Environmental Policy Implementation Networks: who are the movers and shakers?

A case study of selected catchment partnerships, NW River Basin UK

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KEY ACRONYMS

AONB: Area of Outstanding Natural Beauty

CaBA: Catchment Based Approach

CBD: Convention on Biological Diversity

COP: Conference of the Parties

CP: Catchment Partnership

CST: Catchment Support Team

DCLG: Department for Communities and Local Government

DEFRA: Department for Environment, Food and Rural Affairs

EA: Environment Agency

EsS: Ecosystem Services

EU: European Union

GIS: Geographic Information Systems

GMCA: Greater Manchester Combined Authority

MA: Millennium Ecosystem Assessment

MSSTT: (Groundwork) Manchester, Salford, Stockport, Tameside and Trafford

NEA: National Ecosystem Assessment (UK)

NGO: Non-government Organisation

NRA: Natural Resource Area

NW: North West

ODI: Overseas Development Institute

PES: Payments for Ecosystem Services

RBD: River Basin District

RB(M)P: River Basin (Management) Plan

RRT: Ribble Rivers Trust

SNA: Social Network Analysis

TEEB: The Economics of Ecosystem Services and Biodiversity

UK: United Kingdom

WFD: Water Framework Directive

GLOSSARY OF KEY TERMS

The following list aims to provide brief explanations of key words and phrases.

Catchment	The area of land, including the hills and mountains, woodlands, and buildings which water drains from, before flowing into the streams, rivers, lakes and tarns.
Catchment Based Approach (CaBA) Policy	DEFRA framework published June 2013 to encourage the adoption of an integrated catchment based approach to improve the water environment through collaborative working at the catchment level. The aim for this approach is to balance environmental, economic and social demands and align funding and actions within river catchments to bring about long-term improvements. DEFRA supports civil society organisation to establish and maintain partnerships across England's catchments
Catchment Partnerships	Non-statutory, unincorporated groups that consist of key stakeholders, including local communities, to agree and deliver the strategic priorities for the catchment and to support the Environment Agency in developing appropriate River Basin Management Plans
Collaborative Working	Collaborative working refers to a way of working that involves sharing power, risks and ownership of the process.
Complexity Science	A set of ideas and principles which describe the nuances which underpin the processes and dynamics of change, that is, the logical properties of nonlinear behaviour and network feedback systems that create themselves over time through reflection and learning, while seeking to understand instabilities which lead to new forms through sudden changes
Complexity Management Theory	A whole system approach defined by relationships and networks working together with a uniting, common purpose, where control and co-operation are considered necessary to prevent network collapse,
Convention on Biological Diversity (CBD)	A global treaty, the goals of which cover not just the conservation of biological diversity, but also the social features of sustainable use and the fair, equitable sharing of the benefits arising, through an integrated management approach based on ecosystems. The CBD contained twelve principals concerned with the development of an ecosystem management approach.
Environment Agency	Environment Agency of England and Wales.
Host	The lead individual and/or organisation responsible for each catchment stakeholder group (partnership), funded from DEFRA's Water Environment Improvement Fund, established 2016, administered on behalf of DEFRA by the Environment Agency
Localism	Principle that power should be exercised at the lowest practical level. The Government's Localism Bill involves giving Local Authorities new freedoms and flexibilities.

Natural England	The government-funded body whose purpose is to promote the conservation of England's wildlife and natural features. The previously existing organisations of English Nature, the Countryside Agency and Rural Development Service were merged to form Natural England.
NETDRAW	Widely used Visualization software that creates pictures of networks. It can also incorporate attribute data into the diagrams. See www.analytictech.com. NETDRAW automatically generates a visualisation of the data using a standard algorithm to push the most connected nodes to the centre of the screen and the least connected nodes to the periphery. Standard algorithms locate the most central nodes in a network in the centre of the visualisation.
Qualitative Research	Qualitative Research is primarily exploratory research. It is used to gain an understanding of underlying reasons, opinions, and motivations. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. Qualitative Research is also used to uncover trends in thought and opinions, and dive deeper into the problem. Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews, and participation/observations. The sample size is typically small, and respondents are selected to fulfil a given quota (DeFranco, 2011).
Quantitative Research	Quantitative Research is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics. It is used to quantify attitudes, opinions, behaviours, and other defined variables – and generalize results from a larger sample population. Quantitative Research uses measurable data to formulate facts and uncover patterns in research. Quantitative data collection methods are much more structured than Qualitative data collection methods. Quantitative data collection methods include various forms of surveys – online surveys, paper surveys, mobile surveys and kiosk surveys, face-to-face interviews, telephone interviews, longitudinal studies, website interceptors, online polls, and systematic observations. (DeFranco, 2011)
River Basin	A river basin is the area of land from which all surface run-off and spring water flows through a sequence of streams, lakes and rivers into the sea at a single river mouth, estuary or delta. It comprises one or more individual catchments.
River Basin Management	The management and associated planning process that underpins implementation and operation of the Water Framework Directive. It is both an overarching process in terms of existing processes and also defines new sub-processes such as those for hydromorphology. The river basin management plans are plans for river basin management.

River Basin Management Plan	For each River Basin District, the Water Framework Directive requires a River Basin Management Plan to be published. These are plans that set out the environmental objectives for all the water bodies within the River Basin District and how they will be achieved. The plans will be based upon a detailed analysis of the pressures on the water bodies and an assessment of their impacts. The plans must be reviewed and updated every six years.
Rivers Trusts	Charities and organisations set up to assist in the conservation, protection and improvement of rivers and associated environments.
Social Network Analysis **(SNA)**	A set of techniques for identifying and representing patterns of interaction among social entities, be it individuals, groups, organisations or social artefacts. It provides precise and specific insight in place of intuition and general hunches. Social network analysis is predominantly an application of the mathematics of graph theory. The approach employs four principal tools: •social entities are represented as points, each known as a 'node' or 'vertex'; •relationships are represented by lines, known as 'ties, 'edges' or 'arcs'. It is also possible to represent: •the strength of the relationship, for example, by line width; •attributes of the nodes, for example, by different colours or size. Sourced from Getting Started in Social Network Analysis with NETDRAW, Bruce Cronin
Stakeholder	Individuals or groups that are or could become interested in, involved in or affected by our policies and activities. Our stakeholders include regulators, statutory bodies, professional organisations, local organisations and members of the public.
Stakeholder Forum	A group of interested parties to guide and advise on catchment planning and management.
UCINET	UCINET provides extensive tools for comprehensive network analysis. Widely used social network analysis software (Borgatti, Everett and Freeman, 2002) which represents the informal relationships in the organisation. A Windows based tool which is used to manipulate and analyze data collected from individuals during a social network analysis. It includes a comprehensive range of network techniques. There are regular inclusions of new analytical techniques in the field as they are developed. See www.analytictech.com.
Water Framework Directive	European Union legislation – Water Framework Directive (2000/60/EC) – establishing a framework for European Community action in the field of water policy.
Weight of Evidence	A weight of evidence approach integrates results or evidence from several data sources, weighted appropriately, to make risk based decisions.

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My appreciation to those who participated for their support and interest.

Movers & Shakers:

Definition: 'people who are active or influential in some field of endeavour'
'powerful people who initiate events and influence others'

Source: Oxford Dictionaries

ABSTRACT

The current UK Government policy implementation framework, which directs the structure of partnership involvement in the environmental area, has introduced an implementation model which encompasses both 'top-down' and 'bottom-up' theoretical typologies, consequently, there is an opportunity to examine the impact of this novel framework by in-depth, practical examination. To address this gap, a critical analysis of UK Government environmental implementation strategy was undertaken, framed within the financial challenges, political devolution debate and social factors which impact implementation agents.

The research consisted of a case study on the practical experience of selected river catchment conservation partnerships (NW England River Basin), critically examining the overall governance structure and individual partner relationships through the application of a complexity science approach incorporating social network analysis. UK DEFRA guidance encourages the adoption of an ecosystem framework to direct goal prioritisation, consequently, positioning environmental goals against ecosystem services and disservices formed an important facet of the research, established by novel analysis of historical, narrative records and contemporary reports. Both quantitative and qualitative measures were used in the evaluation.

Powerful stakeholders, including partnership development support, are found to influence collaborative activity and maintain a strong focus on statutory goals: suggestions for establishing accountable stakeholders in a complex network are outlined. Understanding long-term trends offers greater potential for robust, innovative environmental interventions, however, the lack of an explicit application of the ecosystem framework is considered to contribute to the prioritisation of water quality and quantity goals within the partnership. The current devolution debate has a discernible impact on the governance arrangements of one of the studied partnerships. Given the restrictions on funding and stakeholder participation found in this study, alternative governance arrangements for catchment partnerships are proposed. Policy frameworks need to support an approach which involves potentially competing UK Government departments, consequently, findings have implications for policymakers, environmental activists and local communities.

CHAPTER 1 INTRODUCTION

The Convention on Biological Diversity (CBD) (1993) is a global treaty, the goals of which cover not just the conservation of biological diversity, but also the social features of sustainable use and the fair, equitable sharing of the benefits arising, through an integrated management approach based on ecosystems. The Convention was opened for signature on 5 June 1992 at the United Nations Conference on Environment and Development (the Rio Earth Summit). It remained open for signature until 4 June 1993, by which time it had received 168 signatures (CBD, 1993).

Table 1.1: Summary of the revised Principles of the CBD Ecosystem Approach (Korn et al., 2003).

Principal	Text
1	The objectives of management of land, water and living resources are a matter of societal choice involving all relevant sectors of society.
2	The ecosystem approach should seek the appropriate balance between, and integration of, conservation and sustainable use of biological diversity as well as the fair and equitable sharing of benefits.
3	Ecosystem management must ensure the sustainable provision of ecosystem goods and services.
4	In order to maintain the provision of ecosystem goods and services, the conservation of ecosystem structure and functioning is a priority target.
5	Ecosystem management should be decentralised to the lowest appropriate level taking into account the linkages with other levels.
6	Management decisions should be based on all forms of relevant information, including that from all scientific disciplines as well as indigenous and local knowledge, innovations and practices.
7	Ecosystem management must consider the relevant economic values, impediments and opportunities including: (a) the reduction of those market distortions that adversely affect biological diversity; (b) the alignment of incentives to promote biodiversity conservation and sustainable use; (c) the internalisation of costs and benefits to the extent feasible.
8	Ecosystem management should be undertaken at spatial and temporal scales appropriate to the objectives taking into consideration effects on adjacent and other ecosystems.
9	Ecosystem management should set objectives for the long term recognising the varying temporal scales and lag effects that characterise ecosystem processes.
10	Ecosystem management should adopt adaptive management strategies recognising the inherent dynamics of change and uncertainties in ecosystems.

The CBD contained twelve principals concerned with the development of an ecosystem management approach, later refined to ten (Korn et al., 2003), which cover stakeholder involvement, decision making processes, information sources and scoping considerations (Table 1.1).

In 2010, the CBD acknowledged a failure to achieve the biodiversity target agreed in 2002, with consequential serious impacts for the future of humanity (CBD, 2010). The Conference of the Parties (COP), who govern the Convention and goal implementation, at their 10th Conference held in Aichi 2010, therefore launched a new strategic plan covering 2011-2020. The strategic plan mission is to *take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services* (CBD, 2017, p2). To implement the strategic plan, governments are required to incorporate biodiversity considerations into national planning, with programmes of work themes aligned to ecosystems for example, inland water biodiversity, forest biodiversity or island biodiversity (CBD, 2010). Mechanisms for implementation are anticipated to require broad political support, involving national Governments, and delivery is to be through partnerships which leverage actions at the required scales (CBD, 2017).

The EU Biodiversity Strategy to 2020, which fulfils CBD requirements, is delivered through a common implementation framework involving the European Commission and Member States, in partnership with key stakeholders and civil society (EU, 2011). A further target to 2050 is outlined in the EU Biodiversity Vision, *where biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value, for their essential contribution to human wellbeing and economic prosperity and so that catastrophic changes caused by the loss of biodiversity are avoided* (BISE, 2018, p1). There is a need for close coordination between the authorities responsible for ensuring implementation of the strategy, from the overarching EU level, through to national and sub-national levels, plus important input from local level stakeholders, including business and society at large (EU, 2014). Consequently, to achieve environmental goals in the 21st Century, implementing organisations need to adopt new, complex delivery mechanisms. The delivery of EU environmental policy by member states has been criticised for a lack of strong implementation which,

therefore, has failed to deliver environmental benefits (HoC, 2016). Effective environmental policy delivery requires an understanding of how environmental goal achievement is influenced by political, economic and social forces (Roseland, 2000), thus, in order to examine the influencing forces in detail, the overarching political, financial and social UK context will form the subject of the next section of the thesis.

1.1 Political Forces Within the UK

Following referendums in Scotland and Wales in 1997 and Northern Ireland in 1998, devolved powers have been transferred from Westminster to the Scottish Parliament, the National Assembly for Wales and the Northern Ireland Assembly (UK Gov, 2013). The Localism Act of 2011 heralded a further change in policy delivery by extending devolution in England (DCLG, 2011): it is a key piece of legislation in the UK Government's drive for decentralisation, devolving power from central government to individuals, communities and local councils. The UK Government is committed to passing selected powers and freedoms to local and combined authorities, with the aim of encouraging the delivery of creative solutions to meet local people's needs (DCLG, 2011). Consequently, there has been a spate of devolution agreements with cities and regions across the UK, including Greater Manchester, Merseyside and the West Midlands (Kay, 2017). The measures set out in the Localism Act (2011) include new freedoms for local government in England, new rights and powers for communities and individuals, reforms to the planning system and reforms in relation to housing decisions, all of which impact upon the local environment. Paul Lenister, at the time of writing, the Chief Executive of the Environment Agency (EA), reported in January 2014 that *with Localism, the whole agenda's moved,* as historic Regional development agencies and spatial strategies are no longer relevant (Marshall, 2014, p1).

1.2 Economic Forces Within the UK

As a result of severe fiscal challenges resulting from the global financial crisis of 2008 and subsequent reductions to government funding, the approach to environmental policy implementation in the UK is rapidly changing. Financial challenges have been outlined by the current Chancellor of the Exchequer (the Rt Hon Philip Hammond MP) who proposes further departmental budget reductions of

up to 6% for the years 2019-20 (Merrick, 2017). The EA, which is responsible for the delivery of many of the UK environmental policies has had grant funding reduced by £150m over five years (Table 1.2) and there are long-term plans to cut a further 1550 from the workforce (Marshall, 2014).

Table 1.2 Environment Agency Grant level changes from 2009 to 2014. Sourced from unison (2014).

Fiscal Year	Grant Level £M
2009-10	846.7
2010-11	799.6
2011-12	749.5
2012-13	723.0
2013-14	709.0

As the EA is increasingly finding it necessary to focus on higher flood-risk areas and assets (ADA, 2017) there are calls from public figures to control costs by using contractors rather than directly employed personnel (Redwood, 2014). Consequently, EA management are restructuring how the agency works, supporting increased partnership working through formal agreements with third-party contractors, particularly river and coastal flood risk reduction, and the use of volunteers in monitoring work, for example, with invasive species (Marshall, 2014). This raises questions relating to the effectiveness of such complex, multiple agency interactions and where accountability for policy delivery lies.

1.3 Social Forces Within the UK

Environmental sustainability has become a prominent issue, with governments working to develop plans for the use and preservation of natural resources (Scerri, 2009; Guerry et al., 2015). Recognising that environmental systems play a fundamental role in societal well-being and economic development (MA, 2005c, EEA, 2016), the concept of Natural Capital, that is, the living and non-living components that contribute to the generation of goods and services which are of value for people (Figure 1.1), has gained ground (Guerry et al., 2015; Hopwood et al., 2005). The

integration of natural capital and ecosystem services into everyday decision-making in order to secure a broader set of desirable outcomes is promoted and contained within legislation (Guerry et al., 2015), thus, such a move to the use of ecosystem services ought to be identifiable in policy reports.

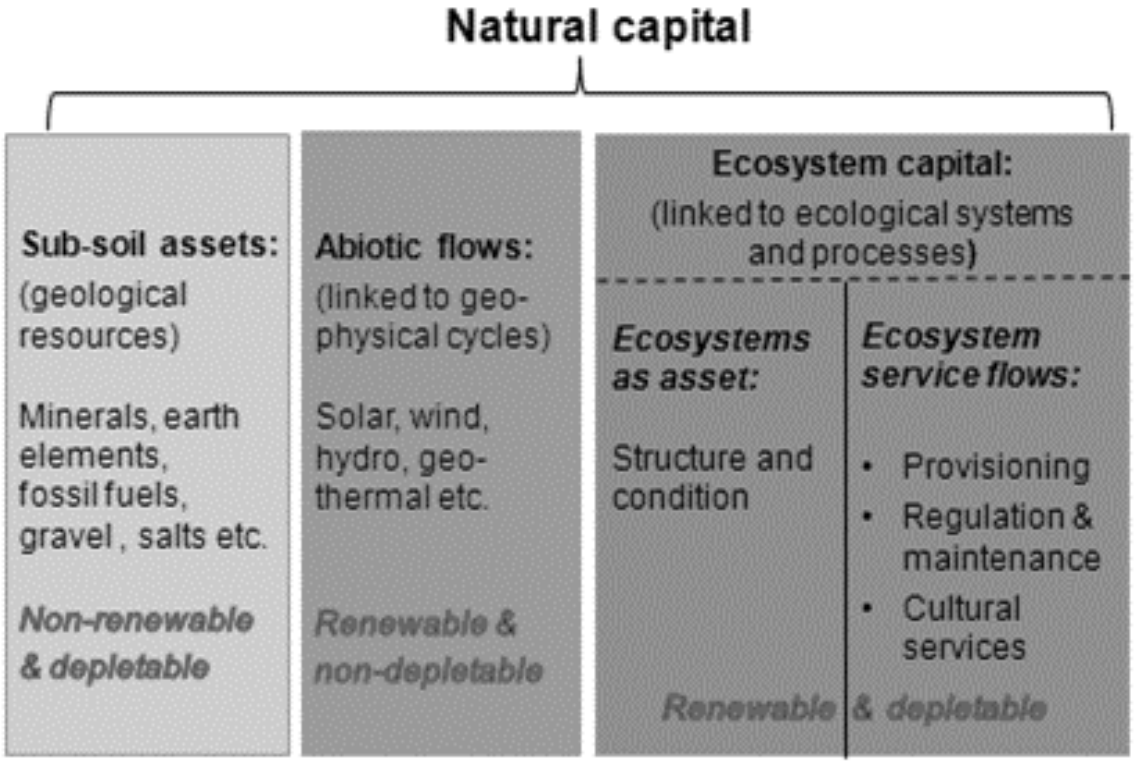


Figure 1.1. The components of Natural Capital (EEA, 2016)

Scholars of social movements have long argued the importance of self-organizing grassroots movements which drive social change (Chetkovich & Kunreuthr, 2006). Environmental volunteering is one such movement: reports identify the key role volunteering has in building community resilience and encouraging individuals and community groups to improve their own surrounds, impacting health, education and skill creation (Clifton, 2014; Rivers Trust, 2017). Between 2000 and 2015, there has been a slight overall rise in the number of people volunteering: participation rates have increased from 39 percent to 41 percent, with a significant rise in youth volunteering (Ainsworth, 2017). The high level of younger people volunteering is believed to be linked to employment, as 58 per cent of students undertake voluntary work which may enhance their CVs (Support Cambridge, 2017).

The use of social networking sites and web-platform IT applications has increased opportunities for citizen involvement in monitoring environmental attributes including biodiversity and invasive species (Blaney et al., 2016; Welvaert & Caley, 2016). There is further potential for volunteers to become more involved and to encourage their greater participation as local stewards of their environment (Blaney et al., 2016), acting upon opportunities presented by changing policy delivery requirements to deliver environmental improvements driven by, and for the benefit of, the local community.

1.4 Policy Implementation Impact

Following the 2008 economic crash, the UK Government addressed severe fiscal challenges in which departmental administration budgets were cut and the then Prime Minister (the Rt Hon David Cameron MP) advertised public-service reform and decentralisation via the 'Big Society' in his speech to the Civil Service Live, 8 July 2010 (Hallsworth, 2011), seeking to unlock the potential present within society. While the phrase was not used beyond 2013 (Butler, 2015), areas of public policy delivery now involve a complex set of interactions among actors who range from Ministers and Government departments, through government agencies, businesses, NGOs and academics, to individual private citizens (Howard et al., 2012). Consequently, policy implementation is now a complex mechanism, involving public and private bodies, and local community volunteers, in activities which occur across multiple scales and timeframes. Reforms have led to the involvement of multiple actors with varying priorities and methods of implementing the overall policy requirements, that is, governance through networks and collaborative partnerships (Carey & Friel, 2015; Goodwin & Grix, 2011).

1.5 Impact on Environmental Management

In response to the overall context, changes in the management responsibilities of key government delivery bodies are under consideration. UK Government, through the Department for Environment, Food and Rural Affairs (DEFRA), has supported the involvement of alternative management bodies which aim to strengthen local decision-making and improve the environment for both people and wildlife (ADEPT, 2017). For example, bodies such as internal drainage boards, local authorities or

landowners and the wider community are now actively involved in pilot projects which explore the re-designation of waterbodies from ‘main’ to ‘ordinary’ watercourse, a process known as de-maining, which will allow assets to be transferred from EA management to the wider community (ADEPT, 2017). Where there is mutual agreement, a local generated appetite and benefit, the EA will permanently pass river maintenance and operational activity to the designated body (ADA, 2017). Similarly, alternative bodies are also pro-actively seeking the transfer of assets to non-governmental management, for example, the transfer of the management of navigable waterways from the EA to the Canal & Rivers Trust (WA, 2015). The lines of responsibility for policy delivery are thus becoming blurred as multiple-agents with multiple aims are involved.

1.6 Study Relevance

All governments in European Union countries are facing the challenge of managing freshwater through an increasingly complex planning process covering diverse social, economic and political areas (GWP, 2012). Outcomes from this study will add to the body of knowledge on policy implementation and inform freshwater management with particular relevance to catchment based policy and partnership development, where minimal studies exist. By illuminating the implementation of public policy via a system stewardship approach, the results contained in this study yield insights in the design of control and steering mechanisms for policymakers and stakeholders working in co-management structures. Future trends in governance placement are provided.

1.7 Thesis Focus

So how has the devolution of responsibilities to new agents been fulfilled? How are local implementing agents connecting with the environment and among themselves? Although the challenges of collaborating agents in policy implementation are recognized in the literature (further examined in Chapter 2), there is less focus on how collaborating teams are shaped at the micro-level and how steerage from the accountable body is manifest at a whole system level in a novel, unincorporated partnership. The research contained in this thesis critically analyses these areas by exploring an environmental policy exemplar through the lens of complexity science.

1.8 Thesis Structure

A more detailed review of the theory of policy implementation with a focus on natural resource management and an introduction to the ecosystem services concept is contained in Chapter 2. Within the literature review, policy implementation in the natural resource area is considered utilising synthesis-based methodology to identify those political, economic and social aspects which act to assist or prevent policy implementation. The over-arching EU policy background and water framework directive provide context to the introduction of the catchment-based implementation model and Chapter 2 contains the review of the current knowledge on catchment partnerships in England & Wales: knowledge gaps and opportunities are identified in Chapter 3 The contents of Chapter 4 present the methodology, including consideration of the application of complexity science tools, identification of the mixed-method approach and examination of the selected tools. Chapter 5 considers the methods applied to investigate current catchment partnership issues, including ecosystem service prioritisation, and to examine internal relationships. The rationale for the catchment partnership selection is described, together with data collection methods and the contact strategy for primary data collection. The results of those investigations are contained in Chapter 6. Chapter 7 contains the resultant discussions, identifying factors impacting the implementation of environmental policy within the collaborative partnerships (micro level), the output from the whole network system review which exposes a dual-steerage mechanism where both statutory and non-statutory actors are present, and contains suggestions to address accountability deficits in the current catchment policy framework. The impact of the current Localism devolution debate on the governance of catchment partnerships is identified and future options considered. Conclusions are contained in Chapter 8 of this thesis.

The thesis structure is presented in the following diagram (Figure 1.2).

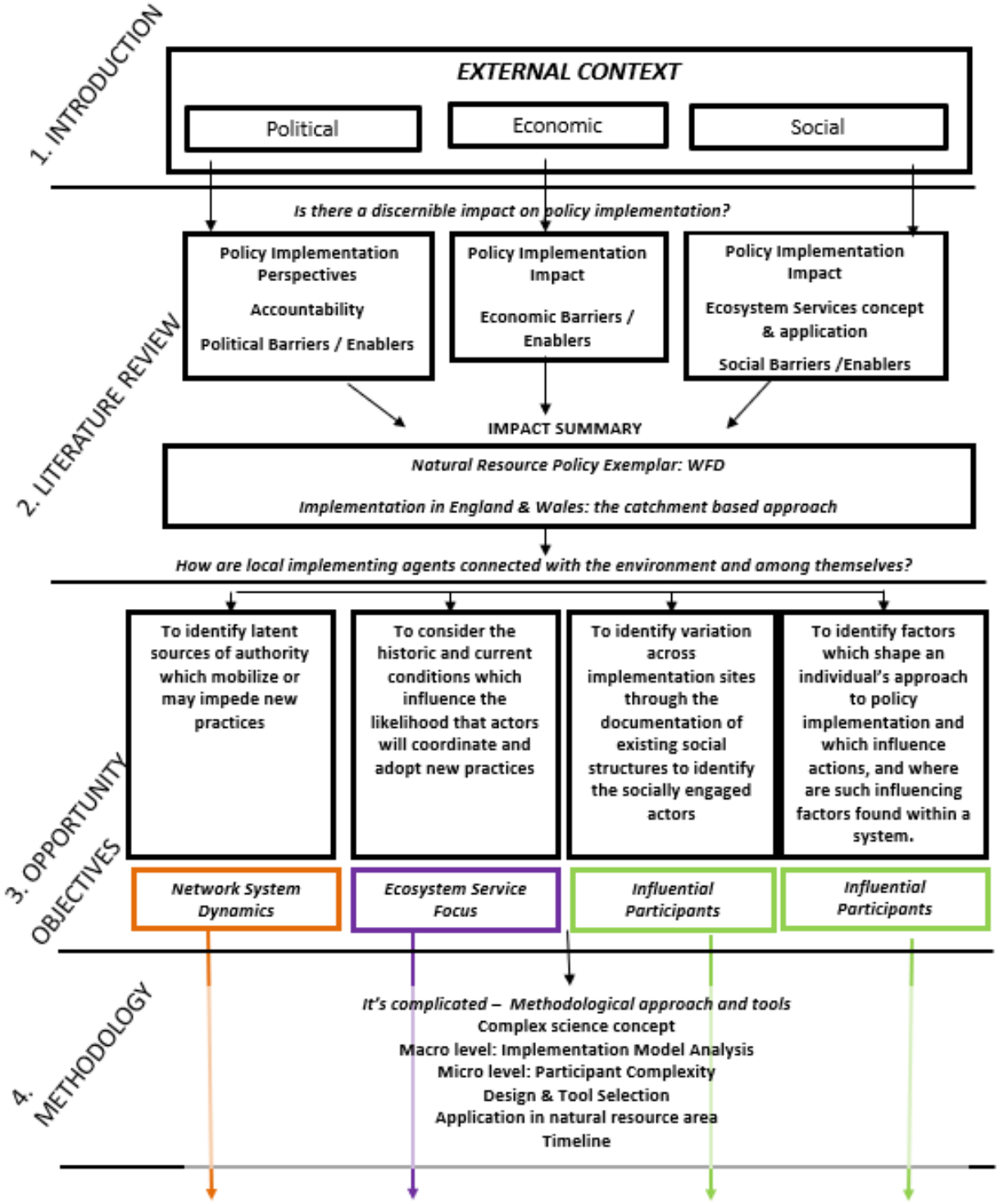


Figure 1.2 Flow diagram of thesis structure, chapter content and relationship (sheet 1of 2)

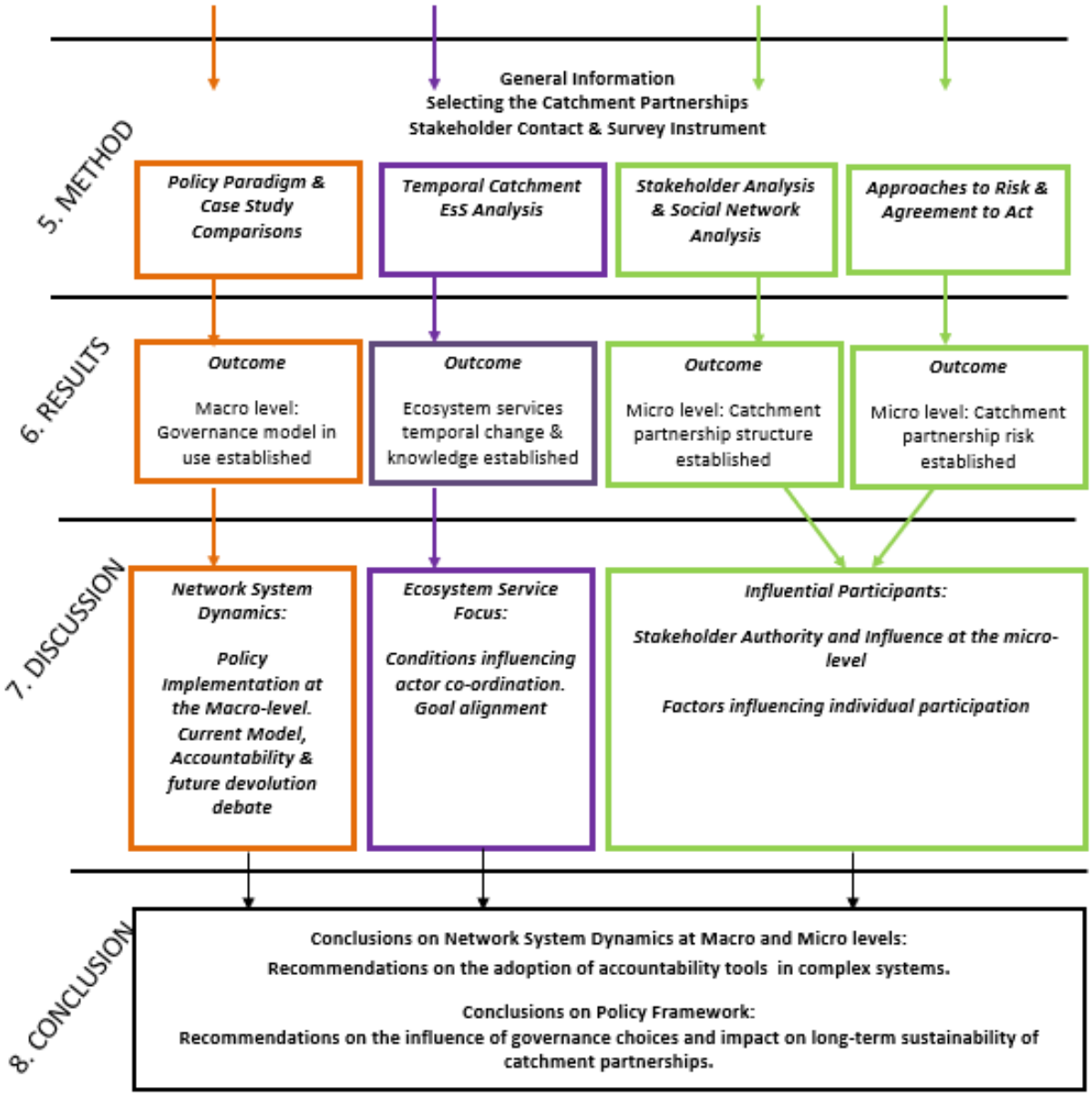


Figure 1.2 Flow diagram of thesis structure, chapter content and relationship (sheet 2 of 2)

CHAPTER 2 LITERATURE REVIEW

2.1 Policy Implementation

Policy implementation is recognised as a distinct stage in a complex change process whereby government decisions are transformed into regulations, programmes, procedures or practices (DeGroff & Cargo, 2009). Policy implementation research involves the study of how policy decision-making organisations may overcome the policy-delivery challenges associated with ambitious aspirations, complex approaches and organisational relationships (deLeon & deLeon, 2002; Moulton & Sandfort, 2017), reflecting the dominant political, economic and social factors present at a point in time (Kelly & Dodds, 2012). The following literature review explores these socio-political aspects and evaluates their role in the success or failure of natural resource policy implementation.

The literature review approach was informed by synthesis-based methodology that seeks to identity, appraise and synthesise comprehensively all the relevant studies on a given topic, avoiding intentional or unintentional bias in the selection of data (Petticrew & Roberts, 2006). To focus on studies published after the endorsement of the Convention on Biological Diversity operation guidance, searches were restricted to 2000 onward (Korn et al., 2003). Within the result, searches were performed to isolate those items referring to policy implementation. Only those items in English were considered. A search of the Scopus database was conducted in July 2015 to include all publications (conference proceedings, published articles, books, legal and technical papers) from January 2000. Scopus is advertised as the largest abstract and citation database of peer-reviewed research literature and quality web sources and currently covers 21,500 titles including journals, trade publications, book series, and conference papers (Elsevier, 2016, p3) versus 12,000 in Web of Science (WoS) core collection (Thomson Reuters, 2015). Both databases are curated bibliometric tools with only a slight difference in coverage (Jacso, 2011). Titles in Scopus are classified under four main headings of health sciences (32% of content), physical sciences (29% of content), social sciences (24% of content) and life sciences (15% of content). Scopus has a European, Elsevier-publisher bias versus the American bias found in WoS (HSL, 2015). Google Scholar is larger than the two other main databases, but has fewer reference or selected articles, it is however an easy

browsing and discovery tool. SCOPUS is noted to have a more versatile search tool than WoS, with greater international coverage and contains an abstract for nearly 70% of its records (HSL, 2015). This is a useful aspect in resource discovery and a key aspect of the initial literature review. Consequently, SCOPUS was the chosen search database. Key search terms used in the search protocol were “ecosystem*” or “natural resource man*” and “implementation management” or “implement co*”; * was included as a wildcard character to ensure the search returned as many related items as possible.

The search retrieved 269 documents including articles, books and conference proceedings. Each title and abstract were examined to identify whether the studies dealt with practical implementation and the presence of socio-political facets. Where no criteria were found or where an abstract only made reference to implementation as a ‘recommendation’, the paper was excluded from further analysis. The majority of the studies were in the environmental and biological sciences (75%), with a lesser percentage from social science, economic and business management areas.

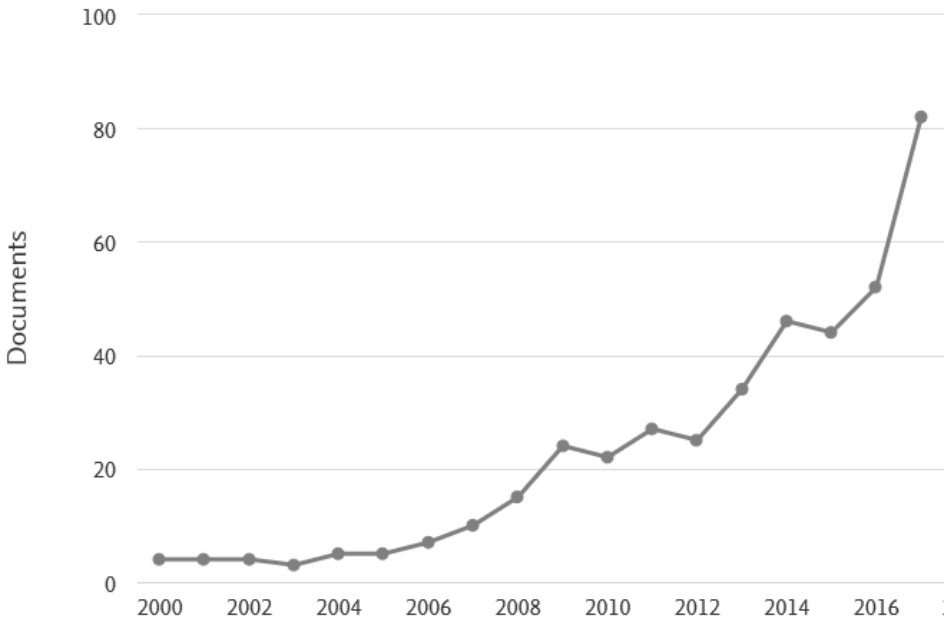


Figure 2.1 Publication by year extracted from SCOPUS search engine for 2000 to 2017 (updated results 07/2018). Peak in 2009 reflects a large number of publications in the Environmental Science area across a range of journals. By 2015 there is an extended subject area scope being reported, not only environmental science but also Agricultural and Biological Sciences. 2017 reports are an increased number of publications in both these key subject areas, accounting for 50% of all documents.

Since 2008, the number of publications per year has continued to grow (Figure 2.1), with a rise in publications from the United States across a range of subject areas and journals. The final selected documents are presented within the following review of the impact of political, social and economic factors upon policy implementation.

2.2 Political Factor Impact

2.2.1 Policy Implementation Perspectives

Since the early 1970s, three main schools of theoretical perspectives have developed, hierarchical domination – a top-down approach; devolution domination – a bottom-up approach; and system stewardship – a network approach. These three perspectives will be considered in the following review.

In Pressman and Wildavsky's 1973 classic study of hierarchical implementation, they defined implementation as *the ability to forge subsequent links in the causal chain so as to obtain the desired results* (pxxiii), that is, a complex process of putting a policy into practice by a variety of mechanisms and procedures involving a wide and diverse range of actors. Their case study examined a development programme in the USA which was mandated by the federal government and depended upon linkages between different organisations. By defining the process as a link of institutional actors, they are assuming a 'top-down' control perspective. They found that if action depends upon a number of links in an implementation chain, then total co-operation between agencies must occur, otherwise small discrepancies at each level aggregate to form a large disparity between the original intention and the end result (Hill & Hupe, 2002). Multiple actors were presented as part of a top-down, cascade approach, however, by the late 1970s the relationship between policy formation and implementation was also regarded as an interactive process. Bardach (1977) suggested implementation mechanisms were successful when a top-down process was supported with additional actions to remove obstacles, however it is argued that such support should be provided to facilitate a 'shared' approach to problem resolution rather than imposing a single top-down view (Hill & Hupe, 2002). Sabatier and Mazmanian (1979) also outlined a top-down approach, but by 1986 theorists advocated the incorporation of feedback on the implementation process and learning from experience, to advise policy design (Sabatier, 1986).

During the 1980s the process of policy implementation was influenced by changes in public administration towards decentralisation, partnerships and the devolution of both responsibilities and accountability (Kaul, 1997); consequently, public policies are increasingly implemented through co-operative or collaborative partnerships. Martin Lipsky (1980) presented an alternative view of implementation theory, where the decisions of those Lipsky termed 'at the street-level', that is, those coping with the pressures of work-loads and possibly restricted resources to carry out the work, establish the mechanisms which deliver the policy. Thus, discretionary freedom, together with autonomy, act to implement the policy, but, it is noted, the implementation mechanism may take a different format than originally envisaged by policy makers (Hill & Hupe, 2002). Hjern and Porter (1981) studied interactions between different organisations via the decision-making actors who interact and carry-out actions beyond their own formal hierarchy, so forming an implementation network. However, the prioritisation of different interests and strategies among actors may result in contention between participants and differences in the interpretation of policy goals (Scharpf, 1978). Barrett and Fudge (1981) also considered the network structure, questioning how the nature of the relationships between the participants impacted the implementation mechanism, in particular, how individual connections influence policy adoption and interpretation. The variety of participants in collaborative networks influence the bottom-up choices of the street-level implementers, as each partner brings different knowledge and experience to the network, thus policy implementation becomes fluid and dynamic (Hill & Hupe, 2002). Each policy, however, cannot be considered in isolation and Elmore (1978) recognised that those implementing actions are forced to make choices between interacting and often conflicting programmes and directives.

From 2000, policy-makers sought to integrate managerial approaches from the private sector into the public organisations responsible for delivering policy, namely, contracting out, a greater client-orientation and the introduction of market mechanisms (Klijn & Koppenjan, 2000). Governments are now experimenting with innovative ways of delivering their services through new forms of bureaucratic collaboration, involvement from more community and voluntary organizations, and across networks which interact in the vertical (up and down hierarchies) and horizontal (mix across public and private actors) levels (McGuire, 2006; Or & Aranda-

Jan, 2017). Stewardship theory has been introduced as a means of defining management relationships based on behavioural principals, in situations where individuals are not motivated by individual reward but by the alignment with common principals and objectives (Davis et al., 1997). Stewardship theory fundamentally requires participant interests and motivations to be directed to organisational rather than personal objectives: trust, risk perception and freedom to implement are valued rather than individual control and limitation, consequently, structures which facilitate and empower are favoured by theorists over those structures which are based on monitoring and control (Davis et al, 1997). Allowing for the potential of multiple objectives which may exist within heterogeneous groups, stewardship theory proposes stewards are motivated to make decisions which are perceived to be in the best interest of the group (Davis et al., 1997).

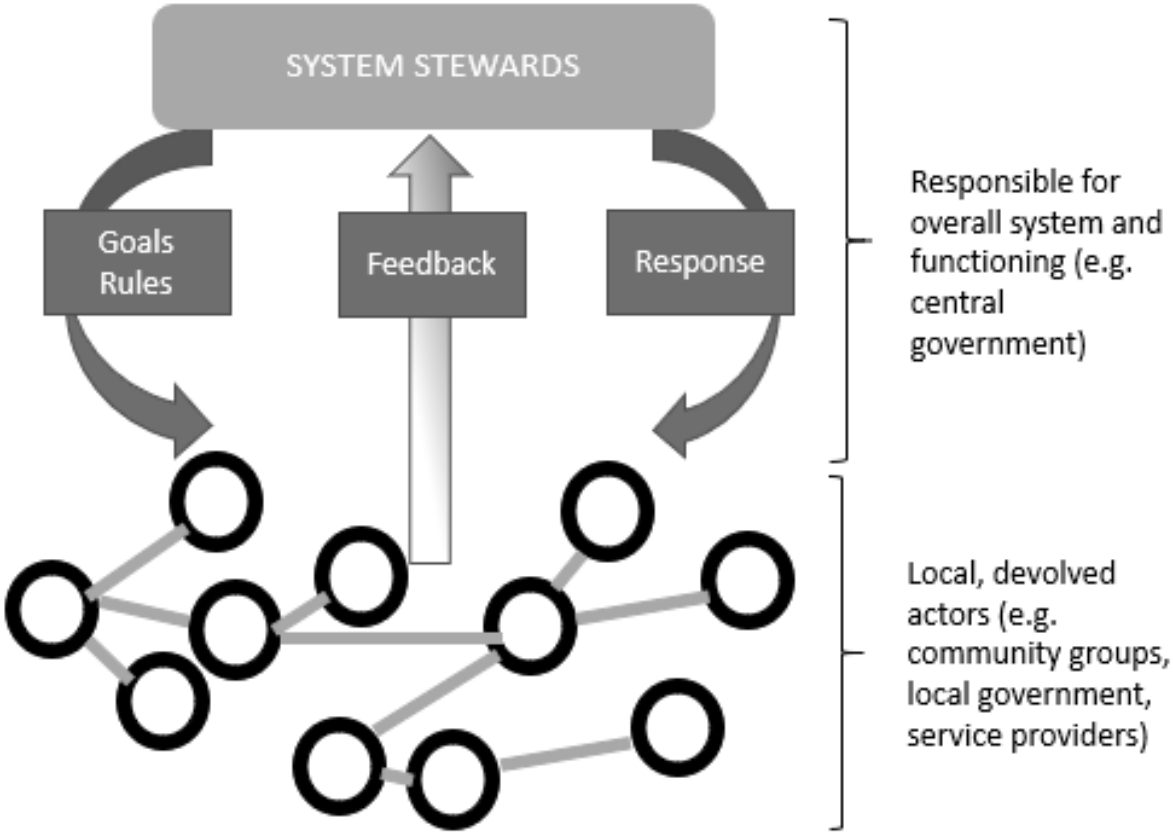


Figure 2.2: System stewardship model – adapted from Hallsworth, 2011

Central policy-makers are moving from a top-down implementation model with fixed ‘rules’ of implementation to a network model where a central policy agent acts as a

steward of the overall implementation system within an overall framework, the governance network (Romolini et al., 2016; Schneider et al, 2003) (Figure 2.2).

There is a blending of hierarchical and bottom-up approaches, and rather than a flat, self-determining implementation structure, there is a lead organisation which acts as a system controller to reduce the complexity of self-management at the local level and to provide legitimacy to the network where Government is still ultimately held accountable for the delivery of policy (Hallsworth, 2011; McGuire, 2006), but how does accountability operate throughout such a governance structure?

2.2.2 Accountability

Accountability in the policy discourse is commonly equated with democracy and responsibility (Abels, 2007), combining the various perspectives and motivations of all the actors involved to ensure overall compliance to legal standards (Mills & Koliba, 2015). Accountability is typically a control mechanism that constrains those wielding power, which in the traditional democratic governing form has been recognised as a hierarchical, linear feedback mechanism, however, the prevalence of more interactive and horizontal governance models, which involve diverse actors, has led to different, multiple relationships (Papadopoulos, 2016). As more implementing, and monitoring, agents have been involved at arm's length of the political core, oversight is lost due to the myriad of implementers involved which impact democratic control and accountability at the policy level, at the central governing body level and at the participating actor level (Kassim & Menon, 2003).

Democratic accountability is fundamental to those elected to public positions who are obliged to provide an account of their performance (Farrell et al, 2017), however, with the shift to system network governance there are concerns that a lack of visibility of the actions taken by implementation agents may erode traditional, formal democratic accountability (vertical accountability). To combat this vertical accountability deficit, governing organisations have sought to retain power and leadership through a steering mechanism, imposing control over implementation agents through statutory and financial means (Arts & van Tatenhove, 2004; Cairney, 2012a; Goodwin and Grix, 2011). However, the retention of power and leadership at this intermediate, steerage, level does not address the question of accountability among diverse agents

at the implementing level. Those implementing agents form an expert panel who are accountable to their professional, peer community (horizontal accountability), thus, peer accountability is considered to be an outgrowth of trust, respect and commitment within such teams (Lencioni, 2002; Papadopoulos, 2016) and where actions are deemed detrimental to co-operating partners there may ultimately be a risk of loss of professional reputation. Conflicting policy mandates where participants do not agree on the common aim (Roux et al., 2011), adoption of adversarial positions where power distribution within the network is unequal (Larson et al., 2013) and a lack of consideration of alternative stakeholder perspectives (Fernandez-Gimenez et al., 2008; Foran et al., 2015) can all be detrimental, reducing trust within a group and, if left unaddressed, may lead some to withdraw from collaborative activity (McGuire, 2006).

Goodwin and Grix (2011) outlined an asymmetrical network concept, identifying the paradox in policy sectors where there is an outward sign of a shift from government to governance through agencies and partnership networks, yet power relations and leadership remain with the state via central steering mechanisms, thus, governing bodies continue to impose their control (Cairney, 2012a).

The literature on complexity provides some advice about how governments should operate within such complex systems. Guidance from the Overseas Development Institute (ODI) proposes accountable administrations should support implementing networks through facilitative leadership as there is minimal opportunity for the governing hierarchy to directly impact policy implementation processes and outcomes (Jones, 2011). Thus, collaborative forms of policy implementation call for a new model for holding decision makers to account, as the traditional post-implementation, bureaucratic system of standardized performance assessments and evaluation procedures based on a best practice model, is not considered flexible enough to accommodate the outcomes from a self-determined framework (Boyne & O'Toole, 2006). Where interventions are necessary, it is recommended steering mechanisms are delivered through an existing network (Jones, 2011), with feedback on performance directed to those elements involved in directing actions at each relevant level and not fed-back via a hierarchical, management control centre (Amagoh, 2008).

Options proposed for a new accountability perspective include:

a) learning, that is, the development of knowledge and competence required to deliver what is promised through dialogue with accountability fora (Bovens et al., 2008);

b) the introduction of a 360^0 perspective whereby an implementing authority is held to account by more than one standard, those standards being inherent to the organisations involved in implementation (Behn, 2001);

c) accountable autonomy - that is, where delegation and evaluation are part of a close, interactive dialogue - links collaborating parties (Fung, 2004);

d) the representation perspective proposed by Esmark (2007) incorporates the views of those involved in the implementation and draws on the participants different accountability standards to provide an accountability framework for the unit which is not imposed by a different entity;

e) accountability to an outside audience established for such a purpose is considered by March and Olsen (1995) in their collective accountability approach, which requires the implementing body to produce an account of the problem, the strategies applied and activities launched to implement the strategy in order to present a collective assessment.

The theoretical views highlight the potential mix of accountability standards, dependent upon who is participating in implementation and also the dual role which may be held by the collaborative group (Sorensen, 2012).

In the system stewardship model, the central policy agents retain influence, preventing implementing agents from deviating too far away from the high-level, policy goals, as government is still ultimately held accountable for the delivery of the policy (Hallsworth, 2011; McGuire, 2006). Policy implementation methods such as system stewardship, together with complexity theory, have a common focus on monitoring and feedback in steering the behaviour of organisational systems (Blackman, 2001), however, the accountability of the participating actors, to each other and to the central governing body, appears to lack formal consideration.

Questions remain as to whether accountability standards are reflected in policy guidance documentation which promotes a stewardship model and how are collaborative groups responding to implementation duality.

2.2.3 Political Barriers / Enablers

Cooperation is an important mechanism in the environmental policy context (Chion et al., 2011), consequently, governance networks which connect local management to wider planning and policy-making actors are an examined concept (Cohen et al., 2012; Everard, 2013; van Oosterzee et al., 2014).

Many environmental issues impact across the globe, for example climate change, however, Stoddart et al. (2011) report the ceding of authority to a supra-national institution to address such global issues is a fundamental obstacle to progress. Although no comprehensive policy or law for ecosystem management exists on a world-wide status (Clarke & Cherney, 2013; Gherasim, 2012; Stoddart et al., 2011), there are legal statutes which impact at different scales. National and trans-boundary environmental laws exist which frame policies and legitimise the need to act to restore or maintain ecosystems (Brody & Highfield, 2005; Efroymson et al., 2004), including those of global heritage value (Bertzky & Stoll-Kleemann, 2009). However, it is proposed that ecosystem managers must first determine the appropriate balance between societal and ecosystem needs, when considering legal directions to either restore or maintain a given ecosystem (Adler, 2013; Baron et al., 2002). Statutory requirements catalyse environmental action in two aspects, prevention of loss and protection of ecological systems (Hamill & Melis, 2012; Tarlock, 2012). In either case, action may arise as a result of development pressures and be led by those stakeholders most impacted by ecosystem change (LosChiavos et al., 2013; Maynard et al., 2011; Pearsall et al., 2005). Legal statutes are noted to have a crucial role in shaping the scope and form of social-ecological management structures, which themselves direct implementation approaches (Benson & Garmestani, 2011; Carlman, 2005). Legal structures drive the agenda for credible transparency and accountability including the need for measures and monitoring. By defining protocols and procedures, together with target standards, stakeholders achieve a shared understanding of statutory requirements (Adamus 2004; Keene & Pullin, 2011). However, conservation strategies which arise as a result of legal

structures may also be constrained by those same regulations (Bernazzani et al., 2012), particularly where multiple priorities and planning contention exist across a range of legal directives (Adler, 2013; Brooks & Chambers, 2013; Stringer et al., 2009). Many legal statutes direct the preservation of known, current, ecological states which may not reflect global influencing factors, such as climate change (Craig, 2010, Kaushik & Sharma, 2015), and so to avoid issues of non-compliance with legal mandates, activity may be restricted to the 'must do' and not 'wish to do' actions (Franklin et al., 2011).

The introduction of a different organisational culture, such as a move from a flexible organisation to one where there is a top-down control, has been noted to influence implementation practices and processes, particularly in the areas of logistics and communications (Jacobson et al., 2006; Koontz & Bodine, 2008). An acceptance of governing structures is necessary to avoid feelings of exclusion and a lack of trust (Fabricius & Collins, 2007; Fabricius et al., 2007). It is often necessary to establish trust via institutional networks (Davies & White, 2012), however, government led initiatives may actually weaken traditional, flexible institutions, so reducing trust among newly formed stakeholder groups (Gelcich et al., 2006). Interacting with diverse stakeholders to achieve collaborative aims has been reported to increase group trust levels (Butler & Koontz, 2005; Fernandez-Gimenez et al., 2008), but poor institutional design can lead to powerful interests dominating (Layzer, 2012; Lynch et al., 2008). Poor design may allow an initiative to be 'captured' by vested interests and asymmetric power relations can dominate the collaborative processes commonly advocated for successful implementation (Beyrner-Farris et al., 2010; Brock & Carpenter, 2007; Layzer, 2012). Management by assertion has been shown to undermine long-term prospects as stakeholder contributions are ignored or under-valued and, together with the existence of sub-groups within an institution, may explain why unsustainable practices continue beyond the formation stage of multi-stakeholder teams (Crona & Bodin, 2011; Longcore et al., 2007). Conversely, when processes are too flexible and commitment low there may be an evasion of responsibilities (Layzer, 2012) and subsequent legal statutes may result in a stringent regulatory framework acting against the implementation process. The adoption of standardised methodologies which arise in order to comply with legal directives may

reduce flexible responsiveness in the light of new knowledge until the legal 'restriction' is either modified or removed (Adamus, 2004; Reid & Brooks, 2000).

Institutional, political, and complexity challenges which result in contention may produce inconsistent management aims and objectives (Brooks & Chambers, 2013; Hatfield-Dodds, 2006), due to a lack of clearly defined objectives and misjudged scientific information (Chapple et al., 2011) and the continuing influence of controlling state agencies in a collaborative partnership process (Davies & White, 2012; Petty et al., 2015). Gratton and Erikson (2007) identified the importance of role definition without constraining the approach to be adopted – 'role clarity and task ambiguity'. Where there are a large number of participants in the network, the lack of opportunity to identify task ownership, together with shortage of skills, may drive a 'lead-organisational' approach which aims to facilitate integration and co-ordination (Provan & Kenis, 2008), however, this may be at the cost of individual autonomy and decision-making participation (Hummelbrunner & Jones, 2013). To address such contention, Brunckhorst (2002, 2004) identifies a need for new organisational forms and institutional arrangements which are relevant at broader levels and across scales (Berkes, 2003; Hansen, 2014).

As 'assertion and control' strategies are less useful in conditions with inherent complexity and uncertainty of outcomes, such as are found in ecological systems due to climate change (Alexandra, 2012), and where such top-down strategies are at odds with indigenous community values (Exton & Smith, 2012) or lacking ecosystem knowledge (Longcore et al., 2007; Rogers et al., 2000), there is a move to consider alternatives to conventional management and governance (Berkes, 2003; Davis et al., 2015).

Central policy-makers in the USA and Europe have thus moved away from a top-down implementation model with fixed 'rules' of implementation to a network model where they instigate an overall framework, the governance network (Romolini et al., 2016; Schneider et al, 2003). Governments are now experimenting with innovative ways of delivering their services through new forms of bureaucratic collaboration, involvement from more community and voluntary organizations, and across networks which interact in the vertical (up and down hierarchies) and horizontal (mix across public and private actors) levels (McGuire, 2006; Or & Aranda-Jan, 2017).

Governance solutions such as co-management – the practice of managing something jointly (Camargo et al., 2009; Elmqvist et al., 2004; Granek & Brown, 2005; Matsuda et al., 2009), adaptive governance – the evolution of the rules and norms in a changing context (Angelstam et al., 2013), collaborative governance - bringing multiple stakeholders from different sectors together in common forum to engage in consensus-oriented solution seeking, problem solving and decision-making in order to leverage and build on the unique attributes and resources of each (Butler & Koontz, 2005; Davies & White, 2012; Friedlander et al., 2014), partnership frameworks - a collaborative relationship between organizations (Boyd & Svejcar, 2009; Hillman et al., 2005) and polycentric institutions - many centres of decision-making which are formally independent of each other at differing scales (Fabricius et al., 2007; Falk et al., 2009) are all offered as solutions. Collaborative governance is now common in the implementation of public policy and is presented as a new paradigm for governing in democratic systems, through the involvement of the public so increasing civic engagement (Emerson et al., 2012), although questions remain as to whether the reality matches the rhetoric (O'Flynn & Wanna, 2008).

Goodwin and Grix (2011) consider the introduction of network policy implementation models result in a paradox: there is an increased dependence to deliver state-set goals and operating models by independent actors outside the central government organisation, yet to do so reduces the autonomy of those 'independent' actors. As more implementing, and monitoring, agents have been involved, albeit at arm's length of the political core, oversight is considered to be lost due to the myriad of implementers involved which impact democratic control and accountability at the policy level (Kassim & Menon, 2003). Huxham (2003) considered the negative aspects to be so detrimental that *unless the potential for real collaborative advantage is clear, it is generally best, if there is a choice, to avoid collaboration* (p421).

2.3 Economic Factor Impact

The ability to comply with statutory requirements is impacted by the socio-economic development status of a state, which influences the time-scales and the relevance of environmental-focussed activity (Cristina-Violeta et al., 2014). Two areas of economic influence were identified in the literature. The first is aligned to the costs of

supporting implementation and the second to payments for ecosystem services (PES).

2.3.1 Policy Implementation Perspective: Support

To encourage compliance with legal directives, legislative and regulatory authorities may find it necessary to offer financial incentives to establish management frameworks and to maintain institutional structures (Erickson, 2015; LosChiavo et al., 2013). Key stakeholders may respond positively to environmental goals through the provision of a tangible incentive for meeting commitments (Fabricius & Collins, 2007; Susskind et al., 2012), which Keough and Blahna (2006) note may not be economic benefits but may involve recreational and environmental benefits. Whatever the form, benefits need to be equitable and agreed to by the stakeholders impacted (Sheppard et al., 2010).

Budget constraints, variability of funding levels and uncertainty over continuation are challenges. The success of environmental protection or restoration activity is noted to be dependent on securing sufficient and persistent funding (Quon et al., 2001). Long-term funding is reported to influence the commitment of natural resource agencies and their involvement is noted to be a problem where there is a lack of funding security (McLain et al., 2008; Moir & Block, 2001).

Marshall (2013) notes structuring an organisation, or introducing a new management structure, is not without cost: systems need to be flexible, responding to scientific and local knowledge, which often conflicts with terms and conditions of funding (Gregory et al., 2013; Sims et al., 2014). Building relationship ties to a large number of new actors is costly in terms of both time and resources deployed, but reliance on a small number of key links can result in over-dependence on one potentially weak actor (Angst & Hirschi, 2017). Consequently, there is a requirement for strong relationship management to strengthen links between participants to facilitate collaboration and effective co-ordination of team activities, preferably based on shared principals, values and aims, rather than contractual arrangements (Hummelbrunner & Jones, 2013). The design and implementation of initial modelling developments need to be economically viable and justifiable to funders seeking low start-up cost at initiation and also cost-effective on-going developments (Brasanac-Bosanac et al., 2011; Marshall 2013; Runting et al., 2013). Management budget allocations are often

made on a ‘best-cost’ priority where scientific knowledge is weaker and may be time-restricted to a specific project (Stocker, 2004). The application of sanctions to non-compliant states may not assist progress toward delivery of desired environmental outcomes. There may be occasions for the use of less adversarial conservation strategies (Nie, 2008) and consideration of redress where legal mandates favour one group over another, such as noted by Gelcich et al., (2006) where a government-led management policy was at odds with an existing community-based system.

2.3.2 Economic Barriers / Enablers: PES

The inclusion of market logic has given natural capital a financial value, that is the Green Economy (Corson et al., 2013), and the second area of economic influence identified considers the market based instruments introduced to encourage saleable ecosystem services (Radcliffe, 2005). Ecosystem services are recognised as possessing a value, yet the range of services contained within an ecosystem may be valued differently by various stakeholder groups, consequently the application of ecosystem service valuation within the decision-making process may challenge previous assumptions about which services are most important and have greatest ‘value’ (Everard, 2013). The payments for ecosystem services (PES) concept contributes to the sustainability of collaborative management where the diversification of economic streams is encouraged and stakeholder involvement is high (Lopes et al., 2011; Schmitt et al., 2013; Thompson et al., 2010), however, PES valuation often favours one aspect over another. Reed et al. (2017) found negative trade-offs between ecosystem services were minimised when PES schemes were identified with specific places or types of ecosystems, so more effectively including cultural ecosystem services and engaging with and empowering diverse stakeholders in scheme design and governance. Alternatively, where commoditisation is fixed over a defined period by a powerful buyer, tensions arise as PES are not decentralised and decision making on ‘worth’ may restrict the choices of ecosystem resource managers, so excluding actions beneficial to other services and benefits (Hayes et al., 2014). Often investment is required to restore an ecosystem, addressing for example, a disservice such as that caused by non-native invasive species (Lu et al., 2007; Mason et al., 2005; Stockwell et al., 2012). In this case, the benefit may not be immediate and the return on investment view ought to include longer-term aspects so that the initiative is more attractive to funders, for example,

Stockwell et al. (2012) report target attainment some four years after the project commencement.

2.4 Social Factor Impact

2.4.1 Policy Implementation Perspective

Empowerment of stakeholders through effective collaboration (Crona & Bodin, 2011) has been shown to legitimise governance actions in the areas of procedures, planning and decision-making through learning (Armitage, 2003; Cowling et al., 2008), as participation contributes to the formation of networks facilitating diverse, information sharing (Davies & White, 2012; Pratt-Miles, 2013; Thompson et al., 2010). However, where co-operative networks have been reviewed, a number of risks have been recorded: for example, there may be a negative impact on responsiveness where closed subgroups or state agencies have influence (Crona & Bodin, 2011; Davies & White, 2012; Habron, 2003; Hamlet, 2011; Knuppe & Pahl-Wostl, 2013; Rogers et al., 2000); mid-scale managers may be poorly connected (Cohen et al., 2012) and unable to influence collective decision making; highly connected networks may show similar behaviours and decisions, whereas greater scope and consideration may result in networks which are low or moderately connected (Bodin & Norberg, 2005; Sandström & Rova, 2010); and low resource investment, including financial, becomes a constraint when not clearly identified (Davies & White, 2012; McLain et al., 2008; Weeks & Jupiter, 2013). Jupiter et al. (2014) conclude that to work holistically across governance scales, institutions should be nested in the policy and planning structure yet with sufficient decentralized autonomy to suit the relevant context. These presence or absence of these key policy implementation factors will be assessed within the investigation reported in this thesis.

2.4.2 Ecosystem Services Concept & Application

Ecosystem services have received continuous international attention since the publication of the Millennium Ecosystem Assessment (MA) in 2003 and the TEEB (The Economics of Ecosystem Services and Biodiversity) study of 2008. The classification of benefits and services identified by MA (2003) consists of four principal categories viz:

- Provisioning services, comprising tangible, extractable and often tradable assets derived from ecosystems including, for example, food, fibre, natural medicines, fresh water and energy.
- Regulatory services, referring to natural processes that regulate factors such as air quality, climate and microclimate, water purification, storm and natural hazard protection, disease and pest regulation, etc.
- Cultural services which provide less tangible benefits such as aesthetics and regional character, educational, tourism and recreational opportunities, artistic inspiration, etc. These non-material benefits are intrinsically linked with human health and well-being but are less tangible than the provision of water or flood regulation (Guo et al., 2010).
- Supporting services which comprise a range of processes maintaining ecosystem integrity, functioning and capacity to supply other services, such as soil formation, habitats for wildlife, nutrient cycling and primary production.

The definitions offered by the overall MA Report (2003), supported by MA Synthesis Reports which, *inter alia*, highlight specific freshwater ecosystem services (MA, 2005a; MA, 2005b), form the backbone of further ecosystem service analysis contained in this thesis, identifying the purpose and values attributed to freshwater: the expanded categories which underpin analysis are identified in Table 2.1.

In 2014, the UK National Ecosystem Assessment reported on the importance of valuing cultural ecosystem services, that is, the environmental setting that give rise to the cultural goods and benefits that people obtain from ecosystems. Such settings are not only natural features, but include the legacies of past and current societies, technologies and cultures. Continual changes in these settings involve complex and variable human responses involving memories, emotions and aesthetic appreciation (Church et al., 2014). Consequently, aspects relating to recreational experiences, cognitive skill and capabilities development derived from riverine existence, plus social bequest actions, are cultural sub-categories considered within ecosystem services analysis. Definitions offered by Boyd & Banzhaf (2007) distinguish between the ecological components directly consumed by humans and those benefits which are a combination of human, social and built capital inputs. However, as the MA (2003, p58) also defines social aspects as cultural ecosystem services or cultural

goods, that is, *the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences,* it is considered that the benefits defined by Boyd are also included in the MA definitions.

Table 2.1: Ecosystem service categories of Provisioning (P), Regulating (R), and Cultural (C) as identified in major mapping typologies, focussing on riverine goods and services. Cultural ecosystem services category incorporates recommendations outlined in the UK National Ecosystem Assessment (2014).

Ecosystem Service Category		Riverine Goods	Riverine Services
P	Provisioning	Food	nutrition source for human (fish, waterfowl)
			nutrition source for animal
		Drinking Water	human use
			animal use
		Clean Water	agricultural use, irrigation
			provision of habitat supporting biodiversity
		Non-Drinking Water	resource for washing, industrial processes
			resource for mechanical power (water)
			resource for mechanical power (steam)
		Fibres & Timber	biomass power source, fuel supply.
			food source for animal-based power.
		Bio-medicinal	products used in healthcare, medicinal uses.
R	Regulating	Water Purification	waste water cleansing – dilution service
			waste water cleansing – biotic waste assimilation
			waste water cleansing – reed beds, wetland filtration
		Water Flow	mediation of flow, stable liquid flow rate and patterns
			moderation of extreme flow rate
		Erosion Regulation	moderation of destructive flow rates
		Pest Regulation	control of invasive species
		Habitat & Gene Pool	lifecycle requirement (pollination, nursery, dispersal).
C	Cultural	Recreation	physical interactions, experiential opportunities, connectivity
		Knowledge & Skill development	cognitive opportunities derived from riverine existence
		Bequest	governance to ensure resource passed to descendants
			existence, sense of place, appreciative values
		Religious Values	spiritual reflections
		Aesthetic Values	art and appreciative opportunities
		Cultural Inspiration	diversity linked to river

The explicit inclusion of ecosystem services in planning at the appropriate scale is suggested as a means of avoiding stakeholder contention (Karrasch et al., 2014; Shandas et al., 2008) as protecting and enhancing ecosystems contributes to the well-being of the local population (Maynard et al., 2011). Inclusion of an ecosystem service approach in planning, ought to allow for consideration of social values within local policies (Shandas et al., 2008).

In a review of an organisation which successfully transitioned to ecosystem-based management, Olsson et al. (2008) identified a critical role for leadership which supports management innovation, stakeholder integration and who possesses political skills.

2.4.3 Social Barriers / Enablers

Co-operation is central to the policy network approach and so explanations for the success, or failure, of policy processes are commonly based on co-operative assessments (Klijn & Koppenjan, 2000). A number of aspects have been identified as critical in the delivery of environmental policy implementation, among which are leadership (Kenward et al., 2011; Olsson et al., 2004; Walters, 2007), flexible organisational frameworks (Dutra et al., 2015; Gorman et al., 2012), co-ordinated participation (Dutra et al., 2015), acceptance of governance structures (Fabricius & Collins, 2007) and clear accountability (Hall et al., 2006). Environmental management problems have been noted when different structural and power levels among stakeholders result in low governability (Boyd, 2008; Camargo et al., 2009). Accountability in a complex governance structure will be examined within the research reported in this thesis.

Barriers to successful implementation were initially linked to multiple participants and a lack of agreement on the actions to be taken; collaboration is not a certainty of success; participants may not agree on the common aim; power distribution within the network may be unequal and trust between individuals lacking (McGuire, 2006). Power and trust impact relationships within management institutions at three key phases of management team development, initiation, formation and sustainable continuation, in addition to influencing external perceptions. If left unaddressed, conflicting policy mandates (Foran et al., 2015; Roux et al., 2011), adoption of adversarial positions (Larson et al., 2013) and a lack of consideration of alternative

stakeholder perspectives (Fernandez-Gimenez et al., 2008) can all reduce trust within a group and lead some to withdraw from collaborative activity.

Sharing knowledge is a key principal to build stakeholders capabilities and is vital to avoid reliance upon personal experience or valuing secondary sources above scientific information (Cvitanovic et al., 2015). Inclusive and improved communication is offered as a mechanism to increase trust between diverse stakeholders (Baron et al., 2009; McLain et al., 2008), particularly where the integration of scientific data needs to be made more understandable and accessible (Brooks & Chambers, 2013; Butler & Koontz, 2005; Chapple et al., 2011; Cvitanovic et al., 2015). However critical information may be ignored if the trust level within a group is low when new knowledge bases are encountered and communication between members is weak, resulting in a lack of compliance (Butler & Koontz, 2005; Camargo et al., 2009; Fang et al., 2006). Organisations which are structured to bridge between various disciplines are proposed in order to facilitate learning and responsiveness (Chapple et al., 2011; Crona & Bodin, 2011; Fabricius & Collins, 2007; Folke et al., 2002; Issac et al., 2014; Maynard et al., 2011; Olsson et al., 2004). This is achieved either through legislation or co-operative agreement (Pratt-Miles, 2013; Roux et al., 2011), however, there are barriers within participating organisations which limit co-operation. To implement on the ground activity, stakeholders need to be empowered not just through collaboration but with clear articulation of roles and responsibilities (Cowling et al., 2008; Granek & Brown, 2005; Habron, 2003; LosChiavo et al., 2013). Unwelcome tension is created in complex ecological systems governance when there are different interpretations on levels of devolved autonomy and responsibilities across varying scales (Davies & White, 2012; Petty et al., 2015).

A lack of external trust has been noted to detrimentally influence political and social support for ecological rehabilitation projects (Quon et al., 2001). External trust relationships may be influenced adversely by the communication of results which are over-reported, such as found by Alexander and Allan (2007) when standardised, cross-project evaluation criteria were applied, or where the report focuses solely on the goals of a specific project (Quon et al., 2001). To address this issue, independent external peer-review has been suggested as a mechanism to provide feedback which will inform further actions and lead to successful management

programmes (LosChiavo et al., 2013; Servos et al., 2013). Institutions managing ecological systems are noted to be complex (Thompson et al., 2010; van Oosterzee et al., 2014) with partnering principals built on equity, transparency and mutual benefit (P.I., 2015), however Blumenthal & Jannink (2000) state there are no techniques for understanding these complex social institutions. Complexity science may offer a mechanism for such investigation, and this concept will be reviewed in Chapter 4.

2.5 Political, Economic and Social Factors Summary

Political, economic and social factors have been identified and found to have a discernible impact on implementation development. Water polices commonly span local political boundaries impacting a wide range of actors across the public, private and non-profit sectors. Implementation mechanisms are characterised by network-based structures of interdependent, multiple organisations, where formal lines of authority are minimised and actors focus on common problems (Schneider et al, 2003). Networks are considered a mechanism to stimulate collaboration and cooperation, to develop a common perspective on policy issues and increase trust and reputation among participants though formal and informal interactions (Schneider et al, 2003). However, there are constraints to participating in such a network. Constraints include the costs of developing and maintaining appropriate contacts together with clearly identified structural support investment (Davies & White, 2012; McLain et al., 2008; Weeks & Jupiter, 2013). Secondly, existing acrimonious or poorly connected relationships may impact the effectiveness of implementation actions (Cohen et al., 2012; Schneider et al, 2003). Thirdly, there may be a negative impact on goal choices where closed subgroups or state agencies have influence, forming highly connected networks which may show similar behaviours and decisions (Crona & Bodin, 2011; Davies & White, 2012; Habron, 2003; Hamlet, 2011; Knuppe & Pahl-Wostl, 2013; Rogers et al., 2000); there may in fact be greater scope and consideration of options within networks which are low or moderately connected (Bodin & Norberg, 2005; Sandström & Rova, 2010). The political framework, within which policies are delivered, drives the overall approach, whether top-down, bottom-up or via collaborative public/private actor delivery. Inclusion and empowerment are commonly identified themes in the

literature. Although risks to successful collaboration are reported, the mechanism to reduce such risks are not common in the environmental collaborative team literature. Consideration of variable accountability standards appropriate for complex policy-delivery processes does not appear to be considered within legal statutes. In particular, the lack of a control mechanism where internal working relationships are dominated by powerful interests leads to the exclusion of weaker collaborating actors, consequently, legitimisation of policy becomes dominated by key individuals. Economic power is expressed not only by support, or lack of support, for the collaborative mechanism, but importantly, in the adoption of market forces linked to the benefits humanity gains from their environment. The impact of powerful, economically strong interests may override less dominant voices and influence the choice of environmental valuation. The ecosystem service concept has been identified as a mechanism to address such weaknesses but organisations applying these concepts are not common in the literature.

Gugu & Dal Molin (2016) propose a set of recommendations for collaborative policy implementers which cover stakeholder diversity, incentives, experience assessment, vision setting, roles and responsibility clarification and trust building actions. Specifically, they consider:

(a) participating organizations should be drawn from diverse sectors, of varying size and financial resources to minimise inter-group power imbalances. Key selection factors are the appropriate size and consequent manageability of the network, together with the resource-contribution and relevance of specific actors.

(b) both organization-specific and network specific incentives may increase the motivation of a particular actor to participate in collaboration;

(c) previous experience of collaboration should be favoured in order to facilitate the functioning of the whole collaborative process;

(d) by defining a common vision at a collective meeting, all members have participated and enhanced commitment to the end vision;

(e) to avoid uncertainty, clarify who is involved in the leadership of the network, their approach, and roles and responsibilities; and

(f) build trust through the identification of operational synergies, the development of a common vision and information sharing on collaborative outcomes.

The application of these recommendations will be examined within the thesis study.

Collaborative watershed partnerships have emerged with the aim of providing both environmental and economic benefits to stakeholders (Hardy & Koontz, 2009). UK policy guidance (DEFRA, 2013) expressly requests freshwater collaborative partnerships address both water quality and ecological issues, and also consider ecosystem services impacts. To tackle the concerns of stakeholders involved in landscape management, there is a requirement to understand how landscapes are, and have been, influenced by human actions across spatial and temporal scales (Schröter et al., 2014; UK National Ecosystem Assessment, 2011). Consequently, any examination of a specific ecosystem, such as a river, may reflect the changing importance of the uses of freshwater by those who reside and work along the riverside. Freshwater is noted to provide many different ecosystem service benefits to society, such as supplying drinking water, supporting fisheries, providing a resource for business and agriculture, transport routes and recreational well-being. To understand and respond to challenges to ecosystem benefits, there is an implied assumption that environmental policy implementation participants possess both a working knowledge of the ecosystem service concept, and also know how to apply such a framework. The presence or absence of these implementation competencies are examined within this policy implementation study.

The paradox identified by Goodwin and Grix (2011), whereby actor independence is compromised by state operating models, offers further opportunity for investigation by exploring the impact of political, economic and social influences upon policy implementing actors. To this end, the collaborative UK (England and Wales) catchment based approach to Water Framework Directive policy delivery forms the focus of this thesis study and is now reviewed in detail.

2.6 Natural Resource Policy

In Europe, the first environmental action programme was set up by the European Commission in 1973 *to protect, preserve and improve Europe's environment for*

present and future generations (EC, 2015, p1) and throughout the past forty years, action has evolved to prevent biodiversity loss and ecosystem degradation, culminating in the EU Biodiversity Strategy (EU, 2011). The UK's membership of the EU has been a critical factor in shaping UK environmental policy (HoC, 2016).

Currently, European countries who are members of the EU are subject to some 200 environmental laws covering air pollution control, water protection and waste policy, the control of chemicals, biotechnology and industrial risks, together with nature conservation (EC, 2015). The EU is also a signatory to the UN Aarhus Convention, which entered into force on 30 October 2001, and gives the public key rights relating to the environment. The Aarhus Convention gives the public the right to access environmental information held by public authorities, the right to participate in decision-making and challenge those public decisions which have been made without regard to environmental laws, and also requires authorities to actively disseminate environmental information (EC, 2015). These facets underpin EU Directives and influence the way implementation occurs, however, witness reports to the 2016 review of EU and UK Environmental Policy undertaken by the House of Commons Environmental Audit Committee identified concerns around EU policy implementation due to excessive complexity, lack of infrastructure investment and reliance on voluntary measures (HoC, 2016, p19). The remainder of this chapter will consider the implementation issues in one specific area, that of freshwater, with a focus on the North West England River Basin.

2.6.1 Freshwater Policy: The Water Framework Directive

Since 2000, the management of freshwater resources in Europe, including the United Kingdom, has undergone a transformation following the adoption by EU Member States of *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000, establishing a framework for Community action in the field of water policy*, otherwise known as the Water Framework Directive (WFD) (E.C., 2003). The WFD is a wide-ranging directive addressing the previous piecemeal approach to water legislation by establishing a framework for the sustainable management of estuaries and coastal water, lakes and rivers, including urban river corridors (E.C., 2003).

The main objective of WFD is to achieve good ecological and chemical status for all surface waters and groundwater by 2027 and the primary aim is to improve and maintain the quality of waters, recognising that water is not a commercial product but a heritage to be protected, defended and treated as such (EC, 2000, page 2, para 19). Further objectives are specified for water ecological and chemical status to protect human health, water supply, natural ecosystems and biodiversity (EC, 2000; EC, 2016) and member states are expected to define and implement measures to achieve and maintain good water status for each river basin (EC, 2000, para 26). Current challenges to the attainment of these objectives include the extraction of natural mineral or spring water, 97% of European bottled water is from such sources, and the unknown impact of fracking upon this highly commercialised product (Arthur, 2015).

Table 2.2 Definitions of status in the Water Framework Directive

Status	Definition
High	Near natural conditions. No restriction on the beneficial uses of the water body. No impacts on amenity, wildlife or fisheries
Good	Slight change from the natural conditions as a result of human activity. No restriction on the beneficial uses of the water body. No impact on amenity of fisheries. Protects all but the most sensitive wildlife
Moderate	Moderate change from natural conditions as a result of human activity. Some restriction on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries
Poor	Major change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the water body. Some impact on amenity. Moderate impact on wildlife and fisheries.
Bad	Severe change from natural conditions as a result of human activity. Significant restriction on the beneficial uses of the water body. Major impact on amenity. Major impact on wildlife and fisheries with many species not present.

The WFD classification scheme for surface water ecological status range from high to bad (Table 2.2) and considers the abundance of aquatic flora and fish fauna, nutrient level, salinity, temperature and morphological features, while good chemical status is identified through achievement of quality standards for 53 chemical pollutants of high concern across the EU contained in EU legislation on chemicals, industrial emissions and pesticide regulations (EC, 2016). The WFD extracts relating to aims and objectives is presented in Table 2.3.

The success of the Directive is noted to rely on *information, consultation and involvement of the public, including users* (E.C., 2003, p4) through the *active involvement of all interested parties* in the production of river basin plans (E.C., 2003, Article 14, p26). Here participation is positioned as a tool to achieve the objectives of WFD, not a means of influencing goal setting (Newig & Koontz, 2014).

Table 2.3: Water Framework Directive Aims and Objectives. Source: Directive 2000/60/EC, EC 2003.

Para	Statement
(1)	Water is not a commercial product but a heritage which must be protected, defended and treated as such.
(13)	The diverse needs and conditions in the European Community should be taken into account in the planning and execution of measures to ensure protection and sustainable use of water in the framework of the river basin.
(13)	Decisions should be taken as close as possible to the locations where water is affected or used.
(19)	This Directive aims at maintaining and improving, primarily, the quality of waters. Quantity control is an ancillary element to the objective of ensuring good quality water.
(26)	Member States should define and implement measures to achieve and maintain good water status for each river basin.
(27)	Aim to achieve the elimination of priority hazardous substances.
(37)	Water used for the abstraction of drinking water must comply with Directive 80/778/EEC of 15 July 1980.
(39)	Measures with the aim of preventing or reducing the impact of incidents in which water is accidently polluted are required.
Article 13.6	River basin management plans shall be published at the latest 9 years after the date of entry into force of this Directive
Article 13.7	River basin management plans shall be reviewed and updated at the latest 15 years after the date of entry into force of this Directive and every 6 years thereafter.
Article 14.1	Member states shall encourage the active involvement of all interested parties in the implementation of the Directive, in particular in the production, review and updating of the river basin management plans. For each river basin plan, states shall ensure they publish and make available for comment by the public.

The Water Framework Directive is implemented by EU Member States who are required to establish river basin management plans and programmes of measures, incorporating environmental, ecological, economic and participatory aspects, but it does not explicitly promote the ecosystem services concept (HoL, 2012), even though the language of the primary aim supports an ecosystem service approach

and later Government guidance does explicitly refer to the use of an ecosystem service approach (DEFRA, 2013).

2.6.2 WFD Implementation in England & Wales

To ascertain how WFD aims are translated to action, the WFD implementation mechanism as applied in England and Wales is further reviewed.

EU directives have provided the framework within which the UK's devolved governments may develop different approaches to achieving the common environmental objectives (HoC, 2016). The WFD was implemented in both England and Wales through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, and the Department for Environment, Food and Rural Affairs (DEFRA) designated the Environment Agency (EA) as the competent authority, that is, the system steward acting on behalf of UK Ministry for realizing the WFD in England, plus Natural Resources Wales as the authority for Wales from 2013.

The EA is an executive non-departmental public body responsible for environmental regulation, which includes management of water quality and resources, conservation of fisheries and ecology, river navigation maintenance and climate change adaptation.

The WFD does not contain guidance on implementation structures beyond the need to apply the directive at the river basin level. To comply with WFD, the EA designated ten River Basin Districts (RBD) across England and Wales, instigating regional liaison panels which include representatives of co-delivery organisations, that is, those organisations who are perceived to directly assist the delivery of measures (Watson et al., 2009; Watson, 2014). The river basin management (RBM) plan provides a framework for protecting and enhancing the benefits provided by the water environment (EA, 2016). For example, the North West RBM plan (Table 2.4) provides a long-term framework for managing the issues that affect the quality of the water environment.

Table 2.4 NW River Basin Management Plan (adapted from EA, 2016).

Information Set	Content
Baseline Classification	Water quality baseline. Deterioration from the baseline is not permitted except in very specific circumstances.
Protected Areas – Statutory Objectives	Areas used for drinking water, bathing, commercial shellfish harvesting and sustaining precious wildlife species and habitat are subject to legally binding objectives that protect areas of land and bodies of water from potentially harmful activities and new developments.
Water Bodies – Statutory Objectives	Water quality objectives where the default objective is good status. Where natural conditions, technical feasibility or disproportionate cost to make improvement impractical are found less stringent objectives may be set. Objectives to be achieved by 2021 unless an extended deadline of 2027 is specified.
Management Mechanisms	Statutory and voluntary mechanisms are used to manage the quality of the water environment. Actions and implementation owners to achieve the statutory objectives are given. Detailed action plan is not provided.
Priority Issues	Diffuse Urban and Rural pollution Physical modifications Sewage contamination

In a House of Commons review, a DEFRA spokesperson reported DEFRA focus on implementing directives *in a way that is flexible, realistic, [and] brings the public with us* (HoC, 2016, p20), yet the UK approach adopted by DEFRA was criticised by environment groups for lack of public engagement (HoL, 2012; Watson, 2015a). UK Government responded by moving toward a more inclusive, partnership-led approach to the management of water resources at a sub-set of the river basin, that is, at the catchment level (Whaley & Weatherhead, 2016), an implementation scale also adopted by other EU states where *some member states may have found the RBD level somewhat impractical and organized important management activities at lower levels instead* (Boeuf and Fritsch, 2016, p9). The Catchment Based Approach (CaBA) is a governance network initiated by the UK Department of Environment and Rural Affairs (DEFRA) with the aim of stimulating public participation and collaborative delivery of the EU Water Framework Directive (DEFRA, 2013), although it is noted, that in order to design and implement the WFD agenda, DEFRA relies on formal traditional government institutions, together with one, or more, types of non-traditional, non-state government actors, public or private actors (DEFRA, 2013).

2.6.3 The Catchment Argument for England & Wales

An early review of the roles and influence of a catchment scale organisation, that is rivers trusts, by Cook et al. (2012) identified differences in actors at national, regional and catchment scales. The lack of integration between various statutory and non-statutory groups, as found in 2009 and identified in Cook et al.'s work, is highlighted. Findings indicate that statutory and non-statutory groups do not duplicate functions but do have complementary interests: this is not unexpected, given the organisation under review, rivers trusts, report aims similar those expressed in WFD goals and adopted by statutory bodies (Short, 2015). Requirements for the integration of future 'institutional arrangements' which enable the engagement of decentralised, multi, decision-making actors are made explicit, including the integration of 'responsibilities and rights from higher-level regulators' (Cook et al., 2012).

England & Wales river basin management (RBM) (2007-2009) was examined by Watson et al. (2009) against the theoretical shift to collaborative networks, that is, a self-organising, inter-organisational policy network, where private and non-profit organisations are identified to have a policy making and implementation role. RBM was found to have maintained a strong central government control of water policy and regulation, even though water delivery has been privatised. WFD implementation is discussed from the perspective of the river basin scale, identifying the strong control of the EA in participant involvement, an information cascade approach to meetings with limited discussion and a lack of local scale (catchment) actors (Benson et al., 2014; Watson et al., 2009). Watson et al. (2009) report little opportunity for those who are being charged with policy implementation at the street level to influence regional river basin plans and so, to address this omission, the catchment scale is considered most appropriate for water management: the conclusion calls for the EA and central government to relinquish decision making powers to the local scale.

2.7 The Catchment Based Approach (England & Wales)

In March 2011, the Minister for the Environment and the Chairs of the Environment Agency (EA), Natural England (NE) and the Forestry Commission (FC) launched the Catchment Based Approach (CaBA) programme, heralding the change in UK Government strategic thinking set out in both The Natural Environment White Paper:

The Natural Choice (June 2011) and The Water White Paper: *Water for Life* (Dec 2011) (CIWEM, 2016). By working at a catchment scale, it was anticipated that communities would be engaged and ownership of issues would be at a scale relevant to key stakeholders, plus new approaches to water management would be developed which deliver economic, social and environmental benefits in addition to the water quality improvement benefits contained in River Basin Management Plans (DEFRA, 2013; Watson, 2015a). The catchment partnerships working approach as proposed by DEFRA (2013) encourages a co-operative, networking structure, requiring linkages between individual members of different organisations who are collaborating partners (Berkes, 2009); however, the implementation of WFD has proved challenging (HoL, 2012). The approach launched in England and Wales 2013, delivers a non-statutory, complementary body to support the formalised WFD implementation mechanism. The catchment partnership as designated is a non-statutory group, it is not hierarchically linked to the river boards and thus, is not under any legislative pressure to deliver WFD goals. The UK solution has not delivered a statutory body at the catchment scale, thus divorcing the catchment partnerships from the legislative process which specifies stakeholder involvement (Article 14, EC, 2000).

At the same time as this legislative demand for stakeholder involvement, there is also a pull from the public to be more engaged in public-sector policy decision-making (OECD, 2015) and functional collaborative arrangements have emerged as a response to this policy environment (Carlsson & Berkes, 2005). The underlying rationale is that by involving different groups, participants who possess different knowledge will broaden the collective, shared knowledge base, and thereby increase the capacity for innovative solutions to natural resource issues as implementation powers are devolved. WFD policy implementation therefore becomes dependent on local activists to engage in projects which support the river basin plan, even though there is no organisational responsibility toward the catchment partnerships from the river basin district boards. Thus, the non-statutory catchment partnerships are expected to fulfil the WFD policy demand for stakeholder inclusion in decision-making *important in ensuring that there is a clearer link between river basin management planning, underpinned by stakeholders at a river basin scale and planning and delivery at a catchment level* (DEFRA, 2013, p15) and also adopt an

ecosystem service approach to natural resource issues c*atchment partnerships look at the water environment in terms of all the ecosystems services connected to a healthy catchment* (DEFRA, 2013, p5). The CaBA experience, post launch, does enable the engagement of local citizen actors at the catchment scale, but lacks the devolution of statutory rights from regulatory bodies identified by Cook et al. (2012).

2.7.1 Catchment Partnerships – Evaluation to Date

The UK Government trialled the Catchment Based Management (CaBA) in 2011, via 25 fully-supported pilots and 37 groups offered limited support and launched the approach across the whole of England and Wales in 2013 (DEFRA, 2013). The launch statement noted CaBA to be a *facilitation and collaboration approach to policy delivery which sits within a suite of statutory and voluntary actions and activities* (DEFRA, 2013, p9) and broad intentions and expectations to support WFD goals were outlined through the *promotion and development of more appropriate River Basin Management Plans (which underpin the delivery of the objectives of the Water Framework Directive)* (DEFRA, 2013, p4). No organisational structure was defined; however, each partnership would possess a lead organisation, who received limited funding to provide a 'host' function for the catchment partnership, and there is a requirement for a representative of the mandated organisation (EA) to act as a co-ordinator between the partnership and the EA. Consequently, collaborative approaches which develop at the local catchment level are expected to work in partnership with government agencies such as Natural England and the Environment Agency, but the implementation is noted to be significantly context dependent and so there are ambiguities in both the mechanism for implementation and the impact of collaborative working within each catchment.

At the launch in 2013, there were 108 catchment areas, hosted by a range of organisations, but over 60% are hosted by rivers trusts, who are independent community-led organisations working to improve local rivers (Table 2.5).

An examination of the stakeholder make-up at launch identified the EA and ecological conservation stakeholders to be present in all the catchment partnerships, with academic representatives being the least reported. Water companies were not found to be present in all the partnerships which is concerning given their influence upon water quality and quantity (Table 2.6).

Table 2.5: CaBA Partnership & Host Organisations at Nov 2103 (Rickard, 2013).

Host Organisation	Count	as % of total partnership
Rivers Trust	68	63
Wildlife Trust	32	30
Other Community Groups	19	18
Groundwork	7	6
Water Cos	5	5
EA	3	3
FW Habitats Trust	3	3
Academia	2	2
National Park	2	2
AONB	2	2
FWAG	2	2
Local Authority	1	1
Nat NGO	1	1

Table 2.6 CaBA Stakeholder Analysis: 69 partnerships details provided. Data taken from CaBA web-pages 2015. (CBA, 2015)

Stakeholder Group	**Present in Partnership (%)**
Regulatory Body	100
Wildlife & Conservation	96
River Conservation	91
Water Business	84
Local Authorities	75
Other Public Service / Government al Bodies	74
Agricultural	59
Recreational	58
Non-water Business	51
Social Engagement Bodies	49
Academic	29

Evaluation of CaBA has been gathered through review by external consultants (Cascade Consulting, 2013; 2015) and supported by academic papers focussing on the England and Wales catchment-based partnership experience.

The report on phase 2 of the Catchment-Based Approach on behalf of DEFRA (Cascade Consulting, 2015) considered the position in 2014. Overall, catchment partnerships were found to be developing and delivering environmental improvements, even though uncertainty regarding future funding was a key issue. Of the delivery cases outlined, the focus is on WFD requirements even though it was found that 25% of the non-government organisations, such as Wildlife Trusts, considered water resources to have little relevant focus for themselves; there is negligible comment on aspects of recreation or heritage improvement. Working relationships among the catchment partners are found to include landowners, local government and business representative, but links to environmental groups such as Nature Improvement Areas or Local Nature Partnerships are lacking. The host and mandated organisation representatives consulted believe mergers with such organisations are unlikely due to difference in scope, scale and methods of working, however, examination of the view of the whole partnership is not considered. The method approach in this study will address this weakness (see Chapter 4).

Through the examination of a fully supported pilot catchment partnership, Short (2015) identified the ‘crafting of institutions' by local actors associated with integrated catchment management. In this case, integration is considered at the horizontal, internal catchment scale. Outcomes identified areas of duplication of interest and opportunities to reduce overlap among deliverables to external government agencies who were seeking stakeholder input to their strategic plans. Integration in the vertical aspect, that is linking into the hierarchical WFD implementation structure, is not considered. Given the short time the pilot had been operating and the focus on developing the partnership itself, the potential for further development (and examination) of networks beyond the catchment partnership is noted. The influence of ‘leaders’ within the partnership and the strategic evolution of partnerships remain unaddressed (section 3.3, objective 3 Influencing Participants).

A 2012 review of the pilot stage focussed on those 37 secondary pilots who did not receive the full pilot support but only received limited monetary funding (Watson, 2015b). The report highlighted the key influence the host organisation brought to the management of the catchment partnership, in particular participation selection, knowledge gathering and strategic direction setting. However, the study only

considered interviews with the host organisation representative, the assumed leader of the partnership, and does not consider whether there are other influencers present within the collaborative group. Much of the questioning focussed on how and why the host organisations structured the formation of the partnership in the limited period since the launch. There is little information on how collaborative interactions may have changed since the early formation stage, nor how the prioritisation of actions, directed by the host to address the known and immediate river conservation priorities of water quality and WFD goals, may expand to consider the wider ecosystem considerations outlined in the launch document. Consequently, there is a possibility for catchment actions and aims to develop and focus on aspects which have great significance for the local actors involved in the partnerships but are not priority WFD goals, an aspect currently unexplored. The non-statutory nature of the CaBA approach is noted to impact the control of the partnerships via the development of formal rules and regulations; participants are unwilling to adopt such protocols, there being no formal links into the WFD implementation mechanism at the river board plan level and, apart from the mandated organisation and the catchment host, participation at the catchment level is entirely voluntary. Who is participating and how they are developing alternative formal linkages is unaddressed (section 3.3, objective 1 Network System Dynamics).

An evaluation of catchment pilot partnerships through the concept of collaborating networks of actors is presented by Watson (2015a): collaboration is defined in that paper as ‘an interactive, social form of decision making in which a diverse group of autonomous actors’ search for agreement on a collective issue or problem in which they all have stakes’. The evaluation considered the pilot stage (2011-2013) prior to the full launch of CaBA in 2013. The impact of two key power relationships are highlighted: (i) those of the government agency who retain controlling interests and so limit devolution of decision-making, and (ii) the influential power of the host organisation at the commencement and in the continuing development of partnerships. Participating actors were found to have initially viewed CaBA as an approach to implement WFD, even though there is no statutory requirement to do so, but over time, partnerships have widened the scope of their interest to consider heritage and recreation, an aspect not found in the phase 2 report produced by Cascade Consulting (2015) (section 3.3, objective 2 Ecosystem Service Focus). It is

relevant to note, building a network is not considered sufficient to address collaborative activity, networks should be functional, purpose driven and provide a sense of solidarity, but network analysis exploring this aspect is absent from the report. Also lacking is analysis which considers whether participants approaches to 'risk' and 'agreement' are impacting collaboration and the deliverability of catchment improvement actions. This thesis will address both these aspects through network analysis and critical evaluation of partnership members' approach to collaboration via risk and agreement to act assessment (section 3.3, objective 3 Influencing Participants).

The lack of constitutional power and inability to directly influence river basin plans is noted by Watson (2015a) and the potential for integration of power and authority horizontally into the decision-making process of other jurisdictions outlined. For catchment groups, the creation of positions and niches within wider institutional arrangements are envisaged. Exploration of this aspect is not presented and there are opportunities for further research to address how 'integration' is manifesting itself within a partnership (section 3.3, objective 1 Network System Dynamics).

To resolve the disconnection between the top-down WFD approach and the catchment scale, Watson (2014) considers the adoption of legislative supported bridging institutions to facilitate cross-scale interaction and deliver successful integrated water resources management. CaBA is noted to sit as an addition to the legitimised WFD implementation mechanism, the lack of an explicit process or mechanism to link the two levels of water planning being highlighted as an issue in CaBA pilot evaluation (Cascade Consulting, 2015). Watson's 2014 study of the catchment scale implementation mechanism in England calls for the development of a formally recognised body at the catchment scale to bridge the implementation gap; however, this body would require power shifts and is likely to be resisted from both national and local agents. At the moment, it is unclear which of the participating actors have influence either within or beyond the catchment partnerships or whether there is a development of a bridging or boundary-spanning organisation already at play in the implementation system. The research contained in this thesis will consider such developments within the current partnership relationships (section 3.3, objective 1 Network System Dynamics).

CHAPTER 3 OPPORTUNITY IDENTIFICATION

3.1 Literature Gap

3.1.1 Political, Economic and Social Factors Gaps

A large body of research exists which examines the political, economic and social factors which influence environmental policy implementation and which have led to the current application of the network, system stewardship model in the UK policy area. The existing research reviewed in Chapter 2 will be used in this thesis to construct *a priori* coding tables in order to ascertain whether, following the introduction of a non-statutory, unincorporated implementation model by UK Government, there is a new aspect which influences policy delivery or whether there is an absence of a previously identified influencing factor. Also, the implementation structure has been examined by earlier researchers from both a top-down perspective and from a bottom-up construct, however, an examination of the novel system stewardship model introduced as the delivery model for catchment based management in England & Wales has not been found to be an examined concept. The research contained in this thesis will address this theoretical model gap.

3.1.2 Natural Resource: Catchment Partnerships Gaps

The adoption of a non-statutory, unincorporated collaborative group approach to deliver a statutory (WFD) directive appears counter-intuitive. Given the time which has passed since pilot evaluation reports were completed, a further review may clarify two aspects: Firstly, whether WFD is a major issue of relevance to all the stakeholders within the catchment or is there a local issue which is of greater importance (section 3.3, objective 2 Ecosystem Service Focus). Secondly, are the hosts continuing to act as 'authority' figures, controlling the participation of actors and direction-setting of activity which may be compatible with the goals of WFD but which may alienate non-WFD interested stakeholders? Host organisations report a shift to a more inclusive, less WFD led focus at the end of the pilot period, 2012, but analysis at the whole partnership level would enable the views of all participants to be considered. This study will address this gap by capturing the views of all members of a partnership and critically evaluating the whole network structure to identify the influential actors within the catchment partnerships (section 3.3, objective 3

Influencing Participants) and seek to address how the unincorporated nature of the group impacts the overall structure and performance.

3.2 Opportunity Identification

In their comprehensive review of network research in public administration, Kapucu et al. (2017), found common recommendations concerning future research which sought to overcome the challenges associated with network scholarship. Recommendations covered distinguishing informal social networks from contractual relationships, plus research on the influence collaborative networks have on the policy implementation process and how this relationship changes over time (Angst & Hirschi, 2017).

Lester and Goggin (1998) also argue that in order to understand more fully the strategic choices of implementers and to be able to explain and predict implementation outcomes, we also need to consider the individual implementers and their roles within networks. Further, Bazeley (2004) outlined four key areas to be assessed by implementation investigation which are presented below, together with the opportunity area relating to catchment partnerships:

1. To identify variation across implementation sites through the documentation of existing social structures to identify the socially engaged actors

Opportunity: Catchment partnerships have been found to be context dependent and vary in participant make-up, goal content and prioritisation, and integration with statutory bodies. Hence, adopting a case study across more than one site is proposed. Published reports to date have focussed on the pilot experience and there remain opportunities for research now partnerships are maturing and developing post-pilot. Opportunity therefore exists for the examination of catchment partnerships, beyond the set-up and initiation phase which has been considered by earlier research.

2. To consider the historic and current conditions which influence the likelihood that actors will coordinate and adopt new practices

Opportunity: Identifying the historic change in ecosystem services embedded in narrative material will provide a benchmark against which the current catchment

management awareness and appreciation of ecosystem services may be considered. The outcome will identify whether the preferences of ecosystem management are reflective of the current social values or are expressing preferences at odds with the current focus and promoting alternative EsS through policy implementation goals.

3. To identify latent sources of authority which mobilize or may impede new practices

Opportunity: Network dynamics are of pivotal importance in the governance of natural resources. This has been recognized by a number of studies that have investigated how the structure of social networks affects the effectiveness of natural resource policy implementation and governance (e.g., Bodin & Crona, 2009; Carlsson & Sandstrom, 2008; Kowalski & Jenkins, 2015; Marin & Berkes, 2010; Sandstrom & Rova, 2010). Through identifying the influential actors within the implementation network, the research contained in this thesis will consider whether the techniques of control and steering considered necessary to achieve policy goals, is discernible.

4. To identify factors which shape an individual's approach to policy implementation and which influence actions, and where are such influencing factors found within a system.

Opportunity: In response to a House of Commons Environmental Audit Committee (2016), written evidence submitted by the Wildlife Trusts identified the effectiveness of the catchment based approach in bringing partners together to address WFD strategic issues but raised concerns with the lack of ambition in the UK implementation of the Directive, an over-complicated process and a failure to capture public support (WT, 2016 AEP0018, In: HoC, 2016). Through the responsible agent, the EA, UK Government has adopted a network implementation model for WFD delivery which has been made complex by the inclusion of non-statutory bodies. The CaBA model is noted by DEFRA (2013) to be a *new focus on institutional arrangements and processes,* impacted by the external political environment and also by the way street-level actors bring their own affiliations and demands to the catchment partnerships. Analysis of personal risk values and the approach to agreement will therefore be critically analysed to identify where such influence factors are found in the system.

In summary, controversy has resulted between those who believe in control, planning and hierarchy versus those who believe in spontaneity, learning and adaptation as implementation techniques. However, it is noted that within the body of work considering implementation theory, theorists differ in their views, identifying a top-down, bottom-up or a synthesis of both aspects as found in the stewardship model, but they are consistent in identifying formal connecting linkages between all levels of activity. This connection provides legitimacy to the actions and decisions of implementing actors and also places a responsibility on those in hierarchical control to oversee the implementation stages. The mix of implementing bodies, conditions to be met and use of collaborating partners has led to a high level of complex implementation interactions and expectations which will be examined by adopting a complex system approach, detailed in the following Chapter.

3.3 Aim & Objectives

The aim of the research contained in this thesis is to provide critical insight about the way in which influence may be expressed to either facilitate, or constrain, policy implementation in an unincorporated collaborative partnership. This will be achieved through adopting a case-study approach to compare stakeholder partners involved in catchment based management. Specific objectives are:

- Network System Dynamics: How is the implementation system developing? Is there a discernible impact due to the Localism Agenda?
- Ecosystem Service Focus: What is the temporal shift and trade-off within catchments and is this comparable? Have catchment partnerships developed their own unique agenda based on an Ecosystem Service (EsS) approach or retained a focus on statutory goals?
- Influential Participants: Which actors are involved and what are their collaborative relationships within catchment partnerships? Which stakeholder groups play an influential role? Do all the collaborating partners possess compatible approaches to risk and agreement to action?

CHAPTER 4 METHODOLOGY

4.1 Personal Approach

Research paradigms are the set of assumptions and beliefs relating to the researchers' perception of the world which thus serves as a 'thinking framework' (Wahyuni, 2012). The researcher involved in the work contained in this thesis, supports the pragmatic approach, this is, the research question determines the research framework, as the philosophy considers objectivist and subjective perspectives are not mutually exclusive but are end points of one continuum. Hence a mixture of approaches and methods is an acceptable framework, with emphasis on what works best to address the research problem at hand, employing both qualitative and quantitative data to better understand social reality (Burke Johnson et al., 2007; Feilzer, 2010; Wahyuni, 2012). A comparison of theoretical research paradigms is contained at Appendix A.

Various research methods are available to address multi-scale dimensions, but Bazeley (2004) considered no one method is more valid than any other approach, however, the context, data availability and the nature of the questions to be answered implies that research is likely to employ mixed methods to enrich understanding (Bazeley, 2004; Moulton & Sandfort, 2017).

4.2 Complex System Approach

Policy makers and implementers who seek to understand adaptive interactions in social, ecological or economic systems utilise complexity systems science to focus attention on dynamic connections and policy evolution (OECD, 2009). The complex system view considers interfaces between participants that interact and adapt to each other, across various scales, spaces and times (Furtado et al, 2015; OECD, 2009).

4.2.1 Complexity: A Whole System Perspective

Organisation processes are complex due to characteristics such as uncertainty, unpredictability and multiple interactions among a number of otherwise autonomous agents, thus theorists consider there is a need to understand characteristics and resulting complexities in order to develop appropriate management approaches

(Meyer Junior et al., 2012). Action to address multi-scale environmental issues in the 21st century may now involve local, national and international policies, delivered across a mix of diverse participants who include governmental departments, private business and voluntary NGOs (EC, 2015). The environmental policy area is thus considered complex (HoC, 2016) and so is a suitable exemplar for investigation by a complexity science approach.

To aid the understanding of network structures, researchers have applied theories of complexity (Bohórquez Arévalo & Espinosa, 2015; Meyer Junior et al., 2012; Stacey, 1995). Complexity science is a set of ideas and principles which describe the nuances which underpin the processes and dynamics of change (Ramalingam et al., 2008), that is, the logical properties of nonlinear behaviour and network feedback systems that create themselves over time through reflection and learning, while seeking to understand instabilities which lead to new forms through sudden changes (Bohórquez Arévalo & Espinosa, 2015; Stacey, 1996). Informal, spontaneous relationships co-exist amid organisational structures (Stacey, 1996), hence personal relationships and group relationships are important to deliver implementation actions. Consequently, management based on complexity theory is a whole system approach defined by relationships and networks, where control and co-operation are considered necessary to prevent network collapse, together with a uniting, common purpose (Blackman, 2001).

Fuentes (2015) considers complex systems analysis is not reliant upon any particular method or tool, but a combination of those tools and methods that best answer the questions are most appropriate. Kapucu et al. (2017) recommendations cover the use of appropriate network analysis methods and tools in the analysis of the implementation systems, bearing in mind the difficulties in defining network boundaries and collecting network data (Isett et al, 2011); the need to address the integration of qualitative with quantitative studies; and to conduct comparative network analysis.

4.3 Policy Implementation Research

One of the main goals in applying complexity research methods is to facilitate the understanding of the social system at both the macro (system) and micro (individual)

level (Ghorbani et al., 2014), thereby providing data to better understand the policy mechanism through exploring non-linear, network features at both the broadest and more detailed levels (Johnson, 2015).

4.3.1 Macro-level Analysis: Implementation Model Analysis:

To analyse policy implementation mechanisms, Van Meter and Van Horne (1975) outlined a model which was guided by organisation theory, and studies considering the impact of public policy, judicial decisions and inter-government relationships. The model considered the level of the change required and also policy aim consensus; so, they hypothesised, implementation is most successful where only marginal change is required and goal consensus is high. To achieve success requires multiple parties to be linked from an initial policy decision through longitudinal stages, that is a top-down model, but with the input of 'subordinates' who also participate in the policy formulation (Hill & Hupe, 2002).

However, the inclusion of multi-actors has been noted to be a concern as the context, institutional arrangements and behaviour of actors' impact upon the transparency and accountability of decision-making (Mabillard & Zumofen, 2016). Policy implementation mechanisms now possess greater complexity (Johnson, 2015; Kapucu et al., 2017; Moulton & Sandfort, 2017). Increasing diversity leads to greater complexity in collaborative systems as different needs, expectations and individual goals correspondingly increase: conflicts may result, reducing trust between stakeholders, less-integration across competing commercial, non-profit or community sectors and fragmented accountability (DeGroff & Cargo, 2009; Gugu & Dal Molin, 2016).

Consequently, Matland (1995) built upon Van Meter and Van Horne's earlier model, identifying how factors considered critical to the implementation process are identified as varyingly dependent on the levels of policy ambiguity and conflict *viz* the Ambiguity-Conflict Model. Levels of conflict impact accessibility to the implementation process: at low levels of conflict access is relatively straight forward, but at high levels of conflict, barriers to entry are high through incompatibility of interests and perceived threats to self-interests, resulting in aggressive behaviours. Conflict resolution mechanisms also vary with conflict intensity: persuasion or problem solving are common at low conflict levels, whereas bargaining and coercion

are common at higher levels of conflict. Similarly, the degree of ambiguity impacts the implementation process. It influences the ability to monitor activities through formal reporting routes, uniformity of understanding across implementation sites, and, in conjunction with local contextual factors, influences the variation in participating, local, implementation actors. Four paradigms were identified: (i) low conflict-low ambiguity or administrative implementation, in essence the marginal change model outlined by Van Meter and Van Horne; (ii) high conflict-low ambiguity or political implementation; (iii) high conflict-high ambiguity or symbolic implementation; and (iv) low conflict-high ambiguity or experimental implementation.

Such models are useful in understanding the policy implementation system and identifying issues which detract from policy delivery. Contemporary developments have built an approach based on complexity theory, whose proponents advocate a shift in analysis from the individual parts of a system, to the system as a whole, that is, the network of elements that interact (Cairney, 2012b). This research will examine the overall WFD policy mechanism to ascertain the policy paradigm and to assess the level of complexity in the applied implementation model (section 6.1; 7.4.1).

4.3.2 Micro-level Analysis: Participant Complexity

Collaborative implementation mechanisms are often characterized by the inclusion of non-state stakeholders, together with horizontal interactions between public, private, and non-profit organisations who may act at different geographic scales, across different planning time-frames and possess different areas of responsibility (Kapucu et al., 2017). By facilitating public and private interests, policy implementation is believed to be more efficient, reducing duplication, improving standards within the partnership members and allowing organisations to extend activities to new geographies, services or clients (Hall, 2011; Provan & Kenis, 2008; Roberts & Marshall, 2008), yet there are risks to participation.

In deciding to participate in a network, actors consider a number of factors (Angst & Hirschi, 2017). Where a problem is complex, decisions on participation rely on the credibility of information provided by other participants or their willingness to contribute to the overall goal. There is often an incentive for a participant to misrepresent their own commitment in order to gain credibility based on the reputation of other constituent members (Keast et al., 2006; Roberts & Marshall,

2008). A key argument for improving networking among the actors and institutions in the system is that the tasks required are so complex, no one actor has sufficient knowledge to complete them, so an exchange of ideas contributes to enhancing the innovative capacity of agencies to deal with complexity (Sorensen, 2012; Sorensen & Torfing, 2012). Efficient means of exchanging information overcome actor weakness, and so networks which rely on a few central actors to bond the network can facilitate information flow among all collaborative participants (Angst & Hirschi, 2017). Network models are noted to be reliant upon mutual dependence and negotiation and yet decisions may not always be legally enforceable on those members of the partnership who do not wish to abide by a facilitated decision (Marcussen & Torfing, 2003). To be successful, trust and an equal contribution to common goals are required (Kemp & Martens, 2007). The evolution of the internal team working as found in the case study examined, is reported in section 7.2.3.

Public policy implementation approaches which involve large numbers of diverse interacting parts are characterised by complexity (Cerna, 2013), consequently the methods and methodologies which study complex systems (e.g. 4.5.1 & 4.5.2) are also applied to analysis of public policy implementation (Furtado et al, 2015).

In their study of public administration Kapucu et al. (2017) found of the 81 articles examined, 35% used both quantitative and qualitative methods to collect network data, that is, a mixed method approach (see 4.4.1). Mixed methods are deemed no less valid than other approaches to research (Bazeley, 2004) and data is often sourced through document review, survey responses and / or interview (Kapucu et al., 2017). Kapucu et al. (2017) recommend future research designs should continue to use multiple types of data collection methods, thereby overcoming the constraints of one particular method and to enhance the reliability and validity of network research in public administration. Validity is noted to stem from the appropriateness, thoroughness and effectiveness with which methods are applied and the thoughtful weighing of evidence, rather than from the application of a fixed set of rules and procedures (Bazeley, 2004).

Within the literature, common tools identified cover:

- The use of multiple regression techniques (O'Toole, 2004) to identify those key variables that significantly influence implementation performance, both positively and negatively; such an approach is stated to be an improvement on best-practice research which may suffer from problems of reliability and validity. However, to enable such a comparison, a substantial number of examples are required, together with researcher time and skills.

- Geographic Information Systems (GIS) is often used in complex systems research for public policy evaluation. It provides a unified way of describing complex spatial data (Heppenstall et al., 2012). However, to combine different data sets, spatial coordinates are commonly used and so must be identifiable to produce patterns of data.

- Agent based modelling enables the examination of the emergent properties from a bottom-up perspective across the individual, population or organisational scales within complex networks (Fuentes, 2015). However, to do so requires computer modelling skills and appropriate resources.

- A tool often used by complex systems researchers, is social network analysis (SNA) which describes the system of interactions that occur within the system (Fuentes, 2015). See 5.4.1 for further details

4.4 Design

The research presented in this thesis covers three main areas: -

- Implementation typology assessment via qualitative analysis, a priori coding

- Historic ecosystem service analysis via qualitative analysis, a priori coding

- Catchment partnership investigation via mixed methods analysis, case study

4.4.1 Mixed Method Concept

Mixed methods research Is not a new concept: Campbell and Fiske (1959) formalized the application of multiple research methods, introducing the idea of triangulation where more than one method is used as part of a validating process to explain phenomena. Denzin (1978) outlined how to triangulate methods and in the

research contained in this thesis, a Concurrent Triangulation Design has been selected. The design uses separate quantitative and qualitative methods where data collection is concurrent, priority is given to the quantitative approach recognising that qualitative data will significantly enhance the insights gained from the quantitative studies through elaborating main concepts (Jackson & Trochim, 2002), and integration of the results occurs during the interpretive, discussion phase (Tashakkori & Teddlie, 2003). The design visualization is shown in Figure 4.1. This methodology is considered advantageous as it is familiar to most researchers, can result in validated and substantial findings, requires a shorter data collection time and there is certainty that the phenomena under investigation has not varied between the application of differing approaches.

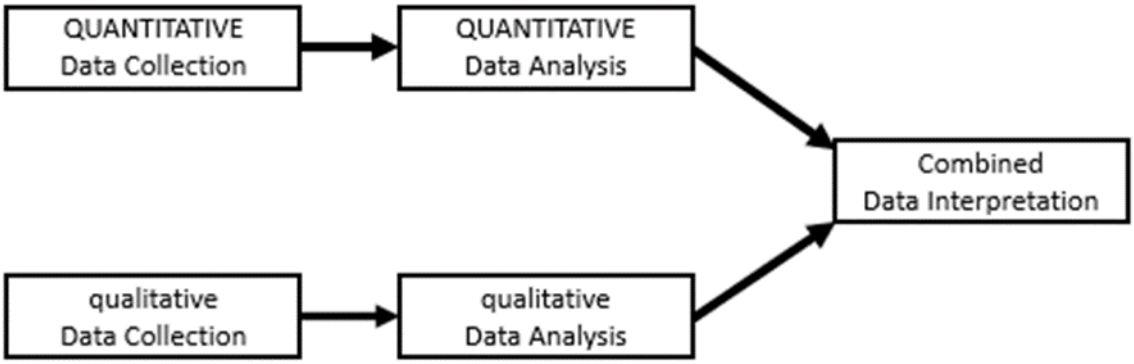


Figure 4.1: Visualisation of the Concurrent Triangulation Design applied in this research

4.4.2 Case Study Concept

Case studies allow researchers to explore individuals or organisations, simple or complex relationships, using a variety of data sources to reveal and understand multiple facets (Baxter & Jack, 2008; Yin, 2014). George and Bennett (2004) identify several advantages of case studies that make them valuable in testing and developing theory, including:

(a) their use in achieving high levels of concept validity through the identification and measurement of indicators representing the theoretical concept,

(b) as a useful means to examine closely the hypothesized role of causal mechanisms, and

(c) for addressing causal complexity.

Case study methodologies are influenced by the approach and the topic under investigation (Baxter & Jack, 2008; George & Bennett, 2004; Stake, 1995; Yin, 2014); a case study may describe a case, explore a case or compare between cases, and involve single or multiple cases. Case studies are often undertaken in the natural resource management area to clarify theories and explore situations (e.g. Baird et al., 2016). The catchment partnership case study undertaken complies with the suitability criteria laid out by Yin (2014), in that 'how' and 'why' questions relating to the implementation of public policy are being asked, the researcher is not able to manipulate the participants or bring any pressure to bear and the context of the catchment partnerships under review is relevant.

Designed as a case study, the research presented will examine the overarching implementation framework, which allows tracing the effects of feedback and direction steering in the collaborative process as a whole, and the micro-level dimensions of selected, collaborative catchment partnerships (England & Wales) which are concerned with the delivery of the EU Water Framework Directive. The research presented adopts Angst and Hirschi (2017) recommendations to adopt interpersonal relationships or interactions between individuals as the unit of analysis and critically analyse the nature of risk among diverse participants in a collaborative network system by means of complexity science tools.

4.5 Research Tool Selection

In order to answer the research questions, the mixed-method approach applied in this study leads the collection of quantitative data collection via survey instruments, analysed by social network analysis, Stacey's participant complexity matrix and evaluation of goals against the ecosystem services framework, plus qualitative data collected from survey instrument commentary and supported by semi-structured interview from a smaller number of participants. Definitions of quantitative and qualitative data collection are as used by DeFranco (2011). The tools were chosen as they:

- Are grounded in a real-world context (Acayo & Schwanbeck, 2015)
- Fits within the complexity science approach

- Address relationship interactions
- Provide answers to the who and how questions
- Prior knowledge on the application and success in identification of implementation barriers was known to the researcher
- Supporting software is available and accessible by the researcher

Each of the quantitative tools applied to survey data is detailed in the following sections, together with the qualitative approach to the identification of ecosystem services.

4.5.1 Social Network Analysis Tool

Social network analysis (SNA) has been used for analysing the structural and relational aspects of complex networks in public administration (Kapucu et al., 2017). Unlike conventional statistical analysis, SNA allows researchers to examine the dynamic interactions between individuals (actors) and the complexity of social systems (Kapucu & Demiroz, 2011). It has been widely used in sociology, psychology, and anthropology to analyse social structures in various contexts (Knoke & Yang, 2008; Scott, 2013; Wasserman & Faust, 1994). A search of the Scopus document database performed in April 2015, using the term “social network analysis” returned over 35,000 documents covering computer sciences, mathematics, engineering (55% of the listed documents), medicine, psychology and biochemistry (36%) and business and management (11%). SNA was not a common analysis tool until the late 1990s when computing hardware and software became commonplace. Since then, SNA has developed into an inter-disciplinary tool, applied in organisational behaviour, social support and diffusion of information research. SNA is found to be commonly applied to complex network analysis to identify structural relationships, supported by qualitative data to provide rich information about the networks (Kapucu et al., 2017).

SNA Theory

A focus on patterns of relationships distinguishes SNA from other analysis techniques (Haythornthwaite, 1996). Krebs (2002) defines SNA as “the mapping and measuring of relationships and flows between people, groups, organisations, computers or other information/knowledge processing entities”. Social networks can be identified and measured using techniques grounded in systematic empirical data

(Carolan, 2014). SNA tools examine how members of a network work with each other, directly or indirectly. The technique is used to visualise relationships which are mapped via quantitative reports of relational ties based on the principles of graph theory (Haythornthwaite, 1996), presented pictorially (sociogram), so facilitating the identification of who knows who and who may act as thought leaders or a central broker in an organisation (Butts, 2008). Analysis may lead to the identification of isolated groups or bottlenecks and identify where there may be a risk to the sustainability of an organisation due to the loss of key personnel or functions (Haythornthwaite, 1996). Data are usually gathered through questionnaires or interviews. Questions may include "Who do you work with?", "Who do you go to for advice" or "Who do you go to for information about…?" (Haythornthwaite, 1996). Responses are transferred to binary data grids which are input to software analysis packages.

Individual measures theory: An individual (actor) in a network may possess greater or lesser prominence compared to the other members of the group due to the number of relationships they possess among the group (Haythornthwaite, 1996). Centrality is important to understand an individual's power, influence and brokerage within a specific network; individuals with high centrality possess greater choice opportunity and are less dependent upon any one specific actor in the network (Hanneman & Riddle, 2005). The centrality of actors in terms of the overall structure is reported by eigenvector values; an eigenvector approach detects the most central actor in terms of the overall structure, through identification of the 'distance' among actors i.e. the most efficient pathway (Hanneman & Riddle, 2005). Higher scores indicate actors are 'more central' to the main pattern and lower values indicate the actors are more peripheral. Where actors receive many ties from other network members they are deemed prominent or prestige actors measured by in-degree centrality. Out-degree actors have many links away but receive few; consequently, they are designated as influencers as their views are exchanged with others.

Actors may connect otherwise disconnected elements by acting as an intermediary position and these brokerage, or bridging, links, are considered important to the transfer of information between others (Haythornthwaite, 1996). Betweeness measures identify those individuals through which communication has to pass before

being shared with others in the network. Where connections have to be made through a key actor, that is, one who contributes most to linking the network, that individuals' betweeness measure is high, while for those at the end of communication lines it is low (Scott et al., 2005).

Network measures theory: Cohesiveness is an attribute of the whole network indicating the presence of strong ties among network members who are therefore likely to have equal access to the same information or other resource. Overall measures of cohesion, e.g. density and centralisation, identify the extent to which all members of a group interact with all the other members (Haythornthwaite, 1996). Results range from 0 to 1, usually reported as a percentage. Network sub-structures, such as cliques, may be found where sub-sets of actors report strong ties among themselves, measured by cohesion.

Density is the relative number of connections; the number of links divided by the number of nodes in the network. Individuals in high density networks are more directly connected to each other than a low-density network (Scott et al., 2005). It is postulated information flows along direct connections and so in high density networks information can flow to and from a number of individuals by different routes. However, in low density networks there are a limited number of routes and information may not transfer across the entire network.

Centralisation measures the extent to which a network unifies to a central point. That is, the degree to which a network approaches a symmetric star. The value is expressed as a percentage: 0% indicates every member (partner) is connected to every other member, 100% indicates all members are connected to one member only. In-degree centralisation indicates a small number of members are consulted by the rest of the members; out-degree indicates a small number of members do most of the consulting of others (Scott et al., 2005). The arrangement affects how quickly and easily information can be distributed, either through minimal contacts as indicated in a 'star' network where information is directed to or from the central point to all recipients at the same time, or via longer delivery routes which may restrict the speed and impact the accuracy of transfer. The evaluation of centrality of actors in terms of the overall structure is reported by Eigenvector values. Higher scores indicate actors are 'more central' to the main pattern of distance and lower values indicate the actors

are more peripheral. Data are directed, and both Freeman's in-degree centrality (indicator of prominence) and out-degree centrality (indicator of influence) are reported.

Application of SNA in the natural resource area.

While SNA is common in computing, medicine and business areas, this does not seem to be the case in natural resource management. A search of the Scopus database limited to the key words 'social network analysis' and 'natural resource management' was undertaken in January 2016. The search was restricted to post 2000 and environmental journals, i.e. Ecology and Society (SJR rank in 2014 = 1.46), Journal of Environmental Management (SJR rank in 2014 = 1.12) and Environmental Management (SJR rank in 2014 = 0.77), to identify current areas of research in the natural resource area. Fifty-three papers were returned, of which thirty-one made explicit reference to SNA. Eleven (35%) were addressing social capital and learning links (e.g. Carien De Villiers et al., 2014). Kreakie et al. (2016) considered the use of internet links to identify social networks, while other researchers focussed on the identification of key network members in order to ensure resilience of management structures (e.g. Beilin et al., 2013). Twelve (40%) of the papers were investigating the social network of specific case studies, of which 4 were in the EU, 2 in South America, 2 in North America, 2 in Africa and 2 in Australia/Asia. Research interests considered actor dominance, centrality and power influence upon trust and governance issues, and the importance of bridging organisations within diffuse information networks (e.g. Calvet-Mir et al., 2015; Fliervoet et al., 2016; Isaac et al., 2014). Guerrero et al. (2013) considered how social network analyses can be applied to issues of conservation planning, including challenges of implementation which arise from a disjointed planning process. In addition to network structure identification, they also highlight a requirement to consider the influence of personal values such as trust, legitimacy, reliability and institutional limitations upon the effectiveness of conservation planning.

A network analysis approach to studying collaborative (aka co-management) arrangements has been adopted by several researchers in the natural resource area. Carlsson and Sandström (2008) found that well-performing co-management systems are characterised by their network structure and qualities, and thus hypothesised that

co-management networks consisting of diverse actors who are closely connected are able to perform better than those not having these qualities. Similarly, Bodin and Crona (2009) also examined governance processes and outcomes through the application of social network analysis and concluded that density, cohesiveness and subgroup structures do differ between different governance outcomes. However, they propose that one particular aspect (measure) should not be favoured over others and a mix of network characteristics are considered most desirable. Sandstrom and Rova (2010) sought to understand the influence of different management structures upon a common goods resource (fishery) and applied SNA to explore the hypothesis of centrality and densely integrated actor networks outlined by Carlsson and Sandström (2008). Their hypothesis is somewhat supported by the SNA result, but restricted empirical material, an inability to control hidden variables and a lack of causality are highlighted as concerns by the researchers. Kowalski and Jenkins (2015) applied SNA to a non-profit organisation which provides a bridge between ocean scientists and management. Their study aimed to examine cohesiveness in working group structures and relate this to goal achievement. In this case, greater cohesiveness was not found to deliver more goal achievement and consequently, the researchers identified leadership to be a critical aspect to goal achievement. However, SNA did successfully report upon the diversity of the working groups, a key aspect of the bridging organisation. In their study of co-management, Marin and Berkes (2010) explored the distribution of power and influence, identifying a greater number of influential functional groups than defined in policy implementation documentation. In their study, conflict and power differences were identified and welcomed as drivers of change and adaptation. In an examination of a network consisting of non-governmental organisations, government agencies and local communities, Cohen et al. (2012) use centrality measures to identify collaborative relationships among stakeholders, identifying important partners, but also recognised conflicting mandates between the various functional groups, together with constraints on finances, time and trust, result in trade-offs between partners.

SNA is not a common tool in the environmental management field, but growing in its application, and there are calls for further research in areas of collaborative partnerships incorporating the use of such a cross-discipline approach (Nuno et al.,

2014; Sandström & Rova, 2010). Participants in the environmental policy area form a collection of 'actors' tied through behavioural interaction, association and formal relationships (Carolan, 2014), aspects which have proved suitable for examination by SNA.

In summary, SNA permits the identification of those actors who hold key positions, either formally or informally, and where behavioural issues, such as trust and agreement, may impact the functioning of a collaborative, diverse partnership and on policy implementation. Thus, the use of social network analysis is considered a suitable tool for the evaluation of the behavioural-led stewardship network.

Analysis details are given at 5.6.4

4.5.2 Interpersonal Relationship Tool: Stacey's Matrix

More network research is called for to explore interpersonal relationships or interactions between individuals as the unit of analysis, including the nature of risk, as a greater preference for risk-aversion has been identified among those employed in public sector than those employed in the private sector, with consequent impacts on the level of risk-taking innovation (Angst & Hirschi, 2017; Dong, 2017). Zimmerman et al. (1998) suggests creative learning, adaptation and innovation occur with 'just enough information flow, diversity, connectivity, power differential and anxiety among agents'. To understand whether individuals feel there is 'just enough' tension to deliver a creative organisation, Ralph Stacey (1996) developed a model to identify the levels of uncertainty and disagreement between a team of people regarding a specific issue, such as may be found in collaborative implementation agents.

Stacey's Model is structured on two axes, the degree of certainty and the level of agreement. Where an issue is classified as 'close to certainty' there are precedents for expectation of success, that is, past experience is used to predict the outcome of an action with a high degree of certainty. The opposite, 'far from certainty', applies to those unique or new issues upon which a decision is to be made and there is no previous experience to predict an outcome, only assumptions. The level of agreement reports the degree to which the members of the organisation agree with

each other. Thus, aspects of 'what to do' and 'how to do' a collaborative task may be examined by application of Stacey's matrix.

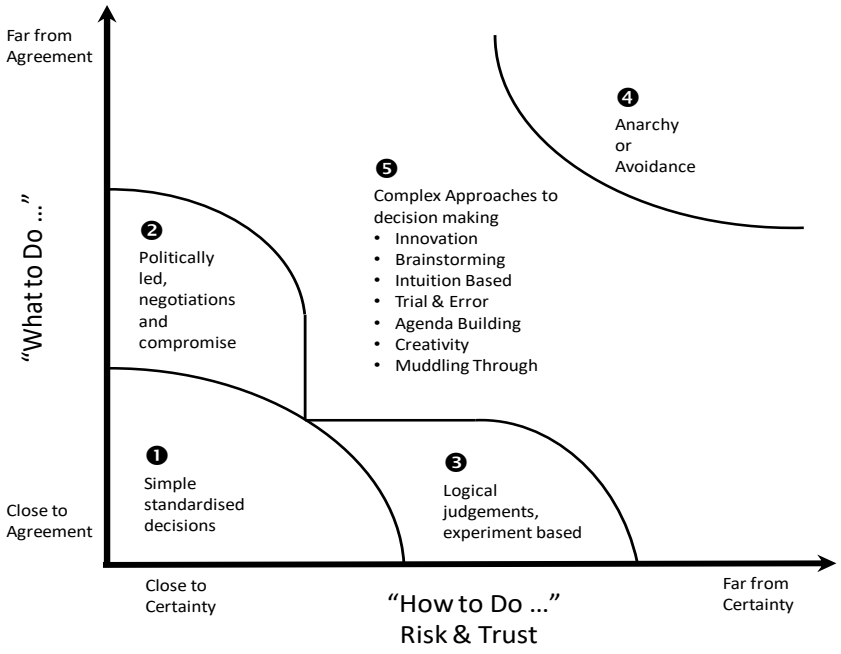


Figure 4.2: Simplified Stacey Matrix identifying the influence of agreement on what to do and risk and trust on how decisions are made. Adapted from Stacey (1996).

Stacey's matrix identifies typical patterns of decision making behaviours ranging from the repeatable, certain outcomes (zone 1 in figure 4.2), to those where there is no agreement and there is an avoidance of action (zone 4 in figure 4.2). Stacey identified the larger central region of the matrix as the zone of complexity (zone 5 in figure 4.2) in which traditional management approaches are not very effective, but it is often the area of high creativity, innovation and new method adoption.

Application of Stacey's Risk/Agreement Framework (matrix) in the natural resource management area.

To understand the use of complexity theory analysis in natural resource management a literature search of the Scopus database limited to the key words 'complexity theory' or 'Stacey theory' and 'natural resource management' was undertaken in January 2016. The search was restricted to post 2000 and environmental journals

which deal with management (Journal of Environmental Management, Environmental Management, and Ecology and Society), as it is the organisational aspect which is under investigation not ecological complexity. Eighteen papers were returned by the search, of which thirteen identified the complexity of ecological systems and modelling issues (e.g. Bryan & Crossman, 2008) together with the difficulties associated with management techniques (e.g. McFadden et al., 2011). Five papers reported upon the investigation of social aspects of teams involved in natural resource management, in particular personality types (Allison & Hobbs, 2010; Hagmann et al., 2002), cooperative organisations and interpersonal relations (Crona & Parker, 2012; Sternlieb et al., 2013) and the impact of trust and legitimacy on resource management success (Graham & Ernstson, 2012). The application of complexity model analysis is not common and none of the returned papers made specific reference to Stacey's complexity model.

Analysis methods are shown at 5.6.5.

4.5.3 EsS Framework Application

Ecosystems are noted to be complex, and accounting for the full range of services, including synergies and trade-offs, is considered challenging (Dick et al., 2016; Hein et al., 2016; Primmer et al., 2015). Trade-offs occur when the provision of one EsS is reduced as a consequence of increased use of another but such trade-offs may occur as an explicit choice or arise without an awareness that such a trade-off is occurring (Dick et al., 2016). Various methods have been proposed to produce such assessments, however, in a review of 153 regional ecosystem service case studies Seppelt et al. (2011) found expert opinion was a viable technique to provide ground truthing of measurements and modelling. Examination of change on the temporal scale has identified regulating, provisioning and cultural ecosystem services and found there is a change in UK focus from provisioning to cultural EsS in the early part of the 21st century (Dick et al., 2016), but EsS delivery is a long-term, continuous process and assessment over a greater time-span may provide further illumination regarding demand and service trade-off. The value of partnership working is identified when dealing with prioritisation and trade-offs between conflicting services (Spray & Blackstock, 2013).

Understanding the effects of management decisions which can change the magnitude and relative mix of ecosystem services, is a core function of ecosystem service assessments (Dick et al., 2016). Such assessments are called for in the catchment based approach, as catchment partnerships are tasked to look at the water environment in terms of all the ecosystems services connected to a healthy catchment (DEFRA, 2013). Following the development of geographic information system software, tools exist to visualise spatial data or build decision support systems and consequently, many researchers have sought to present a visual picture of historical ecosystem changes, assessing the range of species, landscape type and anthropogenic impact (Swetnam et al., 1999; Zu Ermgassen et al., 2012). Source material is assessed for area coverage and retrospective plotting of mapping ranges undertaken to present output as a series of maps (Hendrych et al., 2013; Swetnam et al., 1999). However, to enable complex map visualisations, there is a requirement for data which possess high accuracy and resolution, together with professional, skilled computing operators and data translators (Andrienko et al., 2010; Wang et al., 2006). Where such high-quality data are lacking, alternative methods are necessary, and so an approach based on land-use captured in historical documents is explored.

Plieninger et al., (2014) believe that conventional ecosystem services assessments ought to be complemented by aspects of socio-cultural attitudes, such as may be found in narratives. Narratives generally present a series of events which may be examined by retrospective analysis to gain an understanding of influencing factors and drivers of actions (Sandleowski, 1991). Historical landscape narratives, which highlight natural events and occurrences, are linked to the social values and experiences which were deemed substantial and noteworthy at that particular point in time. So, the historical landscape perspective provides a frame of reference for building an understanding of landscape and ecosystem change (Swetnam et al., 1999; UK NEA, 2014). By uncovering the ecosystem services identified from historical narratives, the method links to the socio-cultural values contained within the ecosystem services approach.

Ecosystem identification

To identify the ecosystem services, the process followed the proposal suggested by Braun and Clarke, (2006, p87). The literature reviewed identified the ecosystem

services linked to freshwater (Table 2.1), consequently a qualitative, deductive framework analysis approach based on pre-conceived, *a priori* coding and categories is adopted for this temporal study (Gale et al., 2013). The coding table is important as it serves as a data management tool for organising segments of similar or related text to assist in interpretation and the template provides a clear trail of evidence for the credibility of the study (Fereday & Muir-Cochrane, 2006).

Theme identification is a fundamental task in qualitative research (Ryan & Bernard, 2003) and the identification requires exclusivity and exhaustive analysis. Coding categories must be mutually exclusive, that is each unit of analysis should fit into one category only and also exhaustive where every response ought to fit into a category, with only a few being classified as other (Frankfort-Nachmias & Nachmias, 1996).

- A code is the label attached to a phrase or other short sequence of the text, for example, in the study reported, *non-drinking water use* is identified where there is a record in the text of any aspect of mechanical power linked to the river.

- Category is the grouping imposed on the coded segments in order to reduce the number of different pieces of data in the analysis, for example, *provisioning ecosystem services* covers text coded as clean water use, non-drinking water use or food source.

- A theme is a higher level of categorisation used to identify a major element for example, *freshwater ecosystem services.*

The content of narrative material will be examined through the application of a coding table to identify the key ecosystem services present in the catchments studied in this thesis, and to consider the aims and aspirations of the catchment partnership against these key services. Detail of the methods applied are found at 5.6.2.

4.6 Research Sources Approach

4.6.1 Archive Material / Public Records

Archive material forms the basis for the historical ecosystem services assessment and also provides a snap-shot of catchment management policy and development at a point in time: it is used for both purposes within this research. Public records

published by EU and UK Government, catchment partnerships and organisations which form the partnerships are easily accessible via the internet and not subject to restricted access. These formal publications are deemed to be factual, possess credibility and be impartial; however, it is noted that bias may be present due to recording methods and content selection (Denscome, 2008). Where documentary sources relating to the catchment based approach development, the membership and goals of the partnerships which form the comparative case study have been used, appropriate referencing is noted in this thesis.

4.6.2 Primary Data Collection

Primary data capture may be achieved via a variety of methods; through interviews, observations, survey or experimentation. In this study, due to the large geographic spread of all the potential participants it was not viable to directly observe interactive behaviours and random sampling of the catchment partnership members would not satisfy the requirement for a whole-network investigation. Interviews would require both the time and availability of interviewees and a skilled researcher to avoid leading the interview and introducing bias and so were discounted as a primary data capture method for the whole network investigation forming a key element of this research. Consequently, a survey approach, supported by a small number of semi-structured interviews, was adopted.

4.6.3 Survey Instrument Approach

Surveys may be either self-completion questionnaires, returned either by traditional post or via e-mail or completed face to face. Face to face surveys are used where detailed information is sought and allow the researcher to question and validate responses: response rates are usually good and appropriate numbers of population demographics can be selected, however, there are considerable time and travel costs which have to be considered and skill is required not to lead the respondent and introduce bias into the results (Denscombe, 2008). Self-completion surveys are often most convenient for the recipients, interviewer bias is not found in the answers, and less time and cost are expanded on data collection by the researcher. However, responses are restricted to the data requirements as laid out in the survey instrument and there is no opportunity for clarification if required. Nonetheless, bearing in mind the limited levels of skill possessed by the researcher in conducting face to face

surveys, the geographic spread and limited availability of catchment partners, for the study reported in this thesis, a structured, self-completion, questionnaire survey was constructed. The questionnaire focused on the specific areas under investigation by capturing quantitative and qualitative data.

It has been noted that in general, survey response rates are falling; rates of over 50% are considered a success (Carr et al., 2017), and where surveys are targeted, for example within an organisation, response rates of 40% are common (Fryrear, 2015); nevertheless, surveys are a popular and common-place approach to research where there is a wide coverage requirement, a snapshot at a set point in time is sought and there is a requirement for empirical data (Denscombe, 2008).

4.6.4 Semi-structured Interview Approach

Interviews are directed conversations where the discussion is directed by the researcher, there is an open consent to take part and the content of the interview can be reported (Denscombe, 2008). Interviews are appropriate where in-depth detailed information is required, usually from a small number of interviewees, such as may be required from key people who can provide further insight (Denscombe,2008). Interviews may occur as a group activity, via a focus group, or on a one to one basis. Focus groups commonly explore non-controversial topics while group interviews are useful to gain consensus and debate views among participants, however, where opinions may be contentious or an individual may not wish to speak in public, one to one interviews are preferable (Denscome, 2008).

Interview structures may be (a) structured, where large numbers of respondents answer identical questions, (b) semi-structured, where specific issues can be investigated and there is flexibility in both the questions and development of the conversation in response to issues raised, or (c) unstructured, where the responder develops the conversation. Both semi-structured and unstructured interviews permit interviewees to use their own words and so facilitate discovery of their experiences (Denscombe, 2008).

Following the mixed-method approach, a small number of semi-structured interviews, based on social constructionist epistemology, were conducted to permit early investigation of the perception of catchment partnerships and later-on in the study

process to investigate key aspects of collaborative partnership working identified from the quantitative research. The use of open-ended questions allowed relevant topics to develop as the interview progressed and provided an opportunity to identify new themes and understanding of the research area. Interviewees expressed their views in their own words and the output can thus provide reliable, comparable qualitative data (Cohen & Crabtree, 2006).

Initial guide questions will be prepared in advance to guide conversations. Interviews will be transcribed for analysis and text coded into the major themes identified in *a priori* coding tables.

4.7 Timeline

The overall approach to the research study and initial attendance at relevant environmental group meetings occurred during 2013. Further key actions and stages in the study are outlined in the following paragraphs.

Phase 1: The overall approach to this research and identification of an environmental policy implementation mechanism suitable for analysis occurred early 2013, fulfilling the requirements of university internal assessment standards. Attendance at Irwell Catchment Partnership meetings commenced in early 2013 in order to understand the internal relationships and functioning of the voluntary groups and to participate in organisational development. The partnership attendance period covered both the catchment based approach pilot stage, when the Irwell partnership was led by the EA, and also the transition phase following the launch of the UK wide catchment based approach in 2013 and the appointment of Groundwork Manchester, Salford, Stockport, Tameside and Trafford as the catchment host, November 2013.

Relationships were established between the Irwell partners and the researcher through regular attendance at catchment partnership meetings and working-party involvement, plus, further relationships were established through introductions to UK CaBA support personnel, Rivers Trust members and Ribble catchment partnership members at the Rivers Trust Conference (Burnley, 26 March 2015) and CaBA Conference (Manchester, 10 July 2017).

Phase 2: Primary data collection was preceded by a period of preparatory work which commenced in June 2014. During this survey-pilot phase, catchment partnership key informants were identified and the logistics of the data collection, availability of participants and ethical procedures were finalised. Data collected to test the survey instrument from both catchment partners and academics, were used to inform the final design and launch mechanism.

Phase 3: Information gathering on historical ecosystem services, as presented in published archives, occurred from late 2013 to early 2014.

Phase 4: The survey data collection occurred in two stages within a fourteen-month period from October 2014 to November 2015, capturing both the system dynamics and personal views of the selected catchment partnership participants. Data analysis occurred following closure of the survey. Following analysis of the results, feedback to the participating partnerships occurred at Catchment Partnership meetings in 2016 and 2017.

4.8 Post Exercise Review.

The research presented in this thesis consists of a case study approach which illuminates both the ecosystem services embedded in historic narrative, plus an exploration of the choices and decisions being made by individual partners and their position within a collaborative network system, aka the catchment partnership.

For the survey element, the same individuals provided both quantitative and qualitative reporting concurrently, and therefore were utilising the same base knowledge and experiences for both methods at the same period, so reducing temporal participant variation. In this study the participants knew their own areas of operational interest well and provided specific area of concern regarding the catchment partnership functioning. The dual design adopted in this study has tested a range of tools. The quantitative tools of social network analysis, Stacey complexity matrix and stakeholder mapping provided a more structured approach compared with *a priori* code commentary analysis, however, the application of both methods was useful in revealing the specific concerns of catchment partners. Stacey's complexity matrix reports two dimensions affecting the agreement to act, that is, both risk and trust. For both to these aspects, respondents are found in all areas of the matrix, that

is, where there are both low risk and high trust responses, and individuals who report high risk and low trust among the group. The qualitative framework analysis also finds low trust values but does not report frequent reports of risk aversion. The qualitative findings support the group acceptance of risk as part of the CaBA approach and a willingness to consider unfamiliar approaches as part of the collaborative 'greater good', however, trust issues are a concern for participants. Thus, by considering the findings of both methods, a greater significance of trust influencing issues in day-to-day activity is highlighted.

A key benefit of performing a small number of semi-structured interviews was the extraction of high-quality data from knowledgeable catchment partners. This was key to the early exploration of the initial policy implementation issues and gathering data on preferences and perceptions. Semi-structured interviewing was a flexible method of data identification, but there was the potential for in-built bias as interviewing only occurred with those individuals willing to participate.

Within the literature, SNA is found to be a tool used for the analysis of collaborative team relationships but the additional application of Stacey complexity matrix, used in this research, has provided a mechanism for exploring participant values which future researchers in the environmental field may wish to adopt.

Adopting a narrative-led approach to identifying temporal ecosystem service priorities has been possible for both a limited stretch of river and bankside and catchment-wide where there are relevant publications. It is acknowledged that the alignment to the ecosystem service framework requires knowledge of the ecosystem service concept, awareness that one event may impact more than one service and that both a positive impact and/or negative disservice may be assigned to the same event. This is not, therefore, a simple approach but is one which enables a top-level multi-ecosystem service synopsis where the use of computing tools may not be viable. The approach has, however, identified the socio-value of a range of ecosystem services which provide benefits for human well-being and environmental sustainability, thus inclusion of such a review in environmental implementation plans would bring further prominence to the ecosystem concept.

CHAPTER 5 METHOD

5.1 General Information

The research aim and objectives (Chapter 3) were answered by adopting a complex science approach (Chapter 4), examining the theoretical constructs and conceptual models from implementation management and testing those ideas within a natural resource collaborative unit. The tools applicable in complex science research were reviewed in Chapter 4. Activities undertaken include primary research through questionnaire; qualitative content analysis of river development histories; critical review of publications - both academic and professional reports; contacts made within the sector through membership of relevant catchment partnership networks and professional interaction via Rivers Trust and CaBA conferences.

The study consisted of four phases:

1. Determination of both the complex science approach to the inter-disciplinary research and the suitability of an environmental implementation mechanism as a policy exemplar.

2. Determination of the scope of the comparative study and the overall data collection approach at the micro-level.

3. Determination of the approach for the extraction and analysis of the ecosystem services (EsS) recorded within catchment narratives, including a detailed assessment along a selected river-length to evaluate the temporal EsS approach.

4. Comparative data collection from participating catchment partners, analysis and evaluation. For this phase, ethical approval was granted by the University of Salford on 22nd October 2014, prior to the collection of any information from the participating catchment partners.

Research was undertaken on a part-time basis and complied with the University of Salford timeline and progression points for studies undertaken on such a basis.

The following sections contain the selection criteria used to identify the catchment partnerships selected for detailed study, the key stage timeline of the phased

research process, plus the specifics of the primary data capture strategy and analysis tools. Results and discussions of the aspects under investigation are reported in Chapters 6 and 7.

5.2 Selecting the Catchment Partnerships

This study builds on earlier academic research examined in the literature review which studied the catchment based approach pilot stage (section 2.7) by examining the impact of longevity, that is, matured working relationships. The implementation system case study is bounded with respect to participation (Baxter & Jack, 2008) mirroring the inclusion and exclusion criteria in 'scientific' studies; thus, the selected catchment partnerships have followed a similar development programme, that is, catchment partnerships were a pilot for the England & Wales Catchment Based Approach (CaBA), prior to May 2013, the partnership transferred from pilot management by the EA to post-2013 management by another organisation and the scale of interest is the entire catchment area. To examine the influence of the host organisation upon the goals and direction of the group, as found in the literature review (section 2.7), different host actors are preferred.

The network system implementation case study reported in this thesis is a comparative case study (Baxter & Jack, 2008; George & Bennett, 2004; Stake, 1995; Yin, 2014) and the unit of analysis is limited to English catchment partnership organisations and relationships which exist within partnerships between 2014 to 2016, ensuring the scope is neither too broad, nor contains too many objectives for one study (Baxter & Jack, 2008).

5.2.1 Catchment Partnership Selection Process

All English and Welsh catchments were considered and evaluated against the following five criteria.

1. Partnerships were a fully supported pilot, operating prior to the launch of the England & Wales Catchment Based Approach (CaBA) in May 2013. Thus, participants are known to each other, initial building of relationships is deemed to have taken place and partnerships have shared goals and aims.
    - A total of 25 catchment pilot partnerships were fully supported between mid-2011 and early 2013.

2. To have been a pilot under the management of the Environment Agency (EA) prior to May 2013 and transferred from management by EA to another organisation. This reflects the CaBA launch document aim, which does not see the EA as the most appropriate lead in the majority of the catchments (DEFRA, 2013), thus the study considers the lead relationship following transition from the EA.
    - Ten pilot partnerships were hosted by the Environment Agency and fifteen hosted by a range of other organisations including Rivers Trusts, Wildlife Trusts, Groundwork, water companies, local authorities and park authorities (Corbelli & Conlan, 2013).
3. To have retained the same geographic catchment area after launch of CaBA. To ensure stakeholder representation is consistent.
    - Five of the EA managed pilot partnerships have maintained the same geographic scope (Corbelli & Conlan, 2013; DEFRA, 2013)
4. To be within the same river basin, to avoid differing influence from River Boards.
    - Four of the pilots which have retained the same geographic area are within the same river basin as another partnership *viz* New Forest and Aldur & Ouse are located in the South East river basin; The Ribble and Irwell are located in the North West river basin.
5. To be managed by different types of organisations to explore the influence of the catchment host upon stakeholder diversity, as found in the literature review (section 2.7).
    - The New Forest and Aldur & Ouse are hosted by freshwater organisations; The Ribble is hosted by a freshwater organisation and the Irwell by a socio-environmental organisation. Thus, the Ribble and Irwell are selected for comparative study.

Applying the filter criteria as specified, resulted in the selection of the River Irwell catchment and the Ribble River catchment for comparative study. It is acknowledged, the selection of a limited number of partnerships may restrict the investigation of alternative operating developments, however, the two partnerships being studied have greater longevity than other partnerships and have progressed beyond the early team forming stages at the time of study – the Irwell is in fact the

longest existing partnership – and the selection also includes one of the most successful partnerships in accessing major funding, that is, the Ribble catchment partnership (Cascade Consulting, 2013; RRT, 2017). Lessons learnt from the operating of these specific partnerships are therefore considered instructive for the development of the entire English catchment programme. Details of the selected catchment partnerships geography and organisational structures follow.

5.2.2 Catchment Details

The selected catchments are both found within England's North West River Basin District (RBD), one of the ten RBDs designated by the EA which fulfil the WFD statutory reporting body. The North West River Basin covers approx. 13,200km^2 with a rich diversity of wildlife and habitats including migratory salmon rivers, with native white clawed crayfish *(Austropotamobius pallipes)* and pearl mussel (*Margaritifera margaritifera*) populations, plus lakes containing Arctic char *(Salvelinus alpinus)* and vendace *(Coregonus vandesius)* – a rare species found only in Derwentwater (EA, 2016). There are twelve management catchments that make up the river basin district (Figure 5.1).

Figure 5.1: North West River Basin and management catchments. Source: EA, 2016.

Around 80% of the river basin is rural, with livestock farming the most common use. However, 7 million people live and work in the North West and the river basin includes large urban centres in the southern area, such as Liverpool and Manchester. The Lake District and Lancashire coast are tourism centres and contribute significantly to the local economy, yet challenges exist where the extraction of too much water from freshwater rivers, lakes or groundwater may damage the environment, particularly Special Areas of Conservation; for example, water abstraction from Ennerdale (West Cumbria) is damaging the river Eden Special Area of Conservation freshwater mussel and salmon populations (EA, 2016).

River Irwell Catchment

Location: The catchment lies to the north of Manchester, comprising a total area of 777 km^2 (James et al., 2012). The main river length of the Irwell covers 63km (39 miles) however, there are five main rivers within the catchment, which together with their network of tributaries, have a total length of almost 400km (EA, 2008). The River Irwell flows into the Manchester Ship Canal, linking to the Mersey Estuary and the Irish Sea (James et al., 2012).

The source of the River Irwell is at Deerplay Moor, 400m above sea-level. The river flows south through a steep and largely rural area to where the topography levels out and major urbanisation commences at Bury. The major tributaries join at Radcliffe (River Roch) and Kearsley (River Croal) and the Irwell then meanders through Lower Kersal and Lower Broughton, Salford, before merging with the Rivers Irk and Medlock at Manchester. The river flows into the Manchester Ship Canal which forms the limit of the catchment partnership management area.

Historic Background: Much of the Irwell catchment has been severely impacted by the Industrial Revolution of the 19th century. The industrialisation impacted the water quality and flow of previously unimpeded rivers. Waters were used to power the looms of the first mills and following the invention of steam power, large factories were constructed. The Irwell and its tributaries were one of the first to be polluted by industry and their waters continued to be the waste disposal mechanism into the 21st Century (James et al., 2012).

River Ribble Catchment

Location: The Ribble is one of the largest rivers in the North West, draining a catchment area of 2128km^2, covering a distance of 110km from source to mouth at the Irish Sea. The catchment has distinct areas of industrial and agricultural use. The Forest of Bowland, an Area of Outstanding Natural Beauty (AONB), is drained by the River Hodder which provides a large proportion of the drinking water supplies for Blackburn and Hyndburn. Areas to the east lie within the boundary of the Yorkshire Dales National Park, which together with the grazing land of the middle reaches, are predominantly agricultural land (EA, 2009).

The Ribble originates high in the Pennines at Newby Head Moss, 422m above sea-level. The river cascades south to Clitheroe, with the Yorkshire Dales National Park to the east and the Forest of Bowland to the west. The mid-Ribble is joined south of Clitheroe by two major tributaries, the River Hodder and the River Calder. The Ribble then meanders through the natural flood plains around Ribchester toward Preston. Downstream of the tidal limit, the River Darwen, which drains the major conurbations of Darwen and Blackburn, joins the main water body with further inflow from the River Douglas in the estuarial reach. The river then widens and flows into the Irish Sea. Major inland waterways within the catchment are the Leeds to Liverpool Canal and the Lancaster Canal both of which are recreational assets connecting the urban areas of Colne, Nelson, Blackburn and Burnley.

Historic Background: Industrial and agricultural pollution, water abstraction and sewage contamination have caused severe habitat damage to the Ribble and its tributaries. The River Calder exhibits many pollution residues e.g. mine-water discharge, contaminated land run-off and sewage discharges (RRT, 2016).

5.3 Stakeholder Contact Strategy

Catchment partnerships are identifiable groups who, together with central support personnel, will provide data, i.e. a non-probability, closed group sample, not requiring proportional population weighting (Denscombe, 2008) Sampling strategies appropriate for non-probability groups include (a) purposive, where particular individuals are selected as they are likely to provide the most valuable data, (b)

snowball where one respondent refers the researcher to further individuals, and (c) convenience where those readily to hand are sampled. Purposive sampling limitation was adopted to capture data from those individuals most involved in collaborative activity, following guidance from catchment hosts. All members of catchment partnerships who met the selection criteria were eligible and invited to participate in survey.

A questionnaire was developed to obtain data from target individuals who formed an active part of the catchment partnership stakeholder group and were identified as such by the relevant Catchment Host. To be considered an active member and not an 'interest only' member, representatives have to meet the following criteria: to have attended at least one meeting of the relevant partnership in the twelve months prior to the survey launch. This definition was introduced as the catchment host identified a number of personnel who received information but were not otherwise involved in the debate on catchment goals or delivery of activities. Where stakeholder organisation had more than one representative who had attended meetings, all those individuals were identified as 'active' and so were eligible to participate. All potential participants were contacted prior to receiving an invitation to complete the survey, following best practice principle noted by Denscome (2008), with the aim of encouraging a satisfactory response rate. General information and the outline request to participate was presented to partnership members at one of their regular meetings and agreement to participate was subsequently referenced in distributed meeting minutes to ensure all individuals, including those who were not present, were aware of the legitimacy of the survey.

All active members of the two selected river catchment partnerships were invited to complete a self-administered questionnaire. Partnership members were invited to participate in the study by individual e-mail to ensure there was no influence from others as a result of group-wide e-mail responses (Pare et al., 2013). E-mail addresses were obtained from the catchment host secretaries who acted as a gatekeeper for contact information. Copies of the word survey were e-distributed to each individual at their organisational contacts, together with an information sheet and participation consent form. The survey was distributed by e-mail during October 2014 (River Irwell) and October 2015 (River Ribble). The completed questionnaire

and consent form were requested to be returned directly to the researcher via e-mail, to comply with data protection act requirements regarding security of information and retention and ensure anonymity of responses within the catchment partnership. E-mails were sent from the researchers' university e-mail account and all e-correspondence was directed back to the same account. Follow-up e-mails chasing responses were also sent to each non-respondent separately. Where responders indicated that they did not wish to participate, no follow-up e-mails were sent. Individuals who agreed to be interviewed were also provided with an information sheet and participation consent form.

Analysis by the researcher occurred with full knowledge of the individual, their role and their organisation function within the catchment partnership; however, in published results individual responders are anonymised in line with ethical requirements.

5.4 Survey Instrument

5.4.1 Survey Instrument Design

The survey was designed as a stand-alone, single-use questionnaire consisting of factual data and semantic differential attitude rating requests, which form the basis of quantitative analysis, together with an open-ended question to capture personal views on partnership operations to provide qualitative analysis data. Open questions have been identified as a means to add richness to survey results, that cannot be achieved with closed questions, so the opportunity for responders to add their own explanatory comments as a follow-on to closed items was offered, in order to yield qualitative commentary.

To develop an understanding of the opinions and attitude of the catchment partnership members toward the working of the collaborative partnership the semantic differential rating-capture format was selected in order to permit a comparison of attitudes. There are two widely used devices: one, the Likert scale is a multi-dimensional attitude scaling method in which respondents indicate the extent of their agreement with each item on a scale (e.g., a five- or-seven-point scale). Likert scale question asked the customer to agree or disagree with, or respond neutrally to, a given statement, where the statement is defined by the researcher, so potentially

introducing bias into questionnaire. To assess the impact of both positive and negative questions, a duplicate question must be inserted, so increasing the length of the questionnaire, potentially reducing the willingness of survey participants to complete survey forms.

An alternative to Likert is the semantic differential, developed by Osgood and his associates (1957; In Friborg et al., 2006), in which the respondent is asked to indicate their rating, usually along a seven-point scale, where two polarized options are offered. The two ends of the scale are defined by pairs of adjectives with opposite meanings (e.g. take risks/cautious, etc.), so guiding the respondents without introducing question bias. Responders can express individual feelings and attitudes for nuanced perceptions. Semantic-differentials can be a very simple way to gauge what people think or feel about objects

In measuring positive psychological constructs, Likert-based response formats have been noted to sometimes introduce an acquiescence bias. To reduce this, items usually are transformed into negations of the concept. Such transformations may introduce errors, as negations of positive constructs may appear contra-intuitive. A semantic differential response format may be an alternative to negations for reducing the acquiescence bias. In work by Friborg et al. (2006), it was found that a semantic differential format may effectively reduce acquiescence bias without lowering psychometric quality.

The questions were tested via pilot with ten responders, consisting of two volunteer representatives from the catchment participants, six academics and two unconnected individuals with no knowledge of survey methods or the catchment organisations (June 2014 to September 2014). Isaac & Michael (1995) identify a sample size of 10 to 30 as sufficient for pilot study research. The range of pilot-testers facilitated a variety of responses covering the question wording – to ensure clarity of the information requested, that is top 10 rather than a ranking of all ecosystem service options; a removal of numeric marking from the semantic differential rating scale and replacement with a series of smiley faces as the choice indicator, so removing any potential bias from responders on viewing one option as ‘good’ or ‘bad’ based on a value; introduction of an Other option on organisation demographics with an associated free-form box to ensure all options were included. Feedback on question

layout and rating scales were adopted prior to the issue of the questionnaire to catchment partnership members. Those members of the partnership who participated in the pilot were offered an opportunity to resubmit utilising the amended formats.

Throughout the survey, page headings were inserted to remind responders that all the results will be anonymised and no-one will see the names of any people listed and there are no right or wrong answers to any questions. Such headings were in bold within a red box to draw responders' eyes to the content.

A copy of the survey instrument is included at Appendix B.

Analysis methods are reviewed in section 5.6.3, 5.6.4, 5.6.5 and 5.6.6

5.4.2 Survey Content

The survey consisted of seven questions in order to investigate three areas of interest: Section 1: You and Your Organisation, Section 2: Your Frequent Contacts and Section 3: Your view on Catchment Management (Appendix B).

Section 1 consisted of two questions and requested factual information covering demographics such as organisation type and knowledge of ecosystem services. Respondents were presented with a set of options and asked to choose the options representing their view by inserting a mark into the relevant check box. Organisational type options included academic, agricultural, local authority, regulatory body, river conservation, wildlife and conservation functions.

Section 2 requested contacts within the partnerships. Three data-capture questions were posed i.e. 'who do you judge to be the key people in the partnership?', 'with whom do you collaborate the most?' and 'who would you go to if you required further information on Ecosystem Services? To help respondents complete the question, a list of all the current people connected to the catchment partnership was sourced from the catchment host and included within the questionnaire. Responders were asked to provide both an individual's name and the organisation represented. Responders were able to offer up to seven nominations in the grid format provided in the survey instrument.

Section 3 explored partnership working and the awareness of the ecological services and goods provided by freshwater. To investigate partnership working and complete

Stacey's matrix, a semantic differential rating scale required responders to indicate a rating along a bipolar scale which was defined by contrasting aspects linked to collaborative working, for example, 'partners always agree on what to do' versus 'partners never agree on what to do'. To avoid any form of bias introduced by either choice of word or numeric rating along this scale, a series of smiley faces were offered as the choice indicator. The indicators were converted to a numerical value for use in analysis, with the understanding that the quantification does not imply that the distance between the categories is in fact equal (Frankfort-Nachmias & Nachmias, 1996, p258).

An open-ended question was included to allow respondents to elaborate on partnership working issues but it is acknowledged that such a question will not yield stand-alone qualitative research insights, but significantly enhance the insights gained from the quantitative studies through enriching main concepts (Jackson & Trochim, 2002).

Responders were asked to identify various dimensions of riverine ecological goods and services important to themselves. A list of riverine goods and services taken from the MA assessment reports (2003, 2005a, 2005b), which covered provision, regulation and cultural aspects, was provided. The list was presented in alphabetical order to remove any bias in the ordering and responders requested to identify the top ten attributes most important to themselves.

5.5 Semi-structured Interview

Key members of the catchment partnerships and UK catchment support personnel have privileged information relating to the internal relationships between catchment partners and their influence on partner working development. As such, they are key people who can add further insight to issues impacting catchment management development. A one-to-one, semi-structured interview method was adopted as this enables the gathering of views and experiences of catchment management yet allows the researcher to direct the conversation to those areas under investigation without leading the interview. Face to face contact was preferred, but where this was not feasible due to either distance or availability, phone-based interviews were conducted. Face to face interviews varied between 20 minutes to a maximum of one

hour, with phone interview lasting one hour. Interview participants were drawn from the key roles and structures found in the studied partnerships viz:

Catchment Host (1 interviewee)

Key Bridging Link (1 interviewee)

Catchment Co-ordinator (1 interviewee)

Key Support Personnel (2 interviewees)

Prior to posing the pre-prepared questions, the interviewee was provided with an overview of the reason for the interview, the intended use of the data, and the confidentiality and anonymity rationale. Interviewees were requested to complete the participation consent forms prior to the interview commencing. It was explained that written notes would be taken during the interview. Initial background questions were asked to set the interviewee at ease and the structured questioning commenced with the main question:

Q: Can you tell me about your experience of working with the catchment based approach?

Additional questions were posed, guided by the role and context of the interviewee. The following list covers the supplementary questions but were not asked of every participant:

Q: What is the view from a UK perspective?

Q: How is your partnership organised?

Q: Who are the stakeholders?

Q: How does the partnership deliver activities?

Q: What is central role in all this?

Q: What is the scale of activity?

Q: How is the partnership developing?

Q: What was the model when first thought of – is it as it is now?

Q: Who's moving from young into mature status?

Q: What may help up skill younger partnerships?

Q: Do you see risk influencing CaBA development?

Q: Is there a lead organisation coming to the fore?

Q: Are there links to other strategic initiatives within the partnership?

Q: Is there a specific value in the catchment host role?

Q: Which aspects give rise to complaints?

Q: What makes CaBA progress from bad to good?

Clarifying, probing questions were used to gain more in-depth answers or to follow-up on points of interest, where this did not interrupt the flow of the conversation. For example:

Q: Can you expand on this a little?

Q: Can you tell me anything else?

Q: Can you give me some examples?

Hand-written notes were typed within 48 hours of the interview, and copies issued to participants for validation where requested.

5.6 Analysis

There are three main area of analysis

a) assessing the WFD/system stewardship model against the theoretical implementation policy typologies identified by Matland (1995) through documentary comparison to *a priori* categories
b) identifying the ecosystem services present in the catchment, historic and current, through documentary retrieval and interpretation to *a priori* categories
c) in-depth investigation into the collaborative catchment partnership working through quantitative data analysis from survey, supported by qualitative commentary analysis to *a priori* categories

5.6.1 Policy Typology Assessment

To explore the EU and UK approach to the Water Framework Directive, Matland's implementation analysis tool (Matland, 1995) was applied to the UK catchment based approach model. Statutory documents were examined to align the WFD UK

mechanism to any of the four aspects of Matland's framework identified in Chapter 2; the key aspects related to each of the four typologies are detailed in Table 5.1.

Documents were searched for through generic web-search engines to cover statutory documents and through SCOPUS academic publication search engines to retrieve any papers specifically studying WFD, UK England & Wales catchment studies. Documents retrieved included the WFD Directive and Annexes, UK DEFRA CaBA Policy documents and academic papers specifically relating to policy implementation review.

A grid containing the aspects which Matland (1995) identified as pertinent to each of the implementation typology was constructed prior to population (Table 5.1). The retrieved documents were read and re-read, and critical aspects relating to the flow of information, participant inclusion, support structures and direction setting mechanisms were identified and placed in the typology grid as present (tick indicator) or absent (cross indicator). The allocation of a specific aspect was not restricted to one typology. Results are presented in the following chapter (section 6.1).

Table 5.1: Matland's Implementation Typology – key factors. (source: Matland, 1995)

Implementation Typology	**Criteria**	**Presence (Y/N)**
Administrative - 'outcomes are determined by resources'	a public administration top-down model	
	the desired policy and information flows from the top-down in an ordered hierarchical manner	
	an over-riding central authority has information, resources and capabilities	
	policy is spelled out explicitly at each level	
	clear responsibilities and tasks are allocated	
	actors are stable across time	
	standard, uniform operating procedures are developed at the lower levels	
	there is an existing technology to deal with the policy implementation	
	sets of rules exist on deployment and procurement	
Political – 'outcomes are decided by power'	over-riding power of the policy maker is supported by judicial review and non-compliance is identifiable	
	actor(s) have sufficient power to force their will on other participants	
	bargaining is necessary to reach agreements through either coercion or remunerative mechanisms	
	different actors to those who produced the overall policy participate in implementation	
	polices are not decided at the lower level	
	policy contains ambiguous language which is resolved as actions	

Implementation Typology	Criteria	Presence (Y/N)
	occur	
	low ambiguity at all implementation levels	
	requires the compliance of actors who control resources essential to the achievement of the policy aims	
	protracted negotiations are common where implementing actors are not in a hierarchical (direct line) relationship to the policy maker	
Symbolic – 'local level actors control the available resources and determine the outcome'	there is competition between actors who have a vested interest in a key aspect and who wish to define the policy in their terms	
	context conditions at each site influence the strength of competing views	
	different coalitions of parties may result at each site	
	outcomes may vary across sites	
	protracted conflict resolution processes common	
	ambiguity in the policy aim or goal	
	professional actors may act as lynch-pins to the differing points of view	
	coalition occurs at the lower level, not at the initial policy definition stage	
	policy definition occurs at the lower level and there is no compliance control	
	a strong political negotiation aspect	
Experimental 'emphasis on the opportunities available to diverse local-level actors'	broad variations in outcomes	
	ambiguous goals due to differing preferences among the actors	
	no pre-defined technology	
	variable participation between the actors	
	actors participate where they are in agreement with the policy aims but possess different views as to how such aims are to be achieved	
	delivery programmes vary from site to site	
	opportunities exist for those actors who have strong interests, and available resources, to shape policy deliverables to their agenda	
	agendas may be left unchallenged	
	policy has a clear goal, evaluation against those goals is achievable	
	where such goals are lacking, evaluation of the process and the way outcomes are achieved provide valuable information	
	Policies with clear and widely supported goals but with no clear means of implementation	
	the programme may become more structured over time, as information on the processes adopted and outcome delivery is gathered.	

5.6.2 Ecosystem Service Assessment

Grey literature, that is. literature produced by government, academics, business and industry but which is not controlled by commercial publishers nor formally published in academic sources, is an extensive, often complex, source of information (Godin et al., 2015). There are some challenges with applying systematic search methods to

the grey literature, due to a lack of standards and resources for how to complete these searches and characteristics of the grey literature: grey literature searches are often not as systematic at traditional searches of academic literature as information may be held in reports, books, fact sheets, websites and policy documents, commonly published on internet websites (Godin et al, 2015). A grey literature search plan includes consultation with contact experts to inform searches of grey literature data bases, Google searches and targeted websites (Godin et al, 2015). Such a search plan was adopted (Figure 6.3) to identify which of the ecosystem services are valued by society over time. Initial contact with the Director of the Greater Manchester Archaeological Advisory Service and a Professor of Ecology, identified key publications covering the selected catchments. These publications were supported by a structed Google search restricted to the geography under investigation to identify those on-line sources (e-book and web-page) which contained histories of the areas under study, plus targeted web searches on historic document repositories of public debates which referenced the rivers. Publications were reviewed to identify temporal changes in the social valuation of an ecosystem and the ecosystem goods or benefits provided, following the process identified by James et al., (2016). The advantage of this approach is that the temporal change across the catchment aids stakeholder awareness of both the interconnectedness of ecosystem services and speed of change. The output provides a synopsis of services rather than an in-depth study of a particular facet.

Prior to applying this identification method to the entire catchment geography, a preliminary study was undertaken relating to a specific stretch of a well-documented river: extant mapping produced during the eighteenth, nineteenth and twentieth centuries, provided basic reference material against which qualitative content analysis of published narrative histories could be compared, so identifying the interplay of ecosystem service values within documentary records.

Each narrative was examined in detail and a note made in Excel of any record which referenced a freshwater ecosystem service as identified in Table 2.1. The year and short description were entered. Data were examined to ascertain whether each noted event was an ecosystem service or disservice and positive or negative code indicator (🡅 or 🡇 respectively) were included in the summary excel file. A positive factor was

assigned if the event represented the service as a benefit, for example a flood event is a positive example of the moderation of extreme flow rates, and a negative factor was assigned if the event represented a reduction in the capacity of the river to deliver a service, for example pollution reduces the capacity to provide clean drinking water for human use. Cultural ecosystem services were categorised as Recreational (R) – includes events identified as leisure and/or social benefits, Cognitive (C) – includes events which offer financial and/or industrial benefits or Governance (G) – includes events which deliver governance and / or infrastructure benefits.

Columns available for population in the excel sheet are:-

YEAR	
EVENT	
ECOSYSTEM SERVICE:	Food – nutrition source for human (fish, waterfowl). Food – nutrition source for animal. Drinking Water – human use. Drinking Water – animal use. Clean Water – agricultural use, irrigation. Clean Water – provision of habitat supporting biodiversity. Non-Drinking Water Use – resource for washing, industrial processes. Non-Drinking Water Use – resource for mechanical power (water). Non-Drinking Water Use – resource for mechanical power (steam). Fibres & Timber – biomass power source, fuel supply. Fibres & Timber – food source for animal based power. Bio-medicinal – products used in healthcare, medicinal uses. Water Purification – waste water cleansing – dilution service. Water Purification – waste water cleansing – biotic waste assimilation. Water Purification – waste water cleansing – reed beds, wetland filtration. Water Flow – mediation of flow, stable liquid flow rate and patterns. Water Flow – moderation of extreme flow rate. Erosion Regulation – moderation of destructive flow rates. Pest Regulation – control of invasive species. Habitat & Gene Pool – lifecycle requirement (pollination, nursery, dispersal). Recreation – physical interactions, experiential opportunities, connectivity. Knowledge & Skill development – cognitive opportunities derived from riverine existence Bequest – governance to ensure resource passed to descendants Bequest – existence, sense of place, appreciative values

Earlier research has identified the application of a ‘dependency’ factor when analysing socio-cultural aspects of water-related use (Feyzi et al., 2011), therefore, each entry was re-read to ascertain whether the activity was totally dependent upon the ecosystem, utilised a key aspect, or was independent of the ecosystem and a Yes or No indicator for each aspect was made in the Excel file. The result of this process was to identify and select only those events either dependent upon, or utilising a key aspect, of the freshwater ecosystem for inclusion in further analysis. Where differing narratives reported the same event, for example a flood, duplicates were removed.

No assessment was made by the researcher as to the magnitude of an impact, for example the level of flood destruction, as the focus of the exercise is to report the occurrence of an ecosystem service without including a subjective reporting bias; disservice events, for example, flooding, are more commonly found in reporting material than service events, for example, provision of clean drinking water, which is taken for granted by urban populations. Such a bias was not captured as it is the occurrence in which the researcher is interested, not the scale of any given occurrence. Future research could address this opportunity to assess the scale and impact of specific ecosystem service records.

Following ecosystem service identification, the file was sorted by year to order those events into temporal periods of pre-industrial revolution, early industrial revolution, high industrialisation and post-industrialisation: this temporal classification was reviewed with a senior archaeologist as part of the evaluation exercise prior to completion of the catchment-wide review. Simple bar charts were produced in Excel which report the count of positive and negative impact events by ecosystem service category (provisioning, regulating or cultural), within each development period. Results are presented in the following chapter.

The evaluation exercise results were reviewed by an expert ecologist with knowledge of the selected stretch and by an archaeological expert to validate the approach. The expert ecologist offered insight on the use and value of urban rivers to assist ecosystem service classification; the archaeologist challenged the identification of ecosystem services which were not clearly linked to river-side developments and

suggestions on ordering the ecosystem services within specific historic develop time-frames (e.g. pre-, early, high, post-industrial) were incorporated into the final report.

Post evaluation, documents were again retrieved from grey/library sources following the previous search method, now identifying those publications which contained information on the whole catchment geography. The ecosystem service identification exercise was repeated, with data captured in excel files, comparison drawn to *a priori* ecosystem services and disservices, events consolidated into pre-, early, high and post- industrial temporal periods, data counts charted in excel (simple bar charts) and results reported in the following chapter.

The results of both the evaluation exercise and catchment ecosystem temporal change are reported in the following chapter.

5.6.3 Stakeholder Analysis

Attribute Data

Attribute data about each respondent was captured. Respondents were asked to identify which functional group their organisation belonged: options included academic, agricultural, local authority, regulatory body, river conservation and wildlife conservation. Data were summarised in a simple Excel table to identify stakeholder diversity: one mark was entered in the appropriate functional group row to enable a simple count of participant diversity. Further self-assessment data were captured relating to respondents' knowledge of ecosystem service terms and use: options ranged from 'never heard of the term' to 'fully understand the nuances of the term and frequently use the term in written work' and similarly summarised in an excel table.

Stakeholder Mapping

To identify those stakeholders who have greatest interest and power, Mendelow's matrix (Kaplan, 2012) was completed based on the following criteria: levels of financial investment, delivery of statutory requirements, social influence, environmental leadership and level of involvement in riverine actions. Information was sourced from catchment actor records and information gathered by the researcher at catchment meetings where discussions occurred regarding current and planned activity in the catchment, the launch of funding opportunities, for example,

those offered by the EA and water companies, and new approaches to resolve the issues affecting water quality, for example run-off prevention projects. The criteria were weighted based on stakeholder contribution to the delivery of catchment partnership goals and the ability of the stakeholder to influence outcomes (Table 5.2). Interest and Power values were consolidated and stakeholders identified as a high, medium or low interest and power actor, before mapping to Mendelow's Matrix. Results are presented in the following chapter.

Table 5.2 Stakeholder mapping weighted criteria.

Mapping	Criteria	Weighting (points)
Interest (I1)	Active involvement in riverine work	3
Interest (I2)	Active involvement in wider environmental work	2
Interest (I3)	Active involvement in non-environmental work	1
Power (P1)	Financial investment in water improvement direct work	2
Power (P2)	Funding body for water improvement work	2
Power (P3)	General funder of wider environmental work	1
Power (P4)	Leadership of environmental group	2
Power (P5)	Leadership of non-environmental group	0
Power (P6)	Social influencer- environmental actions	2
Power (P7)	Social influencer – non-environmental actions	0

Ecosystem Service Prioritisation

Partner responses were consolidated in excel to provide a simple summation of the most commonly reported ecosystem services which are considered important to the responders. Each nomination was allocated one point to allow identification by simple summation of the most frequently reported 'important' ecosystem services within each catchment-actor group. Each catchment was separately consolidated to enable a comparison between the two partnerships.

Data were cross-referenced to the sociograms to explore prominent and influential actor attributes.

5.6.4 Social Network Analysis

Social network analysis (SNA) is noted to be a valuable, albeit challenging, research method to examine the patterns of relationships beyond that of a purely hierarchical-driven aspect (Ward & Butler, 2016).

The structure of the network may be described from both the perspective of an individual's placement within that network and also from a structural whole-network view (Hanneman & Riddle, 2005). For this study, all relationships are presented as directed, that is in visualisations with a pictorial arrow indicator identifying where one actor (the source) reports a relationship with another actor (the receiver). Where two actors report a mutual tie, that is, two directed relationships between themselves, both are included in the analysis (Hanneman & Riddle, 2005).

SNA measurement method: Data matrices were constructed to identify how catchment partners interact. Questionnaire responses were transferred to binary data grids (matrices) created in excel. Where an individual has a relationship with another, this is represented in the matrix by 1, where no relationship is reported a 0 is inserted in the matrix. The matrix must be symmetrical, so where an individual is shown to be 'nominated' a corresponding entry showed the individual as a 'responder' even if no survey response had been received. In such cases, all 'responder' relationships were represented by 0. Responders were identified by code numbers: all names were removed to comply with anonymity requirements in published analysis.

Completed matrices were imported to the SNA software package Ucinet for Windows with NetDraw facility, version 6.528 (Borgatti et al., 2002), which was used to analyse responses in whole network, one-mode format following the instruction manual published on-line by Hanneman and Riddle (2005). The software was downloaded from Analytic Technologies at https://ucinetsoftware/pricing-and-licensing-information, October 2014. Input formats and statistical calculations were performed following the instructions contained in Ucinet6 on-line instruction manual (Hanneman & Riddle, 2005). Cliques were identified and density, centralisation (Freemans node betweenness) and both Freeman's in-degree centrality (indicator of prominence) and out-degree centrality (indicator of influence) calculated, using Ucinet functions (Version 6.528).

Network Comparisons were performed between the Key Personnel network and the Collaborative partners networks for each of the examined partnerships, to answer the question: are collaborating partners also key partners? To test the probability of a tie in one network also existing in the alternative network, i.e. whether a tie between two

particular actors is replicated in the alternative network, Jaccard's coefficient (measure of similarity) suitable for asymmetric, binary data was performed in UCINET 6 (Hanneman & Riddle, 2005). The measure ranges from 0 to 1 and the similarity coefficient gives the proportion of agreement between the collaborative matrix and the key people matrix for the Irwell catchment partnership. Quadratic assignment procedure (QAP) was used to determine whether each Jaccard similarity coefficient was significantly larger than expected by chance. Network comparisons were obtained by constructing matched, symmetrical data matrices which contained all responders for the selected networks.

Sociograms obtained via NetDraw facility identified those partners most central to the network, reported by the size of the partner node (eigenvector centrality value). Both mutual connection ties (red line), i.e. those where both responders identified the other as a key collaborative partner, and also asymmetric ties (blue line), that is, those where one responder identified a link to another collaborative partner but there is no corresponding returning tie, are displayed using NetDraw functions (version 6.528). Example figure at 5.2.

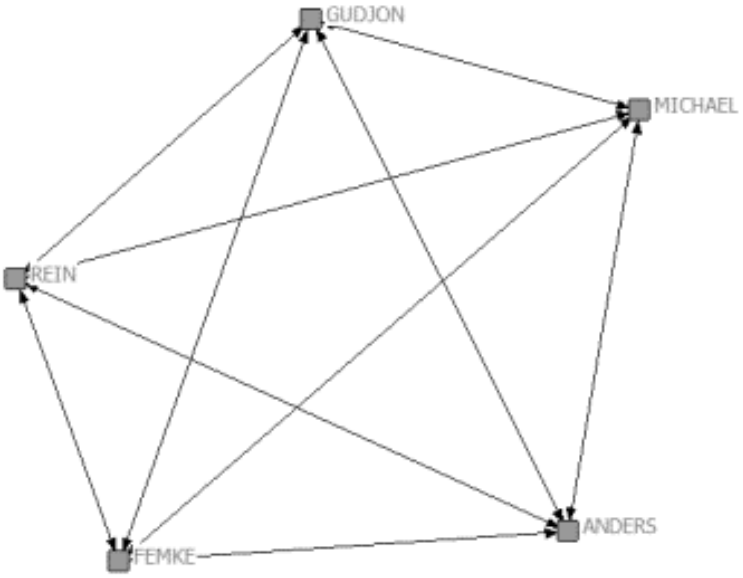


Figure 5.2 Example sociogram identifying relationships between individuals (source:learningonlinepublishing).

To enable social network analysis, the rule of thumb is to seek a response rate >75% (Borgatti et al., 2006). Where response rates fall below this level, social network analysis measures such as in-degree centralisation and simple eigenvector may be used as they are robust at lower sample sizes: Costenbader and Valente (2003) found at a 40% sample rate, simple eigenvector and in-degree centrality measures achieved >90% correlation to the total sample measurement. Simple eigenvector is thus the main analysis measure presented in the result sociograms and in-degree centrality used to investigate prominence. The problem of non-respondents may also be treated by including all network member data and using pre-specified conditions for members with missing data. The non-response effect is reduced by including incoming ties to the non-respondent which have been provided by survey respondents in the analysis and captured in Excel summaries, otherwise known as available-case analysis (Stork & Richards, 1992). Thus, partners who have not responded are not unrepresented in the network analysis, the implicit knowledge generated from other personal interactions is drawn upon to represent their position (Ward & Butler, 2016). Bernela and Levy (2017) explored the impact of adjusting for non-respondents when their survey only achieved a 39% response rate and found no significant difference in the density measure when missing respondent data is taken as zero and compared to the theoretical complete measure. Both incoming ties and zero non-respondent values are the conditions applied to missing data adopted in the analysis contained in the following chapter.

5.6.5 Risk / Trust / Agreement to Act Analysis

The relevant survey section consisted of eight questions which investigated factors which influence the ability of a group to come to an agreement to act. All questions recorded a response across both groups of respondents, there were no partially completed questions returned and the extremes of the value ratings were used by at least one respondent.

Excel was used to manually code the Likert-scale respondent answers into numerical values in order to enable further statistical analysis (Fink, 1995). Values of 1 were allocated to the most agreement orientated responses, with 7 allocated to the least agreement orientated responses. Data for both catchment partnerships were consolidated in excel and input as a single file into SPSS (V20) to test for sampling

adequacy, principal component analysis, factor analysis, factor reliability and non-parametric tests for correlation and difference: details follow. To identify the components. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy represents 'the ratio of the squared correlation between variables to the squared partial correlation between variables' (Field, 2009 p647) and Kaiser (1974, In Field, 2009) recommends accepting values ≥0.5; values between 0.5 and 0.7 are in the acceptable range, with >0.7 classed as 'good'. Prior to completing full analysis, factor analysis was run to reduce the complexity in the data set and identify the principal components within the survey instrument. Principal component analysis establishes whether clusters of similar types of responses exist within the data and how a particular variable (question) contributes to that component (Field, 2009). The validity of the extracted dimensions (reliability analysis) was examined using Cronbach's alpha estimate (SPSS V20). Bartlett's test examined the independence of variables and whether correlation between variables existed. If Bartlett's test is significantly different from zero, correlation exists (Field, 2009). Complexity theory suggests correlation exists between the levels of agreement and certainty, consequently, theory drove the choice of direct oblimin oblique rotation in the factor analysis, in order to maximise the loading of each variable on one of the extracted factors (Field, 2009). Maximum iteration for convergence was set at 50. No data were missing. As the data were ordinal, non-parametric frequency analysis and non-parametric tests for correlation and difference between the two partnerships under investigation were undertaken (SPSS V20).

5.6.6 Qualitative Analysis

Responses to the open-ended evaluation question and semi-structured interviews were transferred to a word summary file and saved in tabular form with sources anonymised before further analysis.

Litchman (2013) states the goal of analysing text and words, collected from research participants, is to arrive at common themes through a process of organising and categorising data. There are two approaches to the analysis of qualitative data and identification of themes; the inductive approach and the deductive approach (Thomas, 2006). Inductive analysis is often referred to as bottom-up and deductive as top-down (Braun & Clarke, 2006). Inductive analysis requires a detailed reading

of raw data to derive concepts, themes or models through interpretations which the researcher makes from the raw data, that is, a study is exploratory, there may be little theory to inform the researcher and there is no pre-existing coding frame (Braun & Clarke, 2006; Frankfort-Nachmias & Nachmias, 1996; Thomas, 2006). The alternative approach of deductive analysis allows researchers to use theory to construct response categories (Frankfort-Nachmias & Nachmias, 1996).

Table 5.3 Qualitative content analysis *a priori* codes and categories developed from the literature review.

Theme	Category	Developed Code	Literature Review Pre-conceived Code
Issues in Catchment Partnerships	Competition within Catchment Partnership	Financial opportunity	Economic funding uncertainty Incentives
		Resource restriction	Cost effective
		External policies	Return on investment Payment for ecosystem services
	Leadership of Catchment Partnership	Championing	Management structure Governance structures
		Prioritisation	Leadership Stakeholder views flexibility
		Relationships	Politics Exclusion Lack of trust Interaction Domination Cliques Avoidance Responsibilities Communication
		Own resources	Commitment Collaborative process
		Financial support (for CP)	Economic supportive costs
		Scale	Legal boundaries, scale
	Knowledge of Catchment Partnership	Measurement	Measures monitoring
		Sharing Data	sharing
		Modelling	Methodologies standards
		Own Awareness/Knowledge	Multiple stakeholders

A qualitative, deductive framework (Gale et al., 2013) was constructed from the political, economic and social aspects derived from the literature (section 2.2, 2.3,

2.4) which have been reported to influence policy implementation in the natural resource area, providing insights to the data gained from the quantitative study (Jackson and Trochim, 2002): the code-theme relationships are identified in Table 5.3. The responses were read several times before coding commenced.

After coding was completed, the data were examined to consider how different codes combine to form the overarching derived code and theme, where each theme is meaningful to the data codes and there are identifiable distinctions between the themes. A strong measure of reliability and thus quality assurance of the coding scheme is to examine whether others can interpret the data by coding in the same manner (Schreier, 2012, p169).

Intercoder reliability was established by independent coding by an individual not engaged with the project: 98% agreement was obtained. Consequently, it is concluded that the conceptual framework achieves reliability for further analysis.

The following chapter presents the survey participation result, reports the macro-level policy paradigm investigation, the temporal ecosystem service change within each catchment and the micro-level catchment team analyses which compare and contrast the stakeholder key participants and diversity of approach to action.

CHAPTER 6 RESULTS

This chapter commences with the results of the macro-level policy paradigm investigation, then reports the ecosystem (dis)services present within the catchment and partnership priorities, concluding with the comparison of the micro-level catchment team analyses. The results presented in this chapter provide the data to evaluate critically and answer the questions identified regarding ecosystem service focus, influential participants and individual approaches to action.

The EU legal system consists of two forms of legislation: regulations which apply to the whole EU immediately they are adopted into EU law, and directives which have to be converted by Member State parliaments in to national law. Directives permit member states to decide how they will achieve the aims, contained in the directive, to deliver a common standard throughout EU. The Water Framework Directive (Figure 6.1) falls into this latter category and the flow diagram is constructed following examination of the narrative directives.

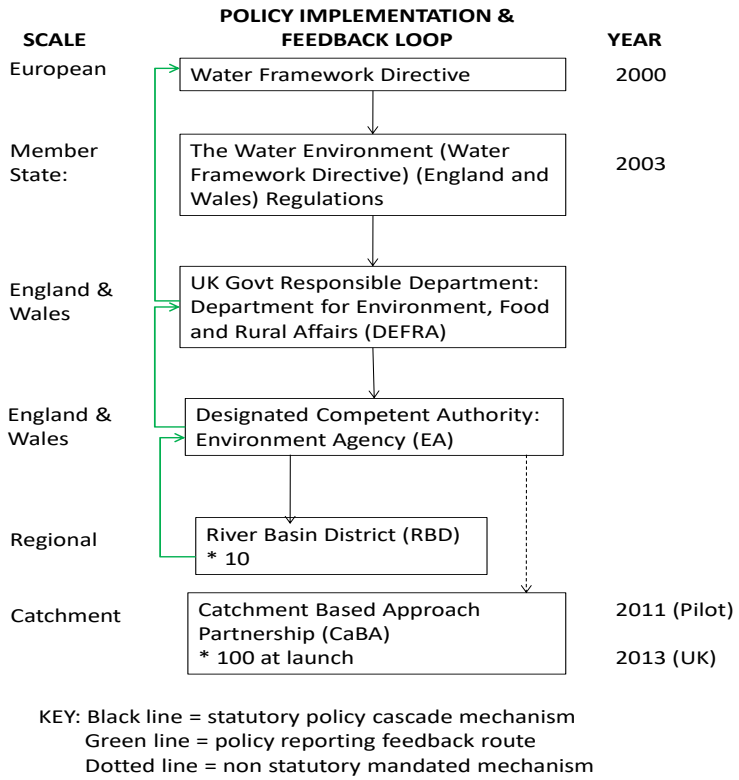


Figure 6.1: Water Framework Directive policy implementation mechanism: timeline, scale of responsibility and statutory feedback loop. (Author's own, 2018, unpublished).

6.1 Macro-level Policy Paradigm: Placing WFD in the Ambiguity-Conflict Framework

The WFD implementation structure as adopted in England and Wales is critically evaluated against Matland's model (1995), (Table 5.1), to determine whether WFD implementation is a fit to any of the four model paradigms (section 5.6.1): where a documentary source, for example, WFD or UK catchment directives or UK catchment review documents, contained a phrase or statement which could be matched to the typological criteria, a tick was placed in the relevant box. The typology criteria are reported in Tables 6.1 to 6.4, followed by explanatory comments.

Table 6.1: Evaluation of UK WFD implementation mechanism to Administrative Implementation typology. Typology criteria extracted from Matland (1995). Presence of a phrase or statement in WFD or England & Wales Catchment management directives / documents which could be matched to the typological criteria is registered by tick. (Author's own, 2018, unpublished).

Implementation Typology	**Criteria**	**Presence (Y/N)**
Administrative - 'outcomes are determined by resources'	a public administration only, top-down model	✗
	the desired policy and information flows from the top-down in an ordered hierarchical manner	✓
	an over-riding central authority has information, resources and capabilities	✗
	policy is spelled out explicitly at each level	✓
	clear responsibilities and tasks are allocated	✓
	actors are stable across time	✗
	standard, uniform operating procedures are developed at the lower levels	✗
	there is an existing technology to deal with the policy implementation	✗
	sets of rules exist on deployment and procurement	✗

~ The Water Framework Directive is outlined at the EU level and contains clear goals and objectives. However, by enacting the Directive within each member state, the means of implementing are variable, depending upon existing national structures which may or may not be readily adaptable. Consequently, WFD implementation is

not delivered in a standard or uniform manner and technologies for dealing with reporting requirements are lacking, as may be seen by the difficulties some member states have in complying with initial adoption (Jager et al., 2016). Thus, it may be argued, WFD implementation is not comparable to the administrative implementation paradigm.

Table 6.2: Evaluation of UK WFD implementation mechanism to Political Implementation typology. Typology criteria extracted from Matland (1995). Presence of a phrase or statement in WFD or England & Wales Catchment management directives / documents which could be matched to the typological criteria is registered by tick. (Author's own, 2018, unpublished).

Implementation Typology	**Criteria**	**Presence (Y/N)**
Political – 'outcomes are decided by power'	over-riding power of the policy maker is supported by judicial review and non-compliance is identifiable	✓
	actor(s) have sufficient power to force their will on other participants	✓
	bargaining is necessary to reach agreements through either coercion or remunerative mechanisms	✓
	different actors to those who produced the overall policy participate in implementation	✓
	polices are not decided at the lower level	✗
	policy contains ambiguous language which is resolved as actions occur	✓
	low ambiguity at all implementation levels	✗
	requires the compliance of actors who control resources essential to the achievement of the policy aims	✓
	protracted negotiations are common where implementing actors are not in a hierarchical (direct line) relationship to the policy maker	✓

~ WFD implementation has some aspects that are comparable to the political implementation model, that is, the overriding requirement is led by the EU which member states were directed to adopt by 2003. Compliance of the member states was monitored and future compliance standards are expressly stated in the WFD. However, the local conditions within each member state vary and there is no standard delivery model for all states. Within each state, compliance is achieved by relevant legislation, which in the case of UK Government (England & Wales) complies with the specified EU directive implementation and management structure, that is, there is a hierarchical responsibility line from a UK Government department

(DEFRA) to the river board level. However, the introduction of the non-statutory catchment partnership approach, which is context dependent, has introduced a highly flexible delivery mechanism in the local situation, a characteristic of bottom-up models. Thus, WFD implementation in England & Wales is found to mirror the political implementation model to the river basin level, but not to the catchment, i.e. street level actor, level.

Table 6.3: Evaluation of UK WFD implementation mechanism to Symbolic Implementation typology. Typology criteria extracted from Matland (1995). Presence of a phrase or statement in WFD or England & Wales Catchment management directives / documents which could be matched to the typological criteria is registered by tick. (Author's own, 2018, unpublished).

Implementation Typology	**Criteria**	**Presence (Y/N)**
Symbolic – 'local level actors control the available resources and determine the outcome'	there is competition between actors who have a vested interest in a key aspect and who wish to define the policy in their terms	✗
	context conditions at each site influence the strength of competing views	✓
	different coalitions of parties may result at each site	✓
	outcomes may vary across sites	✓
	protracted conflict resolution processes common	✓
	ambiguity in the policy aim or goal	✗
	professional actors may act as lynch-pins to the differing points of view	✓
	coalition occurs at the lower level, not at the initial policy definition stage	✓
	policy definition occurs at the lower level and there is no compliance control	✗
	a strong political negotiation aspect	✗

~ The WFD is clearly defined at the EU level with measures, goals and timelines also confirmed in member state implementation legislature, thus a re-imagining of the policy at the local street-actor level is not sanctioned.

Table 6.4: Evaluation of UK WFD implementation mechanism to Experimental Implementation typology. Typology criteria extracted from Matland (1995). Presence of a phrase or statement in WFD or England & Wales Catchment management directives / documents which could be matched to the typological criteria is registered by tick. (Author's own, 2018, unpublished).

Implementation Typology	**Criteria**	**Presence (Y/N)**
Experimental 'emphasis on the opportunities available to diverse local-level actors'	broad variations in outcomes	✓
	ambiguous goals due to differing preferences among the actors	✓
	no pre-defined technology	✓
	variable participation between the actors	✓
	actors participate where they are in agreement with the policy aims but possess different views as to how such aims are to be achieved	✓
	delivery programmes vary from site to site	✓
	opportunities exist for those actors who have strong interests, and available resources, to shape policy deliverables to their agenda	✓
	agendas may be left unchallenged	✓
	policy has a clear goal, evaluation against those goals is achievable	✓
	where such goals are lacking, evaluation of the process and the way outcomes are achieved provide valuable information	✓
	Policies with clear and widely supported goals but with no clear means of implementation	✓
	the programme may become more structured over time, as information on the processes adopted and outcome delivery is gathered.	✓

~ The central principal is 'contextual conditions dominate the process' (Matland, 1995) and outcomes depend largely on which actors are active and most involved at the lower levels. WFD implementation in England and Wales at the catchment level has a strong alignment to the experimental implementation framework. As a non-statutory delivery model, the catchment partnerships have an overall aim to support WFD goals but are free to produce programmes which suit their local context (DEFRA, 2013). However, the formal EU-level reporting mechanism is via river basin plans focussed on water quality, and consequently the gathering of information on the catchment based approach implementation processes and achievements sits

outside of the public legislative process. Support for catchment partnerships and capacity development sits with a separate body – the catchment support team. Catchment plans (where they exist) do not have to comply with any set form or content *[DEFRA] are not requiring the production of a formal catchment plan … set out their priorities in a way that is meaningful for them* (DEFRA, 2013, p15) and opportunities for local actors to dominate and drive local actions are prevalent. There is also an implicit assumption that the participants have similar approaches to risk and agreement to act: competing positions are likely to arise, so impacting implementation processes.

6.2 Ecosystem Services

6.2.1 Actor EsS Awareness & Valuation

Catchment partners self-reported their knowledge of ecosystem services. Responses ranged from 'never heard of the term' to 'fully understand the nuances of the term and frequently use the term in written work'. Respondents provided an evaluation and all ranges of the scale were used (Figure 6.2).

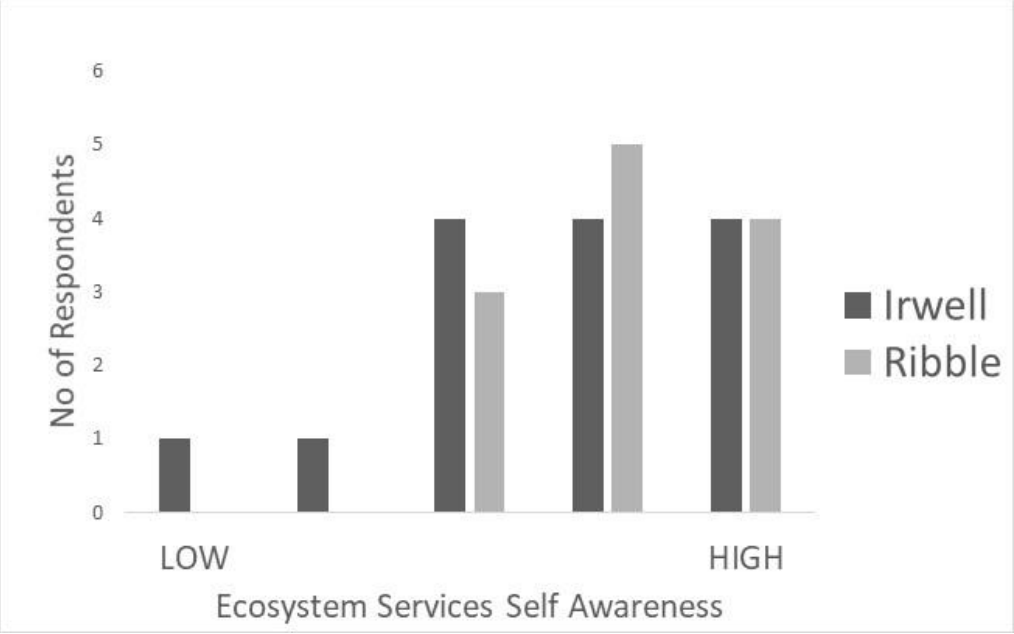


Figure 6.2: Ecosystem services self-evaluation as reported by Ribble and Irwell catchment partners.

Respondents from the Irwell partnership reported the greatest range of knowledge awareness, from 'never heard of the term' to 'fully understand the nuances of the term'. Members of the Ribble partnership ranged from 'comfortable with the

meaning' to 'fully understand'. The majority of the responders categorised themselves 'know how to use the term in conversation and able to respond to questions'.

Aspects of provisioning, regulating and cultural ecosystem services relating to freshwater, as defined by MA (2003, 2005a, 2005b), are noted to be important by catchment partners. Both catchment partnership members report the retention of the river as an asset for future generations and the provision of clean water as a habitat for plants and animals, as the most important ecosystem services (Table 6.5).

The Irwell partnership report a higher count of importance for recreational use of the River, together with an increased sense of place through appreciation of the history of the river and its buildings, than the Ribble catchment partners. The Ribble catchment partners report a higher importance for the provision of drinking water for human ecosystem benefit than the Irwell partnership.

Table 6.5 Catchment Partners Ecosystem Services Priority Goals as identified by catchment partners. Values are the count of responders identifying the ecosystem service as important to themselves.

Ecosystem Classification (P-Provision/ R-Regulating/ C-Cultural)	**Ecosystem Services**	**Irwell CP**	**Ribble CP**
P	Clean water provides habitats for animals and plants	13	11
P	Seasonal, natural variations in flow provide a range of habitats	10	8
P	Provides drinking water source for humans	2	7
P	Provides a habitat supporting young stages of biotic life cycles	11	6
P	Provides a transportation link for species	8	6
P	Provides drinking water source for animals	1	5
P	Provides a food source for animals	7	3
R	Moderates floods, retaining water on flood plain	11	6
R	Natural landscape erosion & deposition mechanism	5	5
C	An asset to be retained for future generations	13	10
C	Provides recreation opportunities	13	6
C	The history of the river and its buildings adds to an individual's sense of place and pride in their area.	12	6
C	A reflective and spiritual asset	7	4
C	Inspires and drives local population culture	5	3

6.2.2 Temporal Ecosystem Change within Catchments

Prior to reporting the temporal change and ecosystem service focus of the selected catchments, the result of the specific case study undertaken to assess the application of the narrative temporal ecosystem service approach is first presented.

i) Evaluating the approach to identifying Temporal Ecosystem Services Change

The collection and analysis of multi-dimensional, historical narrative data relating to freshwater ecosystem services within an urbanised area was undertaken in conjunction with GM Archaeology Unit. The results of this investigation were presented at UK conference and subsequently peer-reviewed and published May 2016 (James et al, 2016). Copyright is retained by contributing authors in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988 (Francis et al., 2016, *frontispiece*) and so material presented for publication is also reported in this thesis.

Evaluation Study: Location & Result

The River Irwell and its tributaries flow from the moors north and east of Manchester, through major urban conurbations of Bolton, Bury, Rochdale, Oldham and Salford to the Manchester Ship Canal, merging into the Mersey River Basin (James et al., 2012). The study area focussed on a 3.8km section of the River Irwell, running southwest from Wallness Bridge (53:29:39N, 02:16:13W), through the City of Salford to Victoria Bridge (53:29:06N, 02:14:46W). The section of the river under study has been formally recorded since 1794, in Green's map of Manchester and Salford.

A flow chart of the phases of the document review (see 5.6.2) and identification of relevant records is shown at Figure 6.3. Publications examined included published histories by Bracegirdle (1973) and Corbett (1907), websites containing records of government proceedings (e.g. Greenwood, 1950), websites retrieved by customised geographic search which returned several relevant on-line records (e.g., Bergin et al., 1989; Cooper, 2005; Dobkin, 1990; Greater Manchester Archaeological Unit, 1993; Manchester City Council [MCC], 2012; Nevell, 2008; Williams et al., 2010) in addition to items recorded in general news channels such as the BBC on-line.

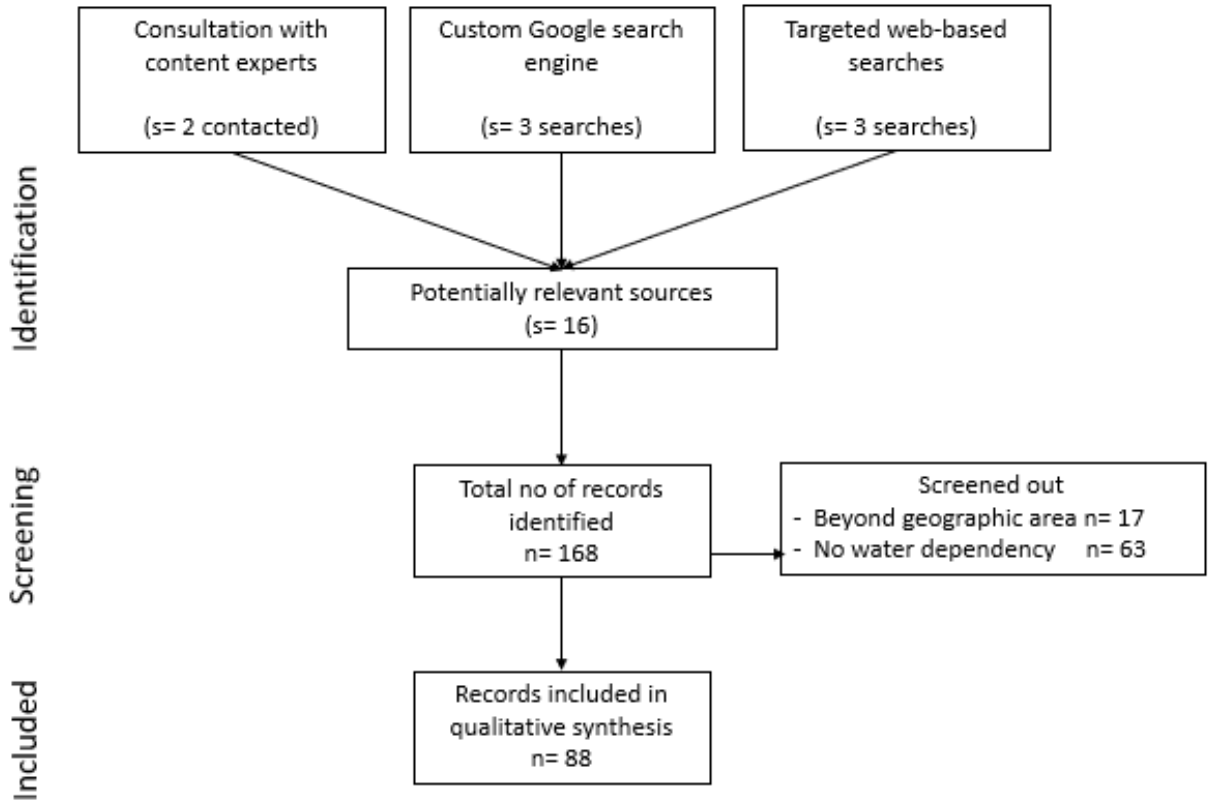


Fig. 6.3 Study flow diagram depicting the three phases of the review, including the number of records screened and subsequently included in the final synthesis.

151 distinct event records within the area under consideration were recorded in Microsoft Excel, identified by the year, description of each event and ecosystem service. Applying the criteria for inclusion resulted in 88 records being considered either dependent upon, or utilising a key aspect, of the ecosystem. The records are presented in tables (6.6 to 6.9), organised as pre-industrial, early-industrial, main-industrial and post-industrial as per guidance from senior archaeologist with knowledge of this area.

Captured narrative outputs were reviewed by an Ecologist with knowledge of the area to confirm the ecosystem service allocation and cross-referenced by a Senior Archaeologist to landscape mapping to resolve areas of uncertainty and to confirm the pre-, early-, main- and post-industrial categorisation. Full details of the work undertaken by the Senior Archaeologist and the relationship with ecosystem services is reported in James et al., (2016).

Data presented here are restricted to those records where the activity can be linked to the area under examination from downstream of Wallness/Frederick Road Bridge to Victoria Bridge, Manchester and where there is a dependency or impact on the ecosystem.

Table 6.6. Events influencing ecosystem service benefits from 1914 to 2011, Post Industrial Revolution. Industry linked to water use declines, facilitating an aesthetic appreciation of the River Irwell. Governance to address water issues in place.

↑ ↓ effect of recorded event upon ecosystem service (upward arrow) or disservice (downward arrow)

Cultural ecosystem services are categorised as:-

R - Recreational – includes events identified as leisure and/or social benefits

C - Cognitive – includes events which offer financial and/or industrial benefits

G - Governance – includes events which deliver governance and /or infrastructure benefits

		ECOSYSTEM SERVICE CATEGORY		
YEAR	**EVENT**	**REGULATION**	**PROVISION**	**CULTURAL**
2011	Formation of Catchment Partnerships (pilot)			↑ G
2005	United Utilities (Water company) sewer filtration improvements throughout catchment	↑		↑ G
1997	Lower Irwell Valley Flood Defence Scheme (Lower Kersal)	↓		↑ G
1986	Mersey Basin Campaign announced			↑ G
1985	Croal - Irwell Valley Local Plan contains 187 improvement proposals	↑	↑	↑ C
1984	Charity fund-raising swim (Clifton to Manchester)			↑ R
1980	Riparian planting Broughton to Pomona Dock via 'Green Finger Scheme'	↑	↑	↑ R
1974	Formation of Regional Water Authorities (North West Water Authority)			↑ G
1974	Regional Water Authority (supply & sewage disposal responsibilities)			↑ G
1972	Reports of ducks breeding on river ('dirty not poisonous')		↑	↑ R
1972	Small fish reported alive at Peel Park, Salford		↑	
1972	Brewing ceased			↓ C
1971	Cotton manufacturing ceased			↓ C
1971	Government funds available to 'Clean Rivers'			↑ C
1970	Completion of Anaconda Cut	↓		↑ G
1954	Flood event - victims petition to speed up flood defence works	↑		↑G ↓ C
1953	Closure of copper works (west of Broughton Bridge)			↓ C
1951	Rivers (Prevention of Pollution) Act			↑ G
1952	Flood defence works undertaken in Lower Broughton	↓		↑ G
1951	Straightening of river at Strangeways Bend commenced (Anaconda Cut)	↓		↑ G
1950	River pollution report prepared by British Field Sports records total catchment pollution and no biotic life		↓	
1948	River Boards Act			↑ G
1946	Severe flood at Salford (Strangeways Bend) worst for 80 years	↑		↓ C

		ECOSYSTEM SERVICE CATEGORY		
YEAR	EVENT	REGULATION	PROVISION	CULTURAL
1945	Agecroft Rowing Club Regatta (first since 1939)			↑ R
1945	Synthetic textile effluent discharge into Irwell.	↓		
1939	Coal mining ceased	↑		
1939	Agecroft Rowing Club Regatta (one-off event)			↑ R
1939	Lancashire Rivers Board formation			↑ G
1938	Lancashire County Council (Rivers Board and General Purposes) Act			↑ G
1937	Flood event	↑		↓ C
1930's	The Great Depression: Economic Crisis			↓G ↓C
1925	Decline of cotton manufacturing (imports from India, China, Japan)			↓ C
1923	Severe flood (worst in 20 years)	↑		↓ C

Table 6.7. Events influencing ecosystem service benefits from 1852 to 1903, Main-Industrial, that is, the Height of the Industrial Revolution. Regulating services are impacted by flood plain development and discharge of pollution from industry on the riverside. Natural flood events are a common dis-service to the local population.

↑ ↓ effect of recorded event upon ecosystem service (upward arrow) or disservice (downward arrow)

Cultural ecosystem services are categorised as:-

R - Recreational – includes events identified as leisure and/or social benefits

C - Cognitive – includes events which offer financial and/or industrial benefits

G - Governance – includes events which deliver governance and /or infrastructure benefits

		ECOSYSTEM SERVICE CATEGORY		
YEAR	EVENT	REGULATION	PROVISION	CULTURAL
1903	Re-build of Broughton Bridge			↑ R
1900	Water plants / moss recurring	↑	↑	
1899	Flood event	↑		↓ C
1892	Mersey & Irwell Joint Committee Act to address pollution/ sewage issues			↑ G
1882	Prosecution of Chemical Manufacturer for pollution	↑		↑ R
1881	Severe flood event	↑		↓ C
1880	Industrial Diversification: rubber goods/cables	↓		
1880	Opening of Wallness Bridge & Hough Lane Suspension Bridge			↑ R
1870s	Abandonment of boating regattas			↓ R
1876	Rivers Pollution Prevention Act			↑ G
1872	Flood event	↑		↓ C
1870	Wakes Week common practise- 1 week closure of mills for maintenance, unpaid holiday for workers	↑		
1869	Rebuild of Broughton Bridge	↓		↑ R
1869	Flood event	↑		↓ C
1867	River Inspector appointed			↑ G
1866	Cessation of ferryboat service across Irwell			↓C ↓ R

YEAR	EVENT	ECOSYSTEM SERVICE CATEGORY		
		REGULATION	PROVISION	CULTURAL
1866	'Great' flood	↑		↓ C
1862	River Conservancy Committee initiated through Act of Parliament			↑ G
1860-70	Terraced housing constructed on flood plain	↓		
1860	Paper mills start-up	↓	↓	↑G ↑ C
1860	'Foulness of waters; receiving refuse for cotton factories, coal mines, print works, bleach works, dye works, chemical works, paper works'	↓	↓	
1858	Opening of Brass / Copper works (west of Broughton Bridge)	↓		↑ C
1852	Flood event @ Peel Park	↑		

Table 6.8. Events influencing ecosystem service benefits from 1791 to 1850, Early Industrial Revolution. The river is integral to the siting of large, steam powered mills, while flood plains are encroached by factory and housing developments.

↑ ↓ effect of recorded event upon ecosystem service (upward arrow) or disservice (downward arrow)

Cultural ecosystem services are categorised as:-

R - Recreational – includes events identified as leisure and/or social benefits

C - Cognitive – includes events which offer financial and/or industrial benefits

G - Governance – includes events which deliver governance and /or infrastructure benefits

YEAR	EVENT	ECOSYSTEM SERVICE CATEGORY		
		REGULATION	PROVISION	CULTURAL
1850	No fish stocks sighted in Irwell		↓	↓ R
1848	West of Broughton Bridge: site of active tannery, engineering works, old silk works and dye-works	↓	↓	↑ C
1846	Opening of Peel Park (Public Recreation site)			↑ R
1845	Chemical works operational	↓	↓	↑ C
1843	Flood event	↑		↓ C
1840	Flood event	↑		↓ C
1839	Victoria Bridge opened (connecting Salford to Manchester)	↓		↑ R
1838	Manchester granted Borough Status – largest factory town in country, 1 of 6 largest towns in Britain			↑ G
1837	Severe flood recorded	↑		↓ C
1833	Flood event	↑		↓ C
1831	Terraced housing constructed on flood plain at Broughton Bridge	↓		
1831	Dye works (West of Broughton Bridge) operational	↓	↓	↑ C
1829	Flood event	↑		↓ C
1819	Fish shoals common - local food resource		↑	↑ R
1817	Formation of Salford Friendly Angling Society: Friendly Societies Act 1817		↑	↑ R
1816	Flood Event	↑		↓ C
1810	Steam powered mills common on lower catchment: 86	↓	↑	↑G ↑ C

YEAR	EVENT	ECOSYSTEM SERVICE CATEGORY		
		REGULATION	PROVISION	CULTURAL
	steam powered cotton spinning mills in Manchester			
1806	John Barge Print Works operational	↓	↓	↑ C
1806	Broughton Bridge Opening	↓		↑ R
1804	Flood event	↑		↓ C
1799	Flood event	↑		↓ C
1791	Richard Arkwright Mill - steam powered cotton spinning mill at Shude Hill.			↑G ↑ C

Table 6.9. Events influencing ecosystem service benefits from 1720 to 1787, Pre Industrial Revolution. The river is integral to the siting of water powered mills, limiting the scale of industrial development.
↑ ↓ effect of recorded event upon ecosystem service (upward arrow) or disservice (downward arrow)
Cultural ecosystem services are categorised as:-
R - Recreational – includes events identified as leisure and/or social benefits
C - Cognitive – includes events which offer financial and/or industrial benefits
G - Governance – includes events which deliver governance and /or infrastructure benefits

YEAR	EVENT	ECOSYSTEM SERVICE CATEGORY		
		REGULATION	PROVISION	CULTURAL
1787	Severe flood recorded - destroyed part of Salford Bridge	↑		↓ C
1786	Ford across Irwell @ site of modern Broughton Bridge			↑ R
1786	Water powered cotton mill operational - change of use from bleachers.	↓	↑	↑ C
1781	Richard Arkwright Mill constructed - water frame cotton spinning mill at Shude Hill		↑	↑ C
1780	Water powered spinning mill construction and associated Dyers present.	↓	↑	↑ C
1761	Opening of Blackfriars Bridge (access to Theatre)	↓		↑ R
1755	Water-powered corn mill at Castle Irwell & Lower Broughton in operation	↓	↑	↑ C
1720	Cotton weaving established			↑ C

Temporal Ecosystem Service Analysis

Provisioning services **-** Provisioning services were the least reported of the categories. Expected ecosystem services and goods comprising agricultural water use, fibre extracts for use as biomass fuel and products used in human health treatment were not identified in the historical narratives. Seven records of biodiversity and food benefit were found, along with five reports identifying the use of the river as a power source. Nine accounts of disservice were noted; the majority of

reports were linked to the industrial use of the river, with reports on the absence of biodiversity and food goods.

Between 1750 and 1820, narratives record the river as a source of food, with fish shoals common. The river is also noted to be a key source of power, with water-powered corn mills (1755) and textile mills (1780s), being remodelled to operate by steam powered engines which require water to operate (1810).

Records of 1830 to 1860 contain reports of continuing industrialisation of the area, so by 1860 waters are contaminated with refuse from dye, chemical and paper works in addition to discharges from cotton factories. The ecosystem impacts are classified as disservices due to a reduction in capacity re provision of clean water and food supply (1850). There is little improvement in the level of biotic life until 1970s when small fish are reported alive in one stretch of the area and ducks are noted to be breeding. The cessation of industrial processes increased the provision of clean water and supported riparian planting schemes in 1980s.

Regulating services - A greater number of published events record aspects of regulating ecosystem services. Regulating services linked to hydrological flow and the use of the river to mitigate hazards were well recorded in the published histories, with an equal number of service and disservice events. The river flood plain is a natural feature which mitigates flood water and regulates the flow of water downstream and 18 reports of floods were found, covering the period from 1787 to 1954.

From 1750 to 1850 the hydrological flow of the river is altered by infrastructure developments such as the construction of weirs, water extraction to support industrial processes and the replacement of fords by bridges (1780, 1800, and 1840). The ability of the river to act as a regulator of pollution and disease is compromised by effluent discharges, contributing to the severity of cholera epidemics in 1832 and 1846.

From 1860 to 1940 flood reports indicate that the river is acting as a natural regulating system and actions to address pollution discharge, in conjunction with the decline in heavy industry, enable an improvement in water purification capacity. In the early 20th century regulating disservices were reported as industrial process

changed during the period of WWII (1939-45), synthetic textile effluents were discharged (1960s) and a major flood defence scheme was completed removing the capacity for the river to access the flood plain (1970s). Most recently, a programme of sewage discharge improvements has facilitated increased purification capacity (2010s).

Cultural service **-** The majority of the published records are aligned to the cultural ecosystem service framework. Sufficient detail was present in the reports to assign events to the areas of recreational leisure activities, cognitive skill acquisition opportunities linked to industrial and financial growth driven by ecosystem use and bequest values identified through governance and infrastructure management. The majority of leisure and social reports and bequest infrastructure reports are benefit focussed. In contrast, cognitive skill (including economic) reports which are most frequent in the historical documents are twice as likely to be a disservice report rather than a benefit.

Social leisure values can be attributed to the physical construction of connecting infrastructure. In the study area, connectivity infrastructure transformed from fords and a medieval stone bridge to a series of road, rail, and foot bridges connecting residential and industrial sites to public parks and recreational sites beside the river. One of England's first public parks, Peel Park was founded in 1846 along a major meander in the river. Angling and rowing societies were also formed in early 1800s but by 1870 activities ceased due to the pollution level in the river water. Recreation activities recur in the narratives from 1930s onward as the river water is less toxic, riparian planting schemes enhance angling and bird watching opportunities, and pollution controls facilitate a charity swim event (1980s).

Bequest values are expressed in narratives through the reporting of legal acts and governance structures which aim to restore the resilience of the river, along with infrastructure developments which protect the local population from destructive flow rates. A major flood defence investment was completed by 1970 ensuring the security of the surrounding commercial and residential developments into the 21st century. The appointment of River Inspectors in 1867 were forerunners to formal Acts impacting river pollution; prosecutions for illegal discharges followed along with the formation of committees to address water issues. The 20th century saw the

formation of river boards (1948) and regional water boards with responsibilities to deal with water supply and sewage disposal (1974). Following privatisation of water companies (1989), a non-ministerial government department (OFWAT) was established to act as an economic regulator and ensure water companies carry out statutory functions (Ofwat, 2006, 2017). Bequest initiatives continue into the 21st century with the creation of Catchment Partnerships.

From 1720 to 1860, as industrialisation and social mobility increased the population, cultural, cognitive skill acquisition opportunities linked to industrial and financial growth driven by ecosystem use are reported. Disservices are frequently reported, as destructive flood events throughout the 1800s and early 1900s destroy industrial sites and subsequently drive redevelopment and land-use evolution. The decline of the cotton industry from the 1920s onward, not only reduced provisioning ecosystem disservices but also had an impact on the opportunity for linked skills acquisition. Further industrial decline in the latter half of the 20th century shifted the social focus to regeneration activities, offering greater opportunities for skill development linked to the ecology of the river.

The application of this novel approach in a test area has enabled identification of the temporal ecosystem services contained within narratives. This new approach is now applied to a 'whole' catchment scale with the outcomes enabling a comparison to the key aims and objectives of each of the studies catchment partnerships; such outcomes are considered in the following Discussion chapter.

ii) Irwell Catchment:

Overview: The Irwell catchment consists of the River Irwell and its main tributaries the Roach and Croal which join the main river in its mid-reaches, plus the Medlock and Irk which join at Manchester, just before the Irwell feeds into the Manchester Ship Canal. The rapid industrialisation in the 19th century has left many of the watercourses in a heavily modified condition, consisting of walled banks and culverts, bank-side mill buildings together with mill lodges throughout the mid and lower catchment, plus reservoirs in the upper catchment. The catchment drains a highly urbanised area of over two million people, with major settlements at Ramsbottom, Rochdale, Radcliffe and Salford alongside the banks of the river, presenting a

significant flood risk for local residents. The catchment contains numerous nature conservation sites include 14 Sites of Special Scientific Interest, Special Areas of Conservation including canals, plus the South Pennine Moors Special Protection Area.

The summary count of specific notable events extracted from published histories are classified by ecosystem service and by pre-, early-, high(main-) and post-industrial time frames (Figure 6.4).

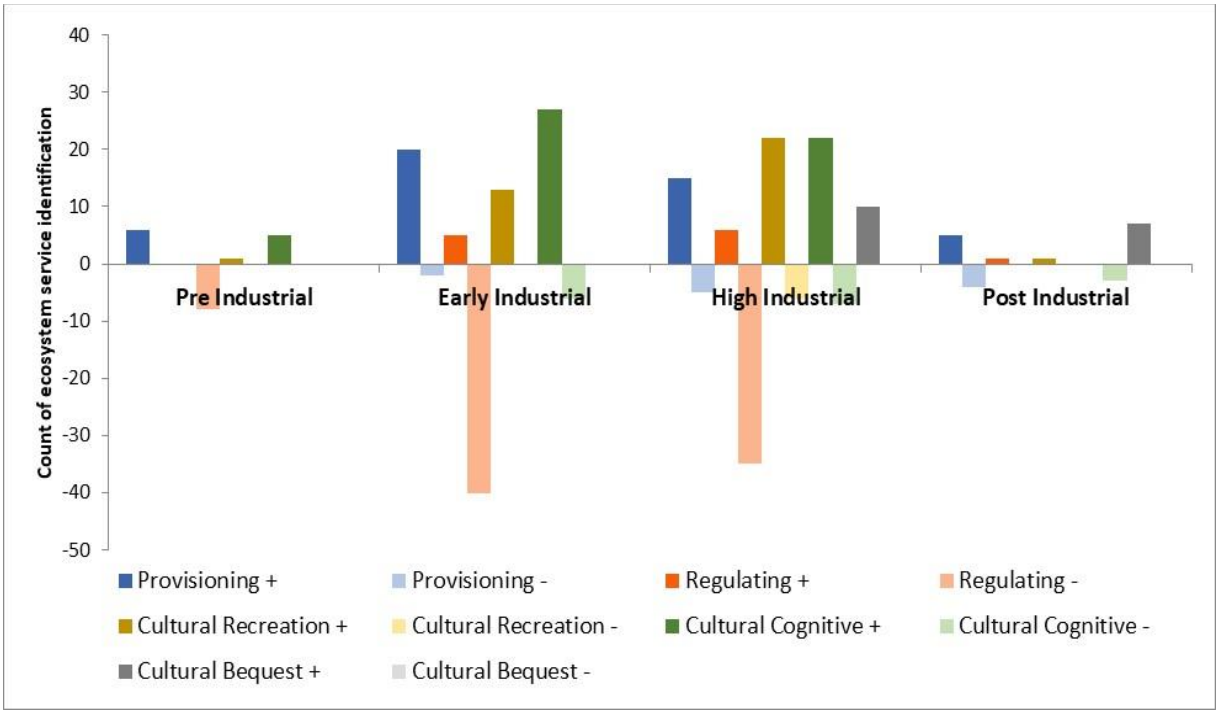


Figure 6.4 Irwell catchment temporal ecosystem service change. Summation of simple count of ecosystem service occurrences within narrative documents relating to the identification of services categorised into provisioning (service and disservice), regulating (service and disservice) and cultural (service and disservice). Identification of cultural services as a bequest service, cognitive service or recreational service is as identified in previous section. See also James et al., 2016.

The River Irwell was impacted in the pre-industrial age through straightening and enlargement of the river channel at Manchester to facilitate the transfer of goods to Liverpool (regulating disservice), construction of warehouses on the river bank (regulating disservice) and construction of major weirs and canalisation which raised the water level upstream of the mills (regulating disservice). The mills used water power to lift goods (provisioning service) but were the source of effluent discharges into the river (regulating disservice). The mills however, were a source of

employment and gaining of skills by the local population (cultural service). Recreational activities (cultural service) are linked to the use of footbridges constructed to access theatres outside of the city limits (Bracegirdle, 1973; Corbett, 1907).

The early industrial revolution period covered further weir construction along the river (regulating disservice) and narrowing of the river channel due to building encroachment to the low water line (regulating disservice). A major period of canal building throughout the catchment changed the water flow in the river as reservoirs were built to feed the canals (provisioning service, regulating disservice, cultural service). Heavy industry along the riverside discharged waste into the river reducing the water quality (provisioning disservice, regulating disservice), although employment opportunities increased (cultural service). Accessibility across the river increased as major bridges were constructed to access new sites for residential development in the flood plain (cultural service, regulating disservice). In the 1820s and 30s recreational boating activities were commonly recorded (cultural service), with formal regattas occurring on the River Irwell, and major public parklands were formally designated (cultural service). Boat hire and boat building were common in the mid-1800s (cultural service), but the locations of boating sites moved further upstream as pollution impacted the lower catchment (regulating disservice), although all boating activity ceased by 1910 due to river pollution (cultural disservice). Industrial processes continued to impact the water quality (provisioning service, regulating disservice, cultural service) and water flow was impacted by further bridge construction (regulating disservice). The first legal statute to address water issues was enacted in 1862 (cultural service) and further legal acts appointing River inspectors lead to the prosecution of both public and private companies in the 1880s (cultural services) (Bracegirdle, 1973; Corbett, 1907).

The Great Flood of 16th November 1866 impacted the North West of England, following a westerly storm and high rainfall throughout the catchment which raised water levels and destroyed buildings alongside the river and also those located upon the natural flood plain (regulating service, cultural disservice). A major period of reconstruction after this flood event further restricted the river channel, and sand bank and gravel extraction occurred (regulating disservice). Further bridge

strengthening and widening occurred in the late 1890s to 1900s as road traffic associated with the newly opening Manchester Ship Canal diverted traffic away from the river (regulating disservice) and further areas of the flood plain were opened for development (regulating disservice). The first sewage farms were built in the mid catchment to process the waste from urban populations, with water discharged to the river increasing the flow (provisioning disservice, regulating service) (Bracegirdle, 1973; Corbett, 1907).

Post the industrial revolution a significant number of legal acts and authority bodies were in place to address the water quality (cultural services). Together with the cessation of the heavy industries, power stations and further sewage farm investment, water quality improved (cultural disservice, provisioning service) and fish and wildlife are observed in the early 1970s (cultural service). The notable temporal change across the catchment is from provisioning to cultural: the river is now a focus of regeneration and recreation (cultural service), although house building continues to occur on the flood plains (regulating disservice) and flood events are a major concern to local residents (cultural disservice) due to current and past encroachment on the riverbanks and flood plains (Bracegirdle, 1973).

iii) Ribble Catchment:

Overview: The Ribble catchment area consists of the River Ribble, along with its major tributaries the Hodder, Calder and Darwen, together with streams which drain the Fylde Peninsula. The catchment area contains a number of nationally and internationally protected sites, for example, Bowland Fell Special Protection Area (SPA) and Long Preston Site of Special Scientific Interest (SSSI) in the upper catchment and the Ribble Estuary SPA where the Ribble enters the Irish Sea. Within the catchment are found locations where caving and pot-holing occur, long-distance walking routes (Pennine Way), plus salmon and trout fishing along the river length. Water is abstracted for drinking, agricultural and domestic irrigation which impacts the water quantity and flow throughout the catchment to the current day, although the creation of protected reservoir catchment areas has resulted in amenity / recreational areas such as Gisburn Forest and Stocks Reservoir Fishery. The main river bisects the catchment; to the north are agricultural lands and to the south, where coal deposits occur, are the urban, industrial developments along the Calder and Darwen.

Dispersed villages with larger towns such as Settle, Clitheroe and Ribchester are located in the middle to upper catchment. Mature river meanders occur through flat, alluvial farmland which forms the majority of the lower catchment floodplain. Historically, the Ribble and tributaries have been impacted by sewage pollution from settlements along the Ribble and Hodder, plus run-off from leached waste from sheep on the high moors and fertilized pasture in the river flood plain. The catchment contains an extensive area of high quality agricultural land in the west where there is a history of agricultural drainage.

The elevated area of the West Pennine Moors is close by the urban settlements of East Lancashire which include Burnley and Blackburn, where rivers were blocked by mill dams and weirs. The nineteenth century use of water power in mills and factories and the associated water use in dyeworks, tanneries and other water dependant process resulted in high levels of industrial effluent and raw sewage being dispelled into the river. Culvertisation in town centres was common and heavy industrialisation occurred along river banks in Burnley, Blackburn and Accrington. For example, in Accrington by the end of the 19th century there were 9 cotton mills, 3 timber yards, a brass foundry, a corn mill, gasworks, dyeworks, tallow works, a sawmill and six other industrial premises plus a 300-yard culvert under the Market Hall (Greenhalgh, 2009).

The summary count of specific notable events extracted from published histories are classified by ecosystem service and by pre-, early-, high (main-) and post-industrial time frames (Figure 6.5). During the pre-industrial period, the water flow of the lower Ribble was impacted by the construction of bridges (regulating disservice), the canalisation of river meanders within the catchment system (regulating disservice), and river dredging (regulating disservice) to facilitate the transfer of coal to Liverpool. The reduction in the capacity of the river to mediate flow rates resulted in floods in the main floodplain (regulating service) of sufficient severity to destroy bridges and disrupt local population movement and trade (cultural disservice) (Greenhalgh, 2009).

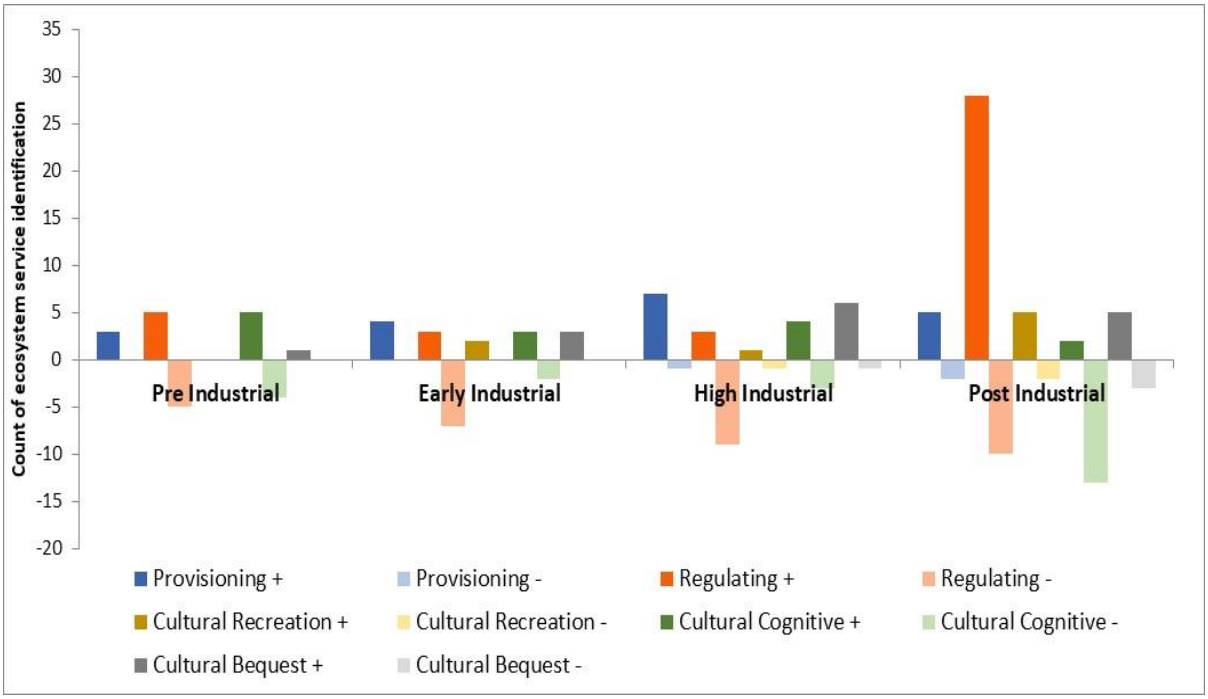


Figure 6.5 Ribble catchment temporal ecosystem service change. Summation of simple count of ecosystem service occurrences within narrative documents relating to the identification of services categorised into provisioning (service and disservice), regulating (service and disservice) and cultural (service and disservice). Identification of cultural services as a bequest service, cognitive service or recreational service is as identified in previous section.

The founding of the cotton industry in Preston marks the early-industrialisation phase along the Ribble with a consequent increased demand for water extraction (provisioning service) across the catchment, which thus reduced the capacity of the river to function with stable flow rates and patterns (regulating disservice). The demand for water led to the construction of reservoirs to service the local population's needs (provisioning service, cultural service). The first record of recreational activities in the catchment occurs as exploration of caves in the upper headwaters (cultural service). Flooding (regulating service) continues to be recorded in the main floodplain resulting in bridge collapse (cultural disservice) as the river system acts to moderate extreme flow rates (Greenhalgh, 2009).

At the height of the industrial revolution, further demands for water for bleach works and population demands are found (provisioning service). The extraction of water from the system continue (provisioning service, regulating disservice) as reservoirs were constructed to supply clean drinking water to both local populations and to

major conurbations situated outside of the catchment area. The reservoirs provide a place for relaxation and appreciative values linked to the river basin increase (cultural service). A major flood event (1866) is noted to impact not only across the catchment but also throughout NW England. The river acted to moderate the flow (regulating service) but widespread flooding of property and business was recorded (cultural disservice). The designation of long distance paths (Pennine Way) offered additional recreation opportunities within the catchment (cultural services). The new dock at Preston increased skill opportunities for the local population (cultural service), however the associated dredging disrupted the flow pattern of the Ribble estuary (regulating disservice). The ability of the river to dilute and cleanse waste water was compromised by the level of industrial discharge in the southern catchment and pollution incidents (regulating disservice) were noted (Greenhalgh, 2009).

The final phase of reservoir construction occurred in the post-industrialisation phase, with water flow disrupted (regulating disservice) to provide drinking water (provisioning service) for large recreational towns on the Fylde Coast. Reservoirs provide a recreational site for the local population (cultural service). The river continued to act to moderate excessive flows (regulating service) however inundation of property located in the flood plain, and the overflow of canalised channels in town centres, resulted in further property damage (cultural disservice). Floods occurred in both summer (flash storms) and winter (Atlantic gales); a recent major flood event occurred on Boxing Day 2015 throughout NW England. However, a series of wet summers was noted to aid habitat requirements (regulating service) as pollution run-off was diluted (regulating service) preventing a build-up of blanket weed (Filamentous algae). The introduction of controls on salmon fishing (*Salmo salar)* resulted in an increase in fish population and the development of further recreational activities (cultural service), although it was noted there was a 20-year time lag between control regulation and catch-level improvements. A similar time-lag is found between the local extinction of otters (*Lutra lutra)* and their repopulation. Further recreational opportunities occur as links between canals, the River Ribble and the estuary are developed in the 21st century (cultural service) (Greenhalgh, 2009).

The notable temporal ecosystem service change in the urbanised areas of the Ribble catchment is from the use of the river to drive cognitive skill development via

employment, through industrial decline, to an increase in recreation opportunities (post-industrial). However, the major services continue to be provision of clean water as a result of large-scale reservoir construction throughout the catchment (early-, high- and post-industrial) and regulation of extreme water flows in the agricultural flood-plain, even though there is a recorded societal impact.

6.2.3 What is the Agents Focus?

Statutory goals are identified in both the Water Framework Directive and NW River Basin Management Plan (RBMP), with Catchment Partnership (CP) non-statutory aims contained in RBM plans, specific catchment plans and web-pages. While the WFD does not explicitly state an ecosystem service approach should be adopted, both the RBMP and CPs are directed to consider ecosystem services.

NW River Basin Aims

The priority river basin management issues, which encompass the catchment sub-scale, are identified in the RBM plan (EA, 2016) as diffuse urban and rural pollution, physical modification and sewage contamination. However, the contribution the catchment partnership has made to resolve these issues is not explicit, the achievement and future aims being presented in the RBM plan as distinct projects. The declared catchment objectives, reported achievements and current projects are compared to the RBM issues to highlight difference in catchment focus (Table 6.10).

The Ribble partnership have a strong riverine and riparian enhancement focus, while the Irwell partners have greater focus on green infrastructure particularly in the urban setting, reflective of the physical locations and local context.

Table 6.10: Placement of catchment management actions in the NW River Basin Plan issues framework. source: NW RBM Plan, EA, 2016

	River Basin Management Issues			
	Diffuse Urban Pollution	*Diffuse Rural Pollution*	*Physical Modification*	*Sewage Contamination*
IRWELL Objectives	- Cleaner water		- Naturally functioning & resilient water bodies - Connected & Managed habitats	- Cleaner water
Achievements			- Moston Brook - Weir Removal	- Moston Brook
Projects	- Street Trees - Green Infrastructure - Addressing Leachates	- Safeguarding Drinking Water (Cloughbottom)	- Moston Brook	
RIBBLE Objectives	- Cleaner Water	- Cleaner Water	- Improved connectivity	
Achievements		- 'Keeping the Ribble Cool'	- River Darwen fish passage	
Projects		- Lower Ribble HLF - Woodland/ wetland enhancement - countryside stewardship (farming) - upland moorland peat restoration	- HLF habitat quality & connectivity, natural flood management - Long Preston Flood Plain SSSI improvement (HLF) - Eradication of non-native invasive - Fish passage improvement & deculverting	

Although the RBM advocates the use of an ecosystem services approach viz: the purpose of a river basin management plan is to provide a framework for protecting and enhancing the benefits provided by the water environment (EA, 2016, p6), the

goals specified are not presented in such a framework and neither catchment have publicised an ecosystem service approach within the river basin plan.

Local Catchment Aims:

Issues worked on include, but are not restricted to, the water environment and river basin management. Key Aims are presented in Table 6.11

Table 6.11 Catchment Partnership Key Aims.

Irwell Key Aims: [reviewed 2015] bold= major aim	**Ribble Key Aims**:
Delivering cleaner water	Improved water quality: reducing diffuse pollution sources including faecal matter to improve coastal bathing waters.
Working toward better functioning and resilient water bodies	Improved biodiversity: increasing riverine & other habitats, connectivity and re-naturalisation.
Better managed, more joined up habitats	Reduced flood risk: using natural processes aid in reducing flood risk.
Access and Recreation value enhancement	Recreation: improving access and information for people to engage with rivers and streams.
Catchment Knowledge enhancement	Education: increasing awareness, engagement and understanding of riverine heritage.
Culture and Heritage enhancement	Social: providing training, volunteering and other opportunities for all to become involved in improving and celebrating their river heritage.
Education, Skills and Training enhancement	Economic: increasing use of the catchment for tourism & recreation, as well as working with local businesses.
Public Engagement enhancement	Climate change: increasing carbon sequestration and shading of streams.
Flood Mitigation enhancement	Partnerships: demonstrating how aligning partners' activities can lead to a range of multiple benefits.
Wildlife Habitat enhancement	

In published Catchment Plans (James et al, 2012; RRT, 2016) aspects of water quality and biodiversity improvement, together with enhanced water body resilience,

are prominent areas of focus. The documents identify additional goals based on social development values, but are not presented in an ecosystem service benefits framework.

6.3 Micro-level Implementing Agents – Catchment Partnerships

6.3.1 Who are the Agents Involved?

North West Level:

The membership of the North West (NW) England River Basin liaison panel as at November 2013 is shown in Table 6.12. A range of public, private and voluntary NGOs are present. Government departments are represented via the Environment Agency and Natural England; major private business representation includes chemical companies and water utilities. Local authority representation for both water providers in the north of the River Basin and urban water users in the south of the River Basin are present. Catchment hosts are included along with riverine interests.

Table 6.12: Membership of the NW River basin liaison panel at November 2013. Source: EA, 2013

Environment Agency	United Utilities
Natural England	Consumer Council for Water
National Trust	Mersey Ports
Lake District National Park Authority	Inshore Fisheries and Conservation Authority
The Rivers Trust	Ribble Fisheries Consultative Association
Canal and River Trust	Chemicals North West
National Farmers Union	INEOS (Chemical Co)
Association of Greater Manchester Authorities	Catchment Hosts
Bolton Council	

Partnership Structures:

According to the NW RBMP (EA, 2016), Catchment Partnerships are groups of organisations with an interest in improving the environment in their local area. They inform the river basin management planning process and help implement measures by providing local evidence; targeting and coordinating action; identifying and accessing funding for improvements in the catchment; and incorporating river basin management into the wider environmental management of the catchment.

Irwell Catchment Partnership aka *The Rivers Return*:

The River Irwell Partnership, known as The Rivers Return to January 2017, acts as a facilitative body and is an unincorporated organisation which has a published constitution and terms of reference signed onto by each partner. All partner representatives have equal status within the partnership. There are four formal positions in the Steering group, a Chair, vice-Chair, an EA representative - the catchment co-ordinator - and a Secretarial role fulfilled by the Catchment host organisation. The partnership has been hosted by Groundwork Manchester, Salford, Stockport, Tameside and Trafford (MSSTT) from 2013 to date (early 2017).

Table 6.13. Irwell Catchment Partnership as at January 2016. There are no direct representatives from Local Nature Partnerships, Areas of Outstanding Natural Beauty or farming representatives.

Membership	**No of Organisations**	**No of Partners**
Mandated authority (EA)	1	7
Other Government Department	1	1
Water Company	1	4
Wildlife & Conservation Organisations	10	16
Academic Institutions	3	5
Local Authorities	10	14
Angling & Recreational Organisations	2	3
Forestry Organisations	1	1
Local Community & Business Groups	3	4

The partnership developed two management groups (as at January 2016): the first, the Steering body, meeting quarterly and the second, a Delivery body, which met as a minimum quarterly. However, both groups were consolidated into one meeting body in November 2016. At the time of the study, there were 55 partners or associates who represent 32 organisations, summarised in Table 6.13. The Irwell has representation from a large number of local authorities reflecting the number of boroughs through which the river flows in addition to the large number of wildlife and conservation organisations represented. The mandated authority has a key presence, with a large number of individuals involved in the catchment including those involved in payment for ecosystem services valuation projects in addition to the catchment co-ordinator. There are no direct representatives from Local Nature Partnerships, Areas of Outstanding Natural Beauty or farming representatives such as are found in the Ribble Partnership.

Where specific projects are identified, one of the partner members' volunteers to lead on behalf of the partnership; the partnership itself does not lead on the development of specific projects as it is not a legally recognised body. The Catchment host provides the secretarial function for the partnership but to date the host organisation has not led on the development of projects outside of its normal business.

River Ribble Catchment Partnership aka *Ribble Life*:

The group has been hosted by Ribble Rivers Trust (RRT) from CaBA launch to date (Jan 2017), working under the 'Ribble Life' banner. The Ribble Rivers Trust provides the Secretarial role to the catchment partnership and also provides an impetus and focus for large project development where delivery is in partnership with other organisations operating within the catchment. The RRT advocates the use of ecosystem services principals (Spees, 2015).

As at January 2016, there were 37 partners and affiliates on the partnership board, representing 20 organisations, summarised in Table 6.14. Wildlife and conservation representatives form the greatest element of the partnerships and there is also a larger representation from the private water company. Local community organisations are not specified partners, unlike the Irwell partnership.

Table 6.14: Ribble Catchment Partnership as at January 2016. Local community organisations are not specified partners.

Membership	No of Organisations	No of Partners
Mandated authority (EA)	1	2
Other Government Department	1	2
Water Company	1	6
Wildlife & Conservation Organisations	5	12
Academic Institutions	1	1
Local Authorities	3	5
Angling & Recreational Organisations	1	2
Forestry organisations	2	2
AONB & National Parks Authorities	3	3
Farming Organisations	2	2

Both partnerships are similar in make up to the national picture (Table 2.6) with a representative of the regulatory body present, wildlife and river conservation representation. The partnerships include water company and local authority agents, as per >75% of all partnerships, and include some agents from the less common academic stakeholder group.

6.3.2 Stakeholder Mapping

Interest & Power Criteria

Stakeholder groups were mapped as per the criteria stated in section 5.6.3, that is, their weighted contribution to the delivery of catchment partnership goals and their ability to influence outcomes. Stakeholders were identified as either interest (I) and/or power (P) as per their contribution to catchment goals and delivery of projects, and weighted 0 to 3 based on their level of catchment activity (I1 to I3, P1 to P7). The overall rating of high, medium or low is a simple summation of the individual weighting. The overall mapping is presented in Table 6.15.

Table 6.15: Stakeholder mapping. X indicates where the stakeholder has either interest (I) or power (P) as per their contribution to catchment goals and delivery of projects, weighted 0 to 3 based on their level of catchment activity (I1 to I3, P1 to P7). The overall rating of high, medium or low is a simple summation of the individual weighting.

Stakeholder	Interest			Power							Overall Rating (H/M/L) I / P	
	I1	I2	I3	P1	P2	P3	P4	P5	P6	P7		
Mandated Authority (Environment Agency)	X	X		X	X		X		X		H	H
Other Govt Department (Natural England)		X				X	X		X		M	M
Water Company (United Utilities)	X	X		X	X	X		X	X		H	H
Wildlife/Conservation organisations	X	X		X	X		X		X		H	H
Academia			X					X		X	L	L
Local Authorities		X	X	X		X		X		X	M	L
Angling/Recreational organisations	X						X		X		M	M
Forestry organisations		X				X	X		X		L	M
Local Community & Business Groups		X	X					X		X	M	L
AONB & National Park Authorities	X	X		X				X	X	X	H	M
Farming organisations	X	X				X		X		X	H	L

The high, medium and low ratings are mapped into a matrix (Figure 6.5). The organisations who have the greatest interest and power in the catchment are the Environment Agency, the mandated authority, the private water company, who adhere to specific discharge and abstraction limits, and those wildlife and conservation organisations active in the social sphere. Although academic organisations are involved in the catchment, they are considered to have low power and interest as they are not wholly focussed on the catchment. The completed matrix is shown in Figure 6.6.

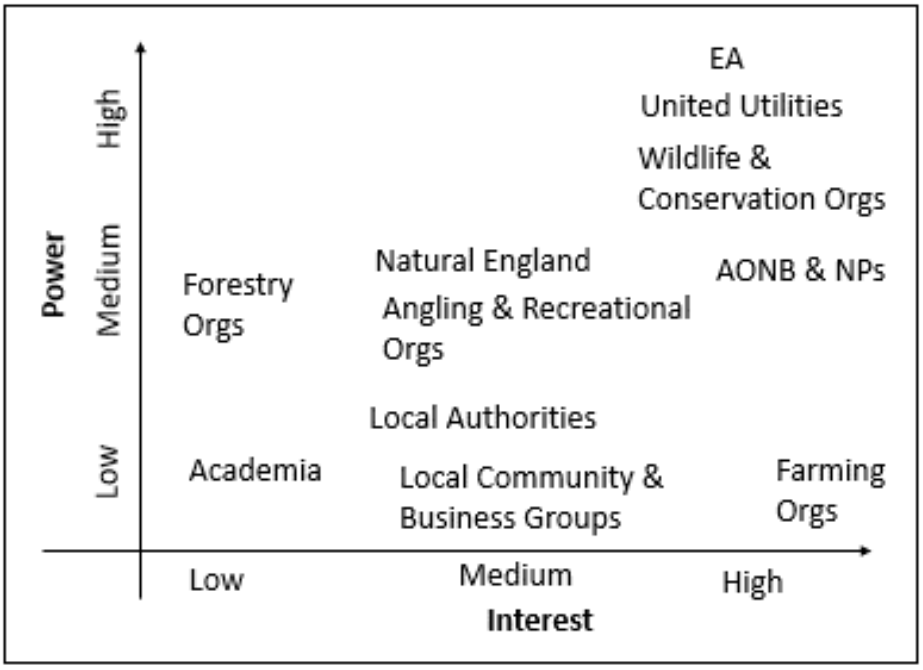


Figure 6.6: Completed Mendelow's Interest & Power Matrix: Catchment Partnership stakeholder map.

6.3.3 Diversity of Respondents

Demographic questions required respondents to identify their type of organisation from a provided list in order to ascertain the heterogeneity of the group. The range of stakeholders within the partnerships cover social engagement organizations, wildlife and conservation charities, regulatory and authority bodies, academics and recreational service representatives (Table 6.16), however, the majority of the respondents have either a regulatory role or are river conservation focussed. Those individuals who represent the catchment partnership management structure, i.e. the chair, vice-chairs, catchment co-ordinator and catchment host, are present in both response groups.

Overall, catchment partnership activities are uniting a diverse group of actors and various stakeholders' groups and interests are captured in the survey data.

There is a slightly greater senior management representation in the Irwell responses than in the Ribble group responses (36% and 25% respectively), but there are no director level representatives for regulatory and authority bodies in either partnership. No academic role responses were received from the Ribble catchment partnership.

Table 6.16 Survey responders by organisation type and responsibility level where reported.

Catchment	Social Engagement	Wildlife & Conservation	Regulatory & Authority Bodies	Academia	Recreational Services	TOTAL
Irwell (Total)	**3**	**4**	**4**	**2**	**1**	**14**
Director/Chair	1	2	0	1	1	5
Non-director	2	2	4	1	0	9
Ribble(Total)	**1**	**4**	**6**	**0**	**1**	**12**
Director/Chair	1	1	0	0	1	3
Non-director	0	3	6	0	0	9

The respondents represent a range of organisations, and are found to be comparable in their make-up to the national picture (Table 2.6) with all the key participating groups reported.

6.3.4 Survey Participation & Response Rates

The validity of complex system research is noted to stem from the appropriateness, thoroughness and effectiveness of applied methods (Bazeley, 2004). The appropriateness of the tools applied is presented in a previous chapter (Chapter 4) where the complex science approach was considered, thus it is the thoroughness and effectiveness of the survey data collection tool which is reviewed.

The survey was open for eight weeks for each catchment partnership, Oct 2014 to Nov 2014 for the Irwell partnership and Oct 2015 to Nov 2015 for the Ribble partnership. Individual reminders to participate were issued after four and six weeks from the date of first issue. No analysis was undertaken until after the closure of survey. No returns were received after this point.

The response rate from the targeted active participants was similar in both partnerships (Irwell partnership = 41%, Ribble partnership = 42%), however, when considering the most active partnership members (>1 meeting attendee), 67% of the most active are from the Irwell and 41% from the Ribble partnership – detail response rates are shown in Table 6.17. The results achieved in this study are thus

in line with current response rates (Carr et al., 2017) and the group size is sufficient to allow for an 85% confidence level at a 10% margin of error.

Table 6.17 Survey response rates

	Irwell Partnership	Ribble Partnership
Total membership	55	37
Active members (attended at least 1 meeting in previous 12 months	29	24
Active members (attended >1 meetings in previous 12 months	18	17
No of returns from active (1 meeting) members	12	10
No of returns from active (>1 meeting) members	12	7
No of returns from 'interested' members	8	2
No of 'available case' responses (based on collaboration network responses)	23	19
Response from active (1 meeting) members (%)	41	42
Response from active (>1 meeting) members (%)	67	41
Total response as percentage of 1 meeting members (%)	69	50
'Available case' response as percentage of active members (1 meeting) (%)	79	79

In comparison to other surveys of natural resource management teams, the response rate achieved lies in the mid-range, being greater than the 27% achieved from a questionnaire format survey of global biosphere managers (Schultz et al., 2011) but less than the 67% maximum survey response reported in a survey of working groups led by a natural resource management organisation (Kowalski & Jenkins, 2015), when both catchment response rates are considered.

6.3.5 Who is Influential in the Partnerships?

The focus of this section is on how the interactions between partnership members are represented though social network analysis and whether variation exists between the selected catchment partnerships. The results presented will be analysed from the perspective of influential individuals within the dynamics of three networks, those identified as key to the catchment partnership, those who are collaborating partners and those reported to be ecosystem service knowledgeable. A comparison between the key partners and collaborative partners' networks will be drawn to identify whether similarities are present. The analysis is based on the comparison of the two

selected catchment partnerships, as at November 2014 and November 2015 respectively, and describes the system and the structure of their networks.

Evaluation prior to Social Network Analysis

In addition to the targeted group, a small proportion of the returned surveys were from non-targeted respondents and these were also incorporated into the network analysis to gather as complete a picture as possible (Ward & Butler, 2016). By including such available-case and interested actor responses, the percentage response rate achieved for social network analysis is 79% for both catchment partnerships (active-member target number). This result compares with the adjusted response rates reported by Kowalski and Jenkins (2015) who also incorporated available-case data. In their study, response rates for their groups ranged from 56% to 67%: post adjustment their reported response rates range from 64% to 94%, the percentage improvements ranged from 5% to 27%. The percentage point change reported in this thesis is at the lower end of this range.

Social Networks Summary

Both catchment partnerships report a slightly denser key people network than their collaborative network, and it is within the key people network that the only cliques are found (one per catchment). Influencing (out-degree centrality) results are much greater in the Ribble partnership than the Irwell partnership for all three networks and the Ribble partnership reports a greater level of similarity between the collaborative and key people networks, being twice the result for the Irwell partnership; however, the Ribble partnership report the lowest density of the three networks examined for the ecosystem service knowledge network. The density of the Irwell ecosystem services knowledge network is similar to that of the key people network. The greatest levels of influence are reported in the ecosystem service knowledge network for both partnerships. Details are shown in Table 6.18.

In the collaborative networks, both partnerships report low level of cohesiveness, measured by density and centralisation, when compared to the theoretical maximum of 100%, however the Ribble partnership values of 15% and 28% respectively are three times those of the Irwell partnership (Table 6.18). Mutual ties within the Irwell partnership are spread among the structure and do not show the high centralised focus on the catchment host which is reported by the Ribble partnership.

Table 6.18: Ribble and Irwell catchment partnerships summary.

	Irwell			Ribble		
	Key people network	**Collaborative network**	**Ecosystem services knowledge network**	**Key people network**	**Collaborative network**	**Ecosystem services knowledge network**
Density (%)	10.7	5.4	11.7	16.8	14.6	6.4
Centralisation (Freemans node betweenness) (%)	10.5	8.1	12.1	15.6	27.5	2.4
Prominence (In-degree Centrality) (%)	64.9	26.7	23.1	43.2	37.4	35.3
Influence (Out-degree centrality) (%)	3.1	4.1	8.9	26.6	31.5	45.8
Mutual Ties (No.)	5	5	0	10	6	1
Cliques (No.)	1	0	0	1	0	0
Similarity of Key / Collaborative networks (%)	28			56		

The analysis of the Irwell partnership identified those partners involved in active river restoration projects in the catchment as less prominent within the collaborative network than those of the Ribble partnership, also they lack the mutual links with key prominent members which are found in the Ribble analysis. The Ribble catchment partnership report less difference between prominence (in-degree centrality value) and influence (out degree centrality value) within the collaborative network than the Irwell partnership, that is, those Ribble partners who are prominent and who are consulted by the rest of the partnership are also key influencers with mutual tie links to other prominent actors in the network.

Prominent Partner Comparison

Figure 6.7 simplifies the actor analysis and compares the prominence of key functional groups found in both catchments. Both partnerships place the catchment host and catchment co-ordinator at the centre of the networks, together with well-connect influencers representing riverine, wildlife and woodland interests. The exception is the Irwell ESS knowledge network, where the catchment co-ordinator and host are secondary in prominence to the academic and urban forestry

stakeholders. The Ribble networks give high prominence to representatives of large landscape management organisations who are well connected to the partnership management. However, the Ribble networks do not include the range of diverse interests which are present in the Irwell collaborative network, lacking direct representation from academic or heritage interests. The Irwell and its subsidiary rivers flow through a number of boroughs and the representatives from local authorities are least connected in the collaborative network.

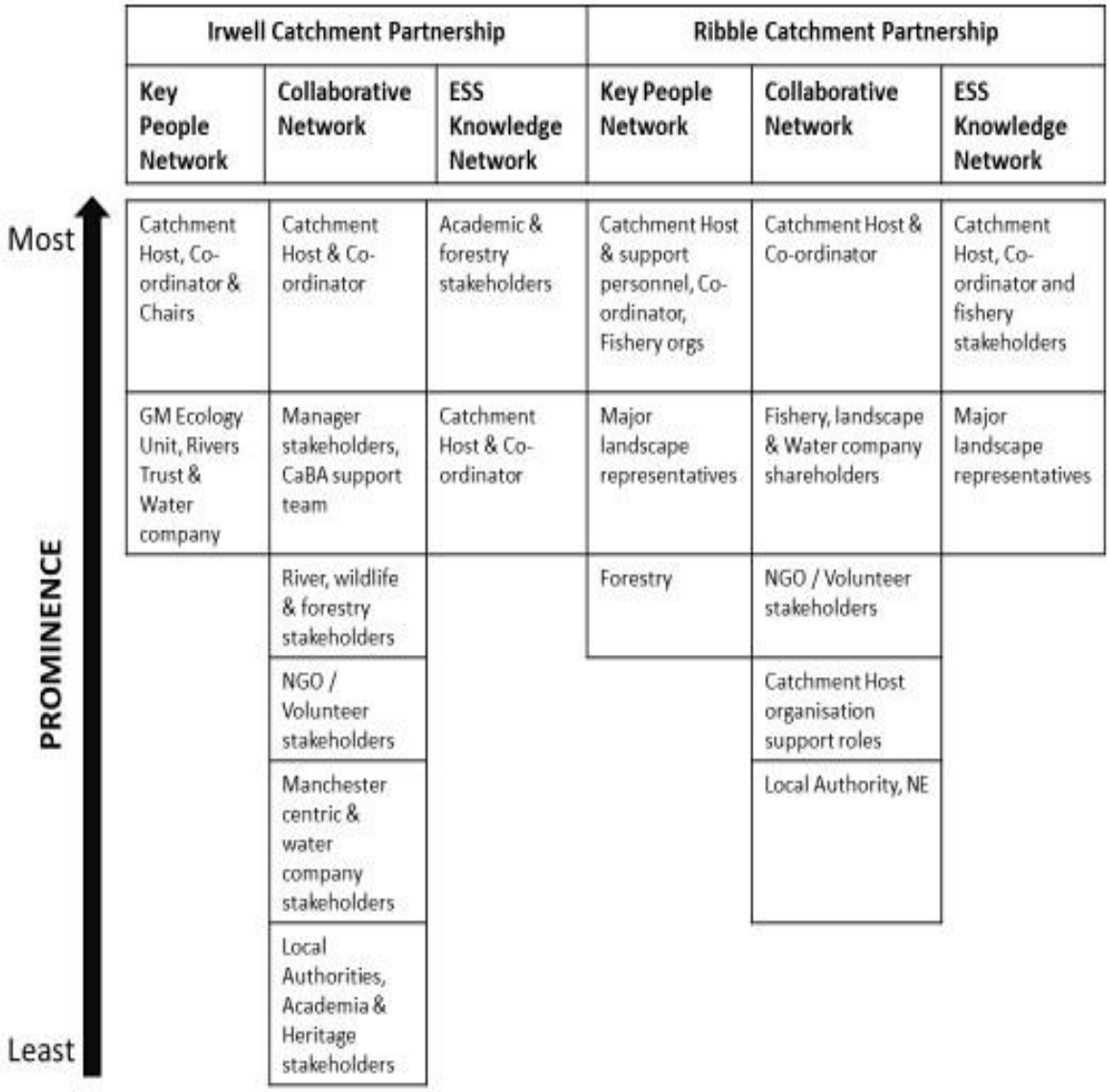


Figure 6.7: Prominent partners within Irwell & Ribble catchment partnerships. Key personnel, collaborative partners and ecosystem service knowledgeable partners identified by survey, for catchment members 2014-15.

The Irwell partnership lacks the support roles which the Ribble catchment host organisation dedicates to supporting the catchment partnership. These roles provide scientific measurement, publicity and administrative support for catchment activities.

From this analysis, it can be argued that greatest prominence is given to the political operation of the partnerships, secondary focus is given to the natural capital area and thirdly, to social organisations.

Social Networks Visualisation

The representation of the informal relationships in the organisation is the result of a social network analysis of data collected from individuals; Social Network Analysis (SNA) being a set of techniques for identifying and representing patterns of interaction among social entities, be it individuals, groups, organisations or social artefacts. It provides precise and specific insight in place of intuition and general hunches. Social network analysis predominantly employs graphical techniques, an application of the mathematics of graph theory. The program builds the graphic based on mathematical criteria, concerned with the actors' centrality inside the network.

Standard algorithms locate the most central nodes in a network in the centre of the visualisation. On opening the file, NETDRAW automatically generates a visualisation of the data using default options where a standard algorithm places the most connected nodes to the centre of the screen and the least connected nodes to the periphery. Eigenvector Centrality weights degree centrality by the degree-centrality of the nodes a node is connected to. The Eigenvector approach to measuring closeness uses a factor analytic procedure to discount closeness to small local subnetworks. NETDRAW display gathers the most connected nodes into the core and places peripheral nodes in zones where they have some connections. Within the approach social entities are represented as points, each known as a 'node' or vertex' and relationships are represented by lines, known as 'ties, 'edges' or 'arcs'.

For a presentation of the calculations of eigenvalues and eigenvectors from matrix input see the Centrality Measures briefing by Meghanathan (2015). NETDRAW

visualisation of the three examined networks drawn from the survey question responses and SNA measures, reviewed in section 5.6.4, follow.

Key Personnel Network:

Responses to the question 'Who do you judge to be the key people in the catchment partnership?' are reported for each catchment partnership before comparing the catchment results.

Irwell catchment partnership:

The social network analysis covered 23 members of the partnership, either as direct responders or as those identified as key partners, linked by 54 network ties. The sociogram (Figure 6.8) identifies five mutual connection ties (red) i.e. those where both responders identified the other as a key partner, the majority being asymmetric ties (blue) i.e. those where one responder identified a link to another partner but there is no corresponding returning tie. Overall, 11% of all the possible ties are present (density = 0.107 ±0.0435) and the network centralization is low at 10.46%.

Those partners who are most central to the key personnel network are shown in Figure 6.7 by the size of the partner node. Overall in-degree centrality = 64.9%, out-degree = 3.1%, of the theoretical maximums indicating a wide variation between prominence and influence within the network. Out-degree supportive analysis (Bonacich) reports low results across all partners, indicating there is no key influencer in the network relationship.

The most central and prominent actors (>30 eigenvector) are the catchment host, catchment co-ordinator and chairs of the partnership strategy and project groups. Further analysis also identifies these actors are a clique within the overall network. However, when supporting analysis is considered there are a further three actors who gain influence as they are connected to other high prominent actors (Bonacich Centrality measure with beta = 0.346, >400 degree of centrality); these actors include representatives from GM Ecology Unit, Irwell Rivers Trust and United Utilities.

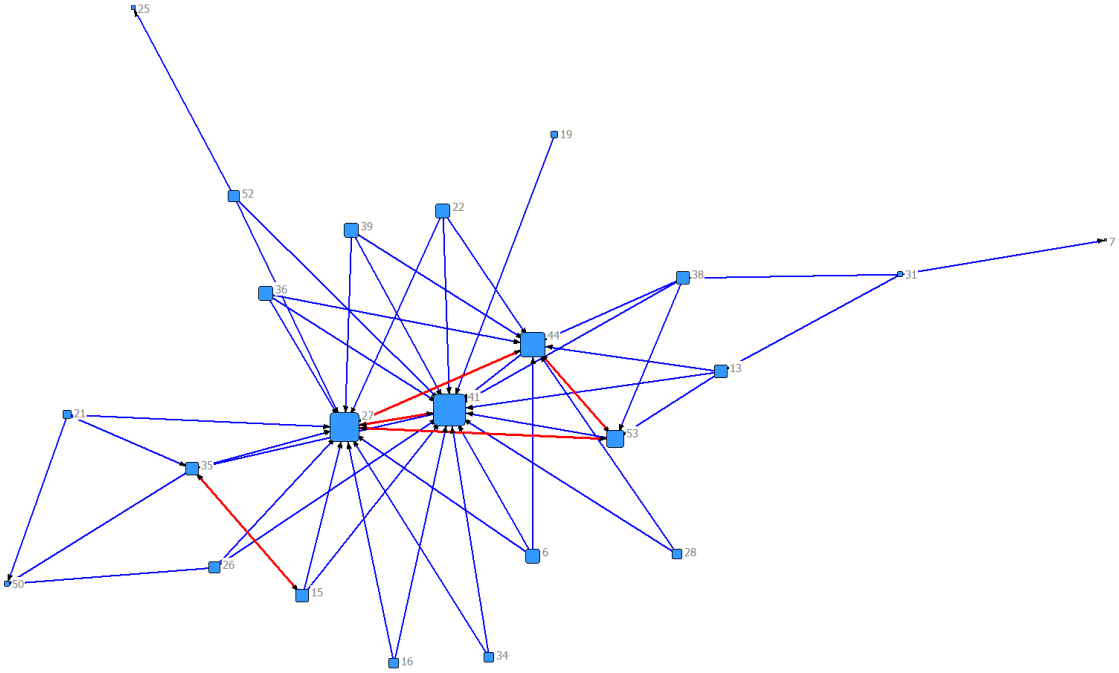


Figure 6.8: Social network of stakeholders in Irwell catchment partnership. Actor node size weighted by centrality value (eigenvector). No of ties = 54 identifying key personnel. Mutual (reciprocal) ties shown in red. Density = 0.107 ±0.0435. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

The catchment host, Irwell Rivers Trust representative and catchment co-ordinator are found to be key structural links in the network (Freeman Betweeness>21) as they link between other pairs of actors in the network and so have people who depend upon them to make connections.

Ribble Catchment Partnership

The social network analysis covered 20 members of the partnership, either as direct responders or as those identified as key partners, linked through 64 differing connectedness of ties. The sociogram (Figure 6.9) identifies 10 mutual connection ties (red) i.e. those where both responders identified the other as a key partner, the majority being asymmetric ties (blue) i.e. those where one responder identified a link to another partner but there is no corresponding returning tie.

Overall 17% of all the possible ties are present (density = 0.168 ±0.374) and the network centralization is 15.6%. Those partners who are most central to the network are identified in Figure 4.8 by the size of partner node (eigenvector value). In-degree

centrality = 43.2%, out-degree = 26.6%, of the theoretical maximums indicating variation between prominence and influence within the network.

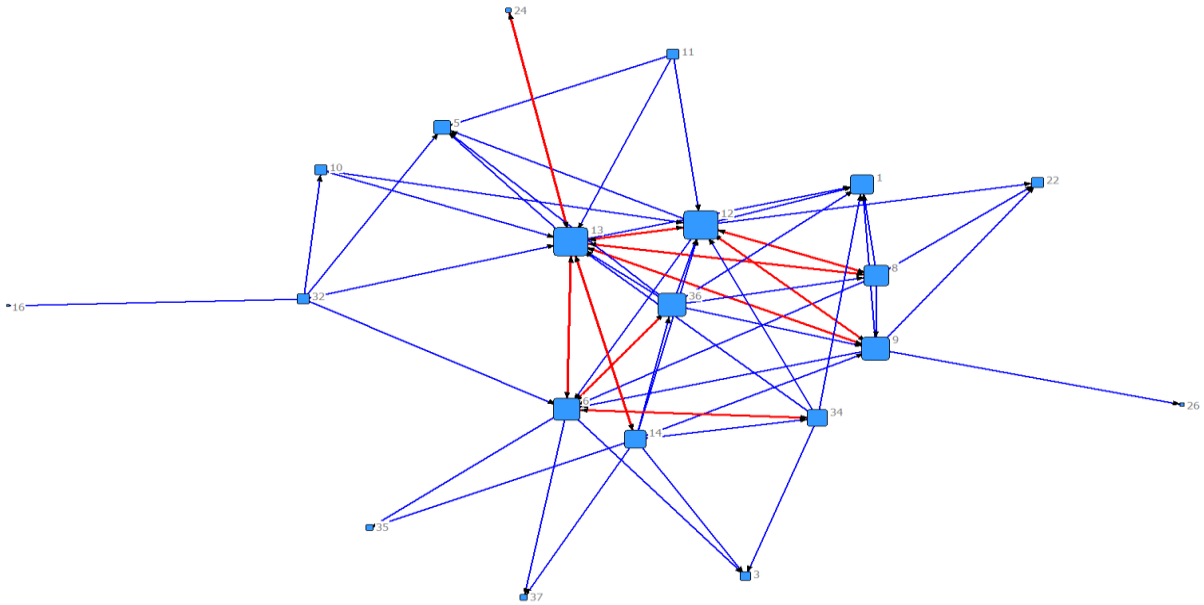


Figure 6.9. Social network of stakeholders in the Ribble Catchment partnership. Actor node size weighted by centrality value (eigenvector). No of ties = 64 identifying key personnel. Mutual (reciprocal) ties shown in red. Density = 0.168 ±0.374. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

The most central and prominent actors (>44 eigenvector, in-degree >7) are the catchment host, catchment co-ordinator, representatives from Ribble Fisheries, and a member of the catchment host organisation involved with capital works developments. One clique was identified through analysis, which consists of the catchment host and co-ordinator together with representatives from major landowners (Yorkshire Dales and Forest of Bowland). When supporting analysis is considered, (Bonacich Centrality measure with beta = 0.250, >500 degree of centrality) a further partnership member concerned with the Yorkshire Dales is identified as prominent as they are ‘connected’ to other high prominent actors. Key influencers in the network are the catchment host and co-ordinator, representatives from the Forestry Commission, major land owners and Rivers Trust support personnel (Bonachich out-degree >1000).

The catchment host, co-ordinator and Ribble Fisheries representative are key structural links as they link between other pairs of actors in the network and so have people who depend upon them to make connections (Freeman Betweeness>18).

Collaboration Network:

Responses to the question 'with whom do you collaborate the most frequently' are reported for each catchment partnership before comparing the results. For this study, whole network analysis was desired to answer the objectives, consequently, collaboration activities were not pre-defined and it was left to each responder to consider how their organisation collaborates within the catchment partnership. Thus, collaborative actors cover all interactions including data sharing, co-operative funding bids and working together on project delivery. There was no request to identify the frequency of interactions and the question was left as 'most' acknowledging some organisations may collaborate less frequently than others. The self-assessment of 'most collaborate' places a limitation on the network model in that no weighting is placed on the quality or length of the collaborative episode. The information to create a weighted network, such as duration, outcome or nature of collaboration, could be gathered in future research.

Irwell Catchment Partnership

The social network analysis considers 40 members of the partnership, either as direct responders or as those identified as key collaborative partners, linked by 57 network ties. However only 5% of all the possible ties are present (density = 0.054 ±0.0162) and network centralization is low at 8.11%. A wide variation between prominence and influence within the network is reported (in-degree centrality=26.7%, out-degree=4.1% of the theoretical maximums). Those partners who are most central within the collaborative network are identified by the size of the nodes reported in Figure 6.10. The most central and prominent partners are the catchment host and catchment co-ordinator, together with a CaBA central support representative and organisation managers from both the host and co-ordinator organisations. The prominent actors link between other pairs of actors in the network and so have people who depend upon them to make connections, in particular the catchment host actor (Freeman Betweeness=88.8). Additional key structural linking actors are the representatives of wildlife and river trusts. Key influencers in the collaborative

network are three partners engaged in the active delivery of river improvement projects (out-degree Bonacich>1000), two actors reporting a mutual tie (red); however, these actors report moderate centrality scores and are not as prominent within the network as the catchment host and catchment co-ordinator reducing their ability to directly influence other members of the partnership.

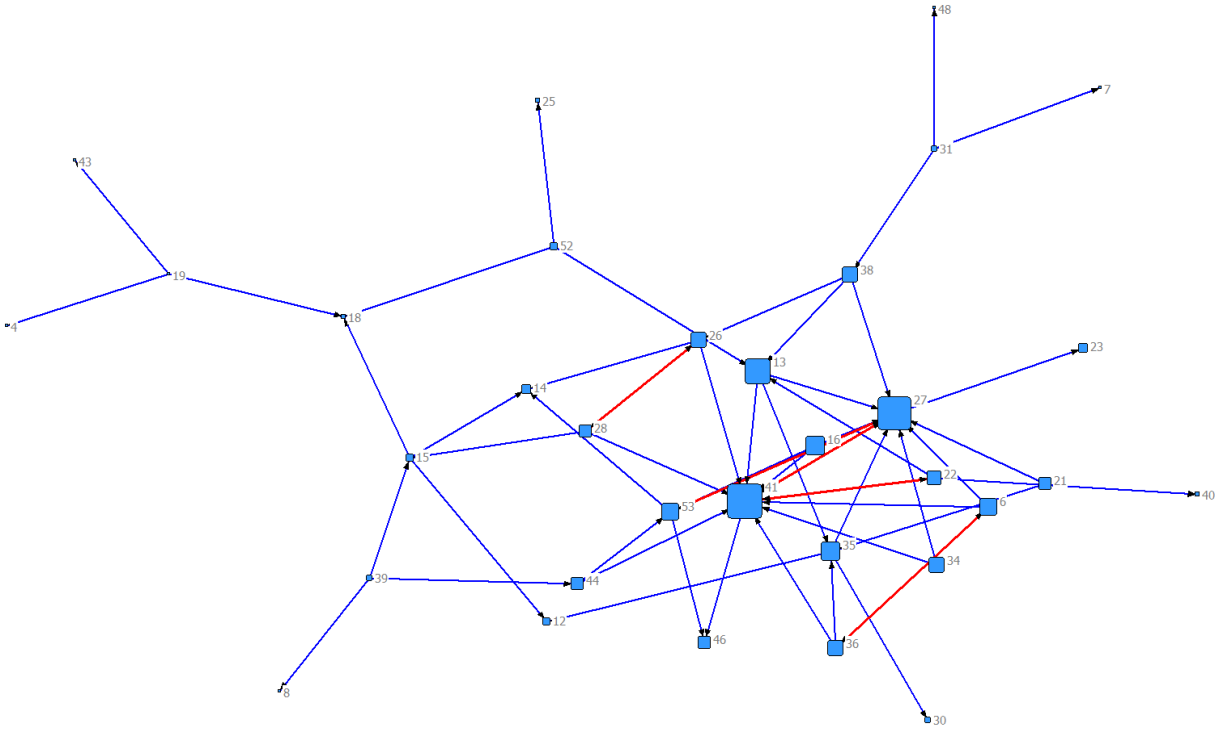


Figure 6.10. Social network of stakeholders in the Irwell catchment partnership. Actor node size weighted by centrality value (eigenvector). No of ties = 57 identifying collaborative relationships. Mutual (reciprocal) ties shown in red. Density = 0.054±0.0162. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

There are a further five actors who gain influence as they are connected to other high prominent scoring actors even though they are on the periphery of the network; these actors include further personnel employed by the mandated organisation, Manchester centric institutions and water company representatives (Bonacich Centrality measure with beta = 0.529, >500 degree of centrality). Those actors representing local authorities associated with the main tributaries to the Irwell and heritage interests are least connected. Although no formal clique was identified by analysis, mutual ties exist between the catchment host and catchment co-ordinator together with links to those actors leading on management projects on behalf of the

catchment partnership. A further mutual tie exists between actors who are involved in collaborative volunteer-led conservation activity. Neither of these actors reports high prominence or influence within the collaborative network, however, there are direct links into a prominent linker. A key bridging function, which links otherwise unconnected partners, is provided by actors representing the Greater Manchester Ecology Unit and recreational fishery interest.

Ribble Catchment Partnership

The social network analysis covered 19 members of the partnership, either as direct responders or as those identified as key collaborative partners, linked by 50 network ties of differing connectedness. 15% of all the possible ties are present (density = 0.146 ±0.353) with 6 identified as mutual connection ties (red). The network centralization is 27.5%. There is little variation between prominence and influence within the network (in-degree centrality=37.4%, out-degree=31.5% of the theoretical maximums). Those partners who are most central to the collaborative network are identified by the size of the actor node shown in Figure 6.11. The most central and prominent partners are the catchment co-ordinator and catchment host (>50 eigenvector). These prominent actors link between other pairs of actors in the network and so have people who depend upon them to make connections, in particular the catchment host (Freeman Betweeness=92.4) who is also identified as a key influencer in the partnership. Additional key structural linking and influencing actors are the representatives of forestry and fishery organisations (out-degree Bonacich>1000). There are a further three actors, representing large landscape and water management organisations, who gain influence as they are connected to other high prominent scoring actors even though they are on the periphery of the network (Bonacich Centrality measure with beta = 0.342, >500). It is of interest to note several actors on the periphery include several personnel employed by the host organisation who link to prominent scoring individuals who represent forestry, fishery and farming interests. No explicit academic or heritage interests are found within the collaborative network.

Those actors representing major land owners and landscape management organisations are closely connected to each other within the structural diagram and link directly to both the catchment host organisation and the catchment co-ordinator

although no formal cliques were identified in the network. Five of the six mutual ties are linked to the catchment host organisation. One further mutual tie exists between actors representing regulatory and authority organisations. No key bridging actors are found.

Actors representing forestry and regulatory organisations are found toward the periphery of the network, however they do report direct links into a prominent influencer with connections to other members of the organisation.

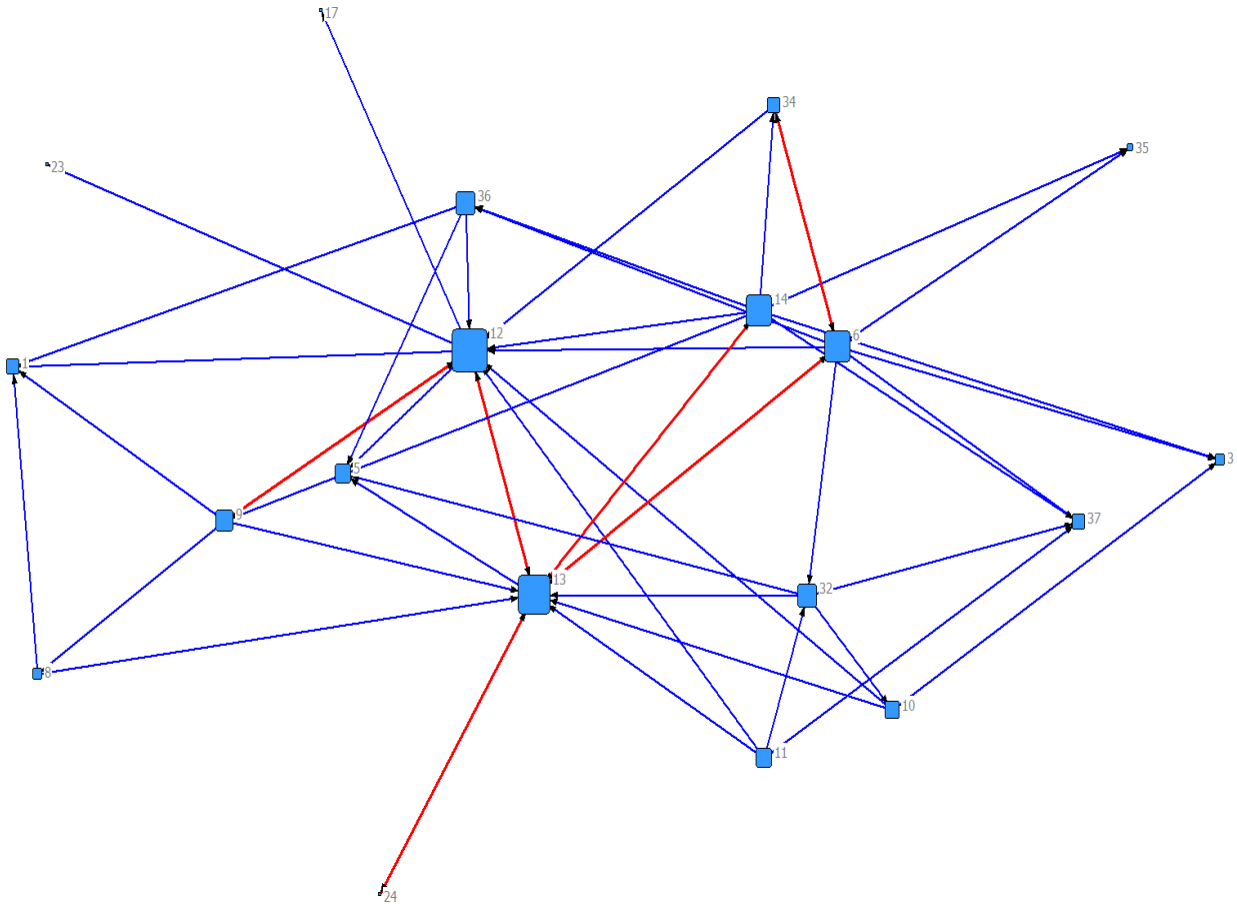


Figure 6.11. Social network of stakeholders in Ribble catchment partnership, actor node size weighted by centrality value (eigenvector). No of ties = 50 identifying collaborative relationships. Mutual (reciprocal) ties shown in red. Density = 0.146 ±0.3533. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

Ecosystem Services Knowledge Network:

Both partnerships were asked to identify those people within each relevant partnership who they would go to for information relating to ecosystem services. The

networks are reported for both the Irwell and the Ribble partnerships in figures 6.12 and 6.13 respectively where the size of the actor node reflects the centrality value (eigenvector).

Irwell Catchment Partnership

The social network analysis covered 16 members of the partnership, either as direct responders or as those identified as possessing ecosystem services knowledge, linked by 28 ties, none of which are mutual connections. Overall, only 12% of all the possible ties are present (density = 0.117), however, centralisation is higher at 23%.

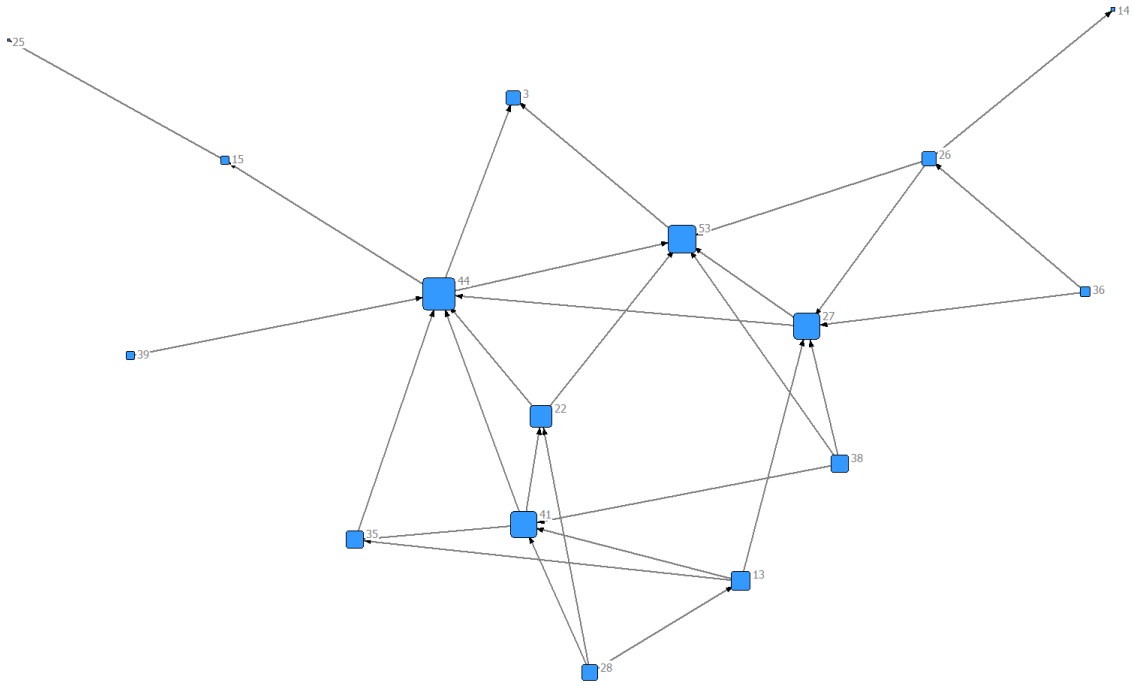


Figure 6.12. Social network of stakeholders in the Irwell catchment partnership. Actor node size weighted by centrality value (eigenvector). No of ties = 28 identifying ecosystem services knowledge network. No mutual ties are reported. Density = 0.117 ± nc. SD is not calculable for this network. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

The most central and prominent actors (>50 eigenvector, in-degree >5) include the key academic member of the partnership, project group chair representing urban woodland organisation and the catchment host and co-ordinator, however no clique was identified by statistical analysis. Both the academic member and the urban woodland representatives are the most prominent actors in the network (in degree

>5), both individuals assessing themselves at the highest level of ecosystem services knowledge.

Partnership members representing riverine and wildlife organisations who also self-reported the highest level of ecosystem service knowledge are not directly recognised by other members of the partnership as key contacts, however, these partners are sought as information sources by the catchment host so are linked into the overall network through an important actor. The academic member is also the key structural link in the network, linking between other actors (Freeman Betweenness>45). Out degree (Bonacich) reports were low across all partners, indicting there is no key influencer in the ecosystem services knowledge network.

Ribble Catchment Partnership

The social network analysis covered 21 members of the Ribble partnership, either as direct responders or as those identified as key ecosystem service knowledgeable partners, linked by 27 ties, only one of which is mutual between the catchment coordinator and the Forest of Bowland representative. Only 6% of the possible ties are present (density = 0.064) but centralisation is greater at 35.2%.

The most central actors are the catchment host, catchment co-ordinator and the representative of the Ribble Fisheries (eigenvector >55). The catchment host is the most prominent of those individuals self-reporting the highest level of ecosystem services knowledge, that is, the most sought by other partners looking for information on ecosystem services. Other high knowledge partners representing Natural England and forestry organisations are found at the periphery of the network, with single connections to the catchment host, lacking direct linkages to other actors within the network.

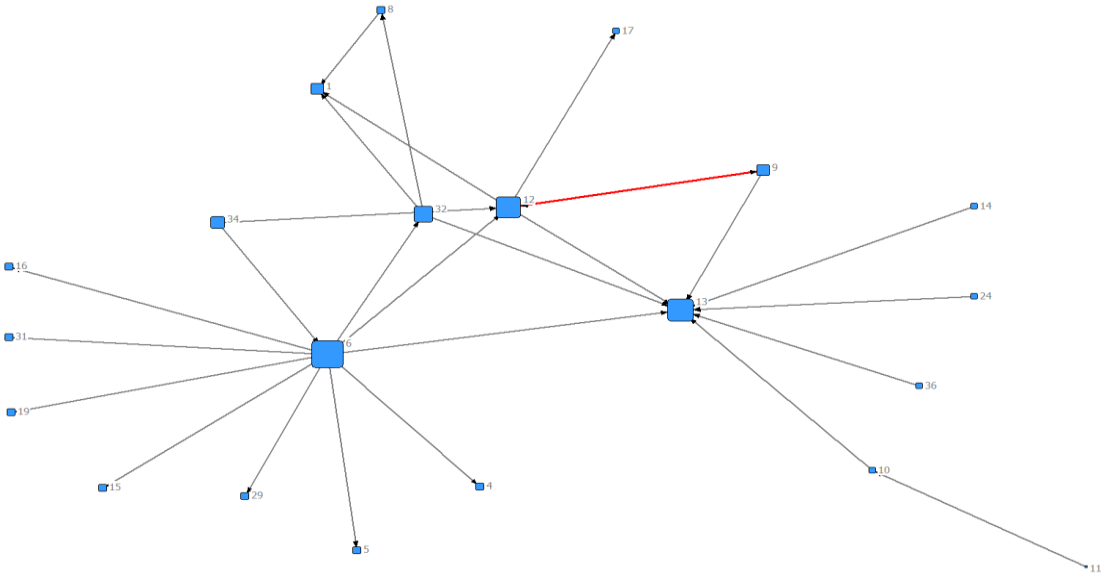


Figure 6.13. Social network of stakeholders in the Ribble catchment partnership. Actor node size weighted by centrality value (eigenvector). No of ties = 27 identifying ecosystem services knowledge network. One mutual tie (red) is reported. Density = 0.064 ± nc. SD is not calculable for this network. Participant names have been removed in line with ethical requirements and replaced by numeric which does not infer any value.

Prominent members of the partnership also include the Yorkshire Dales National Park representative, who is closely linked to Environment Agency personnel and further Yorkshire Dales representatives. There is one key influencer (outdegree = 10.0) within the network, Ribble Fisheries, as this actor has links out to several water company and mandated authority representatives, connecting a variety of views and information relating to ecosystem services across the partnership.

Comparison of Key Personnel network and Collaborative partner networks.

Irwell catchment partnership:

The density of the collaborative network (5%) is half that of the key people network (11%). To test whether this difference has not arisen by chance, a t-test bootstrap paired sample was performed using matched network matrices, that is, matrices adjusted to include all respondents to either question (Hanneman & Riddle, 2005). The difference in density means for the adjusted matrices is 0.0027. The standard error of the difference by the classical method is 0.0092; the standard error by bootstrap estimate (10,000) is 0.0245. The conventional approach underestimates the true sampling variability. By bootstrap method, two tailed probability is 0.841,

consequently there is a probability the observed difference would arise by chance in random samples drawn from these networks. t=0.198, ±0.0135, CL [-0.0291, 0.0238], p=0.841.

QAP compared the observed Jaccard similarly coefficient to an average value obtained as the result of simulations (10,000) where the rows and columns of the matrices are permuted randomly. The result obtained is *s*= 0.276±0.019, p=0.000 i.e. if there is a tie in one network, there is a 28% chance there will be a tie in the alternative network. The simulation (QAP) correlation if random actors were matched = 0.026 (average). The observed measure is different from the random result, consequently the relationship observed is not due to chance and association exists between the two networks.

Both tests indicate the collaborative and key people networks have similar strength of ties as there is no significant difference in the overall density, however the ties are different as only 28% of ties present in one network exist in the alternative network.

Ribble catchment partnership:

The density of the key people network (17%) is similar to that of the collaborative network (15%). To test for difference, a t-test bootstrap paired sample was performed using matched network matrices, that is, matrices adjusted to include all respondents to either question (Hanneman & Riddle, 2005). The difference in density means for the adjusted matrices is 0.0303. The standard error of the difference by the classical method is 0.0216; the standard error by bootstrap estimate (10,000) is 0.0491. The conventional approach underestimates the true sampling variability. By bootstrap method, two tailed probability is 0.160, consequently there is no significant difference between these networks. t=1.370, ±0.0221, CL [-0.0131, 0.0737], p=0.160.

QAP compared the observed Jaccard similarly coefficient to a mean value obtained as the result of simulations (5,000) where the rows and columns of the matrices are permuted randomly. The result obtained is *s*= 0.562±0.031, p≤0.001 i.e. if there is a tie in one network, there is a 56% chance there will be a tie in the alternative network. The simulation (QAP) correlation if random actors were matched = 0.066 (mean). The observed measure is different from the random result, consequently the

relationship observed is not due to chance and association exists between the two networks.

Both tests indicate the collaborative and key people networks have similar strength of ties as there is no significant difference in the overall density, and there is a strong similarity as 56% of ties present in one network exist in the alternative network.

Limitations

The results presented here are limited to those individuals who chose to respond to the survey. Even though previous work has shown that the social network analysis measures used in this study provide an accurate portrayal of the whole network based on a partial network sample (Contender & Valente, 2003), it is acknowledged that these results may be restricted given that each working group network was only partially sampled. However, by considering both the participants approach and placement within the social network of a co-operative group, the influence of leaders who possess skills useful in this environmental management setting is uncovered.

6.3.6 Working Relationships - Risk / Trust / Agreement to Act

Throughout this study, methods were used which developed the understanding of the catchment partnership concept, in particular the influence of social connections on the implementation of water policy. The focus of this section is on how the interactions between partnership members are influenced by levels of complexity analysed from the perspective of trust and risk, and whether variation exists between the selected catchment partnerships.

The results presented describe the principal components present in the survey responses together with the examination of factors that influence collaborative behaviour. The analysis considers the comparison of two catchment partnerships, as at November 2014 and November 2015 respectively.

The relevant survey section consisted of eight questions which investigated factors which influence the ability of a group to come to an agreement to act. All questions recorded a response across both groups of respondents, there were no partially completed questions returned and the extremes of the value ratings were used by at least one respondent.

Evaluation prior to Statistical Analysis

Prior to undertaking statistical analysis on the Likert-scale survey responses, Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was undertaken. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO=0.500, meeting the threshold for sampling adequacy, with all KMO values for the individual items greater than the acceptable limit of 0.5 except for one item. Individual variables identified from the anti-image correlation table (SPSS output) identified three variables as falling below the threshold, however these variables were not eliminated from the factor identification as the overall KMO met the threshold (Table 4.19).

Explanatory Factor Analysis

Summary

A principal component analysis (PCA) was conducted on the 8 items with oblique rotation (Direct Oblimin). Bartlett's test of sphericity $X^2(28) = 74.55$, $p \leq 0.001$, indicated that correlations between items were sufficiently large for PCA. Three components were identified which had eigenvalues over Kaiser's criterion of 1 and in combination explained 72.6% of the variance. Table 4.20 shows the factor loadings. The items that cluster on the same component suggest factor 1 represents attitude to risk taking, factor 2 represents level of agreement and factor 3 represents trust values (Table 4.20).

Factor Extraction

The linear components within the data set were determined by calculating the eigenvalues for the R-matrix, the magnitude representing the importance of a particular vector. Kaiser's criteria is considered accurate when there are <30 variables and after extraction communalities are >0.7 (Field, 2009, p660). Kaiser's criteria were applied to the 8 variables in the survey and eigenvalues greater than 1 were displayed in SPSS V20. Following extraction, only Q4 has a communality value <0.7 (Table 6.19).

Table 6.19. Sampling adequacy (KMO), communalities after extraction and corrected item correlation results. The full wording and semantic differential rating scale for the questions is found in Appendix B.

Variable (Question)	KMO	Communalities after extraction	Corrected item correlation
Q1	0.423	0.716	0.567
Q2	0.617	0.737	0.586
Q3	0.572	0.728	0.567
Q4	0.561	0.505	0.401
Q5	0.572	0.723	0.638
Q6	0.406	0.752	0.372
Q7	0.503	0.863	0.619
Q8	0.413	0.785	0.655

While the Pattern matrix is preferable for interpretation, as it contains information representing the unique contribution of a variable to a factor, the structure matrix is a useful double check (Field, 2009). Consequently, both tables were considered in the identification of the alignment of components to the identified factors (Table 6.20).

Three factors were identified, representing 37.3%, 22.7% and 12.6% of the eigenvalues respectively.

Table 6.20. Pattern matrix. Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. Rotation converged in 7 iterations. The full wording and semantic differential rating scale for the questions is found in Appendix B

Pattern matrix	Factor 1	Factor 2	Factor 3
Q8	0.919		
Q2	0.826		
Q7	0.644		
Q3		0.850	
Q1		0.816	
Q4			0.327
Q6			0.900
Q5			0.760

Factor Identification

Factor 1 contains three questions (Table 6.21) which for analysis were scored along the range 1 to 7. All the questions deal with certainty of deliverability of actions and have consideration of risk as a common theme.

Table 6.21. Risk Factor question components. The full semantic differential rating scale for the questions is found in Appendix B.

Q8	Partners are willing to take risks	Partners are always cautious
Q2	Partners always base action on reliable facts	Partners always base actions on assumptions
Q7	Partners always explore novel methods of working	Partners always stick to known methods of working

Factor 2 contains two questions (Table 6.22) which identify agreement upon actions as a common theme.

Table 6.22. Agreement Factor question components. The full semantic differential rating scale for the questions is found in Appendix B.

Q3	Partners are always in agreement on how to do it	Partners never agree on how to do it
Q1	Partners always agree on what to do	Partners never agree on what to do

Factor 3 again contains three questions (Table 6.23). All the questions again deal with certainty of deliverability of actions and have consideration of trust as a common theme. Although Q4 has a communality value <0.7 and could be discarded from further analysis, the question has been included as sharing of information has been identified as a key aspect to trust building within a partnership (Dent, 2006).

Table 6.23. Trust Factor question components. The full semantic differential rating scale for the questions is found in Appendix B.

Q4	Partners always share all their information	Partners never share all their information
Q6	Partners always welcome new ideas	Partners never welcome new ideas
Q5	Partners always trust each other	Partners never trust each

Of the three factors identified, factor 1 contains questions relating to risk taking, factor 2 represents levels of agreement and factor 3 identifies elements of trust among partners. Factor 2 alone aligns with the level of agreement complexity theory aspect outlined by Stacey, while both factors 1 and 3 correspond to the level of

certainty aspect of the complexity concept. Consequently, factors 1 and 3 will be combined and considered as one factor in the following analysis.

Reliability Analysis

Questionnaire scales are tested for reliability that is, the ability to measure the construct under investigation. Reliability analysis was tested by Cronbach's α (SPSS V20) on each factor subscale as identified in Table 4.20. Values of 0.7 to 0.8 are reported to be acceptable, although values below 0.7 are expected for various psychological constructs due to the diversity of factors being measured (Field, 2009, p 675). Additionally, where there are a small number of components, the mean correlation between items in addition to the overall result are considered (Field, 2009). Individual components, as reported on the corrected item-total correlation (SPSS V20), are considered acceptable if the scores are >0.3 (Field, 2009, p678). All scores were >0.3 and are reported in Table 6.19. Cronbach's α are reported in Table 6.24

Table 6.24. Reliability Scores for factor scales.

Item	**Cronbach's α**
Risk Factor	0.775
Trust Factor	0.650
Certainty Factor	0.764
Agreement Factor	0.721

Attitude to certainty, sub-analysed at risk taking and trust value subscales of the questionnaire, achieved reasonable reliabilities, all Cronbach's α>0.65. The level of agreement subscale also had an acceptable reliability at Cronbach's α>0.70. Both elements are, therefore, considered reliable for use in further complexity model analysis.

Stacey's Matrix Analysis

The impact of complexity on the catchment partnership relationships is analysed through the application of the Stacey Model, reviewed in Chapter 2, section 2.9b(ii), which identifies the level of agreement about an issue or decision within the group, team or organisation and the degree of certainty within the group. Themes of risk and trust are combined to provide an amalgamated certainty factor, which was

plotted against the agreement factor in excel and scatter grams obtained for both catchment partnerships.

Figure 6.14 contains a plot of all the responses. The vertical y-axis identifies the degree of agreement on what should be done and the horizontal x-axis presents the degree of certainty, represented in this analysis by the mean of the variables forming the risk and trust factors. Values of 1 represent those responses with the greatest level of agreement and certainty of action success; values of 7 represent responses with least levels of agreement or certainty of action success. Full circles represent responders from the Irwell catchment partnership and open circles represent responders from the Ribble catchment partnership. Large circles represent those who are the most senior representatives of their organisations, that is Chair, Vice-chair or Director.

Overall:

Overall, the majority of the catchment partnership responders register levels of agreement and certainty which lie in the mid-range of the scales, with a slightly greater level of agreement compared to the level of certainty (Figure 6.14). Those responders who are most senior representatives of their organisations also lie within the central region of the scatter gram, with the exception of one individual.

Those responders reporting most certainty and most agreement (lowest scored) responses for the Irwell partnership, include a senior representative and mid-range manager both of whom are involved with volunteer management and cooperative working. Similarly, the Ribble partnership members report most certainty and most agreement scores from two responders who offer advisory services to clients and are most familiar with working in partnership.

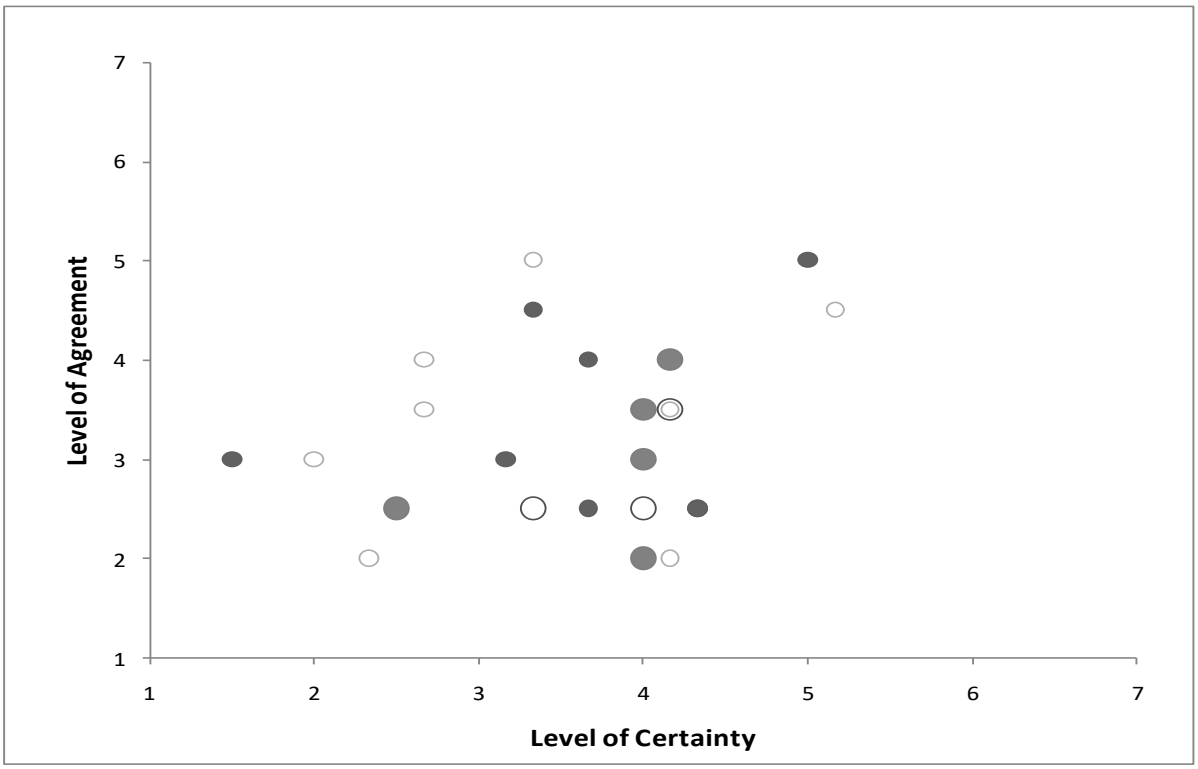


Figure 6.14. Complexity Matrix for Catchment Partnerships. Full circles represent responders from the Irwell catchment partnership; Open circles represent responders from the Ribble catchment partnership. Large circles represent those who are the most senior representatives of their organisations. Data captured Nov 2014 (Irwell) and Nov 2015 (Ribble).

For both catchment partnerships, the lowest levels of agreement (higher scores) are the responses of mid-range managers of large government orientated organisations.

Factor and Question Analysis:

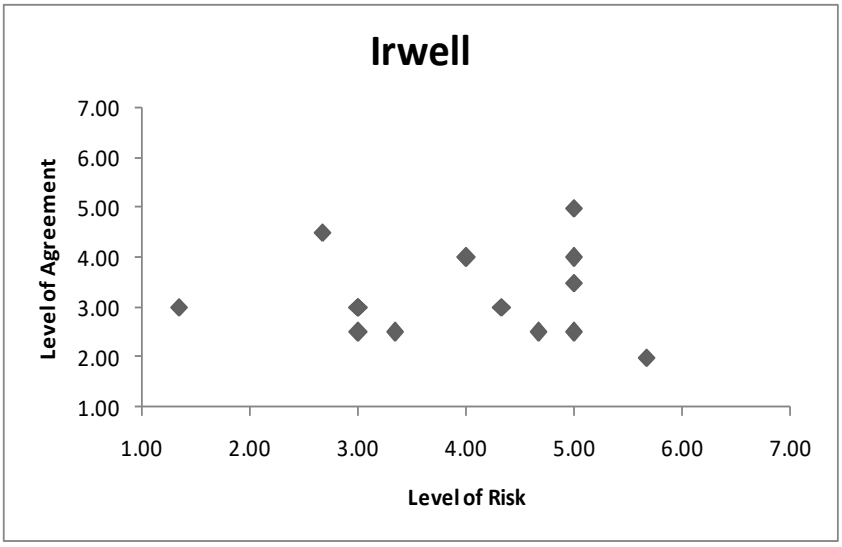
There is no significant difference in the mean responses at either the factor or the question level between the two partnerships (Table 6.25) and both partnerships report higher levels of risk based uncertainty than trust based uncertainty.

Table 6.25. Between partnership test for difference at both factor and question level mean and standard error of mean reported. Non-parametric Kruskal-Wallis test for difference (*H*), p<0.05, df=1, n=26 (total). nd= no significant difference reported.

	Irwell Partnership (N=14) M±SEM	**Ribble Partnership** (N=12) M±SEM	**Test for difference**
Q1	2.93±0.25	3.25 ±0.35	*H*(1) = 0.38, nd
Q3	3.50 ±0.27	3.33 ±0.26	*H*(1) = 0.04, nd
Level of Agreement (mean Q3+Q1)	**3.21±0.23**	**3.29±0.27**	***H*(1) = 0.07, nd**
Q2	3.64 ±0.36	3.58±0.31	*H*(1) = 0.03, nd
Q7	3.93 ±0.38	3.42±0.40	*H*(1) = 1.13, nd
Q8	4.21±0.42	4.08±0.50	*H*(1) = 0.03, nd
Level of Risk (mean Q2+Q7+Q8)	**3.93±0.33**	**3.70±0.33**	***H*(1) = 0.73, nd**
Q4	3.93±0.27	3.83±0.32	*H*(1) = 0.18, nd
Q5	3.57±0.29	3.50±0.38	*H*(1) = 0.01, nd
Q6	2.86±0.38	2.58±0.36	*H*(1) = 0.29, nd
Level of Trust (mean Q4+Q5+Q6)	**3.45±0.26**	**3.31±0.25**	***H*(1) = 0.15, nd**
Level of Certainty (mean Q2+Q7+Q8 +Q4+Q5+Q6)	**3.69 ±0.23**	**3.50±0.27**	***H*(1) = 0.24, nd**

Within the Irwell catchment partnership, the partners report reasonable levels of agreement to actions committed to by the partnership (mean 3.21±0.23) but the reported mean level of risk in achieving those outcomes is greater than the mean level of distrust within the group (3.93±0.33 and 3.45±0.26 respectively). A low level of risk is reported by an individual most involved in volunteer activity and who has experience of working in a partnership concept (Fig 6.15a). In contrast, those individuals representing large, multi-departmental organisations not involved with co-ordination of volunteers report a high risk response (Fig 6.15b).

(a)



(b)

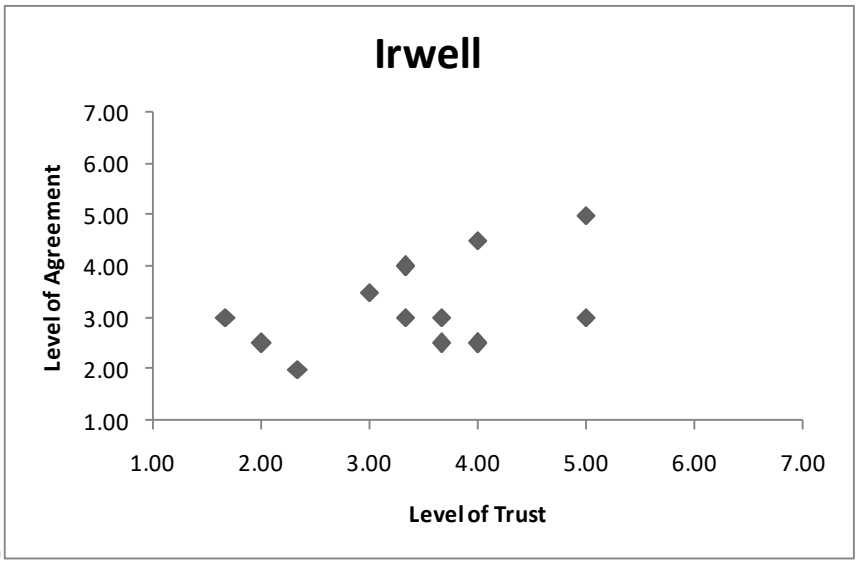
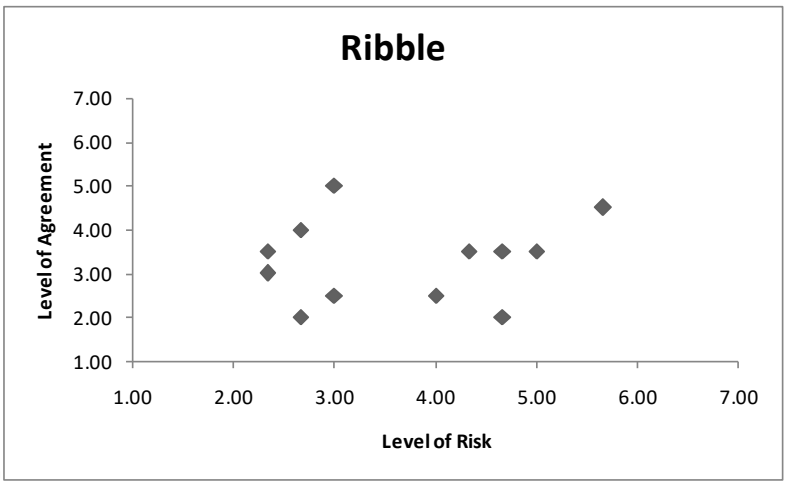


Figure 6.15 Irwell Catchment Partnership Levels of Risk (a) and Trust (b) compared to level of Agreement scored responses.

High levels of trust are reported by a group of individuals all of whom co-ordinate volunteer-led actions within the environmental arena (Fig 6.15b); by comparison, responders reporting higher levels of distrust are individuals whose organisations have been active in planning and funding large-scale conservation schemes. This suggests that co-ordinating to deliver projects by the use of volunteers is considered to be trustworthy and a low risk action, but interacting with funding bodies and large organisations unfamiliar with collaboration to deliver a project has inherent risks and thus less level of trust among partners upon actual project agreement.

Within the Ribble catchment, partners also appear to have reasonable levels of agreement to actions committed to by the partnership (3.29±0.27) and again report a higher level of risk in achieving those outcomes than the mean level of trust within the group (3.70±0.33 and 3.31±0.25 respectively). The most risk averse are again mid-range managers of large government orientated organisations plus a key influencer within an association role (Fig 6.16a), while those who report most trust in the process work in partnership as normal role function (Fig 6.16b).

(a)



(b)

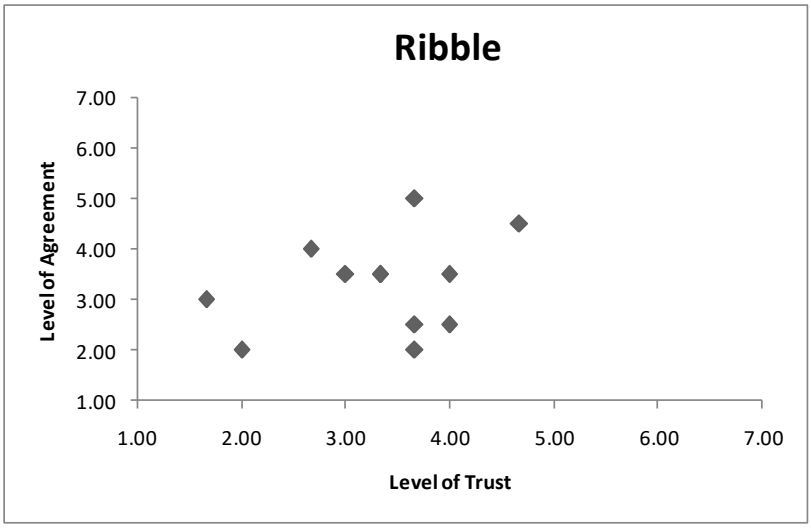


Figure 6.16 Ribble Catchment Partnership Levels of Risk (a) and Trust (b) compared to level of Agreement scored responses.

The highest levels of uncertainty are reported for Q8, that is, the question identifying the degree to which partners are believed to be willing to take risks versus being cautious; both the Irwell and Ribble partnerships report responses toward the cautious end of the scale (4.21±0.42 and 4.08±0.50 respectively). The higher value

responses to Q4 indicate low levels of trust related to partner information sharing (3.93±0.27 and 3.83±0.32 respectively).

While the overall level of agreement is reasonable for both partnerships, there is slightly less agreement on how to carry out an action rather than agreement on what the action ought to be, particularly in the Irwell partnership. A cautious approach, lack of information sharing and lower levels of agreement on how to deliver an action are the key traits reported.

6.3.7 Coded Comments: Qualitative Findings

Responders were offered an opportunity to expand upon their responses within the survey instrument, augmented by commentary obtained through semi-structured interview. A total of 142 coded comments were extracted from the responses (Table 6.26) – full details of the comment, developed coding and categorisation are contained in Appendix C. To protect participant confidentiality names have been removed in line with ethical requirements. All the *a priori* codes were used, no comments were left uncoded.

Table 6.26 Count of Participant coded comments categorised from *a priori* developed coding. Further details contained in Appendix C.

Coding Category	Stakeholder Power / Interest Category (No)			Total No of Coded Comments
	High	Medium	Low	
Competition	22	4	3	29
Leadership	76	8	16	100
Knowledge	8	1	4	13
Total No of comments	106	13	23	142

Overall, 74% of the comments were provided by high interest and power stakeholders, with 70% of the comments pertinent to leadership issues. Further analysis of the leadership comments (Table 6.27) finds partnership relationships are most frequently noted (33%) by high interest and power (i/p) stakeholders, with

financial competition among high i/p partners also a frequent concern. Low interest and power stakeholder comments linked to the prioritisation of goals are most frequent (50%).

Table 6.27 Count of Participant coded comments categorised as Leadership.

Stakeholder Power / Interest Category	Championing	Prioritisation	Relationships	Own resources	Financial support (for CP)	Scale	**Total No of Comments**
High	12	19	25	10	4	6	76
Medium	1	3	3	0	0	1	8
Low	3	8	1	1	2	1	16

Overall Findings:

The participant comments demonstrated that the partnership members are able to reflect upon the working processes and relationships encountered in their participation in the collaborative group. Their reported reflections are critical of the leadership of the partnerships, particularly the domination by larger, more powerful organisations. Taken together with an apparent lack of appreciation for the additional demands placed on individuals by the act of participation, there is an overall negativity expressed in the value of the CaBA approach. However, this is not a unanimous view; a few participants are positive in their outlook and view the partnership as a means of communication and an opportunity for expanding their scale and range of activities. No formal governance mechanism concerns were raised, with the exception of one individual who is tasked with day to day running of the group. Trust concerns are common, linked to frustrations with data sharing, financial competitive actions and avoidance of contention resolution, however, although trust issues are frequently raised, no suggestions for further internal or external accountability controls are found. Recorded risk issues are limited to barriers to participation and the longer-term sustainability of the partnerships – but these are less frequent than trust based concerns.

Competition Category Findings:

The majority of responders concerns with competing positions are expressed through a negative attitude to sharing financial resources, the impact of public sector responses to financial constraints and the impact of those decision on the viability of the multi-agent collaborative concept. Operating structures are thus more complex and more difficult for organisations to manage. These views are most common among those high interest and power stakeholders.

~ *The evolution of catchment management has made the task of making improvements more difficult and more complicated than it used to be for our own organisation. There are a lot more politics to navigate when applying for the little funding currently available .. those organisations/individuals equipped to manage funding and deliver on-the-ground are essentially all in competition with each other for the limited funding available. respondent ref #C35 High power / interest mapping (pim)*

Responders consider the lack of public-body capability to participate, and lead, actions to be detrimental to CaBA success, a view commonly expressed by low power/interest stakeholders.

~ *Public sector spending cuts are continuing & increasing & will affect catchment management. #C06 High pim*
~ *Local authority cuts have had a negative impact – no budgets to maintain infrastructure, no staff to work with volunteers. #C26 High pim*

Leadership Category Findings:

There are a number of positive statements relating to the value to be gained by cooperation, particularly at the strategic level, but these are in the minority and caveated by concerns regarding the whole-hearted support for the concept at senior levels within participating organisations.

- ~ *Organisations are involved because their areas of interest intersect with the CBA and catchment management can be a tool through which their priorities are achieved. #C41 High pim*
- ~ *Some of the key investors within a catchment (UU, EA) might understand and support the catchment approach. However, the joining up of activity and resource to deliver wider outcomes/additionality is as much of a responsibility of them as it is the wider partnership organisation. Whilst I am sure this does happen, how widely does it occur across the large investment programmes of these partners or are some of the other funding/organisational barriers get in the way? #C34 High pim*

Partner relationships concerns and prioritisation issues are expressed by a large number of the responders. Trust and respect have been identified as critical influencers upon effective peer accountability: a number of the responders register dismay with the performance of their peers, yet there is no conflict resolution mechanism reported. Commentators identified the hard work required to reach agreed-upon common ground, yet the effort involved in managing team dynamics in order to progress as a unit is not valued by all participants, in particular, one individual who is deliberately introducing contention. The current mechanism to deal with such contention is through the formalising of operational 'rules' via the production of terms of reference documentation, however, producing such bespoke control mechanisms takes away from the resources available which encourage collaborating opportunities, such as promotional work.

- ~ *Developing terms of reference (ToR) appropriate to the role of the group takes time and agreement. #C27 High pim*
- ~ *This takes an enormous amount of TIME and the relationships between the different pieces of work are complex. #C41 High pim*
- ~ *Different organisations have different priorities so you need to work hard to find the common ground so there is a slow pace in the on-going development of the partnership but particularly in the formation of an action plan. #C27 High pim*

~ *[Resource spent] managing the politics and tensions around perceived "empire building" aspirations of some members. #C36 High pim*

Currently, some individuals are not constrained by their peers and form disruptive and acrimonious relationships without any consequential action. This discontent is not recognised by all members of the group. The lack of a mechanism to resolve these internal issues is raised as a concern by only one high interest/power stakeholder.

~ *I believe the group should be more successful than we are, so I'm stirring the pot, as rivers are not central to the core of our host's organisation. I'm looking to introduce a forum to remove this political interference. #C38 Medium pim*

~ *It's very difficult to know how to talk about (and resolve) these issues as a group. #C35 High pim*

There is a clear recognition that the demands of maintaining the catchment approach is focused on a few, committed individuals - this is a risk to the sustainability of the partnership. Environmental interested organisations are recognised to be at the fore-front of the group directing partnership aims, but the lack of consideration of other interests is causing frustration with the focus and value of the group to those who have more diverse interests, commonly low interest/power stakeholders. The lack of a large, championing organisation, with scope beyond the catchment is called for by one low interest power individual as a means of resolving the current frustration with the partnership construct. Consequently, the catchment partnership is seen as a drain on limited resources by some participants.

~ *The catchment-based approach is additional work for minimal perceived benefit and therefore very reliant on the enthusiasm and energy of a few people in each partnership to get momentum going. Most of the partners cannot see what additional benefit CaBA will bring to their work. #C16 High pim*

~ *.. need to work hard to find the common ground. #C27 High pim*

- ~ *Overwhelming emphasis on natural environment versus historic environment. #C39 Low pim*
- ~ *Catchment partnership is primarily a collection of professional (salaried) eco-interested parties, so some stakeholders are not represented. Biodiversity interests have been at the fore. #CS2 High pim*

Knowledge Category Findings:

Responders reflections are focussed upon a lack of data availability and sharing mechanisms. Investment to support knowledge transfer networks is required and smaller organisations are looking to the larger organisations provide the mechanisms. Such expectations are not however made explicit in the partnership demands upon core organisations. There are expressions of dismay with the catchment partnership as a concept where the reality of participants' abilities and opportunities are not taken into consideration, resulting a feeling of lack of respect for participants.

- ~ *Catchment based approach requires integration and joining up of plans and activities of a range of organisations to maximise value. The theory behind this is sound. However, limited resource to undertake the process of joining up and operating a knowledge transfer network can limit effectiveness, even if resourced at the centre of the partnership. If other partners are effectively not similarly resourced for the task of catchment partnership working, it can be a barrier to their participation. #C34 High pim*
- ~ *I think that CP needs to be realistic about what its members can/will do. As an example, one workshop was convened and it was obvious that attendees were unlikely to have sufficient knowledge to take any meaningful view. #C19 Low pim*

General

The open-ended question was included to allow respondents to elaborate on partnership working issues, with the aim of enhancing the insights gained from the

quantitative studies through elaborating main concepts. It is noted, that all of the themes developed from the literature review are found in the narratives supplied by catchment partners: thus, selections of extracts relating to the categories derived by complexity theory analysis are incorporated in the discussion contained in Chapter 5 to provide richness of interpretation through combining differing methods.

CHAPTER 7 DISCUSSION

The research presented in this thesis focused on key issues of policy implementation: how does the introduction of a complex form of collaborative system networking impact policy implementation and how are local implementing agents connected to system feedback? The emergence of network analysis and complexity thinking in the natural resource areas provides an avenue that allows new insights into how implementation can be assessed and helps understand the factors that influence environmental management success.

The research aimed to understand how the delivery of statutory environmental goals was, and will be, influenced by the characteristics and structure of implementation teams at the micro-level by examining catchment partnerships, their declared goals and partners approaches to risk and trust, in addition to how steerage from the accountable body is manifest at a whole system level. Selected UK catchment partnership groups in the North-West River Basin were used as a case study. The research was categorised into three different themes linked to the objectives of the study (see section 3.3):

- Network System Dynamics: How is the implementation system developing? Is there a discernible impact due to the Localism Agenda?
- Ecosystem Service Focus: What is the temporal shift and trade-off within catchments (historic analysis) and is this comparable to current goals? Have catchment partnerships developed their own unique agenda based on an Ecosystem Service (EsS) approach or retained the initial focus on statutory goals?
- Influential Participants: Do all the collaborating partners possess compatible approaches to risk and agreement to action? Which actors are involved and what are their collaborative relationships within catchment partnerships? Which stakeholder groups play an influential role?

The objective of this chapter is to discuss the thematic results at the micro-level, that is, those influential participants and the factors which shape their participation (Section 7.2), to discuss the ecosystem services identified within the catchments and the implications for goal co-ordination among catchment partners (Section 7.3), and

to identify the system level model and consider the implications of the results for environmental policy implementation (Section 7.4).

7.1 Overall Findings

The findings of the research set out in this thesis indicate that while the catchment context influences the make-up and goal prioritisation of individual catchment partnerships, the partnerships studied remain strongly influenced by the mandated authority, complying with the system stewardship model where policy aims are achieved by the steerage given via influencing central government agents (section 6.3.2, section 6.3.5). Evidence generated was described in earlier chapters and can be summarised as follows:

- Implementation models have been defined in the literature and three main theoretical perspectives identified – a top-down, bottom-up or system stewardship approach (section 2.2.1). By considering the UK WFD and catchment management mechanism against Matland's Ambiguity-Conflict framework (1995), the disconnect between the political structure and local implementing actors is exposed. The approach launched by DEFRA in 2013 produces a hybrid of two aspects, that is, an amalgam of the political and experimental implementation frameworks (section 6.1), reflecting the arms-length implementation model specified by system stewardship. However, there are no formal connecting linkages via the publicised River Basin Management route which would be expected to provide the support responsibilities identified as key to success by earlier researchers.
- Partnership goals reflect the physical locations and catchment context, however, neither partnership have expressed their goals in terms of an ecosystem service (EsS) framework (section 6.2.3), even though partners all reported ecosystem services important to themselves (section 6.2.1). The primary aims of WFD to protect freshwater for the future and improve water quality are found to be the most important ecosystem services identified by catchment partners. Irwell partners report greater focus on cultural EsS, i.e. recreational and heritage values, than Ribble partners, who place greater value on provisioning services i.e. drinking water.

- Both partnerships place the catchment host and catchment co-ordinator at the centre of their networks (section 6.3.5). Secondary focus is given to the natural capital area and least focus to social capital organisations. Prominence is not influenced by the presence of a different host organisation. Prominence in networks was identified through social network analysis, reducing non-response effects in line with best-practice and focussing on robust measures.
- The influence of the mandated authority remains high (section 6.3.5); both partnerships report high prominence and influence for those representatives, who thus provide system steerage and so prevent divergence from WFD goals, in effect describing a top-down controlling model. Consequently, low power/interest stakeholders were most concerned with goal prioritisation issues (section 6.3.7). From the analysis presented in this thesis, it may be argued that the greatest prominence in catchment collaborative networks is given to the political operation of the partnerships and a secondary focus is given to the natural capital area.
- The networks reported in this analysis have differing levels of cohesiveness (section 6.3.5). Differences are reported regarding the support functions provided by the catchment host organisation: the Ribble catchment host organisation support the partnership with personnel who are directly involved with specific functional interests such as farming, invasive species activity and publicity mechanisms. These additional host resources are not found in the Irwell partnership, who include the CaBA support team as integral actors (section 6.3.5).
- While both partnerships are heterogeneous with a wide range of partners and interests, those functional groups associated with natural capital improvement and legislative responsibilities are found to be most influential in this analysis (section 6.3.2). The Ribble collaborative network appears to be more homogeneous than the Irwell network having a larger presence of Rivers Trust participants and lacking the local groups and heritage actors identified in the former partnership make-up. There are similarities in stakeholder make-up between the River board and catchment partnerships.

- Both partnerships report a slightly lower level of agreement on ‘how to do’ when compared with the level of agreement on ‘what to do’ (section 6.3.6). The levels varied among partners, with representatives of those organisations involved in partnership working reporting most agreement to act and most trust among partners. There is no significant difference between the examined partnerships, both identifying trust issues which are not addressed by formal accountability mechanisms (section 6.3.6).

The following sections consider the key themes of the study. Quotes from individuals within both catchments and UK support organisations are provided to expand on survey responses. Qualitative analysis has been led by the *a priori* themes described in section 5.6.6 and responses from stakeholders provide illumination to the quantitative survey results. All respondents are anonymised and the quote sources indicated by code in line with ethical requirements, together with the stakeholder power and interest mapping designation (High/Medium/Low). For example, the code ‘High pim’ following a quote indicates the respondent is a representative of an organisation or group which has a high rating on the power and interest mapping (Figure 6.6). Respondents are anonymised in line with ethical requirements and represented by code – no specific designation is attached to the code. The full record of narrative responses and derived deductive coding is provided at Appendix C.

7.2 Influential Participants

Areas of review considered in the following discussion are the:

- complexity of the partnerships, which will be reviewed to explore how individual attitudes to risk and trust influence the agreement to act.
- structure of the partnerships, through reviewing the prominence and influence of key actors within the catchment partnerships identified by application of social network analysis.
- attributes of the catchment partnership actors, to examine how they are a determinant of the goal choices.

7.2.1 Partner Approach

Institutions managing ecological systems are noted to be complex, with management often decentralised from government bodies to the lowest level of governance which is deemed capable of dealing with the required tasks (van Oosterzee et al., 2014). Catchment partnerships were instigated by UK Government in 2011 and reflect a move to this decentralised concept. Catchment partnerships form a body which consists of diverse members: participants range from representatives of UK Government Agencies through wildlife charities to local community activists (section 6.3.1), however, such diversity has been found to produce a management dilemma regarding innovation and action (DiTomaso et al., 2007). The increasing demand to include stakeholder participation, such as outlined in EU policy Water Framework Directive (EC, 2003), is leading to the adoption of governance models which incorporate a network focus, building collaborative multi-stakeholder partnerships (Kemp & Martens, 2007; Marcussen & Torfing, 2003). MacLeod et al. (2007) have stated sustainable catchment management requires integration of a wide range of stakeholder requirements and the multi-stakeholder nature of common-property water catchments has been noted to be a challenge (Venter et al. 2008), as stakeholders in such groups possess varying views, different values and knowledge and their expectations reflect different temporal and spatial scales (Stankey et al., 2005). The work reported in this thesis builds on partner relationship research in the environmental field, by examining the influence of trust and risk-taking on cooperative performance through the application of Stacey's matrix (section 4.5.2), in order to understand the behavioural and social dynamics in catchment partnerships. The evolution of catchment partnerships from existing riverine groups has influenced the make-up of partnerships (section 6.3.1) and the shared background has produced the higher levels of agreement reported for 'what to do', but responders from both partnerships reported lower levels of agreement on how to implement actions (section 6.3.6), which is characteristic of implementation difficulties common to heterogeneous groups (DiTomaso et al., 2007). For both partnerships, the lowest levels of agreement (higher scores) were the responses of mid-range managers of large government-orientated organisations. For these organisations, hierarchical governance is the traditional model, with a chain of control from the decision makers

to implementers enforced through the imposition of numerous laws and regulations (Hall, 2011) removing the decision-making required at the lower working levels when encountering risk situations, thus avoiding preferences for risk situations in the public sector (Dong, 2017). Catchment partnerships act as collaborative networks and are reliant upon mutual dependence and negotiation which is unfamiliar to those working in government organisations, hence the greater levels of uncertainty reported.

> *~ There still exists a silo mentality in some organisations. It can be difficult particularly in local authorities to identify the officers who can take a lead. Organisational structures can be a barrier. #C06-High pim.*

Earlier research has noted that innovation and creativity, are more likely in heterogeneous groups but the ability to integrate divergent ideas and implement actions is more difficult (DiTomaso et al., 2007). In the findings presented, catchment partnerships report trust and risk-taking concerns which impact the certainty of the group to deliver actions (section 6.3.6), an aspect symptomatic of a heterogeneous group and conforming to DiTomaso et al.'s (2007) earlier research. The majority of the respondents in this study correspond to the central region of Stacey's matrix (section 6.3.6), that is, the zone where traditional management approaches are less effective and which Stacey termed the 'zone of complexity' (Seigel, 2011). In this complex zone, organisations report greater levels of creativity, innovation and new method adoption, but the participants may feel they are muddling through in order to work to a collective outcome. Catchment partnerships conform to this pattern.

> *~ There is a lot of new information to absorb, and at times people may feel they are being asked to contribute to something they don't feel they have sufficient knowledge of #C41-High pim*.

Sharing knowledge has been identified as a key principal to build stakeholders capabilities including trust (Cvitanovic et al., 2015; Dent, 2006), yet both catchment partnerships report a result closer to the 'Partners never share all their information' end of the scale (Irwell mean 3.93±0.27; Ribble mean 3.83±0.32). Central CaBA support officers, who are representatives of some of the environmental NGOs who have been most active in river catchment management since 2010 (CBA, 2017a),

report difficulties for those catchment partnerships which are newly formed and where there are pressures to implement actions.

> *~ Young CaBa need time to build trust and avoid the mud-slinging which often happens ... and this impacts the trust in listening and understanding between partners #CS1-High pim.*

However, the catchment partnerships in this study do have longevity, as both were pilots, so the lack of trust reported is influenced by some additional aspect.

> *~ general lack of collating and sharing data and evidence #C27-High pim.*

Factors which influence the lack of information sharing were provided by the partners and reported in Appendix C; the key themes identified by the partnership members include a lack of resources to amalgamate various plans.

> *~ Catchment based approach requires integration and joining up of plans and activities of a range of organisations to maximise value ... however, with limited resource to undertake the process of joining up, even at the level of operating a knowledge transfer network, effectiveness is limited #C34–High pim.*

Additionally, where incomplete data are available, there are concerns expressed about the confidence partners possess in making decisions on 'risky' data.

> *~ The weight of evidence approach is simple in concept but only used in practise by those who despite the obvious issues are often happy to use [this] information after critical review, while others will either believe it verbatim or ignore it #C16-High pim.*

Previous researchers have advocated the sharing of scientific information to avoid the group relying on personal experience (Cvitanovic et al., 2015) with the expectation that this will build trust. However, this creates a paradox for catchment partnerships: to build trust, information is expected to be shared and projects monitored and reported but, due to a lack of resources and incomplete information,

the available information may not satisfy those desiring such information, so trust remains lacking.

Stacey's matrix correlates simple management practices, which include traditional monitoring and evaluation approaches, to the greatest levels of certainty and agreement to act. Where there is less certainty reported, Stacey proposes the use of slightly more complicated approaches such as coalition building, negotiation to create an acceptable compromise and evaluation against a vision, particularly where detailed plans are not available (Seigel, 2011). Rather than specific, detailed project goals, which are not considered inclusive by those low power/interest stakeholders (section 6.3.7), catchment internal relationships may benefit from the greater flexibility presented by working to an overall vision, reducing additional measurement and progress report demands.

A previous study by Fernandez-Gimenez et al. (2008) noted that collaborative working can lead to trust building. In their 2008 study, the groups under review consisted of multiple individuals with different interests and levels of expertise which is comparable to the catchment partnership structures. Fernandez-Gimenez et al. (2008) found the strongest trust relationships were reported when diverse mixes of personnel were involved equally in a task and there were repeated interactions among group members. Projects designed by a lead agency alone resulted in less trust building, an issue which has also been reported by the catchment partnerships,

> *~ Issues include managing the politics and tensions around perceived 'empire building' aspirations of some members #C36-High pim.*

although the counterview has also been reported where the lead agency implementing actions is considered competent and is delivering desired outcomes.

> *~ We trust [XX] and just let them get on with it #C03-High pim.*

Consideration must therefore be given to the issue of goal alignment which impacts the trust levels, the attainment of a shared objective producing greater harmony.

Catchment partnerships have been in place for over three years and aspects of homogeneous group functioning would be anticipated.

> *~ We are quite a diverse range of organisations yet I think our specific areas of interest are generally complementary #C26-High pim.*

Where the length of relationship and previous cooperative working has influenced management choices, working practices may become familiar leading to a homogeneous group reporting greater cooperation and trust among members, but where aspects of adaptability and innovation are less likely (DiTomaso et al., 2007).

> *~ Representatives have been part of the partnership for a long time; [XX] catchment partnership members have been present for a while so there is no need to keep building relationships #CS2-High pim.*

However, reports of greater cooperation and trust are limited and for both catchment partnerships a slightly cautious approach is currently prevailing.

Costa (2003) explored how trust functions within work teams and the relation with team performance. Perceived trustworthiness and co-operative behaviours were the two strongest components of trust identified in the 2003 study, however monitoring behaviours within the team resulted in negative impact on trust. Where the risk associated with trusting is high, monitoring becomes the basis for trust building, however there is a risk to the organisation, as in high monitoring / low trust scenarios the commitment to the organisation decreases (Costa, 2003). Work by Aulakh et al. (1996) reports the use of monitoring mechanisms between partners is detrimental to partnership performance. By considering a move away from monitoring outcomes to a social control mechanism instigated through building a common culture, a social obligation to the partnership is formed which is maintained via social pressure mechanisms (Aulakh et al., 1996). These mechanisms include the facilitation of role understanding through organisational exchanges, so forming shared beliefs and interpersonal interactions. Survey response analysis presented in this thesis, indicates that those who are familiar with partnership and collaborative working report greater levels of certainty in the success of actions – this suggests that it is the personal experience with partnership working which is crucial to cooperative success and trust building. This raises an interesting question – does a reliance on the 'scientific approach', including the application of between-partner monitoring and

evaluation, negate the influence of co-operative working in the catchment partnership? What makes a 'successful' partnership, therefore, ought to be articulated and agreed within catchment partnerships, and incorporate statements of knowledge sharing expectations, together with commitment to catchment partnership development through work exchanges between organisations. In Fernandez-Gimenez et al. (2008) review, the groups under study included an explicit project goal to achieve greater levels of co-operative behaviours, which included trust building. Catchment partnership may benefit from adopting similar measures when involved in cooperative projects.

Central CaBa support officers recognise successful partnerships as those where specific personal qualities are found.

> *~ people with the knowledge [are] in the lead organisation, [they] avoid alienating sectors [partners] and bring hard-nosed, business discipline to each catchment. Need a scale of ambition #CS1-High pim.*

Personal qualities are identified as including:

> *~ Need a risk taker – need someone with an ability to take and own the risk and dedication to keep at it* and
>
> *~ which are project orientated and focussed on action #CS1-High pim.*

This suggests the central support team view partnerships with a recognisable leader as those expected to deliver against firm objectives Within the catchment partnerships under study, the Ribble catchment host has been successful in leading a catchment wide proposal and attracting Heritage Lottery funding of £2M (2015) with an aim to "galvanise the partnership through developing and agreeing a clear strategy and plan" (Ribble Life, 2015), The Ribble catchment host acts as a champion for their catchment, yet the catchment partnership still reported a lack of agreement on how to implement plans as respondents have indicated they consider some partners adopt more cautious solutions.

> ~ *XX naturally risk averse so can't rely on them to push new concept forward #CS1-High pim.*

Asymmetric power relations have been shown to undermine long-term prospects (Crona & Bodin, 2011; Longcore et al., 2007) and an institutional design review may benefit catchment partnerships integration where apparent success is not fully supported by all partners. Unlike the Ribble catchment partnership, the host organisation of the Irwell partnership does not act in the champion role. Instead, partner organisations champion their own areas of focus with resultant issues on funding competition and a perceived lack of benefit in the adoption of co-operative working.

> ~ *the catchment based approach is additional work for minimal perceived benefit and therefore very reliant on the enthusiasm and energy of a few people in each partnership to get momentum going #C16-High pim.*

> ~ *I think that [catchment partnership] needs to be realistic about what its members can/will do #C19-Low pim.*

The area of least agreement to act and least certainty within the Stacey Matrix is termed the 'zone of complexity' (Figure 4.2) where the more complicated management tools of planning, visioning or negotiation are not considered effective (Seigel, 2011), however, it is often found that Leaders may emerge from this zone of chaos in order to create stability (Seigel, 2011). Within the Irwell partnership, the diversity of policies and desire by some partners for faster implementation of catchment activity has resulted in action-orientated individuals, found in Stacey's zone of chaos, introducing tension and influencing other group members.

> ~ *Given the size of the area and the number in the group, is swift action possible? #C31-Low pim.*

> ~ *Believe the group should be more successful than we are #C38-Medium pim*.

> *~ stirring the pot, as rivers are not central to the core of [XX] organisation #C38-Medium pim.*

The structure and positioning of catchment partnerships as the mandated authority is challenged by a proposal to introduce a pan-catchment forum to improve efficiency,

> *~ Want to introduce a forum to remove the political interference #C38-Medium pim.*

However, the introduction of a new player at the grass-roots which overlaps with existing partners has reduced trust and led to core partners withdrawing from formal meetings. Avoidance of issues and the adoption of adversarial positions have been previously noted when powerful interests dominate, consequently governance design is a critical control within collaborative processes (Beyrner-Farris et al., 2010; Brock & Carpenter, 2007; Layzer, 2012; Lynch et al., 2008). Transparency and openness are critical to successful partnerships; however, this is not apparent in the responses of Irwell partners. Ladson & Argent (2002; In Stankey et al., 2005) noted that where the focus of the lead organisation does not represent the diversity of values within the partnership, there may be resistance to change resulting in adherence to the status quo. The majority of the comments received from low power/interest mapped stakeholders relate to prioritisation issues and a lack of perceived interest in non-water related goals: the application of an ecosystem services framework to address this weakness is considered in section 7.3

Within section 7.2.1 the influence of certainty and agreement on catchment partnership activity has been examined. The application of Stacey's matrix has identified responders who are least certain, and report less agreement on how to act, and proposals offered on how to develop internal trust and understanding through work exchanges. Those who reported greatest levels of certainty and agreement are those familiar with co-operative partnership working, reflecting their learnt experiences.

> *~ My project works on a partnership model & so the CP is a natural extension to the way I work #C06-High pim*.

Experience of coalition building and joint activity co-ordination would be anticipated to be valued skills within the partnership and consequently those reporting greater levels of certainty and agreement would be expected to have a lead role within the group and/or be instrumental influencers among their peers. The structure of both catchment partnerships through social network analysis is examined in the following sections to ascertain whether those partners who are comfortable with the collaborative approach are the leaders of the group or whether hierarchical functions or dominant champions have greater influence.

7.2.2 Partnership Structure

Both catchment partnerships consist of stakeholders from the public, private and voluntary sectors, participating according to their interests (section 6.3.1). A viable Catchment Based Approach is generated by engagement and collaborative, partnership working (DEFRA, 2013) and the DEFRA policy document deliberately excludes prescriptive methods on how catchment partnerships should be organised. However, there are two key roles specified among the wider partnership members, the competent authority representation and catchment facilitator/host. Both the partnerships reviewed here report these roles to be present and they are, in fact, the most prominent within the collaborative networks.

Watson (2015b) reported the influence of the host impacted the stakeholder mix; this has been found where the partnership hosted by an environmental, community orientated charity has a greater range of stakeholders within the collaborative network than that managed by a river interest body which lacks the local groups and heritage actors within the reported partnership network, however, the prominent stakeholders within the groups are comparable (section 6.3.5).

Key Actors

The Ribble collaborative network appears to be less heterogeneous than the Irwell network with a strong riverine influence due to the presence of host organisation personnel in addition to the host officer; these personnel are directly involved with specific functional interests such as farming, invasive species activity and publicity mechanisms. Network structures do require support and Kowalski and Jenkins (2015) identified a critical role for host organisations to provide technical, financial and personnel resources to facilitate interdisciplinary dialogue and collaborative

activity. Indeed, the Catchment pilot feedback report produced in 2013 noted the requirement to provide the *additional human, administrative and technical resources* deemed necessary to deliver an effective catchment-scale collaborative initiative, proved to be a barrier to one interested organisation (Watson 2013, p24). While the support requirement to facilitate collaborative activity has been recognised and fulfilled within the Ribble partnership, such support resources are not apparent within the Irwell partnership. Consequently, there may be more potential for collaborative activity in the Irwell by strengthening the co-ordinating role with support resources similar to those found in the Ribble partnership, rather than relying upon the central CaBA support team. This echoes the findings of Cohen et al. (2012), where co-ordination roles are noted to be vital to strengthening co-management actions, particularly where no alternative co-operative body exists. It is known that alternative *fora* for natural capital discussions are present in the UK, for example, Local Nature Partnerships/ Natural Capital groups, Associations of Local Authorities; examination of how catchment partnership members sit within these other *fora* would illuminate duplication and potentially identify whether catchment partners report low cohesion where alternatives exist. The outcome may give a signpost as to how catchment partnerships are developing and linking into policy frameworks which provide legitimacy to their actions. Further review of the current network dynamics relating to the Irwell Partnership are discussed in section 7.4.

The Ribble catchment host appears to be critical to the flow of information within both the partnership structure and their own organisation. However, by centring upon one actor and one organisation there is a risk to the resilience of the Ribble catchment partnership should the host organisation withdraw from the hosting function or the key actor be lost.

Partnership Cohesiveness

Attributing ‘importance’ to the position of a node in a social network implicitly employs a theory of social interaction, normally a variant of the theory of social capital. Aspects often mentioned in describing social cohesion are shared values and communities of interpretation, feelings of a common identity, a sense of belonging to the same community, trust among members as well as the reduction of disparities (Berger-Schmitt & Noll, 2000). The partnerships examined reported similar prominent

individuals, however the networks reported in this analysis have differing levels of cohesiveness, the Ribble partnership reporting density and centralisation values three times those of the Irwell Partnership for the collaborative network (Table 6.18). The impact of the different cohesion results upon the commonality of purpose and belonging are considered: High centralisation is theorised by Bodin et al. (2006) to be beneficial to the relaying of information and speedy decision making, which is necessary for the coordination of resources particularly during periods of change. However, where a few individuals have a high prominence, there may be a risk of increasingly centralised decision making, which was found in the case examined by Baird et al. (2016); in this Canadian initiative, high density and centralisation values of 33% and 36% respectively were identified, together with a decision making sub-group (Baird et al., 2016). The Ribble partnership has a centralisation of 28%, similar to the Canadian case, which taken together with the reported high prominence of a few individuals, suggests a risk of centralised decision making in the Ribble partnership.

Trust is theorised to impact density results; high density at the initiation of a project leads to opportunities to increase trust between participants due to greater interactions among actors, however high density levels reported beyond the group formation stage may result in social control through the homogenisation of views and experiences (Bodin et al., 2006); the development of mutual norms and understanding of similar perceptions over time may be reinforced by peer-pressure from influential actors, possibly restricting the ability to innovate or introduce new actors into the group (Bodin et al., 2006). The Ribble is less heterogeneous then the Irwell as the riverine focus is enhanced by member of the catchment host organisation in supporting roles, therefore the density value of 15% may be indicative of a similarity of ideas and problem-solution within the group. The Ribble network also identifies a sub-group of senior personnel representing major land management organisations who report mutual ties with the catchment host, the host also being a key influencer within the network. Consequently, there is a risk of unacknowledged influence if decision making and agreements on collaborative actions are not made transparent to all partnership members.

The Irwell catchment partnership reports very low density and centralisation values. The hypothesis between structure and performance outlined by Carlsson and Sandström (2008), proposes those structures with low cohesion and higher diversity may be less effective in decision making, prioritisation and demonstrate difficulties in resolving conflicts between partners. Since June 2016, key members of the Irwell partnership, identified as such in social network analysis, have withdrawn from formal meetings and co-operative opportunities have fallen. Partners have expressed a number of reasons for this: difficulties in scale and competition for environmental-uplift funds are prevalent. Partners report catchment partnerships are a viable method of raising interest in river restoration,

> *~ value as a mechanism for drawing together work at a strategic/policy level, providing a point of reference and perhaps taking on a level of public interface work that the partner agencies don't have the time or expertise to do #C19-Low pim.*

however, the most reported issue covers the lack of funding to implement projects and the sharing of the limited funds available in 2014/15.

> *~ major issue ... those organisations / individuals equipped to manage funding and deliver on-the-ground are essentially all in competition with each other for the limited funding available #C35-High pim.*

> *~ Restoration is no longer cost efficient, and progress has slowed. It's very difficult to know how to talk about (and resolve) these issues as a group #C35-High pim.*

> *~ [XX] might provide a starting point for projects but perhaps only as a means of attracting / directing funding... where resources are tight this is only going to happen if the input/output is considered worthwhile #C19-Low pim.*

In the Irwell collaborative network analysis, those actors who are most certain of the collaborative working principals are not as prominent within the network and appear less able to influence decisions when compared to those of similar certainty of

collaborative working within the Ribble network (Figure 6.7, section 6.3.5). The Ribble catchment host appears to be critical to the flow of information within both the partnership structure and their own organisation; this is reflected in the higher cohesion factor reported for the Ribble network. Those able to champion the collaborative approach in the Ribble are well connected to the catchment host who has a key influencing aspect which is lacking in the Irwell structure. This uniting function is not apparent in the Irwell and so information relating to collaborative working principals and certainty of delivery may be restricted. To address this potential weakness, the function needs to be delivered, if not by the host, by one of the key practioners who can champion the success to other partners and to a wider stakeholder audience.

Theoretically, both partnerships may benefit from a denser network traditionally achieved by a more hierarchically structured group, however previous researchers have warned against systems which are too dense as there is a risk of peer-pressure from influential actors which may restrict the ability to innovate or introduce new actors into the group (Bodin et al., 2006). A move to a controlling hierarchy based on the current collaborative structures may reduce the influence of social and community groups and deliver a more homogenised partnership. There is a particular risk in the Irwell where those possessing collaborative work methods are more marginalised than in the Ribble.

7.2.3 Catchment Partnership – Micro-level Evolution

The catchment based approach policy framework as designed by DEFRA allows for flexibility of approaches and recognises that the patterns of partnership working will evolve. The catchment partnerships considered within this study have engaged with the current Catchment Based Approach programme and fulfil the requirements as specified in policy documents (DEFRA, 2013).

The findings from the social networks analysis contained in this thesis, suggest future UK policy guidance outlining partnership-led approaches would benefit from the inclusion of aspects of Gugu and Dal Molin's (2016) recommendations to address identified weaknesses, specifically:- clearer statements specifying the resource requirements necessary to fully support collaborative partnerships initiatives, so avoiding risks with either unsupported partnerships or over reliance on one influential

partner; to be transparent of where such support is located in the system; and ensuring diverse stakeholder representation enables a range of views and ideas to be explored, which may challenge approaches and so maintain adaptability and sustainability in the future. The stakeholders present in the partnerships are similar to the River Basin (RB) management contributors (section 6.3.1): the lack of difference in stakeholder diversity between the RB and Catchment groups has no doubt assisted in focussing the catchment partnership on WFD requirements, the RB *raison d'être*, and so local, non-riverine participants have been found to lack influence, being peripheral within partnership social networks. The stakeholder mapping of interest and power highlights the continuing notable influence of the mandated authority, water companies and wildlife conservation stakeholders, who are also key members of the NW River Basin liaison panel. The homogeneity of stakeholders between RB and Catchment groups, reinforces similarities of approach to problem solving across geographic scales. To encourage new ideas and approaches to problem solutions, catchment partnerships may wish to review stakeholder representation, to prevent RB scale interests from overpowering local influence.

While useful at the implementing team level, Gugu and Dal Molin's (2016) recommendations do not consider the multi-level aspect found in the whole network model. Therefore, network management strategies are required which direct interactions between actors via steering strategies which unite the various views and perceptions of the actors involved (McGuire, 2006): such steering strategies cover the selection of actors who possess the necessary resources to address the policy needs and who are motivated to do so. The influence of such a steering agent is identified and discussed in section 7.4.

Partnership arrangements involve actors agreeing to work together to achieve common aims, so building collaborative, multi-stakeholder groups (Kemp & Martens, 2007; Marcussen & Torfing, 2003), however, in the case of catchment partnerships there is no requirement for groups to produce a written partnership agreement and/or be directed by a formal steering group, although CaBA Support best-practise documents do advocate such formalisation of roles and responsibilities (CBA, 2017b). While such formalisation gives structure to partnership operations, it does

not however offer joint bargaining power to access financial resources, as the partnership network does not have a separate legal status outside of its members and financial transactions occur within each independent organisation, consequently, large scale opportunities are often more difficult to attract (OTS, 2008). The Ribble partnership has secured a large Lottery Fund award, but such funding has been through the auspices of the Rivers Trust and not in the name of the partnership. This action has provided the catchment unit with public liability coverage, removing legal and financial penalty risk, encouraging the imaginative and wide-ranging actions expected by DEFRA. To facilitate such financial opportunities, there is an argument for catchment partnerships to legalise their status - should CPs continue to exist as a separate entity or become 'embedded' within the local Rivers Trust organisation? Embedding does present a risk as the strategic direction of Rivers Trusts has been noted to exhibit a WFD focussed agenda and so the catchment partnership may lose social-focus benefits, but there is a great opportunity to be seen as a more relevant and credible organisation. Thus, the Rivers Trust 'formulae' regarding the method of approach, planning, prioritisation and measurement is embraced, both explicitly and implicitly, diluting competing stakeholder preferences. As social-orientated agents are currently either not present in one of the examined partnerships, or walking away from the partnerships as they are currently structured in the second, maybe it is time to consider a change in system structure: the proposed agent is, therefore, not the EA nor CaBA Support, a *de facto* Rivers Trust support team, but the Rivers Trust, who are, thus, clearly recognised and held accountable for delivery of WFD and EsS requirements.

7.3 Ecosystem Services Focus

Barriers to achieving WFD improvements have been presented in the NWRBM plan as four key issues. This RBM framework is not reflected in catchment plans, but when such a comparison is made, the impact of local context on goal choices is made apparent - a strong riverine and riparian focus is reported for the Ribble partnership versus the urban, green-infrastructure focus found in the Irwell partnership plans (Table 6.10). Partnership key aims are presented in terms relating to the water quality, ecological potential and resilient water bodies (James et al., 2012; RRT, 2016), thus, published catchment partnership aims continue to be

presented in WFD terms (Table 6.11). But is WFD the only desirable outcome? The mandated authority confirmed their desire to direct CPs to the achievement of WFD goals in preference to non-WFD aims at the 2017 CaBA conference, yet Chan et al. (2012) identified a focus on ecosystem services as a means for improving decision-making through the integration of ecosystem service information into planning and management. Further, Wallace (2007) advises measures of EsS ought to be in terms overtly relevant to the daily lives of people, in order to engage a diverse group in natural resource decisions, thus, the significance of the work which examines the range of ecosystem services present in historic published material is shown, through recognising what and how stakeholders recognise EsS. By examining the intrinsic values contained in historic published material, socio-political factors forming an alternative focus for catchment partnership goals are explored (section 6.2.2).

The catchment ecosystem services case studies have not sought to identify cultural aspects of spirituality and aesthetic appreciation as the narratives examined do not record these facets. Areas for further study would be examination of aesthetic appreciation deduced from pictorial records, plus existence values of well-being and sense of place through direct interaction with stakeholders. In both cases, the ecosystem service framework would appear to be a suitable method of analysis incorporating the tangible aspects and the emotional responses. Historical narrative analysis has been possible for the area under study due to the existence of publications which provide sufficient detail for ecosystem services identification. The applicability of this method to other locations is constrained where such records do not exist, however an alternative application of the ecosystem service framework in the identification of social recollections with local stakeholders could be equally revealing. A discussion of the EsS found in the catchment examinations (section 6.2.2) follows.

Over the past 300 years, the rivers have been impacted by those people living and working on its banks: changes in economic drivers, technology innovations and social movement have advanced and relegated the importance of specific aspects of the river to local populations. The intuitive methodology adopted in the case studies has enabled temporal changes in key ecosystem services of provisioning, regulating and cultural aspects to be identified for both catchments. The methodology utilised

historical public data sources which may be considered unsuitable for advanced tools and techniques such as GIS.

The ease of identification of tangible benefits has previously been noted by Guo et al. (2010) and this case study reconfirms this observation within both catchments, however, the temporal change in EsS prioritisation along a given river length is found to be influenced by typography and underlying geology. For the Ribble catchment, the migration from regulating services which maintain an agricultural tradition to provisioning services supporting industrial based economic developments are found in tributaries which drain uplands and so pass through valleys which support water-powered industrialisation in early industrialisation period. Thus, there is a duality of importance found in the Ribble catchment in the 21st century: both agricultural and industrial traditions. This duality is lacking in the Irwell catchment which developed industrial and residential sites upon agricultural lands throughout the flood plain. Analysis has found contentions within ecosystem services categories which can be unpicked and made visible by the application of the ecosystem service framework. In the Irwell catchment, the major tangible benefit of providing water for industrial process in the 1800s is readily identifiable from the construction of mills and weirs along the river channel; however, the social impact of pollutant dispersal and contamination of drinking water is recorded in published histories, for example, the impact of the cholera epidemic in Manchester in 1832 (Harwood, 1895). Provision of clean water for drinking is critical to the health of the population but is a secondary provisioning value for the Irwell, the primary value continuing to be a provisioning service supporting industrial processes. Through cultural bequest value analysis, the historical social value conflict and method of resolution is illuminated; in this case Manchester and Salford obtained an alternative clean water supply from 1851 which still impacts the hydrology of the Irwell in the 21st century, with over half of the current North West water supply extracted from Cumbria and Wales (UU, 2018). Disservice aspects are less reported in ecosystem assessments (Lyytimaki et al., 2008) and in this study the methodology applied has identified disservices values as disruptions to local infrastructure (bequest disservice) and reduced skill opportunities (cognitive disservice). Consequently, the full impact of an event, for example a primary-regulating flood event, is illuminated when an ecosystem service and disservice approach is applied. Following industrial decline, both catchments contain areas of

recreational value for urban populations, consequently, cultural services ought to be important for both catchment management teams. However, the full range of cultural service identified includes bequest and cognitive areas in addition to the more readily identifiable recreational services (Guo et al., 2010). Areas of spiritual and artistic appreciation are not addressed in the method used, so further opportunity exists to use alternative sources to examine those cultural services.

As demonstrated here, applying the ecosystem service framework to landscape management has the potential to identify conflicts otherwise obscured and so enable solutions to be proposed which alleviate stakeholder concerns. Thus, the application of the ecosystem services framework facilitates the identification of cultural values which add a further important dimension to landscape assessment and provide a benchmark against which the current catchment management knowledge and importance of ecosystem services can be placed, recognising individual knowledge and awareness of the ecosystem services terms are likely to vary among catchment managers.

Both the RBM and catchment plans, as published in current material, are presented without reference to either improving or maintaining provisioning, regulating or cultural ecosystem services. To incorporate an EsS perspective requires participants to understand EsS or be aware of who may possess such knowledge within their group if they believe they are lacking information. The research presented here undertook such a knowledge examination within the selected catchment partnerships and found all members are able to prioritise riverine goods and services, even if they believe they are not aware of EsS as a concept (section 6.2.1). This suggest it is the terminology which is barrier to application of an EsS framework, rather than a lack of services appreciation. This finding conforms with previous research which found the term ecosystem service was not commonly understood outside of the scientific and policymaking community (Norgaard, 2010; Thompson et al., 2016). Thompson et al. (2016) found <10% of their survey participants had heard of the EsS term. In the research presented in this thesis, there was a greater proportion of respondents who had some awareness of the term – only one respondent reported never having heard of the term. As the majority of the responders are associated with riverine programmes in a policy delivery area, it is not surprising to find they report greater

awareness and use of the EsS term, but disappointing to find plans and programmes do not contain an EsS aspect to guide the partnership decision making approach.

Through capturing the participants personal values of specific ecosystem services, a number of cultural aspects not prioritised in the main published aims have been identified, specifically recreational and spiritual opportunities in the urban environment: these aspects were not lacking in the more rural Ribble catchment partnership responses, achieving similar levels of importance as wildlife habitat services. Cultural EsS have played an important role in motivating support for ecosystem protection (Daniel et al., 2012) and this study has found the lack of an EsS framework approach within either the RBM plan or publicised catchment programmes may have contributed to a suppression of cultural services valuation in action plans, resulting in an unresolved frustration from members of the partnership for whom riverine services are not their area of interest.

> *~ There is an overwhelming emphasis on natural environment versus [other considerations] #C39-Low pim.*
>
> *~ Catchment partnership is primarily a collection of professional (salaried) eco-interested parties, so some stakeholders are not represented. Biodiversity interests have been at the fore #CS2-High pim.*

This is comparable to the findings of Butler et al. (2001, In Stankey et al., 2005) who found complexity exacerbated stakeholders' concerns regarding impacts on their areas of interests, and also those of Daniel et al. (2012), where weak integration of cultural EsS in policy framework obstructed opportunities. Both of the examined catchment partnerships' publicity material place importance on the social benefits of the rivers, yet those stakeholders most associated with heritage and leisure activities are found to be more peripheral within the key people and collaborating networks, functional groups associated with natural capital improvement being more prominent and influential (Figure 6.7). Consequently, the partnership remains focussed on WFD goals and the lack of adoption of an ecosystem service approach to visioning, results in cultural EsS receding in importance. The catchment partnership will no doubt be hailed successful as water quality, if not quantity, improves, but there is currently also

an opportunity to deliver multiple benefits which adoption of an EsS approach to planning and evidence analysis could fulfil, engaging a greater diversity of participants within the catchment partnerships. Blackmore et al. (2016) argue for an expansion of the catchment partnership mandate to emphasise more than WFD. The research contained in this thesis also supports a widening of interests, demonstrated by the importance participating actors give to a range of ecosystem services beyond water quality. It follows that a formal statement on the mandatory use of the ecosystem service framework within policy documentation would ensure consideration of aspects beyond WFD, such as those cultural aspects relevant to health and well-being, so inviting greater appreciation and potential contribution from social funding bodies.

The timeline of ecosystem service interaction and reaction to events has been explored and the current value of the river to those who work and reside along the river length is considered: for the Ribble, there remains a predominantly agricultural focus in the main river channel impacted by regulating services, however in urbanised Ribble tributaries and throughout the Irwell catchment, the river is predominantly recognised as a recreational-focussed asset (APEM, 2004; HLF, 2011). In the 20th century, concerted efforts were made to address water quality issues in the North West river basin as UK Government funds were made available to 'clean' rivers in the UK in the 1970s and 80s. In exposing the timeframe of ecological degradation and recovery, current development plans for the catchments may be examined to ensure impact assessments have sufficient depth and breadth. By presenting plans in neither RBM or EsS framework, but introducing WFD foci, the ability to see the value of the catchment partnership contribution to local population-needs is obscured: opportunity exist for catchment partnerships to enhance their current perception and contribute to a wider audience through adoption of an ecosystem service framework in their plans which will provide a temporal view of the changes desired and provide a relevant focus for local groups.

7.4 Network System Dynamics

Within this thesis, organisational complexity analysis has been explicitly applied to the interactions of members of the selected catchment partnerships to expose the variation in how members of the groups approach collaborative working. However,

complexity analysis approached from a systemic view-point to explain why system-wide behaviour emerges from the interactions between larger collections of simple components (Cairney, 2012b) may also be applied to the system stewardship framework uncovered.

The shift from government-centred to system network-centred approaches to implementation has led actors from the public, private and non-profit sectors to be involved in compliance, monitoring and oversight functions (Papadopoulos, 2010). In the Institute for Government working paper, System Stewardship: the future of policy making? (Hallsworth, 2011), the author argues that, policy makers need to see themselves less as sitting on top of a delivery chain, but as stewards of systems with multiple actors and decision makers whose choices will decide how policy is realised. Hallsworth (2011) defined system stewardship to be one of making structured judgements, taking in to account the goals, rules, feedback and the intervention response required to a given situation. However, central government are not the only actor that may perform a system stewardship steering role (Jones, 2011) and in the case examined in this thesis, the supportive functions undertaken by both the EA and the CaBA Support Group both fulfil oversight roles. DEFRA established the CaBA Support Group *to steer and support the development of new capability and delivery mechanisms to facilitate engagement around WFD and related delivery via these partnerships* (DEFRA, 2014, p1). Cohen et al. (2012) noted co-ordination roles are vital to strengthening co-management actions: technical and team development support resources are not currently delivered by the host organisation in one of the studied partnerships, but by the central CaBA support organisation. Consequently, there is an additional collaborating body which provides influence, directing the development of management procedures and practices, in addition to the mandated authority. For example, CaBA Support best-practise documents advocate the formalisation of roles and responsibilities in a written partnership agreement and/or be directed by a formal steering group (CBA, 2017b) even though there is no policy requirement for groups to do so. The oversight role of CaBA central support team, thus, grows more influential, leading the development of the catchment approach, yet the diversity of participants within that group is lacking being primarily Rivers Trust personnel (CBA, 2017a). CaBA support group act in effect as a sub-contractor to steer catchment partnership but there appears to be a lack of transparency and

acknowledgement of their influence toward fulfilment of WFD goals. Figure 7.1 identifies this additional agency alongside the roles and feedback route of the WFD designated, responsible agent, the EA; thus, DEFRA exert influence to both system steward agents, that is, the EA and the CaBA Support team.

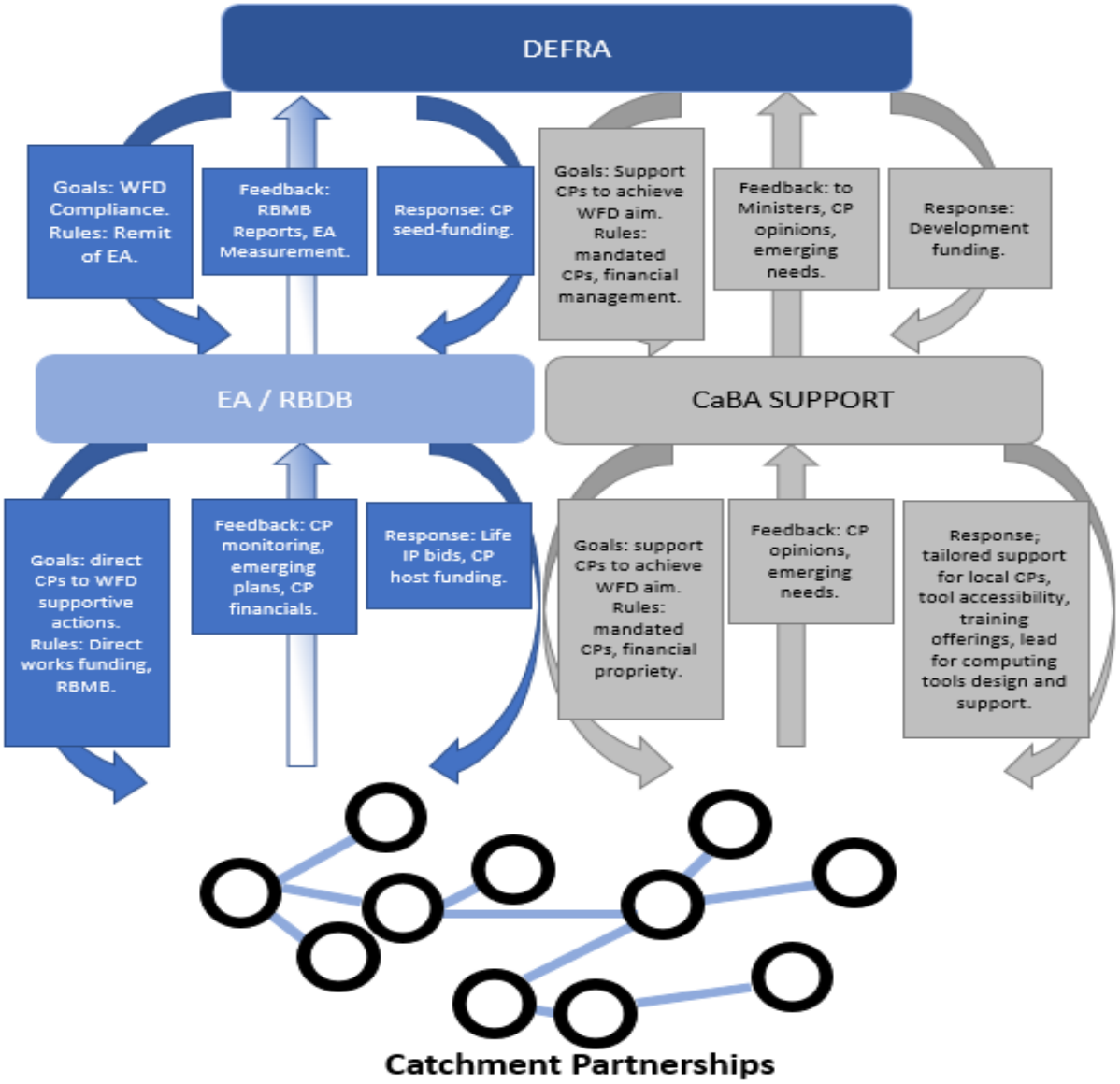


Figure 7.1: Dual System Stewardship model in the current catchment management system. (Author's own, 2018, unpublished).

Feedback loops to DEFRA provide intelligence on the state of water quality to fulfil EU reporting requirements via the EA and also information is provided to Ministers from CaBA support regarding the catchment approach adoption and project delivery (CBA, 2016). As the standardisation of tools to analyse the catchment status

develops – their development was publicised at the national CaBA conference, Manchester 2017 – there is a greater influence from the central CaBA support unit in all catchment partnerships, including those where to date catchment host organisations may have provided support.

The oversight role of CaBA central support team thus grows more influential, leading the development of the entire catchment approach, yet the diversity of participants within that group is lacking being primarily Rivers Trust personnel, thus, a strong Rivers Trust focus leads both development and advocacy for the catchment based approach and has a considerable presence managing a large number of catchment partnerships as the host organisation (Table 2.5).

Despite the shift in tasks from central government to management by multiple agencies at multi-levels, the research reported in this thesis finds the UK Ministry (DEFRA) still maintains an important role in steering environmental policy to achieve WFD goals and objectives. DEFRA formulates the vision and direction of UK policy and directs through regulation the EA, as the responsible authority, and also controls CaBA support group resources.

Borzel (2011: In Curry, 2015) identified issues with the termination of network management structures and the regaining of control by central governments. The current catchment policy framework lacks a termination framework, and consideration of how legitimisation of action is to be maintained should catchment partnerships terminate, must be factored into future implementation directives. However, within the identified network the statutory responsibility is retained by UK Government whether catchment partnerships cease or not, as the system stewardship model maintains overall control by DEFRA via the EA.

As it stands, the water policy system examined identified a similarity of representation at different levels, both river basin and catchment, where the influence of host organisations and EA co-ordinators provide a cohesive focus on WFD goals and provide strong influence within catchment partnerships. Thus, the control and co-operation which prevents the collapse of the system network identified by Blackman (2001) is present. The steering ministry (DEFRA) and the two agents, the EA and the catchment support group, have agreed upon feedback data (Cascade Consulting,

2015) which is directed to the hierarchical structure, rather than the devolved level recommended by Amagoh (2008).

The approach taken by DEFRA, in utilising a Rivers Trust orientated support network to steer the catchment partnership actions, makes it difficult to hold UK Government accountable for decisions made through their influence as there is a lack of transparency of this activity. The implications for accountability in a complex policy implementation situation is further reviewed in the following section.

7.4.1 Policy Framework

The CaBA policy framework was published in May 2013 with an objective of establishing locally-focussed decision making through the launch of catchment partnerships (DEFRA, 2013). Governance options are currently being appraised following the award of €20.0 million in 2014/15 to the UK Environment Agency (LIFE-IP RBMP-NWRBD UK) to address barriers for the North-West England river basin water bodies which prevent achievement of “good” ecological status, as required by the Water Framework Directive (EU, 2016). To contribute to this discussion, the following key points highlighting the risk to policy delivery through a non-statutory, unaccountable model and the means to address these risks, are presented.

Matland’s implementation analysis tool (1995) was applied in this study to explore the WFD implementation mechanism within England & Wales. The WFD policy document contains key requirements for water quality and quantity, applicable throughout the EU, and defines the measures and reporting time frames. There is no doubt this is a political implementation model and as such provides legitimacy to the hierarchical sub-structure of implementing actors, but there is also an un-expressed responsibility for the governing levels to ensure supporting resources are available to facilitate the actions delivering the policy targets. However, the catchment level of implementation in England and Wales is not tied-in to this political structure, and sits, as a non-statutory element, so acting as an experimental implementation mechanism (section 6.1). Hovik and Hanssen (2015) stress the importance of political anchorage as the key to integrating the local and hierarchical networks; there appears to be a significant opportunity to anchor catchment partnerships within river basin district planning, beyond that of advisory status. Currently, catchment partnerships are not in a legal position to demand organisational support offered in theory by a top-down

dominant player, and their ability to contribute to WFD goals is constrained, albeit their key aspirations remain WFD objectives.

The CaBA policy framework delivered national coverage of multi-organisational partnerships but lacked a formal mandate or identified accountability mechanisms. From the evidence presented in this research thesis, the CaBA policy framework has enabled a system approach to policy implementation. The catchment partnership working approach introduced by DEFRA (2013) has delivered a co-operative, networking structure, consisting of linkages between individual members of different organisations who are collaborating partners (Berkes, 2009), however, the implementation of WFD through this mechanism has proved to be challenging (HoL, 2012). Networks may create an accountability deficit where responsibility is difficult to apportion (Papadopoulos, 2010), so the following discussion considers the two accountability typologies presented in the system model, that is *democratic accountability* and secondly, *peer to peer accountability*. Illumination of the current situation within the examined catchments is provided by reflecting upon the results of both the quantitative and qualitative analysis.

Democratic Accountability: Elected policy makers are charged to account for their decisions and so the framework of network implementation complexity does not mix well with traditional government accountability (Peters & Pierre, 1998). Under earlier policy implementation models, public accountability was linked to the bureaucratic top-down model where those 'lower' in the process structure had to account to their superiors; an alternative bottom-up accountability view developed, that is, the users of a service, 'customers', were to hold the bureaucrats accountable (Abels, 2007). In the stewardship system examined, democratic responsibility lies in the publicised statutory route (Figure 4.1), that is, EU ↔ DEFRA ↔ EA ↔ RBM, and formal feedback of compliance standards, such as, specified measures and reporting requirements relating to WFD, is through this same 'top-down' route, so excluding multi-level, non-statutory elements and an additional steering agent. Catchment partnerships are expected to fulfil the WFD policy demand for stakeholder inclusion in decision-making, a role specified in policy documentation *important to ensure there is a clearer link between river basin management planning, underpinned by stakeholders at a river basin scale and planning and delivery at a catchment level* (DEFRA, 2013,

p15), however, the CaBA approach launched in England and Wales in 2013, delivers a non-statutory, complementary body to support the formalised WFD implementation mechanism. WFD policy implementation is co-dependent on local activists to engage in projects which support the river basin plan; such activists are not hierarchically linked to the river boards and thus not under any legislative pressure to deliver WFD goals, breaking the formal democratic top-down accountability line. However, the catchment policy framework does explicitly require catchment partnerships to support WFD, and river basin management plans do have specific sections for catchment contributions, thus the partnerships are linked to the democratic accountability feedback (bottom-up) framework.

Rhodes (in Moran et al., 2006) notes that the presence of multiple accountabilities fragments policy design and policy delivery and so weakens central control. Steps are taken to reduce this potential weakening of power by ensuring the EA, the UK Ministry agent, is a mandated partner within catchment partnerships. However, this study found frustration within partnerships due to the constraints placed on group goals which arise from the influence of the mandated organisation (see section 7.2). This expression of interference echoes the findings of Goodwin and Grix (2011), who considered the introduction of network policy implementation models results in a paradox: there is an increased dependence to deliver state-set goals and operating models by independent actors outside the central government organisation, yet to do so reduces the autonomy of those 'independent' actors.

Under a traditional accountability framework, innovative and adaptive programmes that address new opportunities and adjust to changing condition are likely to be evaluated negatively (Patton, 2011), as traditional approaches to accountability often evaluate and validate programme models through targets, seeking pre-identified, intended outcomes (Mills & Koliba, 2015; Patton, 2011). This approach forms a tension between collaborating partnerships and funders who anticipate explicit pre-ordained criteria to be met; such tensions are reported by the responders to this study, finding a lack of support among funders for the multi-partner, collaborative approach – external bodies business strategies are not synchronised with the demands now arising from the devolved local policy agenda. This has implications

for further UK devolution where the expectation of fulfilment by localised groups will not occur if funding opportunities remain constrained.

The stakeholder concept embedded in the Aarhus Convention (E.C., 2015) has encouraged information and explanation sharing beyond the range of actors involved in the implementation process and Governments are now commonly held to account through the involvement of different interest groups. In the case examined, it is the Committees of the House of Commons and House of Lords who have acted as external reviewers of the democratic process in the UK and outcomes from their committee reviews have critiqued WFD implementation processes including the catchment based approach (HoC, 2016; HoL, 2012). Consideration of variable accountability standards appropriate for complex policy-delivery processes does not appear to be considered within current legal statutes. The CaBA policy framework delivered national coverage of multi-organisational partnerships but lacks a formal mandate or identified accountability mechanisms. DEFRA, and its responsible body the EA, must maintain the existing democratic accountability link to comply with statutory demands, however it is considered future CaBA policy frameworks need to specify the ongoing long-term support requirements, monetary and people, together with consideration of the wider accountability remit. In their analysis of organisational change in the public-sector Dunleavy et al (2005) identify a stall, or even reversal, of the transition to new forms of public sector management in advanced countries, due to the adverse indirect effect of increased institutional and policy complexity – it is possible the additional complexity introduced through formalising accountability within the system stewardship network would be a barrier to further diverse agent participation.

Peer–to-Peer Accountability: From the evidence presented, the CaBA policy framework has enabled a system approach to policy implementation, however, the inclusion of regulatory and statutory bodies, plus NGOs, within the system network at differing levels has implications for accountability. Accountability which has been found in network structures is commonly based on ‘peer’ forms of monitoring and legitimacy between network participants, rather than the usual democratic form of accountability (Curry, 2015). Traditional approaches to accountability evaluate and validate programme models, often through targets, seeking pre-identified, intended

outcomes (Mills & Koliba, 2015; Patton, 2011), in contrast, complexity sensitive evaluation supports the development of innovation and the generation of possibilities as there is no pre-conceived, known solution (Patton, 2011). This forms a tension between catchment agents and funders who anticipate explicit pre-ordained criteria to be met, such as those identified in WFD policy documentation, and the alternative accountability focus of those involve in the emergent implementation who respond to the dynamic opportunities presented in the local catchment context.

Networks often favour the presence of specified or specialised groups of actors, elected and unelected; this may result in weak representation for citizen groups or elected groups not linked with the specialism (Papadopoulos, 2010). This is found to be the case in the system network examined, where the catchment partnerships are dominated, and led, by river interest groups. The lack of a control mechanism has led to a lack of trust being expressed by less powerful collaborating actors. The formalisation of internal working relationships outlining behaviours, expectations and commitments is being addressed through terms of reference documentation, but production is taking a lot of resource, as some partners view CaBA activity as a burden and an addition to their normal working requirements. The lack of a conflict resolution mechanism is resulting in high levels of continuing dis-trust, found in both quantitative and qualitative findings, particularly among larger conservation organisation representatives who have already experienced project tensions. Currently, vocal participants not satisfied with either the aims or performance of the partnership are deliberately introducing contention, forming disruptive and acrimonious relationships likely to results in the abandonment of the partnership by key organisations. The literature on peer accountability does outline tools which may be applied in complex, multi-actor situations (Behn, 2001; Bovens et al, 2008; Boyne & O'Toole, 2006; Esmark, 2007; Fung, 2004; March & Olsen, 1995), but were not identified with a specific typology of complexity. To correct this omission, peer-to-peer tools are now presented against an axis of implementation complexity, to aid the consideration and selection of accountability tools for network system reviews (Figure 7.2).

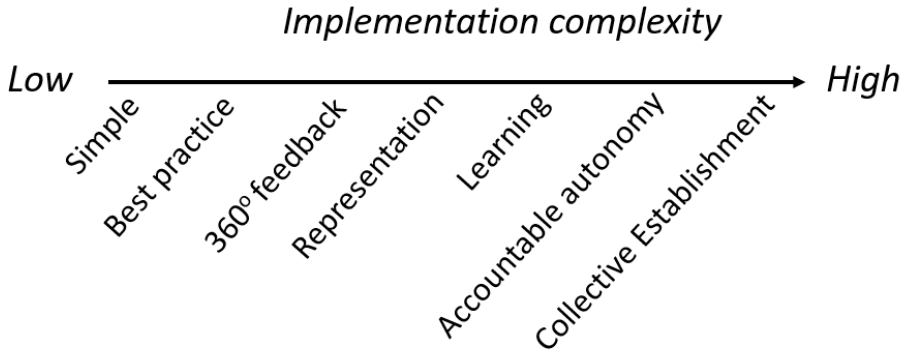


Figure 7.2: Accountability tools aligned to implementation complexity, presented here arranged from low complexity to high complexity. (Author's own, 2018, unpublished).

The current WFD / catchment implementation model analysis presented earlier, identified, by the application of Matland's framework (1995), two aspects that is, a Political model to the River Basin level and an Experimental model at the catchment level. Through a comparison of the issues and barriers to implementation so identified, accountability tools most appropriate for the mixed implementation models uncovered may be identified.

Political complexity may produce goal conflict and so administrative solutions are often less prevalent due to a lack of agreement. Where power interests shape the choice of action and prioritisation of activities, agreement on process or the actions to be adopted is a key measure of accountability. High conflict on what to do acts as a barrier to entering the process as there may be goal incompatibility, threats to self-interest and aggressive power-based behaviours with disputes resolved by bargaining or coercion. Lack of achievement to the simple reporting requirement set out in WFD documents has been identified by EU Review, yet there is a lack of consideration of different reporting mechanisms other than achieving set targets. In these politically complex cases, 360^0 feedback and Representation Perspective reviews which consider a set of standards drawn together from all those involved organisations present to assess behaviours and interactions among the actors, may provide a richer understanding of why implementation is lagging in some EU States.

In Experimental implementation models, administrative accountability may be limited, but policy learning opportunities may be substantial. However, influence from

powerful agents may capture the implementation process resulting in outcomes significantly shape by individual and group interests, thus local goals are more likely to be met than statutory objectives. The local context results in different priories for each catchment partnership which makes it difficult to monitor activities as there is a lack of a formal reporting route, lack of uniformity of understanding across multiple sites, variation in participation and local diverse implementation actors present. Here, Learning Development, which assesses both knowledge and competence to delivers the desired goals is proposed as a method to evaluate implementation and such assessment may be evaluated by external fora. Internal working highlighting the degree of delegation and/or involvement may be reviewed through Accountable Autonomy which is performed by close, interactive dialogues among the range of actors. While Learning and Accountable Autonomy are considered to be appropriate tools for experimental implementation models, there is no barrier to consideration of 360º and Representation tools (section 2.2.2), which may be preferred options for different catchment partnerships.

Figure 7.3 summarises the alignment of accountability tools to Matland's Ambiguity-Conflict implementation policy framework (1995).

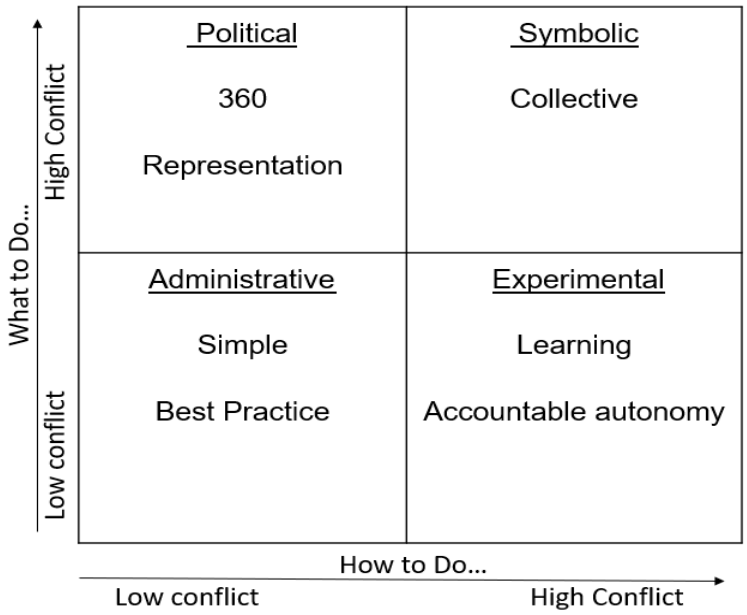


Figure 7.3 Accountability aligned to Matland's implementation model framework. (Adapted from Matland, 1995; Simon, 2017).

Although a democratic accountability framework is found to be present within the total system via the political, statutory model, there is a lack of peer to peer accountability linked to the multi-level nature of the decision-influencing actors. To address the lack of peer accountability in the current catchment policy framework, based on the research reported here, it is proposed that accountability tools are specified in future policy documentation and applied across all the multi-levels, including steering agencies.

An updated policy framework is required now that catchment partnerships have developed into more mature organisations. Within the DEFRA policy directive which launched the catchment based approach there are weaknesses which need to be strengthened to address the network system adopted, particularly clarity of the dual-network structure and steerage responsibilities, accountability of both the democratic and peer networks through the use of appropriate tools, and enablement of wider natural capital benefits through the mandated application of an ecosystem service approach. However, there is a danger of continuing complexity and problem-solving overload: In their analysis of organisational change in the public-sector Dunleavy et al (2005) identify a stall, or even reversal, of the transition to new forms of public sector management in advanced countries, due to the adverse indirect effect increased institutional and policy complexity.

The adoption of current ‘digital-era’ information technology, social media, is suggested as a mechanism to re-integrate and simplify the relationship between agents and the public, thereby embracing the cultural and behavioural changes prevalent in society (Dunleavy et al., 2005). Outcomes are identified as reducing the layers of impenetrability by removing agents and re-connecting processes, facilitating the direct flow of information to the public and allowing the public a mechanism to be engaged in the democratic process (Dunleavy et al., 2005). The availability of information through the internet and views registered on social media has increased the demand for transparency of decisions and actions and also responsiveness to issues raised, so opportunity is considered to exist within an updated policy framework to specify an integrated communication strategy, so relieving demand upon individual partnerships and utilising digital-era media as per current cultural changes, so contributing to sustainable, inclusive catchment management.

7.4.2 Localism Agenda Implications

Important insights into the recomposition of local power relations under the Localism and Devolved Powers agenda are presented (LINK) Evidence of a network design, the network system model, in which UK Government retains ultimate power over the central objectives and exerts influence over the composition of the local system stewardship network, is reviewed in the previous section. Playing such a determining role in both network composition and rules of participation has enabled DEFRA to set the framework within which catchment partnerships operate.

Concurrently, a similar remoulding of local governance networks is occurring: since 2010, the UK Government has undertaken a radical programme of devolution in England, facilitating the decentralisation of power to councils, neighbourhoods and individuals (CLG, 2015). Bailey and Wood (2017) identify the creation of reconstituted networks under the English devolution approach, which maintains central government priorities at the local level through the outline of what local authorities should be doing and the way in which they should be delivering programmes (p975). This emerging model establishes a structure which aligns the local political agenda to Treasury objectives, which Bailey and Wood (2017) termed ‘centralisation by stealth’.

The Localism Agenda is a prominent part of local politics throughout the North West River Basin, as seen by the introduction of the Mayoral Office for Greater Manchester and by moves to introduce a new combined authority for Lancashire (GMCA, 2017; LCC, 2017). However, the move to decentralising power is not an opportunity for local areas to define their own political and socio-economic goals, but a devolution model where central objectives are delivered by local government. This can be understood through the lens of meta-governance outlined by Bailey and Wood (2017) where central government exert influence over local networks through network framing - the mechanism through which asymmetric relations between actors within the networks, networks in different locations and central government departments are constructed.

Greater Manchester is at a more advanced stage of locally devolved powers and the current reconfiguring of the Greater Manchester environmental network is represented in Figure 7.4. Analysis shows the mechanism of meta-governance that

has reworked environmental policy implementation to the local level, through the establishment of Natural Capital Groups and Local Nature Partnerships which sit under the GMCA umbrella. Additionally, there are further environmental interests at lower hierarchical levels, such as the Low Carbon Hub. Bailey and Wood's (2017) review of outcomes pertaining to the devolution narrative, found only 0.8% of the devolution arguments related to the environment – with comments on carbon-reduction prevalent.

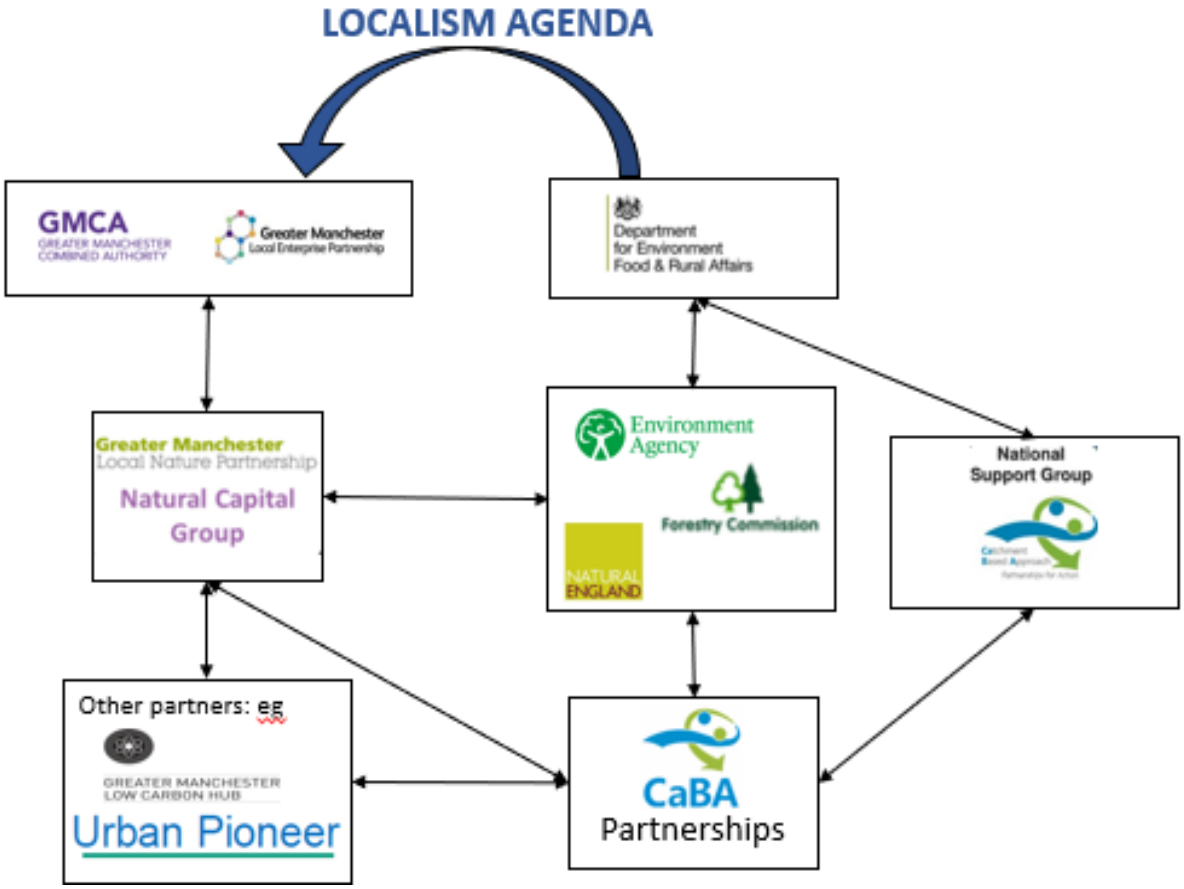


Figure 7.4: Localism and devolved powers impact upon the governance structure of Irwell catchment partnership 2017. (Author's own, 2018, unpublished).

Presently, the Irwell CaBA Partnership sits as attendees to GMCA fora, but maintains a links to the governance framework identified in 2013 and so is not yet completely placed within the local authority mechanisms. Future governance may involve the transfer of CaBA local groups from DEFRA steerage to DCLG control, however, to achieve such a placement, requires the agreement of multiple UK Government departments (DEFRA and DCLG) and formalisation within the local devolved powers governance framework. Such a re-positioning within the overall governance also

needs to address the placement of the CaBA support group, which currently sits outside of the local powers scope. An ability to rescind responsibilities which may be imposed through the localism agenda is not presented in catchment partnership policy documentation and there is a need to address this inconsistency within the range of emerging agreements. Such agreements need to establish limits on central control imposed via devolved supporting mechanism, the performance accountability and the evaluation mechanisms which Bailey and Wood (2017) consider are to be fulfilled in order to continue to receive HM government funding via the localism agenda.

The policy design of the catchment partnerships reflects the overall expression of localism combining local empowerment and collaboration with the private sector, however the transition to less ‘dependency’ on central government is not addressed. Central government power continues to be present in the partnerships through the mandated authority and WFD environmental investment, consequently, local aims and priorities remain largely undelivered. The heterogeneity of catchment partnership goals and objectives do not fulfil a simple standardised delivery model as each site is a distinct, unique requirement and the mechanism for accountability in complex networks remains unspecified for catchment partnerships. The involvement of local government actors reflects a ’co-opting’ of elites (Bailey & Wood, 2017), who are thus responsible for policy success or failure, but who’s goals are directed from central government. Localism does not deliver a fully decentralised decision-making opportunity but does devolve accountability to potentially unprepared local actors. Are catchment partnerships at risk of being a scape-goat for the failure to achieve environmental goals, as the ‘blame-game’ moves from central to local agents?

CHAPTER 8 CONCLUSION

Implementation of water policy in England has been directed from the European, to national, to regional levels, to localised actors. As a result, there is a vertical aspect to measuring policy effectiveness, while links between government agencies and non-state led actors at the catchment scale bring a horizontal aspect to the catchment partnership structure. Implementation of the catchment partnership approach has not been proscriptive allowing the local context to influence partnership development.

The research reported in this thesis focuses on the structure of mature, catchment-scale partnerships and, drawing on theoretical insights of implementation and complexity science analysis, has identified an active system stewardship model. By applying complexity research methods, the study outcomes have illuminated dual-steerage at the system (macro) level and exposed concentrated decision-making and the setting of direction among a few core actors at the individual (micro) level. The application of a complexity science approach has proved to be suitable for the examination of implementation models where there is a mixed typology, identifying system dynamics at both the macro and micro level.

So, who are the movers & shakers?

The transfer of power and function from the central ministry outlined by Rhodes (1996) which delivers governance, as opposed to government control, is not found in this examination of the catchment based approach, nor is the network of catchment partners found to be composed of power-equal partners.

Goodwin and Grix (2011) outlined an asymmetric network concept where the shift from government to governance through agencies is discernible, but power and ultimate leadership remains with the state; such a controlling network has been found in this study where the system stewardship agent operates to direct catchment partnership actions. The external legitimisation network outlined in government documents refer to EA/RBMPs and is focussed on WFD objectives, however, catchment partnerships are unable to influence the overarching WFD goals as there is no statutory link into the regional River Basin Boards. The research has exposed a second steerage actor, that is, the CABA support unit, which is directed by NGOs

whose goals have been found to be complementary to WFD objectives (Short, 2015). Consequently, DEFRA is able to increase other actors' dependence through both its agents, that is, system stewards, and so limit the involvement of potentially rival sources of power focussed on non-WFD goals. Plans for monitoring and evaluation outlined by CABA Support at the Manchester conference 2017, challenge the idea of local catchment partnerships controlling evaluation of their own activities, remaining accountable to centrally-defined models of good practice. While environmental management may have the form of self-determining networks, the reality is the state retains a top-down control, so the diverse participants in the catchment-based approach delivery mechanism are not equal partners with government in the policy direction-setting process. The stewardship model encourages a movement of delivery-expectation from authority bodies to local agents but constrains the flexibility of those local actors through top-down controls. Are catchment partnerships at risk of being a scape-goat for the failure to achieve challenging environmental goals, as the expectation for policy delivery moves from central to local agents?

Challenges by emergent leaders have been identified in one partnership through utilising Stacey's complexity matrix to map individuals into the zone associated with low goal agreement and high distrust. Dissimilar risk and trust perspectives have been identified within each of the examined partnerships, but those individuals most at ease with collaborative partnership working are not identified as key individuals. Active participation of all members ought to be encouraged to improve the levels of cohesiveness, so providing further collaborative learning opportunities.

The duality of implementation model typology found within the identified system stewardship model impacts the choice of accountability tools: those at the 'top' of the system recognising a need for simple, best-practice accountability mechanisms, so disregarding the inherent complexity with the network system model which demands a similarly complex accountability framework for both the political and peer-to-peer aspects. Suggestions to resolve this contention are identified and presented here along an increasing continuum of complexity. Consideration should be given by mature catchment partnerships to their stakeholder make-up and organisational structures, particularly where links into system stewardship mechanisms steer partnerships to a 'preferred' course of action.

The lack of an application of the EsS framework to catchment planning runs a risk of short-term prioritisation of those projects deemed to deliver 'immediate' benefits as the examination of historic EsS identifies extended time-frames before improvements are delivered. The lack of appreciation and recognition of the temporal change highlights a risk to the sustainability of the catchment based initiative should UK Government resource be withdrawn on the basis of non-achievement of goals.

A major difference in the operation of the two catchments has been uncovered regarding the championing of river restoration by the catchment host. In the results described in this thesis, CaBA support were found to be embedded in one of the catchment partnerships examined, where the partnership in question was lacking support resources. The alternative partnership, led by a Rivers Trust member, was found to offer the additional support identified as key to successful partnership functioning. CaBA support team identified one partnership as a strong performer, particularly in attracting funding, however, there is no acknowledgement that the mechanism for gaining access to large funds is due to the removal of financial liability risk. Both partnerships are responding to risk avoidance in two different ways; one through embedding into an organisation which provides financial and legal liability, the second by avoiding the large-scale, imaginative, high-risk actions and maintaining a range of activities compatible with partner organisation aims. The stakeholder make-up of the two partnerships studied is representative of the overall position, but it is acknowledged that to assess the risk-reduction strategies throughout the English catchment partnerships, it would be advisable to expand the scope of the current research. However, from the evidence obtained, in order to deliver the high-impact activities required to deliver WFD targets, the legal structure of catchment partnerships must be addressed. Restructuring power and control away from UK Ministry to leverage financial opportunity is not probable, unless the partnership is controlled by a statutory body with appropriate liability to undertake financial transactions. Following the award of LIFE IP RBMP-NWRBD UK, governance options are being appraised: outcomes which have particular relevance to catchment partnership policy within England are considered within this thesis and alternative governance structures proposed, that is, embedding catchment partnerships within the Rivers Trust organisation and/or linking catchment partnerships to the local government devolution mechanism. The partnership

working mechanism which was intended to deliver the EU WFD aims through broad support is in fact limited in scope and constrained in its aims.

In both catchment partnerships, the representative of the mandated government organisation is both prominent and influential, providing a crucial bridging link between the top-down and bottom-up actors. The networks found within the catchment partnerships examined are driven by Hosts and Co-ordinators, thus, the transfer of power and function from the central state outlined by Hill and Hupe (2002) is not found in this examination of the catchment-based approach policy. There is currently no move toward a total collaborative form of experimental implementation as outlined by Matland (1995), nor to an initiative of networks autonomous from Government intervention. Within this study of environmental management, the UK ministry retains strategic control over policy making and administrative implementation, conceding little power to non-state agencies, despite the recent developments that have seen an increase in the number and variety of actors involved in the formulation and design of implementation projects. Stewardship theory is characterised by an enabling structure which allow participants the freedom to implement actions without the presence of limiting controls, reflecting the devolved-power aspect identified in the experimental implementation model (Matland, 1995). In the evidence found in this study, central controls remain strong: the steer, both policy and resource which are controlled by the UK Government, preserves the overall direction setting and performance management standardisation at the top-level, reflecting a top-down implementation model to the lowest street-level agencies. The inclusiveness of the current stewardship regime is questioned, yet, the Stewardship model has significant opportunity for more involvement of local representatives, encouraging greater input and flexibility in decision-making at the devolved level, if responsibility for the support and development of collaborative local teams is accepted by policy champions.

This study contributes to the broader discussion on how EU policies are implemented by member and associate states; those which adopt a similar approach to policy implementation would benefit from guidelines which identify the purpose and scope of street-level activist participation and the institutional processes which legitimise their actions. The outcomes of this research are still considered relevant Post-Brexit,

as Localism Acts which transfer power from government to devolved Regional actors, will have to address and resolve the issues identified in this study and address the dual steerage from potentially competing government departments. Continuing financial constraints which restrict Central government expenditure are expected to continue in the short-term. Such constraints will impact not just water environment improvements, but also actions for air quality improvement, carbon reduction and wider environmental concerns.

Has the evidence contained in this thesis pointed toward delivery of the effective and urgent actions required by COP at the Aichi Convention in 2010? Are EsS likely to be resilient by 2020? From the examination of the political, economic and social factors which impact catchment partnership effectiveness in England, the answer is not through this delivery model. The partnership working mechanism which was intended to deliver the EU Biodiversity Strategy Aims through broad support, is in fact limited in scope and constrained in its focus as major issues lie with who is driving the partnership and to what end. Firstly, EsS are not apparently at the heart of plans and the length of time required to register change not outlined. Secondly, restructuring power and control away from UK Ministry to leverage financial opportunity is not possible unless the partnership is controlled by a statutory body with appropriate liability to undertake financial transactions, as funding for non-statutory collaborative groups is not supported by those who control the purse strings. Finally, there is a residual belief within the partnerships that senior management commitment to the concept is not welcomed at the mandated authority, due to the outsourcing of jobs and removal of power over delivery priorities. The powerful and influential movers and shakers are the familiar organisations, and the non-statutory CaBA operating model is unable to step up the challenge of delivering enhanced and protected ecosystems without addressing liability issues.

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APPENDIX A Fundamental Beliefs of Research Paradigms in Social Sciences

	Research Paradigms			
Fundamental Beliefs	*Positivism (Naïve realism)*	*Postpositivism (Critical Realism)*	*Interpretivism (Constructivism)*	*Pragmatism*
Ontology: the position on the nature of reality	External, objective and independent of social actors	Objective. Exist independently of human thoughts and beliefs or knowledge of their existence, but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, may change, multiple	External, multiple, view chosen to best achieve an answer to the research question
Epistemology: the view on what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on causality and law-like generalisations, reducing phenomena to simplest elements	Only observable phenomena can provide credible data, facts. Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, the reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the role of values in research and the researcher's stance	Value-free and etic Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Value-laden and etic Research is value laden; the researcher is biased by world views, cultural experiences and upbringing	Value-bond and emic Research is value bond, the researcher is part of what is being researched, cannot be separated and so will be subjective	Value-bond and etic-emic Values play a large role in interpreting the results, the researcher adopting both objective and subjective points of view
Research Methodology: the model behind the research process	Quantitative	Quantitative or qualitative	Qualitative	Quantitative and qualitative (mixed or multi-method design)

Source: Wahyuni, 2012

APPENDIX B Survey Questionnaire

QUESTIONNAIRE

The questionnaire is divided into **three sections.**

Section 1 requests information about yourself and your knowledge of the ecosystem services concept.

Section 2 seeks to identify your frequent contacts within, and beyond, the catchment partnership

Section 3 explores the issues most commonly raised by catchment managers and the way the Partnership is working, together with the awareness of river services and goods.

Please complete the questionnaire as instructed before saving and returning to b.a.law@edu.salford.ac.uk

OFFICE REF:

SECTION 1: You and Your Organisation.

Q1: How would you describe the type of organisation which you represent at the XX Catchment Partnership? Tick one box only.

1	Academic	
2	Agricultural	
3	Industry & Business (non water)	
4	Local Authority	
5	Private Water Business	
6	Public Service	
7	Recreational	
8	Regulatory Body	
9	River Conservation	
10	Social Engagement	
11	Wildlife & Conservation	
12	Other – please describe	

Q2: How would you rate your knowledge of ecosystem services? Please tick one box.

	Response Choice:	**Ecosystem Services**
1	Never heard of it.	
2	Heard of the term, but not sure what it means.	
3	Heard of it and comfortable with its meaning.	
4	Know how to use the term in conversation and respond to questions.	
5	Fully understand the nuances of the term and frequently use the term in written work.	

Remember, all responses will be anonymised in published results and no-one will see the names of the people you mention.

SECTION 2: Your Frequent Contacts

Q3: Thinking of the people in the XX Partnership, **who do you** judge to be the key people in the partnership?

Name:	Organisation:

Q4: Thinking of the people in the XX Partnership, **with whom do you** collaborate the most? Note: there is no need to complete all the boxes, it is your **main** collaborative partners who are requested.

Name:	Organisation:

Q5: Thinking of people in the XX Partnership, who **would you go to** if you required further information on **Ecosystem Services**?

Name:	Organisation:

SECTION 3: Your View on Catchment Management

Q6: How would you rate the following aspects of **partnership collaborative working**? **Mark one box** between the two statements which, on balance, you believe to be a true reflection of catchment partnership working.

Please note, there are no right or wrong answers to the questions

									
6.1	Partners always agree on **what** to do.								Partners never agree on **what** to do.
6.2	Partners always base actions on **reliable** facts.								Partners always base actions on **assumptions.**
6.3	Partners are always in agreement on **how** to do it.								Partners never agree on **how** to do it.
6.4	Partners always **share all their information**.								Partners never **share all their information.**
6.5	Partners always **trust** each other								Partners never **trust** each other
6.6	Partners always welcome **new ideas**								Partners never welcome **new ideas**
6.7	Partners always explore **novel methods** of working								Partners always **stick to known methods** of working
6.8	Partners are **willing to take risks**								Partners are **always cautious**

Please add any explanatory comments:

Q7. The following table identifies the range of services which are provided by rivers. Thinking of the River X, please indicate which of these services are **most important to you**.

Please identify the top 10 only

Goods and Services (alphabetical order)	**Importance to Yourself**
A reflective and spiritual asset	
An asset to be retained for future generations	
Buffers water flow rates, which therefore remains stable and predictable	
Clean water provides habitats for animals and plants	
Cleans waste water via biotic processes	
Dilutes pollutants and moves them down-steam	
Inspires and drives local population culture	
Moderates floods, retaining water on flood plain	
Natural landscape erosion & deposition mechanism	
Offers artistic and appreciative opportunities	
Provides a food source for animals	
Provides a food source for humans (fish, fowl, etc)	
Provides a habitat supporting young stages of biotic life cycles	
Provides a transportation link for species	
Provides biomass harvested for fuel	
Provides bio-medicinal products, healthcare goods	
Provides clean water for irrigation (agricultural use)	
Provides drinking water source for animals	
Provides drinking water source for humans	
Provides human skill development opportunities	
Provides recreation opportunities	
Provides water for industrial use (washing etc)	
Provides water for use in steam power	
Provides water power (green energy)	
Seasonal, natural variations in flow provide a range of habitats	
The history of the river and its buildings adds to an individual's sense of place and pride in their area.	
Transport link for humans	
Wetlands filter pollutants (reed beds)	

Many thanks.

Please save and return to b.a.law@edu.salford.ac.uk

APPENDIX C Participant Comment & Developed Code Schedule

Theme	Category	Developed Code & ID No		Literature Review Pre-conceived Code
Issues in Catchment Partnerships	Competition within Catchment Partnership	Financial opportunity	1	Economic funding uncertainty Incentives
		Resource restriction	2	Cost effective
		External policies	3	Return on investment Payment for ecosystem services
	Leadership of Catchment Partnership	Championing	4	Management structure Governance structures
		Prioritisation	**5**	Leadership Stakeholder views flexibility
		Relationships	6	Politics Exclusion Lack of trust Interaction Domination Cliques Avoidance Responsibilities Communication
		Own resources	7	Commitment Collaborative process
		Financial support (for CP)	8	Economic supportive costs
		Scale	9	Legal boundaries, scale
	Knowledge of Catchment Partnership	Measurement	10	Measures monitoring
		Sharing Data	11	sharing
		Modelling	12	Methodologies standards
		Own Awareness/Knowledge	13	Multiple stakeholders

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Current Issues include trying to get all agencies on board/ work to the same priorities. C52	5 6	C52	M
Obtaining even basic data about the catchment. C44	10	C44	L
Data available relates to WFD. Hence it provides only one description of the catchment. C44	10	C44	L
Not having an organisation that is big enough to effectively champion the catchment. C44	4 9	C44	L
CB Management is new to may partners. There is a lot of new information to absorb, and at times people may feel they are being asked to contribute to something they don't feel they have sufficient knowledge of. Organisations are involved however, because their areas of interest intersect with the CBA and catchment management can be a tool through which their priorities are achieved. C41	5 6 13	C41	H
My issues are around coordination of the partnership – developing and maintaining an agreed and positive direction of travel whilst balancing the needs/opinions and interest of those in the partnership. This takes an enormous amount of TIME and the relationships between the different pieces of work are complex. I find myself managing multiple interrelated projects which all impact on each other! C41	5 6 7	C41	H
Conflict between European Directive and Heritage over weir removals C39	3	C39	L
Overwhelming emphasis on natural environment versus historic environment C39	5	C39	L
Lack of funding C39	8	C39	L

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Loss of jobs, skills, experience and capacity at local authority and national agency level C39	3	C39	L
Managing a wide range of partner priorities and aspirations C36	5	C36	H
Identifying funding to make the Catchment Host role sustainable C36	8	C36	H
Managing the politics and tensions around perceived "empire building" aspirations of some members C36	6	C36	H
Catchment based approach requires integration and joining up of plans and activities of a range of organisations to maximise value. The theory behind this is sound. However, with limited resource to undertake the process of joining up, even at the level of operating a knowledge transfer network, can limit effectiveness. C34	7 9 11	C34	H
even if resourced at the centre of the partnership, if other partners are effectively not similarly resourced for the task of catchment partnership working, it can be a barrier to their participation – so if you are paid for a project outcome, if that project carries no resource to networking/comms etc, it can be hard to justify engagement – making it limited, inconsistent both within and between partner orgs. C34	2 3 6	C34	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
some of the key investors within a catchment (UU, EA) might understand and support the catchment approach. However, the joining up of activity and resource to deliver wider outcomes/additionality is as much of a responsibility of them as it is the wider partnership organisation. Whilst I am sure this does happen, how widely does it occur across the large investment programmes of these partners or are some of the other funding/organisational barriers get in the way. So if a FCRM scheme needs delivering within a timescale (normally financial years) to justify central govt. funding, what is the likelihood of genuine join up and cross benefits to other partners programmes and activity, particularly if those are smaller and not resourced to do so? C34	3 4 6 7	C34	H
Boundaries of catchments don't always follow other boundaries organisations follow and therefore management can be disjointed. C28	9	C28	H
Getting people to work **collaboratively** in the true sense of the word takes time and effort. C27	7	C27	H
Different organisations have different priorities so you need to work hard to find the common ground. C27	5 6	C27	H
A general lack of collating and sharing data and evidence C27	11	C27	H
Keeping track of who's doing what in the catchment C27	11	C27	H
Getting organisations/individuals to take ownership of actions or provide resources to support the Catchment Partnership C27	4 7	C27	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Slow pace in the on-going development of the partnership but particularly in the formation of an action plan. C27	5 6	C27	H
Developing ToR appropriate to the role of the group C27	6	C27	H
Finding funding to sustain the host's role C27	8	C27	H
Obtaining funding for delivery C27	1	C27	H
Competition within the Partnership for funding C27	1	C27	H
The scale of the challenge is enormous but although we have made progress local authority cuts have had a negative impact – no budgets to maintain infrastructure, no staff to work with volunteers C26	3 9	C26	H
Officer coverage of the catchment is fragmented and cross-authority working is not easy c26	6 9	C26	H
Invasive species C22	5	C22	H
Lack of co-ordinated management of habitats throughout the catchment C22	9	C22	H
Inconsistent levels of community engagement throughout the catchment C22	4	C22	H
Lack of promotional work to raise profile of the River Irwell and its value for communities and biodiversity C221	4	C22	H
Lack of financial resources to support the work required on the River Irwell C22	1	C22	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
As the person who manages angling and invasive species within [xx] parks service the main issues of concern for my area of work are Angling, Invasive species, Flooding and Water quality/pollution C21	5	C21	L
Flood management C19	5	C19	L
Improvement for Ecological/recreational reasons C19	5	C19	L
Invasive species C19	5	C19	L
Partnerships lack the confidence to use a weight of evidence approach. This approach is simple in concept but only used in practise by those who are technically skilled. e.g. a modeller is often happy to look at model output critically and use it despite obvious issues while a non-modeller will either believe it verbatim or ignore it. C16	6 12	C16	H
CaBA provides the opportunity to allow catchment management to flourish but there are few incentives for organisations to move it forward (money, perceived support technical, perceived support political) This means that the catchment based approach is additional work for minimal perceived benefit and therefore very reliant on the enthusiasm and energy of a few people in each partnership to get momentum going. C16	2 7	C16	H
Most of the partners cannot see what additional benefit CaBA will bring to their work. It is often perceived as an additional overhead getting them to do what they were going to do anyway. C16	4 7	C16	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
The Environment Agency officially supports the CaBA, however, when you work with them, the higher up you go the less real support there is. This is not surprising as CaBA will inevitably reduce EA headcount and influence if it works. Realistically the EA will return to being just a regulator, with very limited influence. C16	3 4	C16	H
The EA wants to control the CaBA to its own agenda. They keep saying that their budget is being reduced so they need others to deliver their work. This is a rather unfortunate message which does not motivate the third sector and is limiting the ambition, and therefore attraction of the CaBA. C16	3 5 6	C16	H
Money. CaBA either needs a huge central budget (not likely) or a very high profile and backing from the top to help mobilise external funding (this is the what is needed). When partnerships are meeting they need to be able to see that they are part of the 'next big thing' with significant backing then they will take the risks and bring in more resource. C16	4 6 8	C16	H
Too many organisations chasing the same money that do not have Rivers/WFD as a prime objective. C15	1 5	C15	M
A lack of up to date riverine terrestrial habitat data leading to Project/organisation led activities rather than strategically led ones. C15	5 10	C15	M
Unless funding is provided for strategic rather than project outcomes the current approach in the Irwell catchment will fail to have much bearing on whether WFD objectives are met. EA/UUL will not need the group's assistance other than as a rubber stamp to show partnership working. C15	1 3 6	C15	M

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Allocating sufficient time while delivering everything else that I have to as part of my day job which is largely unconnected with the xCP. C13	7	C13	H
Arranging time when key players can meet together. C13	5	C13	H
Change in public bodies meaning a loss of continuity C13	6	C13	H
I have specialist knowledge about the waterway I manage & some knowledge of the Y valley. It's difficult to keep abreast of the issues facing other waterways in the Irwell catchment. Geography/complexity/lack of time & resources are issues. C06	5 13	C06	H
Funding is a key issue. C06	1	C06	H
Increased pressure on all sectors in terms of staffing & resources. The Environment Agency are very interested in working in partnership with other organisations however they have are affected by cutbacks within their organisation as are other partners. Public sector spending cuts are continuing & increasing & will affect catchment management. C06	2 3	C06	H
Coordination & consultation are crucial. Working in partnership has made catchment management seem a possibility. Having a dedicated project manager for the Partnership has been key to taking things forward. It's sometimes difficult to respond to catchment wide issues when your role is to deliver projects for your waterway. C06	4 6 7	C06	H
Some areas of work such as flood prevention/mitigation don't appear to be proactively dealt with outside of the Environment Agency. C06	7	C06	H
Diffuse pollution C53	5	C53	M

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Resources C53	2	C53	M
Co-ordination C53	6	C53	M
The major issues haven't changed either during or as a result of the evolution of catchment based management. The Irwell is still in poor condition and it remains very challenging making both local and catchment scale improvements. However, the evolution of catchment management has made the task of making improvements more difficult and more complicated than it used to be for our own organisation. C35	2 9	C35	H
There are a lot more politics to navigate when applying for the little funding currently available and when drawing project specifications, which is impacting heavily on cost efficient restoration of the environment and is slowing progress. The politics appear to be necessary to navigate the most major issue of the elephant in the room, being that those organisations/individuals equipped to manage funding and deliver on-the-ground are essentially all in competition with each other for the limited funding available.C35	1 2 3 8	C35	H
It has been implied that the number of partners collaborating on a project may in itself be a measure of a success and worth making a target. While this may help navigate the elephant, where more orgs/individuals receive a "share" of the funding, the environment doesn't appear to be getting the same bang for the buck as those organisations sharing the money. Restoration is no longer cost efficient, and progress has slowed. It's very difficult to know how to talk about (and resolve) these issues as a group.C35	1 2 3 6 10	C35	H
Given the size of the area and the number in the group, is swift action possible? C31	6	C31	L

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
We are quite a diverse range of organisations so I think our specific areas of interest are generally complementary. C26	5 6	C26	H
We are interested in the whole catchment where as many others, including EA, are often focussed on the water body/river level C53	9	C53	M
The Universities represented on the Partnership bring very welcome rigour & overview to the proceedings. I find this very helpful. It helps prevent the Partnership from focussing purely on project delivery. C06	4 5	C06	H
I feel that inevitably each partner on the xCP represents their interests to some extent. Although I am employed by zz I participate in the Partnership as the yy project officer. My project works on a partnership model & so the xCP is a natural extension to the way I work. I don't represent zz as such. C06	5 6	C06	H
The Rivers Trust is pushing the multiple benefits of the CaBA. My perception is that other organisations, especially the EA and local authorities, see CaBA as a new (money poor) way to fund single issue projects as before. United Utilities clearly get the concept because they need to do the work anyway and have the funding but CaBA gives them the potential to deliver significant publicity and CR benefits from the same resource. The Red Rose Forest also see that demonstrating multiple benefits gives them a better chance of securing Life IP funding. C16	1 4 6	C16	H
To an extent – wider pressures and responsibilities to take into account. Local authorities do not have the luxury of a single focus (river) C19	5	C19	L
River catchment management and coordination is not my organisations key focus although we recognise the multiple benefits of water related activity. C26	3 5	C26	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
There still exists a silo mentality in some organisations. It can be difficult particularly in local authorities to identify the officers who can take a lead. Organisational structures can be a barrier. C06	6	C06	H
Differing priorities from different groups such as hydro-power companies vs weir removal. C13	5	C13	H
I also think that RR needs to be realistic about what its members can/will do. As an example, one workshop was convened to provide views on the prioritisation of work on specific physical assets (culverts, weirs etc) and it was obvious that attendees were unlikely to have sufficient knowledge to take any meaningful view (there is a great deal of difference between thought at a strategic level and boots on the ground knowledge). C19	5 7 13	C19	L
XX might provide a starting point for projects but perhaps only as a means of attracting /directing funding. However, this would only work if there was buy-in to the group as a representative body and in circumstances where resources are tight this is only going to happen if the input/output is considered worthwhile. C19	2 4 8	C19	L
Too much jargon associated with every sector – need to talk in common language which can be understood by the layman. C41	6	C41	H
We trust [xx] and just let them get on with it. C03	6	C03	H
I believe the group should be more successful than we are, so I'm stirring the pot, as rivers are not central to the core of our host's organisation. I'm looking to introduce a forum to remove this political interference. C38	3 4 5	C38	M
Young Cabal need time to build trust and avoid the mud-slinging which often happens ... and this impacts the trust in listening and understanding between partners. CS1	6	CS1	H
The weight of evidence approach is simple in concept but only used in practise by those who despite the obvious issues are often happy to use [this] information after critical review, while others will either believe it verbatim or ignore it C16	6 12	C16	H

Comment	Developed Code	Actor ID	Stakeholder Map (H/M/L)
Representatives have been part of the partnership for a long time; [XX] catchment partnership members have been present for a while so there is no need to keep building relationships. Catchment partnership is primarily a collection of professional (salaried) eco-interested parties, so some stakeholders are not represented. Biodiversity interests have been at the fore CS2	5 6	CS2	H
people with the knowledge [are] in the lead organisation, avoid alienating sectors [partners] and bring hard-nosed, business discipline to each catchment. Need a scale of ambition. Need a risk taker – need someone with an ability to take and own the risk and dedication to keep at it, who are project orientated and focussed on action. XX are naturally risk averse so can't rely on them to push new concept forward CS1	4. 5	CS1	H
CP has value as a mechanism for drawing together work at a strategic/policy level, providing a point of reference and perhaps taking on a level of public interface work that the partner agencies don't have the time or expertise to do C19	4 5 13	C19	L