, followed by approximately 25% of atheists. When compared with the rest of England Southwell has a fairly aged population with 21% of the people are between 65-84 compared to an average of 17.25%. According to predictions from Southwell Town Council (2014) the ageing population will continue to increase over the coming decade. It is also important to note that the unemployment rates in Southwell are considerably lower than in the rest of England, only 1,59% are actively seeking employment. Overall it could be stated that Southwell is economically prosperous, nevertheless youth unemployment is an issue with 30,64% of Southwell's adolescences being unemployed versus a 25,2% unemployment rate nationally. The functions of those employed are good, with the biggest group being managers or having senior positions (City Population, 2015).

3.4 Flood risk

As been stated before Southwell is vulnerable to pluvial and fluvial flooding, which come at significant environmental, economic and social costs. The three most significant flooding events in Southwell occurred in the years 2000, 2007 and 2013. The flood in 2000 was caused by one of the most wettest autumns on record, followed by severe storms in the second week of November which caused severe flooding all over Nottinghamshire and affected 300 properties. The flood in 2007 was also caused by extremely wet periods followed by intense rainfall, this flood also had significant economic consequences. In July 2013 another flood rippled through the small town of Southwell causing more than 200 homes and businesses to be damaged worth £9m. Many residents were not able to return to their residences for months, some even had to wait up to a year before they were able to return. The flood once again was caused by severe rainfall with 7 centimetres of precipitation falling in two hours (Nottinghamshire County Council, 2011).

Expectations are that due to climate change more extreme rainfall will occur with a also more extreme intensity. Figure 2 bellow shows that Southwell is situated within a valley and that the water runs from the top of the hills into the Potwell Dyke and the river Greet. The flooding occurring around Potwell Dyke shown in figure 1 focuses on the fluvial flooding. There are however other areas which are also prone to flooding these floods are caused by surface runoff and not by fluvial flooding which is why they are not visible in figure 1. Figure 3 shows a map of the flooding caused by surface water, when putting all these maps together it becomes clear which areas within southwell are at significant risk of flooding, both pluvial and fluvial.

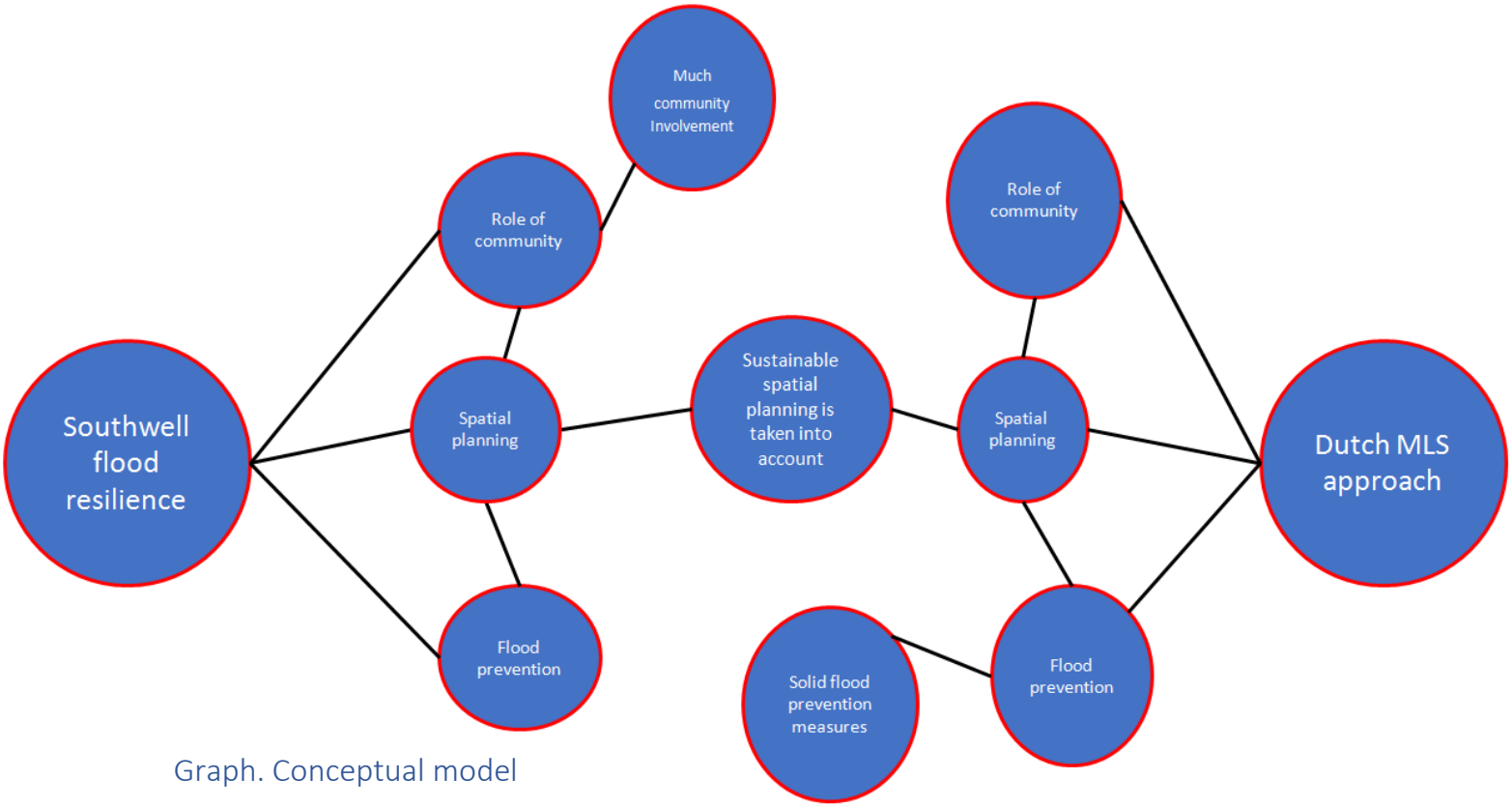
Figuur 2: Level map Southwell **(Wimble & Wimble, 2013)**



Figuur 1: Map surface flooding **(Southwell Town Council, 2014)**

Figuur 3: Flood map **(Environment Agency, 2013)**

4. Theoretical framework



Graph. Conceptual model

4.1 Flood protection efforts by the UK government

The UK, England and Wales in particular, has to deal with a certain level of flood risk throughout the country, mainly due to its precipitation levels, a high level of building density and the increasing forces, that come with climate change. Although not as sophisticated as for example the Netherlands, the UK government has implemented policies, regulations and systems within the government to address the issue head on. The case of Southwell is best explained, after an introduction to general flood management in the UK, after which the specific initiatives in and around Southwell are easier to grasp. England and Wales, both are areas, largely influenced by water of all different kinds. Precipitation levels are generally high, waterbodies are plentiful within the country and due to its island position Great Britain's landmass is exposed to a lot of coastal influences.

The most common sources of flooding in the area are:

- **River flooding** to watercourses, that cannot cope with the water draining into it from the surrounding land, for example
- **Coastal flooding** as a result of a combination of stormy conditions and high tides.
- **Surface water flooding** which might occur whenever the drainage capacity of the local area is being overwhelmed by heavy rainfall.
- **Sewer flooding** that occurs when heavy rainfall overwhelms sewers or when they become blocked. And…
- **Groundwater flooding** as a result of water levels in the ground rising above surface levels. (Agency, 2009)

Since the sources of flood risk are so bountiful in the area and can be found all over the country, solutions to these issues have to be found on a national scale. On the other hand, the UK is famous for having a decentralized approach to problem solving which leads to certain aspects of flood management, which are very specific to the UK.

The national Agency, that is mainly involved in the issue is the Environment Agency. The Environment Agency is the lead organization for providing flood and coastal risk management and warnings of flooding from main rivers and on the coast. They are responsible for the strategic overview for all sources of flooding. Meaning they will give advice and connect management and planning of flood risk from rivers, the sea, groundwater, reservoirs and surface water. An emphasis lies on the connection of several private and public entities involved with the issues and the provision of funding (Agency, 2009). Since Floods are a natural occurrence, which happen too frequently and in too many places to 100% avoid, it is neither technically feasible nor economically affordable to prevent all properties from flooding. The agency therefore takes a **risk-based approach** to achieve the best results possible using the budget and resources available. As a governmental agency, the Environment Agency relies on taxpayer money, therefor approaching all issues with a cost effective perspective, trying to provide the biggest benefit with the available funding. The approach here is twofold, tackling both the reduction of the **likelihood** of flooding and the reduction of the **impact** of flooding, once it occurs (Agency, 2009). Due to the experience of heavy flooding in the early 2000s in 2008 the agency developed an extensive strategy to combat flooding with a policy framework that sets principles, objectives and responsibilities, including:

- Flood risk assessment and flood mapping
- Development control through the planning system
- Constructing and maintaining flood defences
- Protective measures at individual properties
- Protection of important infrastructure to avoid any secondary impacts associated with flooding
- An early warning system that forecasts floods
- A well-prepared emergency response to help people in danger
- Strong and reliable insurance to spread risks and ensure coverage to as many properties
- Help with clean-up and recovery.
- Funding to support the flood risk management strategy (Agency, 2009)

The government strategy to combat flooding has already taken shape, with several acts and initiatives addressing certain aspects of the issue. The Making space for water act of 2005 for example mirrors the Dutch “room for the river” program pretty closely and sets out the cross-government, overarching strategy for flood and coastal erosion risk management in England (Water, 2004). The Pitt Review on the other hand made 92 recommendations following the 2007 floods. The Government supports changes that will help achieve them all. In particular, there is now increasing attention paid to surface water flooding, a main cause of damage in the 2007 floods. The new Floods and Water Management Bill, published in April 2008 for public consultation and pre-legislative scrutiny, will provide the legislation needed to carry out further work in this area (Pitt, 2008).
The following table best explains, how the tasks are divided between organizations in the UK.

Department for Environment Food and Rural Affairs (Defra)	Defra has national policy responsibility for flood and coastal erosion risk management and provides funding through grants to the Environment Agency.
Environment Agency	The Environment Agency is the principal flood risk management authority in England and Wales. It is responsible for forecasting and mapping flood risk, providing warnings, advising

	on development in the floodplain, building and keeping defences in good order and taking part in emergency planning and response. The Environment Agency manages central government grants for capital projects carried out by local authorities and internal drainage boards while also giving generous grants to NGOs.
Local authorities	Local authorities lead in reducing risks from development in the floodplain and management of drainage and small watercourses. They will play an increasingly important role in helping to manage the risks associated with surface water flooding. They also take the lead in emergency planning for flooding and handling the recovery of areas that have been effected by flooding.
Internal drainage boards (IDBs)	IDBs are independent bodies responsible for land drainage in areas of special drainage need. These are mostly low-lying areas that need active management of water levels.
Regional flood defence committees (RFDCs)	RFDCs have a duty to take an interest in all flood matters in their area. They are responsible for decisions about the annual programmes of improvement and maintenance work carried out by the Environment Agency.
Local resilience forums (LRFs)	These are the local planning forums for all emergencies, including flooding. They bring together the emergency services, Environment Agency, NHS and other bodies like water and energy companies. Together they plan for prevention, control and reducing the impact of floods on the public.
Insurance industry	The Association of British Insurers (ABI) and its members is vital in providing cover and handling claims for damages caused by a flood. Under an agreement with the Government, they have committed to continue insurance coverage for most properties, even some at significant risk, in return for action by government to identify and manage risks.
National Flood Forum	A registered charity providing advice to those at risk and campaigning for better protection from flooding.

(Agency, 2009)

4.2 Southwell as part of FRAMES

The European Union allocated 359 Million Euros through the European Regional Development Fund (ERDF) for the timeframe between 2014 and 2020 for the development of better policy, by creating an environment and opportunities for sharing solutions. Southwell's flood protection efforts are a direct

beneficiary, as part of the FRAMES (Flood Resilient Areas by Multi-layered Safety) project within Interreg, a series of five programs to stimulate cooperation between regions in the European Union. In the following paragraphs we are going to explain FRAMES as part of Interreg and how it influences the flood protection efforts of Southwell, by introducing each participating actor, their goals and their role within the project.

1) European Union: An alliance between 28 countries who work together on economic and political aspects form the European Union. Their goal is IT to safeguard safety, mobility and growth. This is done by using one single currency (the Euro), open borders etc. The EU provides benchmark laws, it's members have to comply in many fields like climate change and human rights. The EU regulates via the Water Framework Directive and the Habitats Directive. The EU also is a large provider for subsidies (European Unionin brief, sd). The EUs Floods Directive, which applies to all kinds of floods (river, lakes, flash floods, urban floods, coastal floods, including storm surges and tsunamis), on all of the EU territory requires Member States to approach flood risk management (Environment, 2016).

    a) Interreg: Interreg is a series of five programs to stimulate cooperation between regions in the European Union, funded by the European Regional Development Fund since 1989. To achieve this goal, Interreg Europe offers opportunities for regional and local public authorities across Europe to share ideas and experience on public policy in practice, therefore improving strategies for their citizens and communities. Three types of beneficiaries receive assistance by Interreg Europe directly: Public authorities, Managing authorities/intermediate bodies and Agencies, research institutes and NGOs. To receive financial support any action developed must fall into one of the following categories: Research and innovation, SME competitiveness, Low-carbon economy and environment and resource efficiency (Interreg, 2016).

        i) FRAMES: An Interreg funded project, that focusses on the introduction of and experimentation with the MLS approach, as a more sustainable approach to address the challenges of floods instead of traditional flood prevention in the North Sea region. FRAMES includes 13 pilot projects in 5 different countries in the North Sea region and combines the expertise of 17 research facilities, governmental bodies and NGOs. It hopes to improve the situation in the UK by expanding current approaches to include catchment and emergency planning and community resilience as a more sustainable approach to flood protection (FRAMES, 2016).

2) The Rivers Trust: The umbrella body of the river trust movement was launched in 2001 following extensive consultation with existing charitable rivers trusts and other related interests. The Rivers trust is the logical extension of the increasing level of liaison between established rivers trusts. It has the status of a registered charity and is incorporated as a company limited by guarantee. Rivers trusts are usually local NGOs that start out as private riparian, fishing or river associations. Combining the use of the best available science and data drawn from the Environmental Agency and others with the resourcefulness of local volunteers from angling clubs and riparian owners they work within river basins for the public good (Trust, 2016).

    a) Trent Rivers Trust (FRAMES partner): The local river trust in the region of Nottinghamshire. Trent Rivers Trust is a grass roots organization that was founded in 2001 by small group of anglers passionate about the River Trent and its tributaries for the purpose of conserving and enhancing the river environment (TRT, 2016). It is one of the two local participants of FRAMES. TRT are of value to FRAMES because they have specific experience working with

community groups to resolve conflicts and develop integrated catchment based approaches to solve water management issues. Amongst the team they have agricultural specialists who are familiar with working with farmers and landowners on land use and land management change options. They also have experience of developing and delivering land use interventions using natural processes to reduce the risk of flooding downstream (FRAMES, 2016).

3) National Flood Forum (FRAMES partner): Established in 2002 with start-up funding from the Environment Agency, the National Flood Forum is a national, community based charity, that helps communities prepare themselves for flooding and supports them on a myriad of issues in case of flooding. Considering themselves a strong and independent voice this national organization aims to represent the interests of people affected by flooding with the authorities responsible for managing it. Facilitating and supporting community flood groups throughout the country, they are directly affiliated with 160 local resilience forums(LRF) (Forum, 2016).

    a) Southwell Flood Forum (LRF): While not being directly involved with FRAMES as a partner, the LRF in Southwell is an affiliate of the National Flood Forum and one of the main contributors to community resilience in the area.

4.3 What can be learned from comparing the role of the role of the community in flood resilience in Southwell with the role of the community in the Dutch MLS approach?

The approaches between the UK and the Netherlands is different due to flood resilience. Therefor the role of the community in flood resilience is different duo to the role of community of the Dutch. Both roles of communities have weaknesses and strengths. So when comparing them this will give an overview of what can be learned from the comparison between the role of the role of the communities in flood resilience of Southwell and the Dutch MLS approach.

4.3.1 The UK system

The national government, local government and the authorities bear joint responsibility for flood resilience. After a flood the consequences are mainly passed on to individuals. So basically the inhabitants, entrepreneurs and the companies etc. present in the flood area are on their own to process the flood. (Martijn van den Hurk, 2013).

4.3.2 The role of the community of Southwell

The community of Southwell has set up an Flood Forum, “Southwell Flood Forum Community Protection & Support”. This forum is available for every individual to share their experiences with floods, to come up with ideas to increase flood resilience and to help others out.. The purpose of the forum is to create a more resilient Southwell by increasing awareness and to let people participate whereby they cooperate with each other of how to be resilient. The community is proactive, not reactive, prepared not panicking, active and not passive (Supporting a resilient Southwell, sd). The Southwell Flood Forum has an partnership with the Trent River Trust and this is still being developed with the INTERREG funding. A representative has visited Southwell and during an meeting he gave an presentation to our stakeholders. The partnership needs funding and approval to go public, but they are optimistic (Huson, 2017). The Southwell Flood Forum community has set up an community emergency plan, this plan is an important element in building community resilience in Southwell. The aim of the emergency planning should where possible prevent emergencies occurring and when they

occur. Good planning should reduce, control or mitigate the effects of the emergency. This is an systematic and ongoing process which should evolve as lessons are learnt and circumstances change. The emergency plan will have many benefits:

- Providing coordination, support and guidance to the community ahead of the arrival of the emergency services
- Assist the emergency services by help and share local knowledge during a flood event.
- Help relay local knowledge, concerns and issues to relevant authorities and utilities before and following a flood event.

In partnership with Southwell Town Council, Nottinghamshire County Council, Environment Agency, and Newark Sherwood District Council the Southwell Community Emergency Plan is being developed. The group roughly follows the objectives of the Civil Contingencies Act in its approach working.

The plan will assess the risk of flooding in Southwell, based on actual experiences to inform contingency planning. The plan will include information for residents to prepare themselves and provide coordinated response. The focus is on the welfare of the people, identifying vulnerable people, groups, key contacts and resources within Southwell. Focus on help to maintain the local infrastructure and identify safety places for residents, schoolchildren and other groups. The plan will be updated annually and continue to develop it more. In order to implement this plan there will be a communication system using a network of Street Reps, Flood Wardens and Road Closure Wardens (James Parker, sd).

The Flood Forum of Southwell has even developed an Southwell Community Resilience Handbook (Prentice, 2016). This handbook is to help the people of Southwell to become more flood resilient. The handbook also describes how to react when a flood occurs. This initiative comes from the community of Southwell and it clearly shows that the community of Southwell is well aware and is becoming more and more aware of the flood risks. Also it shows that the community is participating on a more flood resilient Southwell and it has an influence and a great consideration about flood resilience. The link below shows the Southwell Community Resilience Handbook. http://edition.pagesuite-professional.co.uk//launch.aspx?pbid=68c37d7f-f04a-4b41-8e3a-06e5f16a9fa1

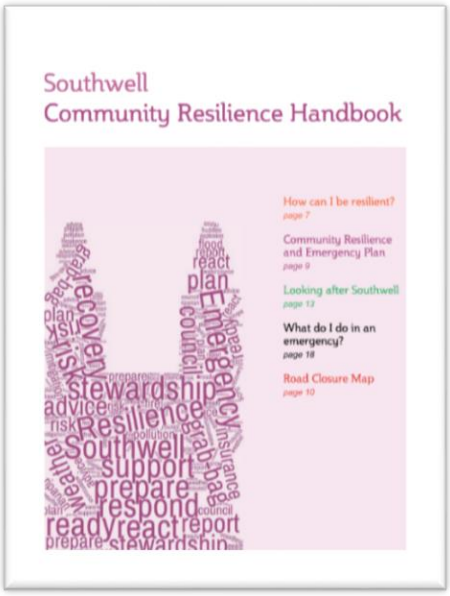


Figure. Southwell Community Resilience Handbook (Prentice, Southwell Community Resilience Handbook, 2016)

4.3.3 The Dutch MLS approach

The national government and waterboards bear joint responsibility for water safety in the Netherlands. The consequence management is considered to be government business and the government provides for financial compensation of flood damage. The Dutch are focussed on prevention of floods so the government with the waterboards has the most influence on flood resilience. Also they try to make the people more aware of flood resilience so they can become more flood resilient (Martijn van den Hurk, 2013).

4.3.4 The role of the community in the Netherlands

The communities in the Netherlands lack on information and awareness on flood resilience. The government has to involve the citizens more in setting up rescue plans. When making the people of the Netherlands more aware about flood resilience and giving them the right information their flood resilience will stimulate the local communities (HZ, 2013). The effects will be much bigger when rescue organisations come in contact with key figures in local communities. By making aware of the risks of floods the communities can speak to the people (Serrano, 2013). Communities in the Netherlands tend to when a flood risk starts to occur place sandbags before their homes or at dykes to protect themselves.

4.3.5 Resilient communities

Resilient communities have some characteristics, they are able to reduce, prevent and cope with the flood risk. The communities are aware and knowledgeable of the risk, well-prepared and they respond better when a flood occurs in their community. Also they recover more quickly from flood events (al, 2011) (Supporting a Resilient Southwell, sd).

4.3.6 INTERREG

INTERREG is an transitional programme and it is focussed on participation of parties of 7 countries. Also even parties from Switzerland who is no EU member could participate and as recently known the UK is also no party anymore of the EU. Target groups are governments, education, companies, development companies and non-profit organizations. Their goal is to strengthen innovative capacity of regions and organizations, speed up the transition to poor carbon economy and an efficient use of materials and resources. The budget is from 2014 till 2020 396 million euros (INTERREG North Western Europe, 2014).

4.3.7 Emergency planning

Emergency planning is the aim of the government to ensure all organisations have effective, well-practiced emergency plans in place. The aim should be where possible to prevent emergencies occurring. In case when they occur good planning should reduce, control or mitigate the effects of emergency. The process is a systematic and ongoing process. By the lessons that are learned and with the changing circumstances this should evolve (What is emergency planning, 2013).

4.3.8 The Civil Contingencies Act

The Civil Contingencies Act delivers a single framework for civil protection in the UK with other accompanying non legislative measures. The Act is separated into two substantive parts. Part one is local arrangements for civil protection and part two is emergency powers. Both parts come together

to form the local resilience forums which are based on help co-ordination and co-operation between responders at the local level (Emergencies: preparation, response and recovery, 2013).

4.4 Southwell spatial planning practice with flood resilience.

The local authorities in the United kingdom play a leading role in developing and maintaining community resilience to flooding. The most serious damage done by flooding depends on the depth and the velocity of the flood, although small floods also inflict a lot of damage. Flood risk management and the sustainable management of surface water – particularly from urban areas – essentially interact with spatial planning in two main ways. The first uses the planning system to avoid new developments in areas of high flood risk, which also ensures that property is adequately insurable. The second focus of flood risk management within planning is on mitigating the surface water run-off impacts of new development on downstream areas. In the planning policies the focus should be on mitigation of adverse impacts from the quantity and rate of run-off, and mitigation of adverse water quality (Local Government Association, 2012).

4.4.1 Important policy tools

National planning policy on development and flood risk previously was set out in Planning Policy Statement 25, reforms in the planning system however have been set out in a new policy document called the National Planning Policy Framework, which promotes greater local decision making. The NPPF maintains strong planning policy on avoiding and managing flood risk with a central role of local authorities in preparing local plans in deciding applications for planning permissions (Local Government Association, 2015).

4.4.2 Flood risk assessments

As set up by the NPPF local planning authorities have to carry out flood risk assessments. New developments and allocation should be considered in the light of this assessment. In this assessment flood maps and detailed information on flood risk is given. This assessment should form the basis for appropriate policies on flood risk management in the area. The assessment contains two main questions, which are: Is the site at risk of flooding and will development of the site cause flooding to adjacent sites and elsewhere in the catchment? This Flood risk assessment forms is the most important governmental tool.

4.4.3 Water cycle studies

Water cycle studies identify any tensions between new developments and environmental requirements in relation to water supply and drainage, and find appropriate solutions to issues found. The goal of this study is to make sure that key players, the Environment Agency and the water and sewage undertaker have data available on these matters (Local Government Association, 2015).

4.4.4 Local Plans

The NPPF explains how Local plans should take account of climate change over the term, also including factors such as flood risk, coastal change and water supply. Local Plans should set out the strategic priorities and policies for an area, including those to deliver the infrastructure for flood risk, coastal change and water supply.

A Neighbourhood plan contains a powerful set of tools for local inhabitants to ensure that they receive the right types of development for their neighbourhood. However, the ambition of the neighbourhood

should be aligned with the strategic needs and priorities of the wider local area, including the management of flood risk.
Neighbourhood plans should be in general obedience of the strategic policies of the Local Plan. In order to do so, clear strategic policies for the area should be set out by local planning authorities (Local Government Association, 2015).

4.5 Spatial planning in practice with flood resilience: Buildings and critical infrastructure

In order to avoid damage being done to new buildings, sound planning should ensure that properties are built with ground floor levels at a locally specified height to achieve sufficient flood protection. Measures like these are very simple and low cost to achieve and are easy to carry forward into general design practice. For Southwell however not many new buildings are being constructed so they look make use of more bespoke solutions. While sandbags may still play an important rule, more robust and watertight measures of protection can be applied to external doorways from ingress of flood water are now available. When it is not possible to keep the water outside the door for whatever reason that may be damage can be reduced significantly if furnishings are easily removable and reliable flood warnings can be given. Furthermore by raising the level of power sockets and switchboards the resilience of electrical and telecoms installations will be significantly increased. Something that is also very important to consider is the resistance and resilience of critical infrastructure, according to the Cabinet Office (2010) this comprises 'those facilities, systems, sites and networks necessary for the functioning of the country and the delivery of the essential services upon which daily life in the UK depends'. Therefore measures to reduce flood risk should be adopted as an integral part of any critical infrastructure owner's business plan.

Furthermore, according to the local governments association (2016)communication networks should not be underestimated, in particular mobile phone networks nowadays form a key aspect of communication during emergency and recovery situations. Consequently it is important that the siting of key mobile phone infrastructure is highly resilient against direct flooding or from loss of electrical power due to flooding.

4.6 Spatial planning in practice with flood resilience Road and public transportation systems

When constructing highways and other road systems in the UK, therefore also in Southwell, account should be taken of the surface flows of water during heavy precipitation, they should be developed with regard to flood risk. Key infrastructure – such as electricity sub-stations, telecoms installations and water pumping stations – should be located so that they are secure from significant flood risk. The role of planning and the effective communication of flood risk are key factors in achieving this resilience. In practice, this may be as simple as building up ground levels locally. In urban areas sometimes runs off other impermeable surfaces and may cause a transport system at only one low spot to fail, which however causes widespread disruption. In the design of major transport infrastructure it is therefore good to consider reliability, availability, maintainability and safety/security . This design should include flood risk, management of surface water and flood routeing. Where possible adjustments of local ground levels or the construction of small scale flood walls to defect a flood route into an area which is of less critical use should be made. When canals are constructed they should have been carefully considered as they may be elevated and could be a source of flood risk to bordering property (Local Government Association, 2016).

4.7 Spatial planning practice and flood resilience Netherlands

Netherlands is known for its water safety approach which is divided into three major layers – prevention, spatial planning and crisis management. First layer serves as a primary guard from floods and other water related threats; second layer is dedicated for smart planning of infrastructure and buildings in a way that in case of a flood, the territories flooded would take as little damage by all means; third layer is dealing with the crisis of a flood – evacuations, immediate reaction and damage control.

Spatial planning is a very essential part for the well-being of safety, environment, accessibility and general resilience of the protected areas. "Outstanding international business climate, allow scope for tailored regional solutions, put users first, clearly prioritize investment and link spatial developments and infrastructure" (Ministry of Infrastructure and Environment, 2011). The goals are quite clear for the upcoming developments in the Netherlands. The current reach of the ongoing developments are in order to change the perspective and approach due to different priorities and policies. The intention is to have less complex, tedious processes of governmental regulations. Decentralized, users-focused new policies are being developed that would benefit the Netherlands much more than the complicated issues that people and companies face with when developments are being made. Simplifying the processes and giving more independency and power to the local municipalities and provinces are going to make the development process much easier and less time-consuming. Central government does not intend to dictate exact plans for the whole country anymore. It is only going to provide guidelines and framework for the municipalities and provinces to use instead of giving exact commands. (Ministry of Land, Infrastructure, Transport and Tourism Japan, 2015)

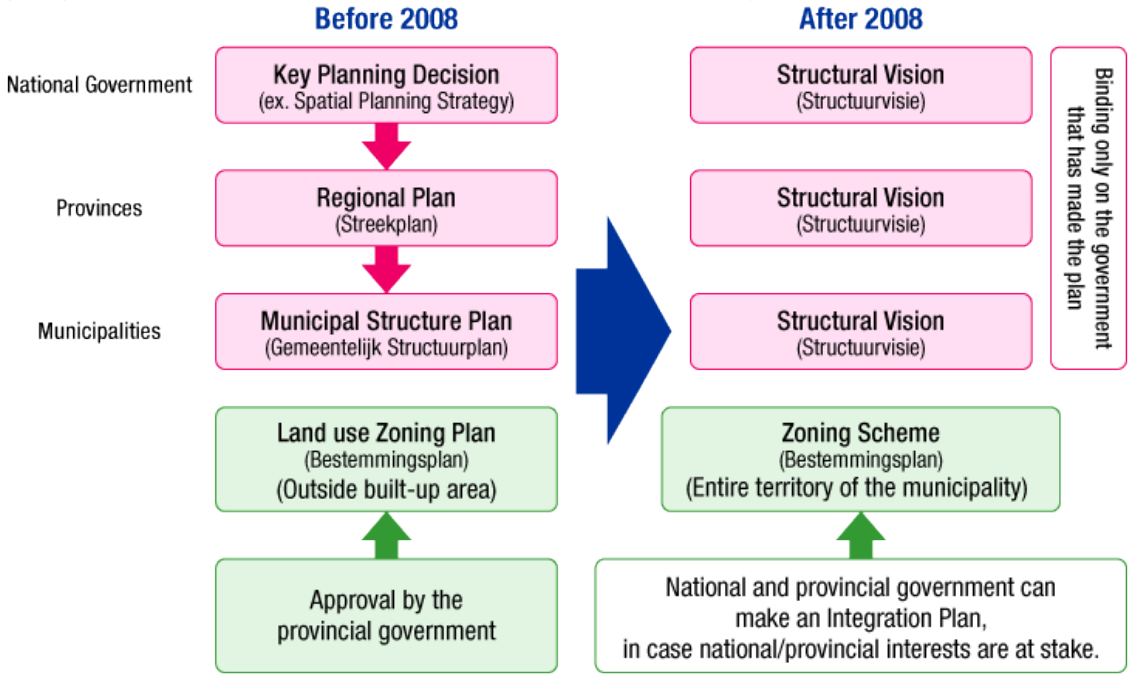


Figure 1. Changes of Infrastructural policies (Ministry of Land, Infrastructure, Transport and Tourism Japan, 2015)

The picture clearly shows the major changes made in the process of infrastructural developments in 2008. Land use planning became a power for municipalities and provinces instead of central government, giving more freedom and personal application to the people while providing a very close methods of governmental control.

The aggressive stance of the Netherlands of fighting against water, natural habitat, etc., has changed into a very balanced approach, making nature, people and industry one robust system instead of sacrificing one for gains in another. The search of balance between pressing issues and topics is

tedious, but very much needed in order to preserve nature, prosperous people and growing business. Large focus on sustainability, long-term developments, preservation and conservation of viable resources has emerged in recent years (Goedman, Houtsma, & Zonneveld, 2008). However, it is not intended to focus on nature in order to compensate the damage already done and trying to reverse it. The new developments of sustainability are being seen as an opportunity to develop new business, entrepreneurship capabilities, opportunities to develop landmark pilot projects and stand as an inspiring example to countries all over the world, proving that people, profits and planet can be balanced without sacrificing one for another.

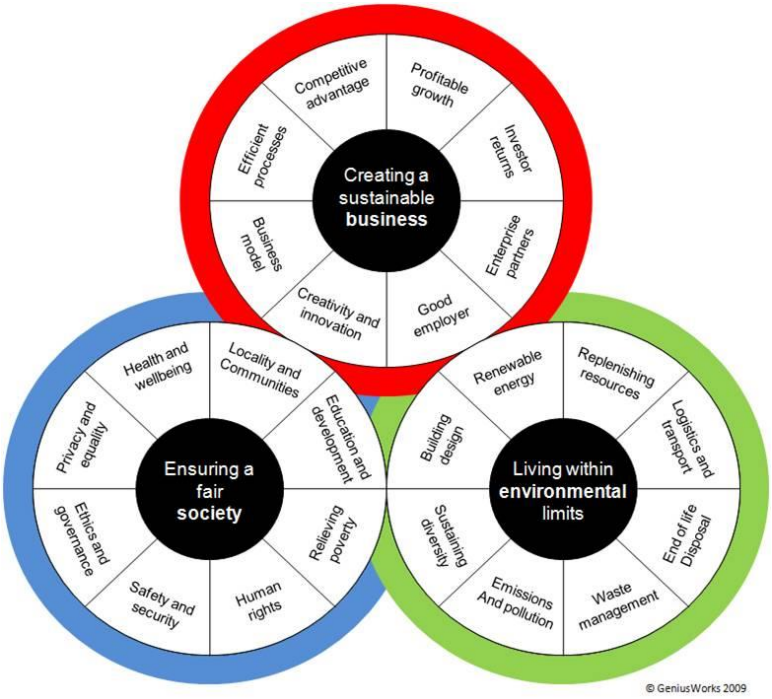


Figure 2. People, profit and planet in detail (Fisk, 2010)

Policy Area	Authority	Web Site
Spatial planning Water resources management	Ministry of Infrastructure and the Environment	http://www.government.nl/ministries/ienm
Housing Policies	Ministry of the Interior and Kingdom Relations	http://www.government.nl/ministries/bzk
Regional policies	Ministry of Economic Affairs	http://www.government.nl/ministries/ez
Amsterdam Metropolitan Area	Amsterdam Metropolitan Area	http://www.metropoolregioamsterdam.nl/

Figure 3. Dutch authorities responsible for policies (Ministry of Land, Infrastructure, Transport and Tourism Japan, 2015)

This table shows what authorities are responsible for the policy areas in the Netherlands. Different ministries have separate, clearly divided tasks that are under their control to manage.
The main policies and principles that Netherlands follows in spatial planning are

- Increasing competitiveness of Netherlands by enhancing spatial and economical infrastructure
- Improving and securing space for accessibility
- Safeguarding the quality of the living environment
- Achieving the aims of the SVIR and safeguarding national interests

(Ministry of Infrastructure and Environment, 2011)

4.8 What can be learned from comparing prevention of flooding in Southwell with prevention of flooding within the Dutch Multi-Layer Safety (MLS) approach?

Physical flood prevention is perhaps not the most important factor when it comes to modern flood resilience, since sustainable spatial planning and effective disaster management are finally recognized as important layers within the framework of flood resilience. However, when a flood occurs, dikes and other protective structures are vital in safeguarding the people and buildings that are located in flood plains. This chapter will provide relevant background information on the flood prevention in Southwell as well as flood prevention according to the Dutch MLS approach.

4.9 Prevention of flooding in Southwell

Firstly, a short introduction to the situation that Southwell is in. Southwell is Vulnerable to pluvial and fluvial flooding with major floods occurring in 2000, 2007 and 2013. The flood of 2013 had enormous consequences, since 200 homes and business were damaged with the total damage going up to £9 million. The town is situated within a valley, which means the water runs from the surrounding hills into the Potwell Dyke and the River Greet, the two streams in the valley. (Hurk, Van den et al., 2013) The United Kingdom has adopted a model in which three 'Flood zones' are used to show the probability of flooding. The flood map of Southwell, which includes three flood zones can be seen

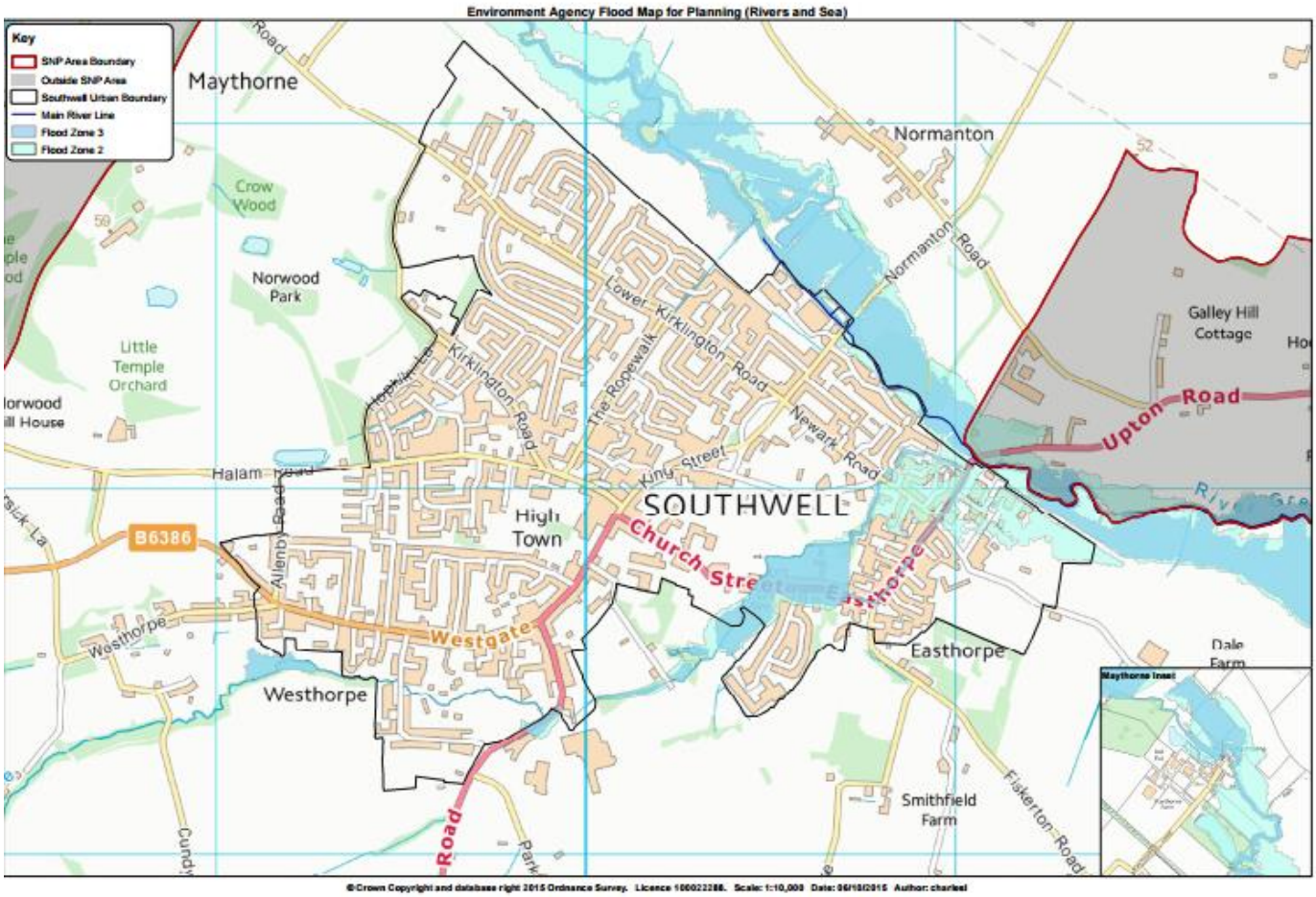


Figure 4) Flood map of Southwell (Southwell Neighbourhood Plan Steering Group, 2015)

below.

Figure 5) Flood map of Southwell

The table that can be viewed below shows the different flood zones and the definitions of them. Using the table as well as the flood map on the previous page, gives a good overview of the situation regarding flood probability in Southwell. The light green areas on the map show the area with a medium probability of flooding and the blue areas show the parts of Southwell with a high probability. It becomes clear that the area with a high probability is significantly large, which means that prevention of flooding is a relevant topic.

The measures to tackle the flooding issues in Southwell are mostly 'soft engineering options'.

Table 3
Flood zones as wielded in the UK. Note: these flood zones refer exclusively to the probability of sea and river flooding, ignoring the presence of existing defenses (Department for Communities and Local Government, 2010).

Flood zone	Definition
1: Low probability	Less than 1 in 1000 annual probability of river or see flooding in any year (<0.1%)
2: Medium probability	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1–0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5–0.1%) in any year
3a: High probability	1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year
3b: Functional floodplain	Land where water has to flow or be stored in times of flood

"Alongside the mitigation options, one of our main ongoing concerns is the maintenance of the riparian owned main watercourse (Potwell Dyke), tributaries, drainage systems and roadways to ensure they operate at their maximum capacity during heavy rainfall." (Huson, 2017) Dikes and other physical measures do not play a significant role in the flood resilience of Southwell. Another focus when it comes to flood mitigation is the implementation of Sustainable Urban Drainage Systems and the regulations that accompany these systems. Planning permission is needed if one would like to drop kerbs in the yard, whereas permeable surfaces do not need an additional permit, this is regulated by the government. Several manuals are available on how to implement Sustainable Urban Drainage systems for civilians. According to the British Geological "Survey Sustainable drainage systems (SuDS) are drainage solutions that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses. By mimicking natural drainage regimes, SuDS aim to reduce surface water flooding, improve water quality and enhance the amenity and biodiversity value of the environment. SuDS achieve this by lowering flow rates, increasing water storage capacity and reducing the transport of pollution to the water environment. The need for alternative drainage such as SuDS is likely to increase to meet environmental challenges such as climate change and population growth. Provision for SuDS and the national standards required for their design, construction, maintenance and operation is included in the Flood and Water Management Act 2010." (British Geological Survey (BGS), n.d.) Figure 2 on the next page illustrates the way SUDS's work. The basic idea is that the pores in the soil have the capacity to store water.

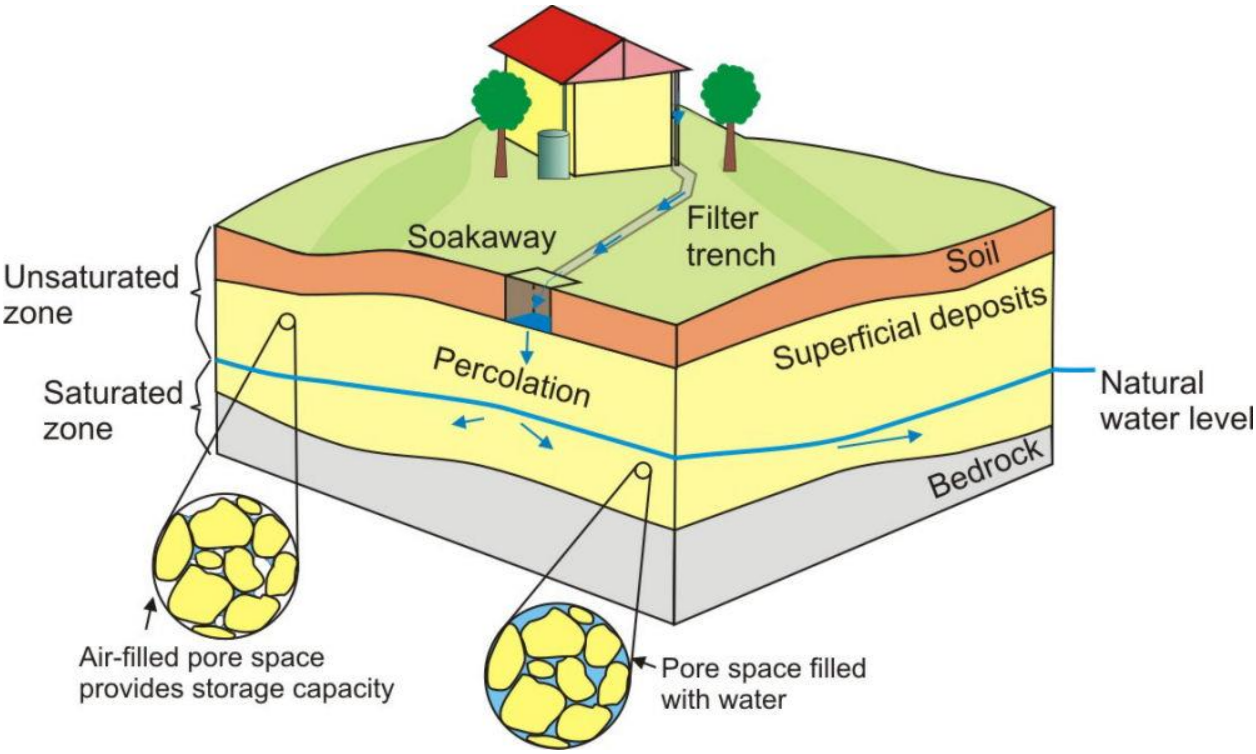


Figure 2) Explanation of how Sustainable Urban Drainage Systems function (British Geological Survey (BGS), n.d.)

Furthermore, as mentioned before, Southwell is protected by only very few solid/physical protection. The main layers of protection are Spatial planning and Disaster management. Therefore the main focus for this sub-question will be on the above mentioned information/measures.
Moreover, Table 2 on the next page gives a good overview of the differences between the Netherlands and the United Kingdom. Some of the information about the United Kingdom also applies to Southwell. For example, for the "choice" rule the authors mention the fact that there is "Suboptimal reliance on defensive constructions for their lacking robustness.

4.10 Prevention of flooding within Dutch Multi-Layer Safety approach

The Netherlands used to have a strong focus on the first layer of the MLS, prevention of flooding. Dikes and other structures were built to prevent rivers and the sea from flooding. It was only recently, that the Dutch realized that a more complete strategy was needed. Instead of relying on solely physical measures, the focus shifted towards a Multi-Layer Approach.

Many people assume that they are safe from flooding, since they have a complex system of dikes and the world famous 'Delta Works' to protect them. (Hurk, Van den et al., 2013)

Table 2) Comparing the Netherlands and the United Kingdom (Hurk, Van den et al., 2013)

Comparative analysis of risk approach in the Netherlands and the UK.

Type of rule	The Netherlands	United Kingdom
Position	National government and water boards bear joint responsibility for water safety Consequence management is considered to be government business Government provides for financial compensation of flood damage	National government and local governments and authorities bear joint responsibility for water safety Consequence management mainly passed on to individuals No public financial guarantees for compensation exist
Boundary	Executive public body (water board) addresses importance of water safety issues in spatial planning, though only since 2001 Insurance companies are absent	Executive public body (EA) addresses importance of water safety issues in spatial planning since its establishment Close involvement of insurance companies
Choice	No water safety-inspired restrictions related to spatial development Rather autonomous execution of water safety policy, exclusively based on flood defenses New development permitted on any location within embanked areas	Limited opportunities for spatial development due to flood zoning and vulnerability classification of facilities Suboptimal reliance on defensive constructions for their lacking robustness Appropriateness of new development based on flood zone and flood risk vulnerability of concern
Aggregation	Major part of decision-making power lies with local government	Major part of decision-making power lies with local government
Scope	No flood risk criterion at early project stage	Initial quest for hospital location at lowest risk of flooding
Information	No necessity for information on flood risks, as defensive constructions are expected not to fail	Major provision of flood risk information via EA flood maps and EA comments
Payoff	Neither coercion, nor penalties if water safety issues are neglected	No formal sanctions for ignorance of water safety issues, but controversy may occur in some cases

Table 2 gives a relevant overview of the comparison between the United Kingdom and the Netherlands. The authors of this research has composed a list of 7 rules that apply to the Netherlands as well as to the United Kingdom. Every rule is explained so that the situations in both countries can be compared to one another. When looking at the “choice” rule it becomes clear that there are no water safety-inspired restrictions related to spatial development and the execution of water safety policy is rather autonomous. Moreover, the “information” rule for the Netherlands states that there is no necessity for information on flood risks, as defensive constructions are expected not to fail.

5. Methodology

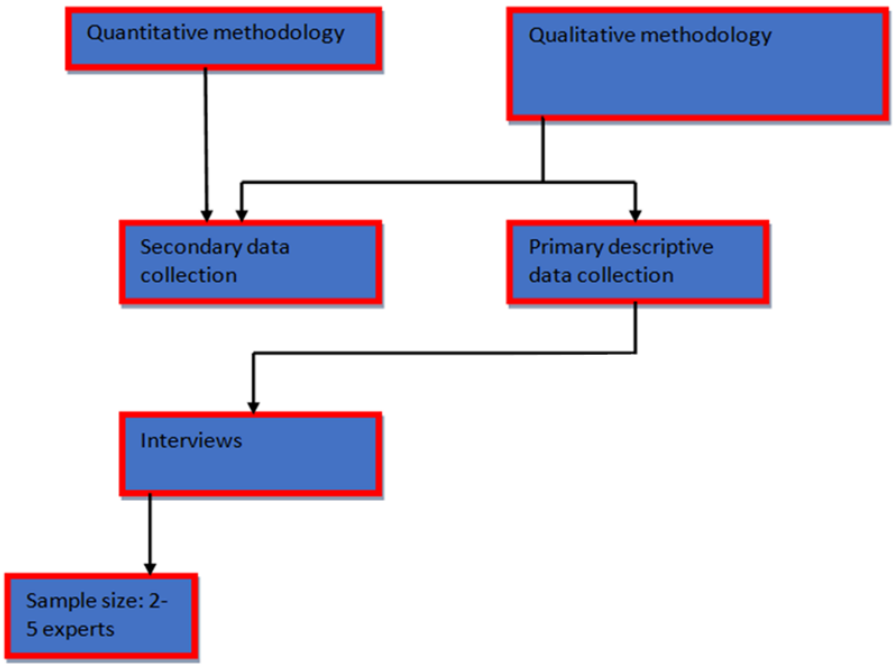
The primary source of data that is intended to be used for research is going to be secondary data. It will be used to assess governmental and societal factors of the area. Also, data from previous flooding events will be especially important for the research, therefore will be examined with special attention. Secondary data will be retrieved through literature review and desk research. Since floods of Southwell are relatively recent, data collection should not be an issue and well-described information should be readily available due to initiatives such as the Southwell Flood Forum.
Primary data will also be used in order to achieve a better end product. This data will be collected through interviews with experts from the area and experts on the general topic of flood protection, however, emphasis is put on locally-sourced information and knowledge. Besides this qualitative method, a survey could also be carried out to find out how the local population deals with flooding. However there might not be sufficient time to collect all this data, therefore further thought will be put into the idea whether locals should be engaged or not.

5.1 Research methods

In this research, both aspects from qualitative and quantitative research will be used. However, the majority of it will be carried out using quantitative research, since it will prove concrete knowledge, lessens the time scale needed to carry out the project and provides a more realistic insight. Qualitative research will not be neglected and will be applied wherever necessary or more appropriate. The research itself is of descriptive type since it aims to identify lessons learned from the comparison of the Southwell flood resilience with the Dutch Multi-Layer Safety (MLS) approach.

An important element of this research is analysing and comparing the different approaches of Southwell and the Dutch MLS. Therefore document analysis forms a great part of the research, policy documents available on digital governmental databases will be carefully read and analysed to form solid results and conclusions on what can be learned from this comparison.
The method which is used to compare different power levels and institutions that have stake and influence in project has been named a power pyramid. The corresponding institutions are placed on a pyramid according to the powers and authority that they have and are structured, starting from the bottom, which has the lowest influence and finishing with the top, key players that have the most possibilities and influence over developments. By using this fairly simple method, we can see the hierarchy of spatial planning authorities and flood risk in both countries and it allows for a clear and objective comparison in regards of power placement. The power pyramid indicates the process and power distribution when it comes to decision making and development planning.
The research on the flood prevention comparison between the Dutch MLS and Southwell will consist of a table comparing Southwell to the MLS and an explanation of it. Because a significant amount of research has already been conducted on comparing the flood safety in the Netherlands and in the United Kingdom, it is not necessary to go in depth too much, since the measures and regulations in Southwell are mostly in line with the national measures and regulations. Furthermore, the area analysis that is a part of the Results chapter is also applicable to this particular sub-question.

5.2 Final research design



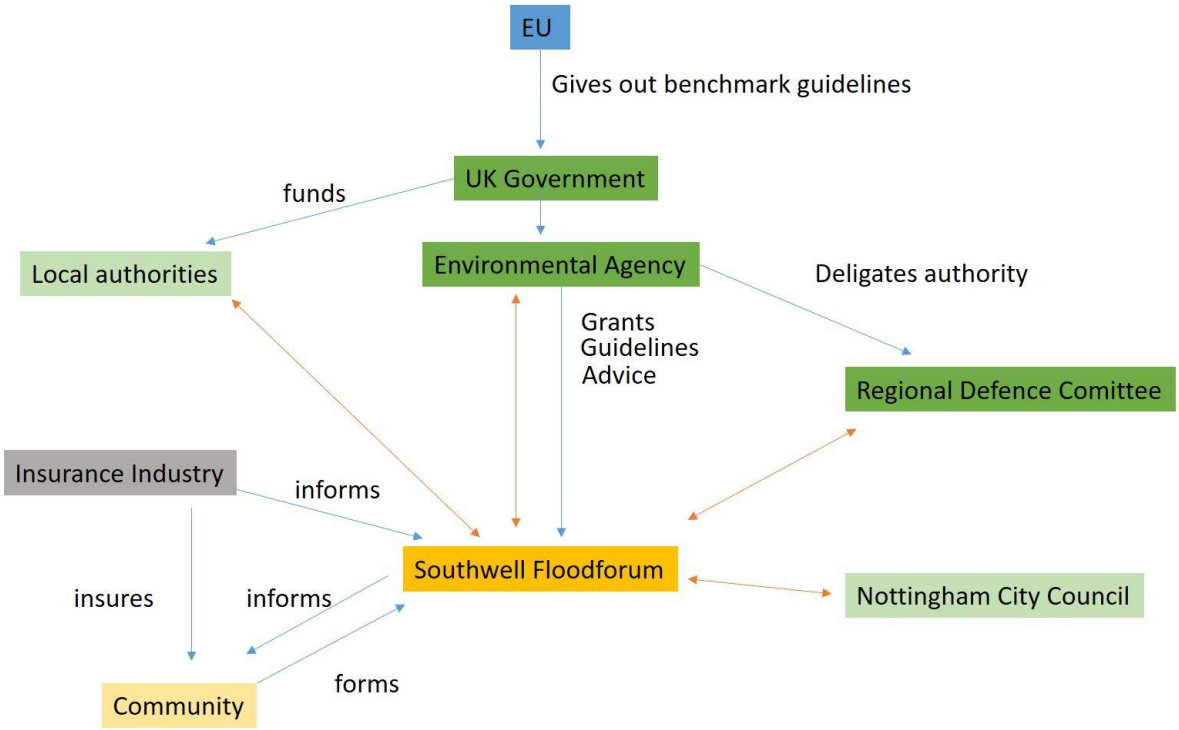
6. Results

6.1 The comparison between the role of the community from Southwell between the role of the Dutch MLS approach

Comparing the role of the Southwell community and the role of the community in the Dutch MLS approach the following results came out. The roles of the communities of Southwell and Dutch MLS approach is that the community of Southwell plays a much bigger role in flood resilience. Their community really is working on to inform the people, participation and making them more aware about flood resilience. They are using tools like the Southwell Flood Forum, educating Wardens,

Emergency Plan and a handbook on flood resilience. The handbook was published in May 2015 and it was distributed to all households, part funded by the Postcode Lottery Trust. The relations between actors are shown in the graph and the power interest grid shows the power and influence.

The communities in the Netherlands tend to lack information and awareness on flood resilience. A key development would be that rescue organisations need to contact key figures in communities to raise awareness and inform them about flood resilience, because they can then inform the people who have better connections with the local communities.



Graph. Actor relations

Authorities for flood matters

Institution	
Environmental Agency	- Principal flood risk management authority - forecasting and mapping flood risk, - Advice and warning for spatial planning - Management of government grants

Local authorities	- Management of the risks of surface water flooding
Regional defense committees	- Improvement and maintenance work
Local resilience forums	- Private initiatives within the community - Local planning forums for all emergencies - Bring together all parties
Insurance Industry	- Provide insurance to private citizens
National Flood Forum	- Registered charity - Provides advice - Campaigns for better protection

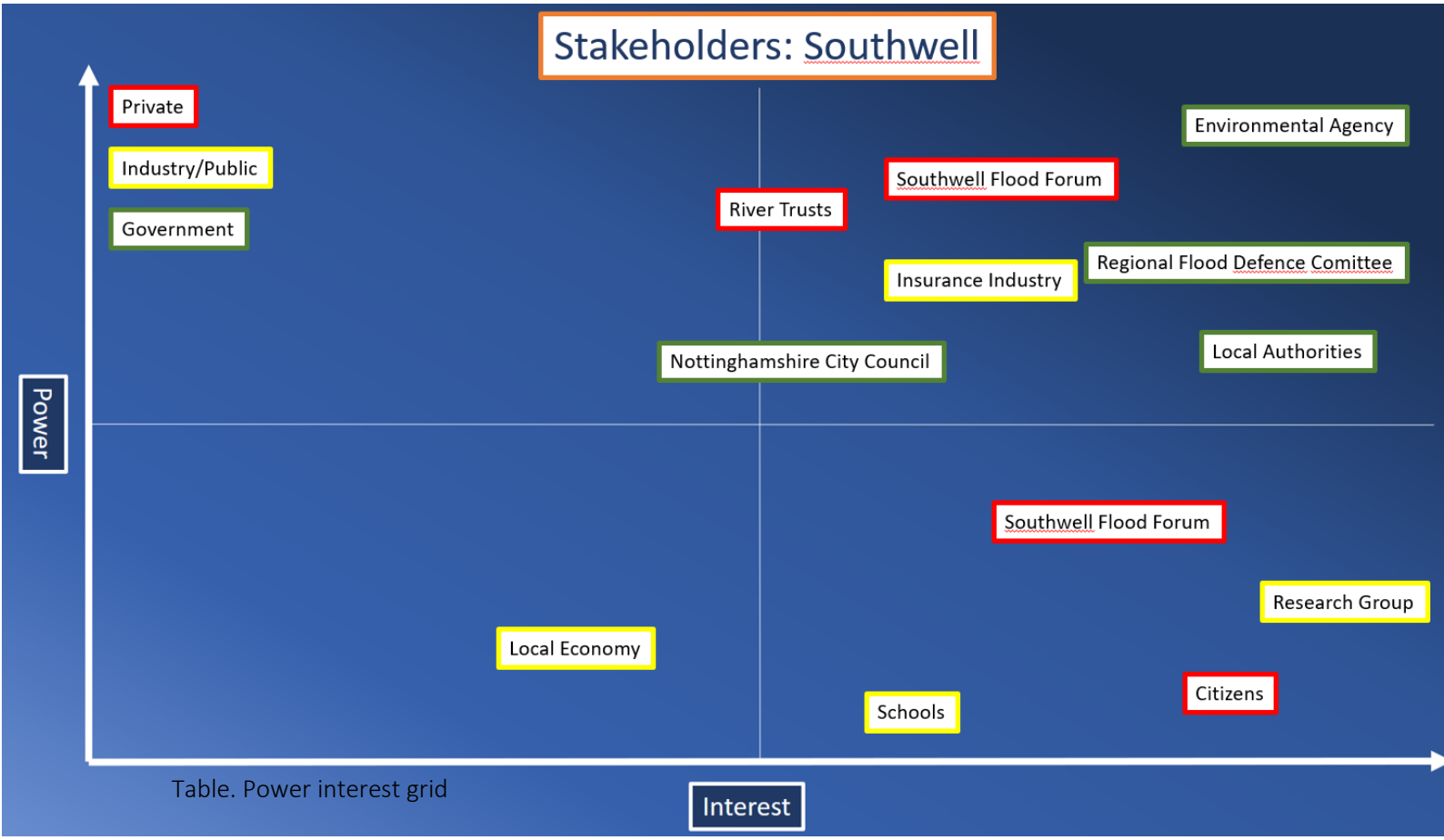


Table. Power interest grid

6.2 Spatial planning on flood risk

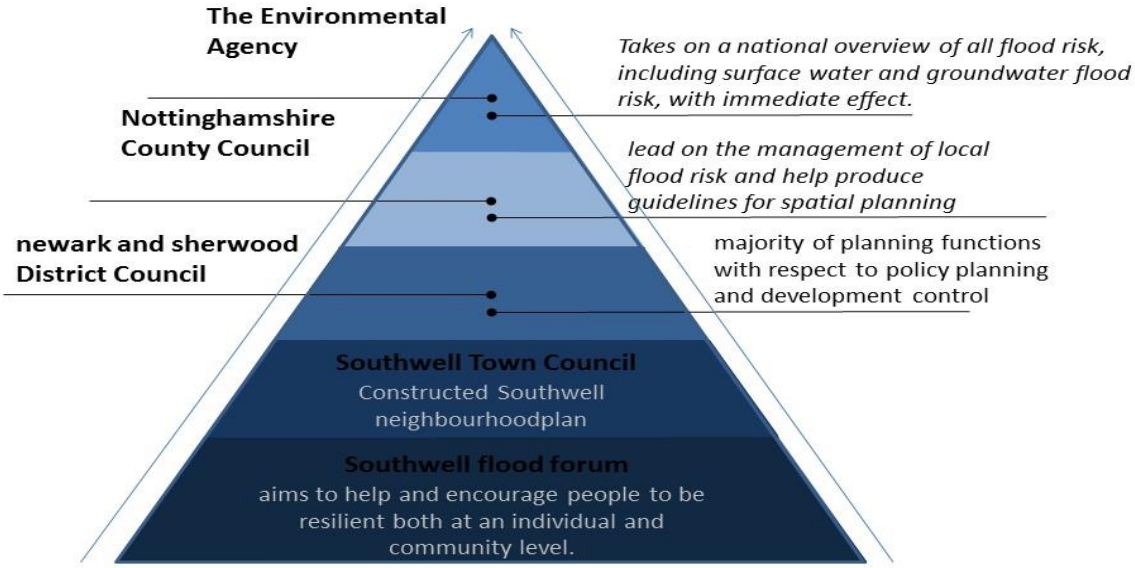
Through the gathering of secondary data on online governmental data bases, as can be found in the theoretical framework, the following results have been constructed.

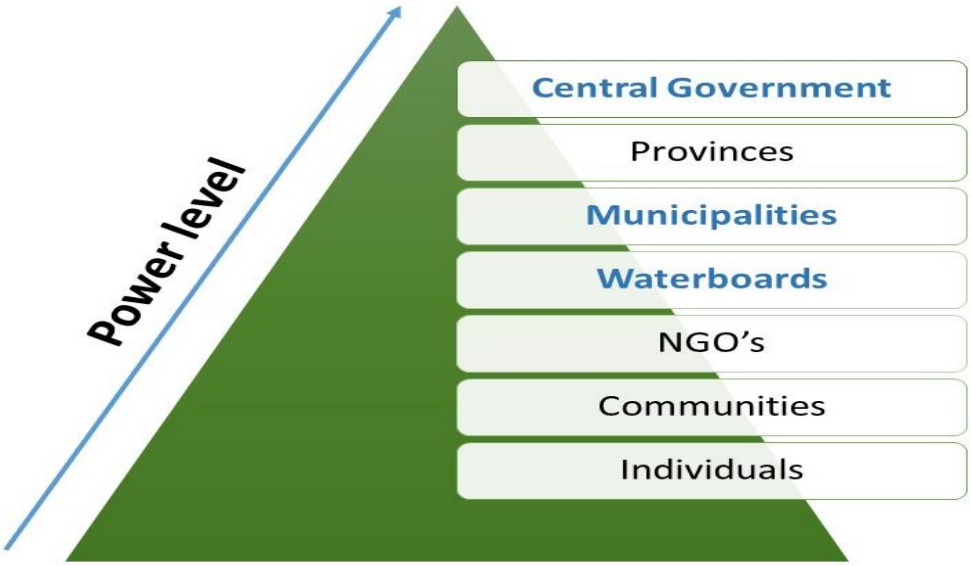
In the table below a comparisons has been made between spatial planning practice and flood resilience in UK (with the main focus on Southwell), compared to spatial planning practice and flood

resilience in the Netherlands. In the data gathering process for the UK it has become evident that the there are four policy documents, which can also be described as tools. These tools all concern spatial planning and flood risk policies and issues, all serve a similar goal: managing flood risk through spatial planning. In the Netherlands the structural visions however do not really focus so much on flood risk, but they do take this in account. In the Netherlands the water boards do work closely with all the different government levels with flood risk being in cooperated into policy documents.

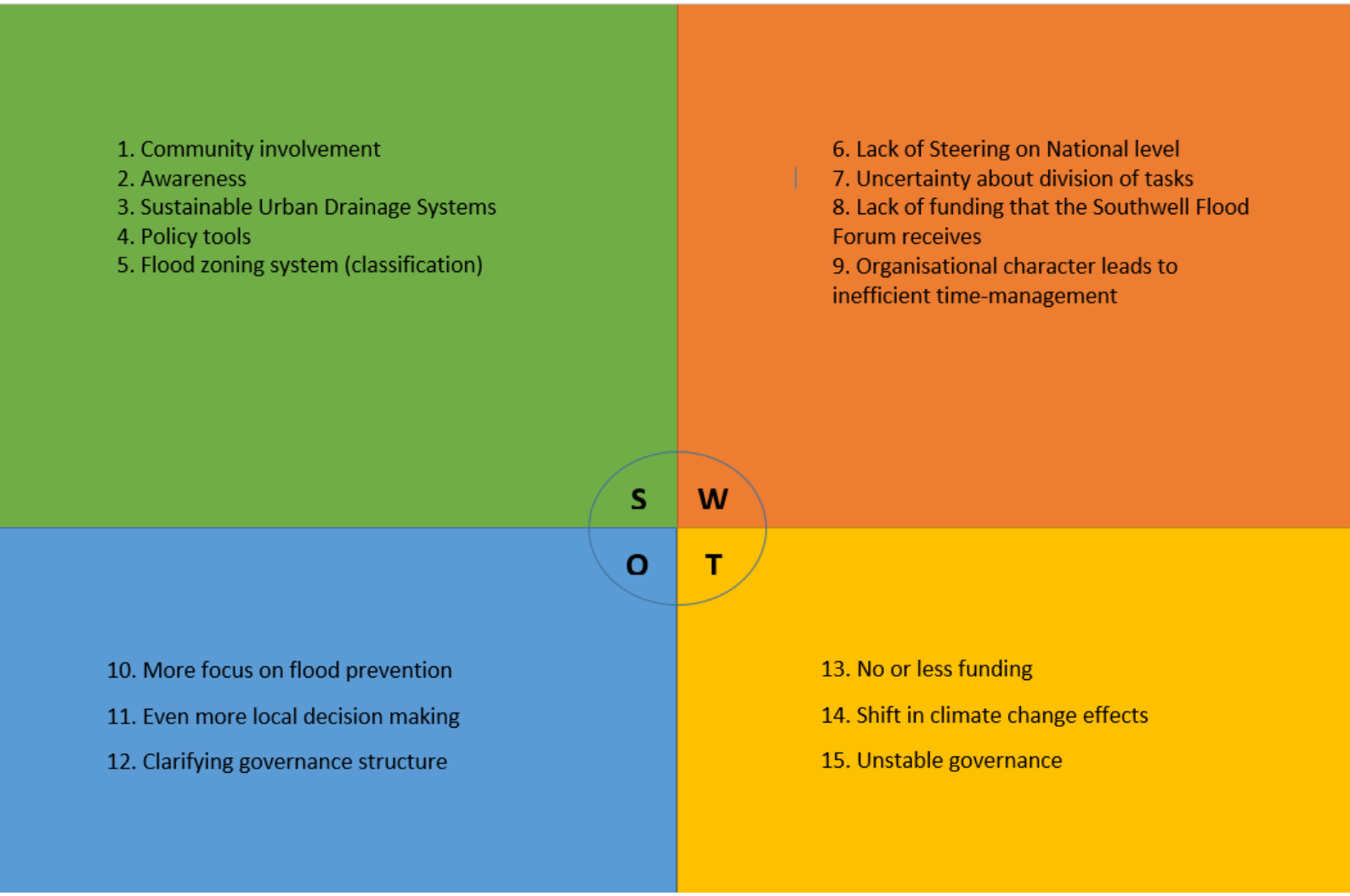
Policy tools UK (Southwell)	Importance (1-5)	Goal	Executive authority
Strategic Flood risk assessment	5	Avoiding and managing Flood risk – Central role local authorities in preparing local plans in deciding applications for planning permissions.	Local Planning authority - Newark and Sherwood District Council
Water Cycle Studies	3	The goal of this study is to make sure that key players, the Environment Agency and the water and sewage undertaker have data available on tensions between new developments and environmental requirements in relation to water supply and drainage.	Environment Agency & local developers
Surface Water Management Plan	4	A Surface Water Management Plan (SWMP) is a plan which outlines the preferred surface water management strategy in a given location.	Key Local partners
Neighbourhood plan	4	A Neighbourhood plan contains a powerful set of tools for local inhabitants to ensure that receive the right types of development for their neighbourhood.	Local Community Council
Policy Tools in Netherlands (MLS)			
Structural Vision (National Government)	3	States the goals and ambitions of national government concerning spatial planning.	National government
Structural Vision (Province)	4	States the goals and ambitions of province concerning spatial planning in confomity with national structural vision.	Province
Structural Vision (Municipality)	5	States the goals and ambitions of province concerning spatial planning in confomity with national and provincial structural vision.	Municipality

Another noticeable result of the secondary data collection are the power pyramids illustrated bellow. The pyramid shows authorities which have influence on spatial planning and flood risk management in Southwell and in the Netherlands. The upper part of the triangle shows the highest government authority. However, being on the same layer and place in one country does not mean that they have exactly same powers – it only indicates the priorities and power over other institutions and people in the regarding country instead of exact match of power in the other country. They might be similar, but they are not the same and usually work in different ways, have different perspectives and approaches. Although the Environmental Agency stands high above all other authorities and councils, there influence is not as large as might be initially thought. All the levels influence each other, from bottom up as well as bottom down. However the approach in the UK is much more based on communities, which is bottom-up, whereas communities in the Netherlands (MLS) play a less central role. Moreover the approach in the Netherlands is more or less top-down, although the National Government is trying to empower local governments more.





SWOT analysis 6.2



6.3 SWOT explanation

This SWOT analysis is meant to provide a final overview of the relevant findings for this research. Its function is providing the Strengths, Weaknesses, Opportunities and Threats that play a role in Southwell flood resilience. For this result, a comparison with the Dutch Mrs was needed in order to show the aspects that could be improved. Every element in the analysis is numbered and will be elaborated shortly in the upcoming list. To get a more in depth overview and with more context, it is recommended to read the other results as well as the Theoretical Framework.

1. As was assumed even before starting the research, the community involvement is an important strength of Southwell, since it is the backbone of the local flood resilience.
2. Awareness is the factor that accompanies community involvement. Because of the community involvement, a large amount of residents are aware of the dangers of flooding. Moreover, the awareness is also strengthened by the fact that the government does not promote the strong flood defense system in the United Kingdom (which is the reason why the awareness in the Netherlands is not on the same level).
3. The Sustainable Urban Drainage Systems are used to create more permeable surface and it makes uses of the storage capacity of the soil. It is very unusual to regulate this nationally and it is an effective tool in coping with excessive rainfall.

4. The government of the United Kingdom makes use of several policy tools (mentioned in the Theoretical framework). The policy/governance when regarding flood resilience is organized in such a way that measures can be implemented easily.
5. The flood-zoning system is a classification system that classifies the probability of a flood occurring into three categories. It is an effective tool for communicating flood safety to inhabitants and people affected.
6. There is a lack of steering on national level. The national government provides a framework and regulations, however they do not have a direct impact on funding, implementing measures and other local issues.
7. The contact person from the Southwell Flood Forum mentioned that the Forum has difficulties dealing with the inefficient division of tasks or the lack of it. This applies to many authorities and mainly the authorities that are positioned higher up in the hierarchy.
8. The Southwell Flood Forum does not receive sufficient funding to implement the plans that they have, ready to implement.
9. Efficient time management is an issue for the Southwell Flood Forum itself and also for other authorities. The contact with several people showed that the organizational structure and character might have to be changed in order to realize more effective time management.
10. A relevant opportunity could be to also implement more physical flood protection measures, since it is an effective way of protecting civilians against flooding.
11. Local decision making is another point that could be exploited even more. It can be significantly beneficial to improve the organizational structure as well as to empower the local people even more, since they have more knowledge on the local situation.
12. Clarifying the governance structure would make the governance and policy regulations understandable for a greater group of civilians, which can have a positive effect on community involvement. Simplifying will have a positive impact in avoiding misunderstanding as well, since misunderstanding between different layers of government is not desired.
13. The Southwell Flood Forum is already in a difficult position because of the lack of funding. A threat to the local flood resilience can be that the Flood Forum does not receive funding at all or not enough to remain functioning efficiently.
14. Climate change is an uncertain factor in flood resilience. The effects of this phenomenon can change over time and it is impossible to predict this entirely. Therefore this factor of uncertainty is included as a threat, since it can have a negative influence on flood resilience.

Government is still involved in flood resilience and it has an indirect influence on local flood resilience as well. Therefore, government tension can disrupt the Flood resilience system thereby affecting the safety of civilians directly.

6.3 Contact results

A part of the research is carried out by doing qualitative research. This qualitative research is done by mailing some professionals to collect some primary data. The results that are retrieved from the professionals contain information about the Southwell flood resilience approach. The data collecting wasn't easy because of the time pressure and the Christmas holidays were in between, this caused a late respond on the mails that were sent out. Just before the deadline of the research in January some professionals had replied on the mails that were sent out. The replies luckily contained helpful data about the current situation in Southwell. The contacts are Alistair Maltby from The Rivers Trust, Paul Cobbing from the Flood Forum UK Jacky Huson from the Southwell Flood Forum. The mails and data results are shown below and some connecting data is shown in the appendixes.

From: Alistair Maltby [mailto:alistair@theriverstrust.org]
Sent: 10 January 2017 15:45
To: Ben Pieterse <piet0037@hz.nl>; Ruth Needham <ruth@trentriverstrust.org>
Cc: Jean-Marie Buijs <jm.buijs@hz.nl>; Paul Cobbing <Paul.Cobbing@Floodforum.org.uk>
Subject: Re: Research FRAMES pilot project of Southwell

Good to hear from you and apologies for the slow response.

We are really looking forward to working with you all in the FRAMES project. You are correct that I work at the National level, and specifically on NGO, and catchment / watershed management rather than specifically on flooding and safety. Our work in Southwell is going to be around the spatial planning opportunities for flood risk reduction through catchment management opportunities. Your best local contact there for more detail will be Ruth Needham who I have copied in.

On the issues of national flood safety policies, it is probably best if you liaise with our other national partner in this project, the National Flood Forum. Paul is copied in and he should be able to direct you to people in his team with the relevant information. The role of civil society in evacuation and flood safety is very much an evolving picture here in the UK, which we hope to develop during the course of the FRAMES project.

All the best

Alistair

Alistair Maltby
Operations Director
The Rivers Trust

+44 (0)7736 364478

From: Paul Cobbing [mailto:Paul.Cobbing@Floodforum.org.uk]
Sent: 11 January 2017 11:23
To: Alistair Maltby <alistair@theriverstrust.org>; Ben Pieterse <piet0037@hz.nl>; Ruth Needham <ruth@trentriverstrust.org>
Cc: Jean-Marie Buijs <jm.buijs@hz.nl>
Subject: RE: Research FRAMES pilot project of Southwell

Thanks for the email.

We need to distinguish between work to reduce flood risk (flood risk management) and keeping people safe in an incident (resilience, contingency planning and incident management, though the term "resilience" has several different meanings and is used elsewhere also). In Britain these areas stem from two different government departments and are different policy areas, although they do of course overlap at each spatial scale and many of the organisations involved have several roles. There are hundreds of documents involved, so it would be helpful to have a more refined understanding of what it is that you are interested in.

Our work in Southwell may focus on risk reduction, though this will be guided by the wishes of the community. From a community perspective, the important point is to focus on what will help them to take control of the flooding in their lives most effectively, so they often tend not to distinguish between these two areas. Of course, this varies from place to place. Establishing what to focus on is a process that we will go through with the community, bringing in partners.

Kind regards

Paul Cobbing

Chief Executive
National Flood Forum
Old Snuff Mill Warehouse
Park Lane
Bewdley
Worcestershire
DY12 2EL

☎ 0777 3355 181
☎ 01299 403101
✉ paul.cobbing@floodforum.org.uk
www.floodforum.org.uk

7. Conclusions

Now what can be learned from comparing the role of the role of the community in flood resilience in Southwell with the role of the community in the Dutch MLS approach? The research objective of the sub question was to learn from the comparison roles of the communities. The lessons that can be learned from the Southwell communities is that they have a high level of awareness and they include participation. The role of prevention could be a lesson for Southwell because they rely on crisis management and almost have no prevention measures.

From the Dutch MLS approach can be learned that they have strong prevention measures due to flood resilience. A lesson what the Dutch MLS approach could learn is to improve their crisis management, because the awareness is for the communities is low.

Spatial planning

Our findings on the Southwell's and MLS approach lead to certain conclusion when being compared with each other. Those conclusions are:

- Role of communities and individuals is much bigger in Southwell than in the Netherlands. People have more say in what they want and what they need to develop, more influence and power. Listening to the needs of people heavily helps on all kinds of developments, including water safety.

  This is primarily because of the fundamental difference of bottom-up approach in Southwell and top-down approach in the Netherlands. Bottom-up guarantees that the people have more influence and voice over the higher levels of institutions, while top-down means governments are in bigger control than the people.

- In Southwell, government transfers responsibility towards the people, while in the MLS approach, government takes responsibility of water safety aspects.

  This is due to spatial planning and primary flood defences issues, since MLS in Netherlands focuses on the primary layers much more and provides guarantees with certain insurances that reduce the probability and impact, severity of a flood in case it happens. Essentially, it leads down to who has more power in the process of water safety also has more responsibilities when it comes to it.

- The MLS approach allows for more freedom when it comes to spatial developments than the Southwell – locations do not need to be carefully assessed due to guarantees by the government and solid primary defences, whereas in Southwell it has to be taken into serious consideration and consultation.

- Southwell educates and provides much more information to its communities than the Dutch approach, mainly due to focus on the third layer, crisis management, which requires well-established co-operation with people and communities.

  This means that people know more what to do when it comes to a flood or other water related issue in their town – they are ready and well-aware of impacts and how to deal with them. Dutch approach does not accomplish the community awareness, because it is somewhat neglected layer, mainly due to guaranteed flood defences by the government.

- Lack of compensations from the government in Southwell in case a flood causes damage – things have to be taken care of privately or via insurance. This means that people do not receive a lot of support from the government and are expected to deal with the issues independently, while Dutch MLS compensates people for occurring floods, if they were to happen.

  This means that people are not always sure if they can cope with the impacts and the floods themselves, in case when there is no private insurance. Government should provide bigger efforts to support its people in times of desperate need.

8. Discussion

In conducting this research a couple of problems were encountered along the road. When initiating this research the focus was slightly different, and more on finding concrete solutions to improve the vulnerability of Southwell to flooding. As time progressed this scope of the research proved to be too large and therefore had to be narrowed done to a more realistic one. Eventually the research was narrowed down to comparing the two approaches of both Southwell and the Dutch MLS in order to see what could be learned. When still dealing with the older scope, contact with multiple experts in Southwell was made to gain a more depth view on how Southwell deals with the flood risk in the area. Although contact had been initiated in the early stages of the research real contact only was made a couple months after initiation, this caused some delay at the beginning of the research. At first this caused confusion as to whether what could be done to gain a more primary data. This is when the scope had to changed and narrowed down, which resulted into the report now constructed. With the research now completed a couple interesting things have come to the surface. We personally think that the Dutch MLS approach could learn much from the community based approach applied in Southwell, and the rest of the UK. Furthermore the awareness of inhabitants of Southwell to the flood risk is greater than in the Netherlands, which are both the result of (national) policies in place. Southwell however could lower their flood risk by taking more and better prevention measures.

9. Recommendations

In the research report to the research question what can be learned from comparing flood resilience in Southwell with the Dutch MLS approach the results say that the community of Southwell has a lot of influence and interest in flood resilience whereby the hierarchy not really clear is. The focus of Southwell is on crisis management and they do not really have good prevention measures they rely on response after a flood. Furthermore the municipality of Southwell plans to implement an green belt around Southwell with the goal to make Southwell more attractive and greener (Prentice, 2015). For the Dutch MLS approach the case is the opposite, the results say that the Dutch rely on prevention and the awareness of the community and people is low (Martijn van den Hurk, 2013). Based on these results some recommendations are made:

- Make the hierarchy for the Southwell area more clear and define it well. This is necessary for a good system in decision making for the Southwell area on flood resilience. The community has a lot of interest and they working together to increase the awareness and flood resilience
- Southwell must put more focus on the prevention of floods (first layer) rather than relying on crisis management (third layer). The crisis management and response on floods in Southwell is their strongest point due to flood resilience and they mostly rely on that, why not implement prevention measures? Prevention on floods will eventually save a lot of money and damage.

The Dutch almost have no floods because they rely on prevention and this shows how that a lot of damage could be prevented.

- The municipality of Southwell is implementing a green belt around Southwell with the purpose of making the area more attractive, they should incorporate flood resilience into this green belt, this creates a multifunctional attractive area whereby the green belt could function as a buffer. By digging in the green belt water from extreme precipitation events can be stored and flood risks will decrease. Another opportunity to create a better environment is to make use of the SuDs described in the theoretical framework they improve water quality by drainage regimes and they reduce surface water flooding and they enhance the amenity and biodiversity of the environment. This combination will strengthen and it will make the Southwell area more green and attractive.
- The Dutch MLS approach should focus on measures that can limit potential consequences of a flood event. The Dutch MLS is focused on prevention and has little attention on the third layer crisis management. The awareness of the people due to flood resilience is low and lacks information, when focusing making people aware, let the people participate give the right resources, the potential consequence of a flood can be reduced. As described in the community of Southwell measures that limit potential consequences works well.
  Both Southwell and the Dutch MLS approach should learn from each other and other countries. It is important to share experiences and knowledge about flood resilience and by learning and sharing knowledge everybody can learn from each other. Also history and past events can help by improving the flood resilience.

Appendixes

COMMUNITY ENGAGEMENT RECORD

Date	Event and location	Type of event	Organiser
September 10th 2013	Post July 2013 flood, Minster Church	Public Engagement	SFF
September 25th 2013	Flood fair, Minster School (also 1st Stakeholder meeting)	Drop-in	NCC
October 5th 2013	Food fair, Minster School	Drop-in	NCC
November 20th 2013	Riparian Owners, Library	Engagement (by invitation - RO's)	SFF
February 2014	Mezze eve at La Parisienne	Fundraising	SFF
March 13th 2014	JH attend NFF Conference on Pathfinder Projects	Conference	NFF
March 23rd 2014	Late lunch at Piano	Fundraising	SFF
April 10th 2014	Public Meeting, Minster School. Presentation by NCC and Consultants AeCOM	Public engagement	SFF
April 10th 2014	Coffee morning at Old Vicarage	Fundraising	SFF
June 18th 2014	Community Resilience open day, Library	Public engagement	SFF
June 21st 2014	Family Fun Day stall	Public awareness, fundraising	SFF
June 23rd 2014	Riparian and Watercourse meeting, Library	Engagement (by invitation - RO's)	SFF
June 26th 2014	Riparian and Watercourse meeting, Library	Engagement (by	SFF

		invitation - RO's)	
July 19th 2014	Flood Fest, Memorial Park	Public awareness, fundraising	SFF
August 30th 2014	Garden Party, Westhorpe	Fundraising	SFF
October 18th 2014	Bucket collection Coop	Fundraising	SFF
November 28th 2014	Christmas tree decorating, Library	Public awareness	SFF
January 17th 2015	Drop in surgery, Repair and Renew	Public engagement	SFF
January 31st 2015	Recruitment Fair, Saracens Head	Public awareness	SFF (RJMP)
April 25th 2015	Golf Day	Fundraising	SFF
July 12th 2015	Tug o War, Memorial Park	Public awareness, fundraising	SFF
September 17th 2015	Public Meeting re options, Minster School	Public engagement	NCC
September 25th /26th 2015	Drop in surgery re options, Admiral Rodney	Drop in	NCC
November 20th/21st 2015	Drop in surgery re options, Admiral Rodney	Drop in	NCC
May 15th 2016	Community Resilience Day (including Warden training), Brackenhurst	Public engagement	SFF

Watercourse Clearance
July 2013 to May 2014

Flood Warden training
About 60 wardens (need ongoing 'maintenance')
26th November 2013 - Theory
21st January 2014 - Theory
10th May 2014 - Practical
17th May 2014 - Practical
31st May 2014- Practical
16th July 2014 – Practical and theory
26th November 2014 - Practical and theory
26th April 2015 – Practical and theory
15th May 2016 – Practical and theory

Technical Group
About 15 people actively engaged on options with NCC/JBA

Education group
About 5 people – online training resources for key stages – dormant

Library Help Desk
About 4 volunteers available for advice/guidance/information on Tuesday and Saturday – 2 hours
December 2013 to May 2015

University of Nottingham – Risk workshops – Shaun Maskrey
About 20 people over 5 workshops. January 2015 to May 2015

Design/publicity
About 2/3 people to maintain website, design, send and display publicity and communications

Issues
Reinvigorate engagement – lot of social capital – some retained – core and Technical group. Some need reviving - Education group
Average age 60? Need to engage younger people and schools
Widen the scope to county?
Engage existing social groups more – churches, U3A, Lions, Rotary, Round Table, etc.

Southwell aims for resilience

Background

Southwell has suffered several small isolated flooding events as far back as 1920, a flood in 2007 when about 100 properties were affected, but it was only after severe flooding in 2013 which affected about 250 properties that the Southwell Flood Forum was formed to be the voice of the community in working towards reducing its flood risk – through mitigation measures as well as through building community resilience.

Southwell is rich in history – a Minster dating from 10th century, many associated church buildings, a hotel dating from 14th century where Charles 1 spent his last night as a free man, a National Trust workhouse and many listed buildings within a large conservation area.

A population of approx 6000 with a good quality comprehensive school and feeder infant and primary schools, a vibrant high street, some small industry and businesses, Southwell is a desirable town with excellent facilities, many cultural and music events including classical and acoustic roots festivals and as such, is in demand for more building development.

Flood risk management
Complex flooding mechanisms – Southwell is located in a 'bowl'-shaped catchment with a watercourse, Potwell Dyke running through it - vulnerability to flash flooding, ageing drainage/surface water system which struggles to cope with heavy rainfall events and new developments which test the capability of the infrastructure and environment to cope with increased demands have proved challenging to determine what mitigation options could be most beneficial to reduce flood risk.

The flood risk management in terms of mitigation – mostly 'soft' engineering options - is being led by our Lead Flood Authority, Nottinghamshire County Council, supported by a Technical Subgroup of local residents with a range of skills and experience – hydrologist, geologist, modeller, civil engineer etc. The FRAMES project will focus on Natural Flood Management options.

Alongside the mitigation options, one of our main ongoing concerns is the maintenance of the riparian owned main watercourse (Potwell Dyke), tributaries, drainage systems and roadways to ensure they operate at their maximum capacity during heavy rainfall, Raising awareness of the importance of 'community stewardship' is part of the community resilience campaign.

Community Resilience
The Forum has a Community Emergency Planning team, on which, among others, we are very fortunate to have two residents a) the Nottinghamshire County Council Group Manager, Emergency Planning and Registration supporting us in a voluntary capacity and b) an employee of the Environment Agency in Lincoln who is a trained Flood Warden for the EA.

This team, In partnership with the Southwell Town Council has started to develop a Community Emergency Plan which embraces a road closure scheme with 20 closure points – thought to be the largest scheme in Europe. The aim is to save lives by aiming to prevent people entering floodwater, prevent cars driving through floodwater to avoid I) becoming stuck ii) creating bow waves and thus protect properties. This scheme has required nine training sessions to recruit 60 Road Closure Wardens who have the delegated legal authority to close roads when pre-determined triggers are met.
We are aware the Golden Hour before emergency services might be able to arrive following a flooding event is the vital time for locally trained Wardens to maintain safety and keep people informed.

Fortunately our flooding tends to happen quickly, but also subsides quickly, so in terms of evacuation plans, the only particular area of concern is a group of bungalows for the elderly which were badly flooded in 2013. A group of Wardens dedicated to these people is being developed. Other institutions such as the schools, churches and homes for the elderly would be responsible for their own evacuation plans. Many families had to be re-housed while their properties were being repaired, but residents took responsibility for their own situation, or in some circumstances the local Council had responsibility.

We have held resilience events to raise awareness of how residents and businesses can be more resilient and to encourage them to ensure their personal and organisational Emergency Plans are robust for flooding and other emergencies. All our public engagement events have included information on Property Level Protection, in particular one event In January 2015 specifically on the Repair and Renew Grant which we campaigned to be eligible for (originally only for flooding suffered from December 2013).

Other initiatives include a Communications Hub – a central point of contact in the event of an emergency – based at the Town Council and staffed by volunteers from the Forum and the Town Council.

In May 2015 we published a Community Resilience Handbook distributed to all households, part funded by the Postcode Lottery Trust which encapsulates the wide range of resources available to residents, explains community resilience and individual responsibilities etc.

So far our campaign has been top-led, but our forward plan is to devolve day-to-day maintenance to Lead Flood Wardens and their teams of Wardens within huddles (areas based around road closure points), overseen by the Community Emergency Planning Team and Southwell Town Council.

We would like to develop firmer links with the schools, churches, existing interest groups such as U3A to consolidate and build on what we have already achieved.

Bibliography

Agency, E. (2009). *https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf

al, S. e. (2011).

British Geological Survey (BGS). (n.d.). *British Geological Survey (BGS)/ Research/ Sustainable Urban Drainage Systems*. Retrieved 01 20, 2017, from British Geological Survey (BGS): http://www.bgs.ac.uk/research/engineeringGeology/urbanGeoscience/suds/home.html

City Population. (2015). *SOUTHWELL*. Retrieved from citypopulation.de: https://www.citypopulation.de/php/uk-england-eastmidlands.php?cityid=E34001066

Emergencies: preparation, response and recovery. (2013, February 20). Retrieved from GOV.UK: https://www.gov.uk/guidance/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others

Environment, E. C. (2016, 10 21). *Europa.eu.* Retrieved from http://ec.europa.eu/environment/water/flood_risk/implem.htm

Fisk, P. (2010). *People Planet Profit.* Kogan Page. Retrieved from Gamechangers.

Forum, N. F. (2016). *National FLood Forum*. Retrieved from http://www.nationalfloodforum.org.uk/

FRAMES. (2016, 10 1). *Trent river trust.* Retrieved from http://www.trentriverstrust.org/site/sites/default/files/20160314084809_app_FRAMES.pdf

Goedman, Houtsma, & Zonneveld. (2008). *Sustainability in Dutch Spatial Planning.* ISOCARP.

Hurk, Van den et al. (2013). Water safety and spatial development: An institutional comparison. *Land Use Policy (Elsevier)*, 11.

Huson, J. (2017, 01 15). FRAMES and civic society.

Huson, M. (2017, 1). Corresepondend Southwell Flood Forum. (D. Friederich, Interviewer)

HZ, R. D. (2013). Zeeland heeft meer aan zelfredzame gemeenschap bij overstroming. *PZC*.

Interreg. (2016). *Interregeurope.* Retrieved from http://www.interregeurope.eu/about-us/what-is-interreg-europe/

INTERREG North Western Europe. (2014). Retrieved from INTERREG: http://www.rvo.nl/subsidies-regelingen/interreg/programmas/interreg-north-west-europe-nwe

James Parker, R. F. (n.d.). *The Community Emergency Plan*. Retrieved from Southwell Flood Forum: http://www.southwellfloodforum.org.uk/community/emergency/

Local Government Association. (2012, 11 12). *Managing flood risk: roles and responsibilities*. Retrieved from http://www.local.gov.uk/local-flood-risk-management/-/journal_content/56/10180/3572186/ARTICLE

Local Government Association. (2015, 9 21). *Management and spatial planning*. Retrieved from http://www.local.gov.uk/spatial-planning-and-flood-risk/-/journal_content/56/10180/3579261/ARTICLE

Local Government Association. (2015, 9 16). *Policy context*. Retrieved from http://www.local.gov.uk/local-flood-risk-management/-/journal_content/56/10180/3572110/ARTICLE

Local Government Association. (2016, 08 22). *Spatial Planning and floodrisk*. Retrieved from Local government and Parlement: http://www.local.gov.uk/spatial-planning-and-flood-risk/-/journal_content/56/10180/3598714/ARTICLE

Martijn van den Hurk, E. M. (2013, 9 24). *Land Use Policy.* Retrieved from science direct: file:///C:/Users/Max%20van%20Beek/Downloads/article%20Uk%20compared%20with%20NL.pdf

Ministry of Infrastructure and Environment. (2011, March). *Summary National Policy Strategy for Infrastructure and Spatial Planning.* The Hague: Ministry of Infrastructure and the Environment. Retrieved from www.government.nl

Ministry of Land, Infrastructure, Transport and Tourism Japan. (2015). *Overview of Spatial Planning in Asian and European countries.* General Affairs Division, Policy Planning office.

Nottinghamshire County Council. (2011). *Nottinghamshire Preliminary Flood Risk Assessment.* NOTTINGHAM: JBA Consulting.

Pitt, S. M. (2008). *http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf.* Retrieved from http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf

Prentice, B. (2015). *The Southwell Neighbourhood Plan.* Southwell.

Prentice, B. (2016). *Southwell Community Resilience Handbook.* Southwell: Southwell Flood Forum.

Serrano, E. D. (2013).

Southwell Town Council. (2014). *The Southwell Neighbourhood Plan.* Southwell: Southwell Town Council.

Stephen Parry, G. L. (2013). *Strategic stone study - a building stone atlas of Notthinghamshire.* Notthinghamshire: English Heritage.

Supporting a resilient Southwell. (n.d.). Retrieved from Southwell Flood Forum: http://www.southwellfloodforum.org.uk/community/

Supporting a Resilient Southwell. (n.d.). Retrieved from Southwell Flood Forum : http://www.southwellfloodforum.org.uk/community/

TRT. (2016). *Trent River Trust*. Retrieved from http://www.trentriverstrust.org/site/

Trust, T. R. (2016). *The Rivers Trust*. Retrieved from http://www.theriverstrust.org/riverstrusts/trust_movement.html

Water, S. f. (2004). *Look-Up.org.uk.* Retrieved from http://www.look-up.org.uk/2013/wp-content/uploads/2014/02/Making-space-for-water.pdf

What is emergency planning. (2013, February 20). Retrieved from GOV.UK: https://www.gov.uk/guidance/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others