A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Doctor of Philosophy

"We Don't Eat Fish..." Science, Policy and EU Governance: The Implementation of Arsenic Limits for Drinking Water in a Hungarian Case Study

Julia LEVENTON

June, 2011

Budapest

Notes on copyright and the ownership of intellectual property rights:

(1) Copyright in text of this thesis rests with the Author. Copies (by any process) either in full, or of extracts, may be made only in accordance with instructions given by the Author and lodged in the Central European University Library. Details may be obtained from the Librarian. This page must form part of any such copies made. Further copies (by any process) of copies made in accordance with such instructions may not be made without the permission (in writing) of the Author.

(2) The ownership of any intellectual property rights which may be described in this thesis is vested in the Central European University, subject to any prior agreement to the contrary, and may not be made available for use by third parties without the written permission of the University, which will prescribe the terms and conditions of any such agreement.

(3) For bibliographic and reference purposes this thesis should be referred to as:

Leventon, J. 2011. *"We Don't Eat Fish..." Science, Policy and EU Governance: The Implementation of Arsenic Limits for Drinking Water in a Hungarian Case Study,* Doctoral thesis, Department of Environmental Sciences and Policy, Central European University, Budapest.

Further information on the conditions under which disclosures and exploitation may take place is available from the Head of the Department of Environmental Sciences and Policy, Central European University.

Author's declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Furthermore, this thesis contains no materials previously written and/or published by another person, except where appropriate acknowledgment is made in the form of bibliographical reference, etc.

Julia Leventon

THE CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:
Julia LEVENTON
for the degree of Doctor of Philosophy and entitled: "We Don't Eat Fish..." Science, Policy and EU Governance: The Implementation of Arsenic Limits for Drinking Water in a Hungarian Case Study.

Month and Year of submission: June, 2011.

This thesis examines the causes of Hungarian non-implementation of EU legislation for controlling arsenic in drinking water. Natural concentrations of arsenic are found in groundwater and soil systems throughout the world. Where these groundwater resources are used as a source of drinking water, people are exposed to arsenic, presenting a threat to human health. Chronic exposure to arsenic has been linked to skin, bladder and lung cancers, and a variety of other diseases including ischemic heart disease and diabetes. In order to prevent these health impacts, numerous legislative agencies set limits for concentrations of arsenic in drinking water. The EU sets a limit of 10 ppb (μg/l). This limit is adopted by all member states that must then juggle social, scientific, economic and political considerations to ensure it is met. Hungary heavily relies on drinking water sourced from high-arsenic groundwater. However, despite adopting the EU limits, much of the water delivered exceeds 10 ppb. This puts approximately one quarter of the population at risk from arsenic-related health problems. This thesis seeks to explain this governance failure.

The methods employed in this research take a multi-disciplinary, holistic approach to examining the institutions of governance in Hungary. A case study of Békés County in South Eastern Hungary is examined. A policy review is conducted, covering every level of policy to characterise the institutional structures of drinking water management, and to highlight points of administrative and scientific failure in the multi-level governance system. Discourse data is collected from every policy actor. This is used to explore the policy related beliefs of the actor, according to analytical frameworks taken from the Advocacy Coalition Framework (ACF). These are explored to examine points of clash between policy actors and the institutional structure in terms of beliefs about the content and approach of policies and the assignment of roles. These points of mismatch are used to explain how implementation deficits occur, how they interact, and therefore what the underlying causes of governance failure are.

The results show that governance failures are created when policy actors do not adjust their beliefs to match those incorporated into the policies and institutional structures of the EU. Resistance to institutional adoption results from the persistence of actor beliefs incorporated under previous governance institutions, and because of the lack of information or resources available to facilitate belief change. In particular, a lack of scientific justification behind the 10 ppb limit prevents the availability of such information. These findings expand upon current understandings of structure-agency interactions of institutions in EU governance systems, and the role this plays in policy implementation. Recommendations are made for further research to improve current understandings of governance failures in the EU. Recommendations are also

made for the improvement of policy implementation, including the rectification of scientific errors incorporated into policy, and the way in which policy rationale is communicated to policy actors.

Keywords: Environmental governance, Arsenic, Groundwater, Implementation, Hungary, Europeanisation, Institutions, Advocacy Coalition Framework

Acknowledgements

Funding

I acknowledge funding from the European Commission (AquaTRAIN MRTN-CT-2006-035420).

I am also grateful for a six-month write-up grant provided by the Central European University.

People

I am thankful that my PhD experience has been vastly enriched by a large number of people, across multiple countries who interact with many areas of my life. All of them have offered opportunities and supported me in ways they probably didn't even realise. I am not sure that an acknowledgments page does them all justice, but I would like to take this opportunity to say thank you:

Thesis Committee: To Prof. Alexios Antypas (CEU, supervisor), Prof. Ruben Mnatsakanian (CEU, committee member) and Dr. Petr Jehlička (The Open University, UK, opponent). It is special to me that I can count amongst my acknowledgments Dr. Lindsay Stringer (Leeds University, external supervisor) who has supported me since my undergraduate degree.

Participants: To the numerous study participants, without whom this thesis would not have been possible. Thank you for your time, encouragement and enthusiasm. I hope I have the opportunity to return the many favours one day.

AquaTRAIN Colleagues: To the lead scientists, I thank you for your guidance and opportunities, with special mention to Prof. Dave Polya (network coordinator) and Dr. Stephan Hug. To the researchers, I thank you for the discussion, support and especially friendship, with special mention to the soon-to-be Dr.s Aimee Hegan, Claudia Cascio, Chris Parsons.

In Hungary: To my Hungarian supporters, helpers and friends Orsi Korsos, Edina Muray, Zsuzsanna Fehér, Zsófia Szi-Ferenc, thank you for the help, advice and support. To my PhD colleagues and staff (and friends) in the Department of Environmental Science and Policy, thank your for the help and discussion, especially Krisztina Szabados, Irina Herczeg and Prof. Alan Watt.

In Italy: To staff (and friends) in the Soils Action, particularly Luca Montanarella, Gergely Tóth, Frank Verheijen, Vit Penizek and Simon Jeffery.

In Greece: To staff (and friends) in the HERS Lab, particularly Nikos Nikolaidis, Leeda Demetropoulou (and family), Daniel Moraetis and Fotini Stamati.

In the Czech Republic: To the Mildorf family, Vaclav, Milada, David, Tereza and Vojta. Thank you for accepting and supporting (and feeding) me.

Those Without Borders: To my friends, Aida Geragusian, Paul Rockliffe, Melissa Davis, Andrew Lister, Brigit Chesworth and Matt Bond, thank you for coming on the journey with me. Finally to my family, Jill, Charlie and Martin Leventon, Clare Baker and Tomáš Mildorf, all of the above thanks apply to you and yet somehow don't quite feel big enough.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ACF - Advocacy Coalition Framework

ÁNTSZ - Állami Népegészségügyi és Tisztiorvosi Szolgálat (Public Health and Medical Officer Service) (HU)

ASHRAM - Arsenic Health Risk Assessment and Molecular Epidemiology (a Framework Programme 5 research project)

ATSDR - Agency for Toxic Substances and Disease Registry (US)

AquaTRAIN - Geogenic chemicals in groundwaters and soils: A Marie Curie Research Training Network (a Framework Programme 6 research project)

BMDL - Benchmark dose lower confidence limit

CEECs - Central and Eastern European Countries

CEECHE - Central and Eastern European Conference on Health and Environment

DALY - Disease Adjusted Life Year

DARFÜ - Dél-alföldi Regionális Fejlesztési Ügynökség (Southern Great Plain Regional Development Agency (HU)

EAWAG - Swiss Federal Institute of Aquatic Science and Technology

EC - European Commission

EPA - Environmental Protection Agency (US)

EU - European Union

EUM - Egészségügyi Minisztérium (Ministry of Health) (HU)

FAO - Food and Agriculture Organisation

GV - Guideline Value

IARC - International Agency for Research on Cancer

ICP-MS - Inductively Coupled Plasma Mass Spectroscopy

ISPA - Instrument for Structural Policies for the Pre-Accession

JECFA - Joint FAO/WHO Expert Committee on Food Additives

KÖVÍZIG - Környezetvédelmi és Vízügyi Igazgatóság (Inspectorate for Environment and Water) (HU)

KÖRKÖVÍZIG - Körös-vidéki Környezetvédelmi és Vízügyi Igazgatóság (Körös Region Inspectorate for Environment and Water) (HU)

KvVM - Környezetvédelmi és Vizügyi Minisztérium (Ministry for Environment and Water) (HU)

LOAEL - Lowest Observed Adverse Effect Level

MAFI - Magyar Állami Földtani Intézet (Geological Institute of Hungary) (HU)

MAVIZ - Magyar Víziközmű Szövetség (Hungarian Water Utility Association)

METEAU - Metals and Related Substances in Drinking Water (a COST research project, Action 637)

MF - Modifying Factor

NOAEL - No Observed Adverse Effect Level

OKI - Országos Környezetegészségügyi Intézet (National Institute of Environmental Health) (HU)

PHARE - Poland and Hungary: Assistance for Restructuring their Economies

ppb - parts per billion (μg/l)

ppm - parts per million (mg/l)

SAPARD - The Special Accession Programme for Agriculture and Rural Development

SUMANAS - Sustainable Management and Treatment of Arsenic Bearing Groundwater in Southern Hungary (EU Life Project)

TDI - Threshold Daily Intake

UF - Uncertainty Factor

UNECE - United Nations Economic Commission for Europe

VITUKI - Környezetvédekmi és Vízgazdálkodási Kutató Intézet Nonprofit Kft. (Environment and Water Research Institute) (HU)

WFD - Water Framework Directive

WHO - World Health Organisation

WWI - World War One

WWII - World War Two

1. Introduction

1.1. The Arsenic Problem

Naturally occurring arsenic in groundwater is a potential public health catastrophe. Arsenic is a known carcinogen when a person is exposed both via ingestion (IARC, 1990) and inhalation (IARC, 1980). Arsenic-tainted groundwater poses a threat to human health when exposure pathways are created between the water and humans; either by using the groundwater as a source of drinking water, or as irrigation water for crops. The 1990 listing by the International Agency for Research on Cancer (IARC) for ingested arsenic was created in response to the link emerging between cancer and high levels of arsenic in groundwater used as drinking water (IARC, 1990). Such drinking water sources provide doses of arsenic that do not induce acute health impacts. However, chronic low-level arsenic ingestion has been linked to a range of cancers, including skin, bladder and lung, and a wide variety of non-cancer impacts including diabetes and skin irritation and irritation of the mucus membranes including dermatitis, conjunctivitis, pharyngitis and rhinitis (ATSDR, 1990) and ischemic heart disease (Argos et al., 2010). The most visible impact is that of arsenicosis, which is a discolouration and painful thickening of the skin on the hands and feet. The impacts have been particularly prominent across South East Asia where tube wells were installed by aid agencies to access groundwater for drinking water and avoid the bacteriological risks associated with the use of surface water (see Pepper, 2006). Unfortunately, in many cases, the geological environment means that the aquifers being exploited by tube wells have very high levels of naturally occurring (geogenic) arsenic. The resulting human impact has been termed an "environmental health disaster" (Rahman et al., 2009; Charlet and Polya, 2006). In Bangladesh alone, between 35-77 million people are exposed to arsenic via their drinking

water, and as many as one in five deaths in affected regions could be attributable to this arsenic (Argos et al., 2010).

Geogenic arsenic poses a potential health threat across a wide geographic area due to the diversity of groundwater environments that favour arsenic release from the rocks. Arsenic tainted aquifers are usually closed or inland alluvial basins; they are characterised by reducing conditions, young sediments and sluggish groundwater flows (Smedley and Kinniburgh, 2002). They can also be geothermal aquifers as these are characterised by high mineral contents that can include arsenic, particularly where the surrounding bedrock has high levels of pyrite (Ballantyne and Moore, 1988). Collectively these geological environments tend to be located in the shadow of igneous mountain areas, or in sedimentary flood plains and are not globally rare. Smedley and Kinniburgh's comprehensive review notes geogenic arsenic contamination in groundwaters in countries including Bangladesh, India, Taiwan, Northern China, Vietnam, Hungary, Romania, Mexico, Chile, Argentina and the USA (Smedley and Kinniburgh, 2002). New aquifers are continually being identified and studied in locations including New Zealand (Welch et al., 2003), Cambodia (Polya et al., 2005), Northern Greece (Kouras et al., 2007) and Finland (Kurttio et al., 1999). Predictions based on geological and hydrological parameters indicate that groundwaters in South East and North West China, Central Australia, Northern Afghanistan, Northern Mali and Zambia are also likely to display high concentrations of arsenic (Amini et al., 2008).

In Europe, the biggest concerns around groundwater tainted with geogenic arsenic originate in the Pannonian Basin. The Pannonian (or Carpathian) Basin is a low-lying basin bordered by the Carpathian, Tatra and Alp mountain ranges, and covers the whole of Hungary and Slovakia along with parts of Romania, Ukraine, Serbia and Croatia. In the South Eastern sections of the

basin, around the Tisza river basin, the underlying geothermal groundwaters are high in arsenic (Ujevic et al., 2010; Cavar et al., 2005; Varsányi and Kovács, 2005; Manojlovic et al., 2008; Jovanovic, 2010). The affected area covers the Southern Great Plain region of Hungary, as well as the Western borderlands of Romania, and the northern borders of Serbia and Croatia. Here, the geothermal groundwaters are high in arsenic as a result of water-rock interactions facilitated by microbial action and exacerbated by the high dissolved organic matter content (Rowland et al., 2010). In these countries, geothermal groundwater provides a source of bacteriologically clean drinking water, meaning that substantial numbers of people in Hungary, Romania, Croatia and Serbia being exposed to this arsenic via their drinking water supplies (Varsányi et al., 1991; Gurzau and Gurzau, 2000; Cavar et al., 2005; Manojlovic et al., 2008; Jovanovic, 2010). The impact is not highly visible in the way it is in parts of South East Asia; incidences of arsenicosis, the discolouration of skin, are not widely reported. However, the impact to human health in the region has been demonstrated with empirical data, showing higher rates of arsenic related illnesses such as cancer and diabetes in populations that receive high-arsenic drinking water (Lindberg et al., 2006; Lindberg et al., 2007). The size of the affected area, and the number of people exposed make this the most significant incidence of geogenic arsenic exposure in Europe.

The movement of arsenic through the rock, water, soil and plant systems is a complex interaction of natural and anthropogenic processes. Arsenic release from the solid state into groundwater occurs in reducing environments; anaerobic conditions lead to reduced minerals within sediments or rocks, which lead to dissolution of Iron (II) and Manganese (II) along with arsenic which may be adsorbed to the surface of these minerals (Ahmann et al., 1997). The exact mechanism through which this occurs varies with the groundwater environment. It is often driven by microbes, which means that temperature (Masson et al., 2007) and organic matter

degradation (Bauer and Blodau, 2006) affect the rate of arsenic release. Any anthropogenic activities that affect these factors also affect the rate of arsenic release into the water environment. For example, in Bangladesh, human-constructed surface ponds provide recharge to the shallow groundwaters and the high levels of organic carbon in the recharge water promote arsenic release in the aquifer (Neumann et al., 2009). Similarly, arsenic in soils is the result of both the underlying bedrock and any additions from water. Therefore the content and mobility of arsenic in soil varies with both geological conditions and the geochemical properties of the soils; with anthropogenic impacts, which alter the hydraulic regime (Roberts et al., 2009) and physical structure (Millwards and Liu, 2003); and with climatic conditions which influence the hydraulic regime or temperature. Reducing conditions in soils increase the amount of soluble, and therefore mobile, arsenic (Selim et al., 2001). Therefore, soils that are irrigated with arsenic rich water, and that are periodically flooded (such as rice paddies), display a much higher concentration of arsenic, which is mobile and available for uptake by crops (Roberts et al., 2009).

In this complex system, the potential human health threat from arsenic is therefore the result of both direct exposure and indirect exposure pathways. Direct exposure is the result of using the groundwater as a source of drinking water. There are no losses of arsenic in this pathway. A person's average 2 litre consumption of water containing 100 ppb arsenic would result them consuming 200 μg of arsenic per day, almost all of which would be inorganic and toxic. Exposure routes via soil are less direct exposure pathways because there are losses of arsenic in the pathway, though they are not insignificant. For example, in the food exposure pathway, arsenic is lost because the amount of arsenic that appears in crops depends on the crop (Baker, 1976). Rice accumulates significant amounts of arsenic compared with other agricultural products (Meharg, 2004; Williams et al., 2005; Mondal and Polya, 2008). The consumption of

rice grown in As-rich soil and irrigated with As-rich water is an important indirect exposure pathway (Meharg et al., 2008), The concentration of arsenic is further exacerbated when the rice is cooked in arsenic rich water (Nicole et al., 2006). Indeed, the levels of arsenic discovered in rice mean edible arsenic is a significant exposure pathway in some high rice diets, including Bangladeshi populations (Signes-Pastor et al., 2009, Cascio et al., 2010) and babies fed baby rice (Meharg, 2008). In addition, recent research indicates that agricultural workers may be at risk of inhalation of arsenic volatilising from tainted soils (Mestrot et al., 2009). Only a small amount of the arsenic in the water system will volatilise via the soil system, but its potential to contribute to a human's total arsenic intake remains.

Regulatory agencies control exposure through these pathways by setting limits on the permissible concentration of arsenic in the pathway. Arsenic is considered to be a non-threshold chemical because it is carcinogenic. This means that regulatory agencies consider that no amount of arsenic consumption is safe; it will induce a health impact whatever the dose. Because it is a non-threshold chemical, a multistage linearised methodology is advocated by the World Health Organisation (WHO), the European Union (EU) and the US Environmental Protection Agency (EPA) for setting allowed concentrations of arsenic in exposure pathways. In this approach, epidemiological study data is used to construct a dose-response curve for the points at which data exists. Where possible this is from human studies, though animal studies are often used due to a lack of availability in human studies. In the case of arsenic limits, human data is available and is used. However, in common with many toxic materials, the epidemiological data used are based on high dose studies, where subjects receive chronic, but relatively high doses of the material. Below these data points, linearity is assumed in order to extrapolate the health impact from lower doses, unless there is evidence to suggest that dose-response is not linear. Indeed, the EPA has

strict criteria for evaluating studies for use in risk assessment, and for instances in which non-linearity can be assumed (EPA, 1996). Once the dose-response curve has been characterised, the lifetime excess cancer risk at lifetime average daily dose 1 mg/kg/day can be found. This is then used to create a Guideline Value (GV) by making assumptions on body weight and length of a lifetime. The GV does not predict how many cancers will be caused by ingesting arsenic at this level, only the maximum potential risk in the face of large uncertainties.

Across the world, regulatory agencies have so far concentrated their arsenic limits on controlling only the direct, drinking water exposure pathway. There are numerous, scientifically argued calls for legislation to limit the amount of arsenic in food (see for example Meharg and Raab, 2010; Al Rmalli, 2005). Currently only China has regulations over the permissible concentrations of arsenic in food. For drinking water, every major governing body such as the WHO, the EPA and the EU have regulations or recommendations for the control of arsenic in drinking water. These regulations vary, but concentrate on setting maximum recommended or permissible concentrations of arsenic in drinking water. The WHO set their limit at 10 ppb (or μg/l) in their guidelines for drinking water quality. The EPA and the EU follow these guidelines and have set their limits at 10 ppb. The US reduced their limit to 10 ppb from 50 ppb in 2001. The recommended limit remains at 50 ppb in parts of South East Asia including Cambodia, Bangladesh and Pakistan. The EU adopted the 10 ppb limit in 1998 in the Drinking Water Directive (93.83/EC). The drinking water directive aims to protect human health from dangerous substances in drinking water by setting standards for water supplies. It outlines maximum permissible concentrations for elements in water intended for human consumption. These must be complied with at the point of consumption. The limits are in the form of parameters and indicator parameters. Parameters are strict, whereas the exceeding of an indicator value demands

further investigation as to whether or not it actually poses a risk to public health. The 10 ppb arsenic limit is listed as a parameter value.

1.2. The Importance of EU Policy

In the Pannonian Basin the EU shapes the way in which arsenic in drinking water is managed. All member states are required to align their own governance systems with those of the EU. This alignment is often an iterative process; member states download the requirements and shapes of EU governance, and simultaneously upload their own values and governance systems into the EU. The iterative adjustment of governance systems in member states is a process of europeanisation, whereby a common EU identity is created and national level systems are adjusted to match EU policies, practices and politics (Schmidt and Radaelli, 2004). The impact is more one-directional in the case of newer member states including Hungary (joined 2004) and Romania (joined 2006). For these new members, a condition of membership was the adoption of the *Aquis Comunautaire* (the body of EU legislation). Therefore, these countries lacked the opportunity to shape policy and law, but the downloading of EU governance to their own systems was compulsory. A similar download of EU governance can occur in prospective member states such as Croatia and other neighbouring, newly independent states such as Serbia. While not yet compulsory, the EU system acts as a model for governance, meaning that EU values are downloaded and adopted into their own systems (Borzel and Panke, 2010). This extended influence of the EU beyond its own boundaries occurs because the EU is a global governance system. It interacts with other systems, negotiating agreements and influencing policies meaning that europeanisation is a form of globalisation (Wallace, 2000). This global

reach of the EU, and its direct shaping of governance systems means that it plays an important role in shaping environmental management both in member states and those outside its borders. This means that the EU has the potential to plays an important role in the management of geogenic arsenic in all countries in the Pannonian Basin, both member and non-member states.

The EU shapes governance systems by providing both laws or legislation, and a set of principles that shape the way in which these rules are implemented. In the EU, laws are in the form of directives and legislation, collectively called the *Aquis Comunautaire*. These are established by the European council, parliament and commission, and each member state has voting rights proportional to their population size. Each member state must formulate national legislation and policy in order to transpose legislation into national law. These laws must then be met using a governance system, which must meet the EU principles of governance, though they are free to innovate and refine within these boundaries. These principles shape and define the roles of policy actors by defining the way in which they should work and relate to each other. The key principle is that of subsidiarity which is enshrined in the Maastricht Treaty. This states that actions must be taken at the most local level possible and practicable. This translates into a multi-level approach to management. Policy actors are arranged in a hierarchy according to their geographical coverage. In a simplified system, national policy actors refine EU legislation to suit the country context, and this is further refined by regional actors to suit the regional context. At the local level, policy is enacted. Overall there is as evolution of policy as it progresses towards the local levels of policy and becomes more tangible as specific actions. In conjunction, power and responsibilities are dissipated and shared from the national level in two directions; upwards to the supra-national (EU) and downwards to the regional and local levels of governance.

The multi-level approach creates a system of network governance whereby a variety of actors must pool their expertise and roles in order to implement policy. Governance networks are "legally autonomous organisations that work together to achieve not only their own goals, but also a collective goal" (Provan and Kenis, 2008, p. 231). Each autonomous organisation or policy actor brings expertise that is combined in order to create knowledge, absorb it into the policy system, formulate policy and implement it. These organisations come together around thematic topics to form formal and informal governance networks (Rhodes, 1996). This approach is a common feature of EU governance where policy enactment often requires a range of expertise, and resources that are spread between state and non-state actors (for the application of this concept to the EU governance system, see Leygues, 2000). Water is an area of EU policy that demands the evolution of particularly complex networks involving a diverse and interdisciplinary range of actors (Richardson, 1994). This is due to the wide range of uses of water and its complex interactions into all areas of the environmental system, which collectively result in a wide range of interested parties and stakeholders. How well the network 'functions' is determined by how network conditions lead to network outcomes (Provan and Kenis, 2008). In the case of networks formed for the implementation of a specific policy, functioning refers to how networks achieve the policy outcome.

The exact character of the network approach for policy implementation and the way it functions depends on the individual member state. Every member state has a different 'baseline' governance system that it held when it joined the EU. The degree of change required to meet EU requirements has therefore varied between member states. Some member states are widely considered to be environmental leaders, such as Germany or Sweden, as their approach to environmental legislation, even without EU impetus, is extensive. Whereas others are

environmental laggards, such as Greece or Spain, as they traditionally neglect environmental issues. The extent to which their legislation has had to change in response to EU requirements has therefore varied; the laggards have had to adopt a larger number of measures and make greater adjustments to the policy actors and their roles. Furthermore, some member states already had a system of governance similar in approach to that promoted under EU principles, whereas others had a historically centralised regime (e.g. Greece, Spain, Portugal). These formerly centralised systems are required more extensive evolution to bring their governance systems in line with the EU. In addition, all member states are allowed a high degree of autonomy within the specified governance principles. In light of this varying starting point, and differing reactions to EU legislation, the results of europeanisation have varied. Therefore, the uniform approach to governance does not translate into uniform governance; there is "differential europeanisation" (Benson and Jordan, 2010 p. 366). These different forms of network governance incorporate different tensions and barriers to functioning (Provan and Kenis, 2008) and policy implementation varies. This means that the effectiveness of the EU approach to managing arsenic in drinking water is dependent on differing national governance systems and the way in which they interpret and execute legislation.

The governance system in Hungary is not effective in terms of implementing EU regulations for arsenic in drinking water. 97% of Hungary's drinking water requirements are met through groundwater (KvVM, 2006). Nearly half of this water comes from deep groundwater (KvVM, 2006), which can be split into thermal or non-thermal waters. This means that a significant amount of Hungarian drinking water is supplied from groundwater sources tainted with geogenic arsenic and other elements. Prior to EU membership, Hungary had a limit for arsenic in drinking water of 50 ppb. In adopting the *Aquis*, Hungary has had to lower the

permissible level of arsenic in drinking water. A compromise was reached during accession negotiations, and the limit was relaxed to 30 ppb, with the requirement that 10ppb be met by the 25th December 2009. At the beginning of 2010, 24% of drinking water supplied in Hungary was failing to meet EU drinking water standards for arsenic, boron, fluoride, nitrite and ammonia (KvVM, 2010). 435 settlements received water that exceeded 10 ppb arsenic, 74 of which exceeded 30 ppb (KvVM, 2010). These problems are particularly acute in the Dél-Alföld (or Southern Great Plain) region (see figure 1.1) because of the greater reliance on geothermal groundwater for drinking water supplies.

Figure 1.1: The Dél-Alföld Region of Hungary

1.3. The Thesis: Research Aims and Context

The overarching aim of this research is to explain why the Hungarian governance system is failing to implement EU drinking water regulations with regards to arsenic in drinking water. This is an important aim in itself because understanding failures is key to addressing them and thus protecting the health of the population in Hungary. But the aim also has wider applicability. The fact that the EU regulations are failing to deliver arsenic-safe drinking water in Hungary means that the EU regulations are not protecting all EU citizens. Because the EU shapes the way drinking water is managed for all countries in the Pannonian Basin, it is necessary to explain these failures in order to understand the extent to which they are a peculiarity of Hungary, and the potential for further failures in other Pannonian Basin countries. Therefore, in fulfilling this overarching aim, results can be generated which can be explored in the context of other EU member, and neighbouring countries in order to ensure the delivery of arsenic-safe drinking water and the protection of human health. The overarching aim will be achieved by firstly examining current literature to identify existing explanations for this non-implementation phenomenon, and thus highlight the exact research gap that this overarching aim fills. A theoretical framework that fills this gap is then created in order to theoretically explain non-implementation. A set of concepts are created, leading to a specific research aim in order to test theoretical explanations, and to defined research questions to meet this specific aim. A research strategy is then designed and executed in order to fulfil the research aim in the Hungarian context, and the results produced are related to the original overarching aim. Therefore, the remainder of this thesis proceeds as follows, and is depicted in figure 1.2:

- Reviewing current literature on policy implementation (**Chapter 2**). The review highlights the deficiencies in current understandings of policy implementation in the EU. It answers the questions: How is implementation studied; what are the key concepts; and what are the research gaps? To do so, definitions and frameworks for characterising and explaining implementation failures are examined. These are applied to both research into arsenic management and research into wider policy implementation. This produces operational definitions for implementation failures in the EU. Their applicability and limitations in terms of the central thesis aim are examined. This review therefore locates the thesis research within existing implementation literature, and in doing so, demonstrates research criteria necessary for examining the thesis' central aim.

- The theoretical framework (**Chapter 3**) continues by proposing a theoretical and analytical framework for examining implementation in the EU. This chapter answers the question: How is implementation in the EU explained by theory? It provides the concepts and their theoretical links necessary in order to explain the failures of the EU governance system in implementing policy. This is done by examining the theoretical nature of governance in the EU. These characterisations are then explored to examine how policy is implemented, and to explain potential barriers to implementation. How these barriers influence implementation is explored in order to set a research aim for this thesis. A specific analytical framework for explaining governance failures in Hungary is proposed, and focussed research objectives are formulated.

- **Chapter 4** is a methodology chapter. It is constructed based on the concepts outlined in Chapter 3. These are operationalised in relation to the Hungarian context, and

a research approach is chosen that will address the shortcomings of previous research (as outlined in Chapter 2). A case study approach is chosen to provide the context for an in-depth examination of the whole governance network and its successes and failures. To achieve this, a two-phase approach is outlined with distinct methods tailored towards specific objectives. These are tied together by pursuing a holistic and integrated research approach. These approaches are described in detail.

- **Chapter 5** presents the results of the first methodological approach. It is a policy review based chapter that highlights the policies, policy actors, points of failure and the wider governance network in the Hungarian case study. It characterises points of failure according to the analytical framework provided in chapter 3. The outcomes from this chapter are fed into Chapter 6.

- **Chapter 6** presents the results from the methodological approach. The methods are applied to the case study using a sampling approach chosen in light of the outcomes of Chapter 5. This is described. This chapter is discourse-based and presents the characterisation of individual policy actors, according to analytical frameworks identified in chapter 3. These characterisations are discussed in relation to the points of failure identified in Chapter 5.

- **Chapter 7** brings together both sets of results in order to discuss how they fit the theories and frameworks developed in Chapters 2 and 3. These explanations of governance failures are then tested and verified via a focus group. The results of this group, and their implications to findings are discussed.

- The conclusions (**Chapter 8**) draw together the thesis and address the overarching aim. It outlines the main findings to provide explanations for Hungarian failures to manage arsenic-rich drinking water. Recommendations are made for both science and policy in order to improve the implementation of arsenic legislation in Hungary, and in the wider EU. The wider applicability of the findings to other EU and non-EU countries are considered in terms of their implications for institutional theories of governance, the EU approach to environmental management, and current efforts to improve implementation, particularly in new member states. Recommendations are made both for further research to further expand upon understandings and for changes in current approaches for dealing with non-implementation and capacity building for EU accession.

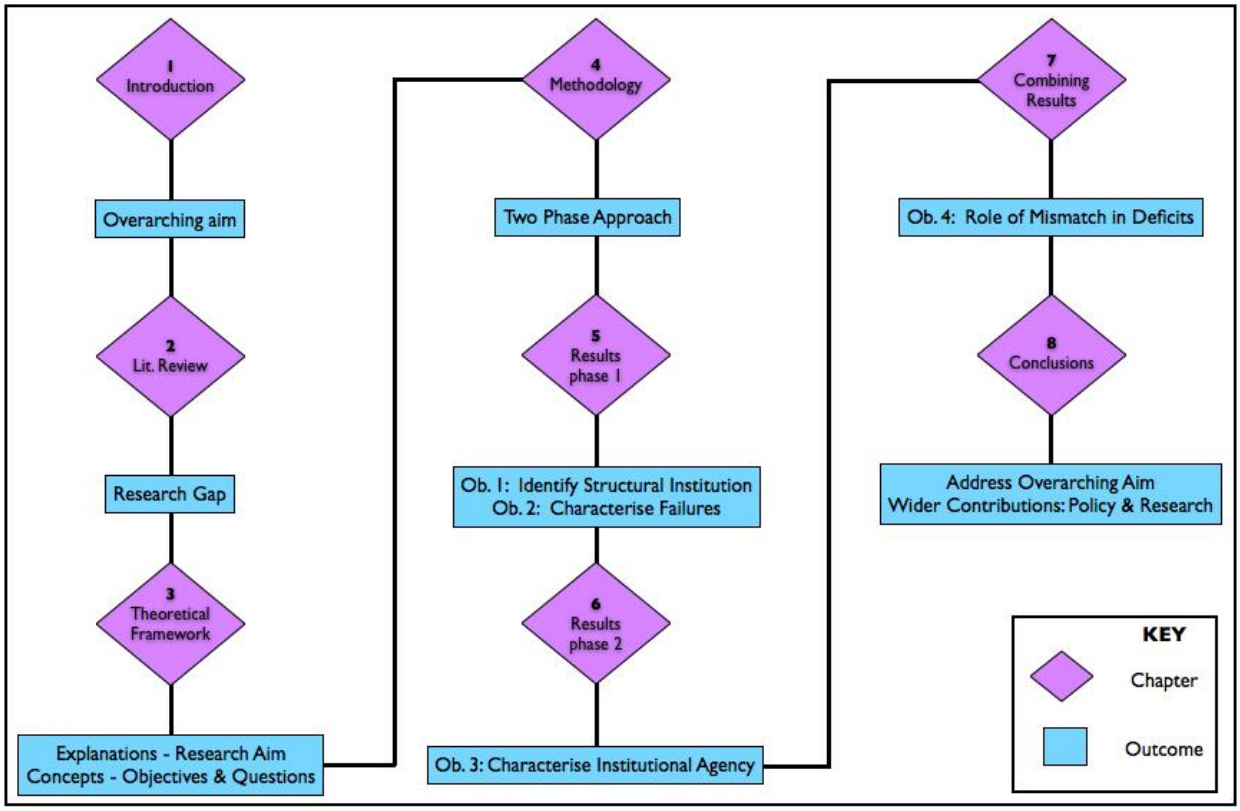

Figure 1.2: Thesis Map

The research in this thesis fits into the wider research context of global and EU arsenic management. The issue of arsenic in groundwater currently receives a large amount of attention from a multitude of academic disciplines in response to the huge health impacts being experienced across the world. Geochemists and biogeochemists are exploring the mechanisms of arsenic release and movement in environmental media; analytical chemists are improving detection and measurement techniques; biochemists and epidemiologists are examining the mechanisms of impact in the human body; and engineers and chemists are creating technologies to remove arsenic from environmental media. Indeed, this thesis research was funded through my involvement in a EU-funded research network called AquaTRAIN. The network included 15 PhD and post-doctoral researchers based in 15 European research institutes, with the contributed expertise of a range of international experts in the field of arsenic contamination. Each researcher pursued a separate project within the network's central aim of developing understandings of arsenic behaviour and impact to improve remediation and protect human health. The research presented in this thesis fits into this aim by building on the separate strands of knowledge that create the arsenic problematic, and by drawing them together to examine the ways in which governance systems respond to create policies and resource management. The findings therefore include recommendations for further targeted areas of technical research, as well as recommendations to the EU governance system to improve the way in which current resource management approaches take advantage of the arsenic knowledge that does exist.

Besides the direct contributions to arsenic management, the research in this thesis contributes to wider implementation research, particularly in the EU context. Through the

examination of failures around arsenic management, the research builds on current understandings of how implementation failures are created in the EU system. These contributions are achieved by developing frameworks for identifying the points of failure in a EU multi-level governance system; and by creating an explanation for these failures that treats the governance system as a holistic, institutional system. The identification of points of failure and explanations for them changes the way in which implementation deficits are characterised in the EU, which has further implications for the way in which they are addressed. Therefore, recommendations can be made to help improve the practice of policy formulation and implementation around wider environmental issues. In particular, these recommendations focus on the way in which legislation is introduced to member states, and the way in which new member states are brought into and 'trained for' the EU. These recommendations have much wider implications for the way we conceptualise and research implementation issues in the EU, and the analytical frameworks and methods developed in this thesis provide the tools necessary to respond to these emerging understandings.

The research is conducted on an evolving management scenario, which means that the results presented here represent a snapshot in time. Background research began in October 2007, with primary data collected from April 2009 to March 2010. The research presented in this thesis is therefore an explanation of the failures of the Hungarian governance system up until the end of the data collection period. Following the end of the research, further developments have occurred in the ongoing tale of arsenic governance in Hungary, particularly within the projects that were in progress during the data collection period. However, nothing has been finalised, and the overall failures still exist. Additionally, there was a national election in Hungary in April 2010. The right-wing party FIDESZ formed a new government, and with a two-thirds majority,

won enough votes to modify both the constitution and major laws. As a result significant changes have been made to government bodies throughout Hungary. In terms of drinking water management, there has been a change in personnel in many of the national bodies. The Ministry of Environment and Water (KvVM) has been taken over by the Ministry of Rural Development. This means that the responsibilities for water management have been transferred to the new ministry. The Ministry of Health (EUM) has been absorbed by the Ministry for National Resources. Collectively, these changes mean that the governance system that is examined in this thesis does not exist in the same form today. However, many of the same bodies are still involved, and the distribution of powers and responsibilities remains essentially the same. Most importantly, despite the developments in implementation projects, and the changes in ministries, the governance failures still exist. While the actors and the situations discussed in this thesis have changed and evolved, the underlying explanations for governance failures that are uncovered have not been addressed. Therefore, despite the specifics of the research becoming more dated with every day in this evolving management scenario, the practical, policy recommendations and theoretical contributions remain valuable.

2. Policy Implementation and Policy Failures in the EU

2.1. Implementation Research: Definitions and Frameworks

Implementation studies form part of a global and wide-reaching body of research into policy effectiveness. Every form of governance system has an interest in understanding how and why policies work in the way that they do. Policy analysis is a field that has concentrated on explaining which policies will achieve specific goals. It is often split into analysis for policy, and analysis of policy (see Parsons, 1996). The former is concerned with selecting policy options to achieve goals, and the latter is concerned with evaluating policies and understanding their development. To give an example of this, tools such as Environmental Assessment, including Environmental Impact assessment and Strategic Environmental Assessment, are a form of policy analysis employed in different ways, as both analysis for, and of, policy. These tools are employed in large development projects, such as Poverty Reduction Strategy Papers of the World Bank (see for example Dalal-Clayton and Sadler, 2005), and in smaller local level building projects. If applied as part of the policy design process, such tools shape the final policy by highlighting considerations and consequences that must be accounted for (George, 2001). When implemented after policy execution, environmental assessment monitors the success of the policy at meeting environmental goals. Therefore, while analysis for policy shapes policy design, and analysis of policy is evaluation, they feed into each other. Taken collectively, they are a practical exercise for shaping policies, and an academic exercise in setting evaluation criteria and methodologies (see for example Sauer et al., 2009). Implementation research began to emerge as policy makers realised that regardless of research for or of policy, the policies themselves were not self-executing (Elmore, 1979). In implementation research, focus is shifted away from what happened, to why it happened. Therefore, implementation research is not evaluation research or

analysis of policy, though the two are interlinked, rather, it considers the *ability* to achieve the desired result (Pressman and Wildavsky, 1973). Ability to achieve goals is related both to the execution, and to the goals that are set (Pressman and Wildavsky, 1973). Therefore, while implementation is separate to policy evaluation, it cannot be separated from policy design. Implementation cannot begin until the policy has been set (Van Meter and Van Horn, 1975) which means that implementation does not include the examination of rejected policy proposals in the same way that policy design research might.

Within any approach to understanding implementation, the starting point of any piece of the research affects the causal factors identified for success or failure. In top-down studies researchers begin with a policy decision and examine the extent to which objectives are achieved and why (Sabatier, 1986; Hill, 1997; Hjern and Hull, 1982), and are unable to account for the plurality of functions, interests and policies occurring simultaneously (Sabatier, 1986). On the other hand, bottom-up approaches rely too heavily on the perceptions of participants, and are unlike to capture factors that are not recognised by them (Sabatier, 1986). The two approaches show different things; top-down is useful for examining specific policy areas, but bottom-down is useful for exploring the competing priorities of local actors. Attempts have been made at specifying the conditions under which each approach is most applicable. For example Matland (1995) organises policy contexts according to the degree of ambiguity inherent in a policy, and the degree of conflict between policy actors. Top-down approaches provide accurate explanations of low ambiguity scenarios, where macro-implementers either wield high influence (low conflict) or must consider the structuring of resources (high conflict). Bottom-up approaches are useful for generating causal factors in high ambiguity scenarios where there is more choice available at the micro-implementation level. This means that the wide range of

implementation research conducted has resulted in a wide variety of factors identified as causing implementation failures and each individual study is unlikely to provide a full picture.

The explanations generated by implementation research tend to be specific to both governance system and policy area due to the different opportunities these factors present for failure. EU governance systems have different policy actors with different distributions of powers compared to the US governance system. These differ again to the relationships between institutions such as the World Bank and the recipient countries in which their policies must be enacted, or to any governance system that results from a multitude of counties agreeing on and implementing supra-national agreements. In each scenario the policy changes its form and focus, and implementation must follow different routes through different institutional, political and cultural contexts (Hill, 1997). This means that the actors and the range of interests, powers and influences vary. Therefore, the vast majority of implementation studies are case studies, examining the implementation of a particular policy or set of policies. Each of these has a different focus. For example, US investigations of the failure of federal programmes in the 1960s had a different focus and system, and therefore approach, than British investigations into the implications of changes in policy delivery systems in the 1990s (Hill, 1997). The approaches employed to examine them are matched to context and therefore vary within each governance system (Van Meter and Van Horn 1975). It also means that the identified factors which cause failed implementation are limited in terms of the extent to which they can be generalised across contexts (Elmore, 1979). Often, underlying theories that create the factors that cause implementation failure are common across governance systems. However, when typologies and categorisations of implementation failures are formulated, they are specific to governance systems. Therefore, the operationalisation of implementation research varies to such an extent

that EU implementation research is its own discipline, with different language, definitions and explanations, separate from US implementation research, despite significant overlaps. Comparisons and therefore generalisations come from comparing the same policy in different governance systems, or different policy within the same governance system.

The EU has proved to be a particularly ripe governance system in terms of implementation research, particularly around environmental legislation, spawning categorisations of types of implementation failure. The European Commission (EC) formally synthesises and enshrines compulsory legislation. However, while the Commission is held responsible for implementation, it has little influence over national policy implementation. Its primary involvement in national execution is through its requirement for feedback, information and reporting from the member states (Bauer, 2006). These weak enforcement powers must oversee implementation of the same governance principles operationalised in a variety of ways in member states (see chapter 1). This creates a great deal of interest in examining how the features of different member states contribute to different implementation successes and failures within and across policies. Environmental policies have become the subject of implementation attention due to the explosion of EU legislation in the sector, and the high degree of variability of its success in securing environmental goals across the member states. This has revealed the phenomenon of an implementation deficit.

An implementation deficit is defined as the gap between the goals embodied in EU legislation and its practical effect (Jordan, 1999). Four types of implementation deficit have been characterised by Weale (1992) and expanded upon by Jordan (1999). They create the terminology of the policy goal as the targets created in order to solve a particular policy problem.

The products of legislation are then the policy output, as the written policy, and policy outcome as the action secured as a result. An implementation deficit occurs when either policy output or outcome fails to meet the policy goals or the policy problem, as shown in Figure 2.1. Under this framework, implementation deficits can be understood to be either failures of the governance administration (types A and C), or failures to incorporate accurate causal theory into the policies and actions (Sabatier, 1986); i.e. the policy goals cannot be achieved, and/or the policy problem cannot be addressed if the causal theory incorporated into policy is erroneous.

Table 2.1: Implementation Deficits (after Weale, 1992 and Jordan, 1999)

Orientation to Problem	**Focus of Analysis**	
	Policy Output	**Policy Outcome**
Orientation to policy goals	A	B
Orientation to policy problem	C	D

2.2. Application to Arsenic Management

2.2.1.Research for Policy: Limit Setting

Research around arsenic management provides a significant amount of research for policy, which informs our understanding of health impacts and shapes the way in which exposure is considered by policy. A wide variety of health impacts are linked to arsenic exposure. These include skin and lung cancers, skin irritation and irritation of the mucus membranes including dermatitis, conjunctivitis, pharyngitis and rhinitis (ATSDR, 1990). The dose and response for each disease is thought to be slightly different. For example, Steinmaus et al. (2009) find that

there is no increased risk of diabetes mellitus in a US population exposed to low-dose inorganic arsenic. This suggests that some health impacts may not be a non-threshold reaction. However, in cancer end points, arsenic is considered to be a non-threshold chemical, in that there is no safe dose and any amount increases the risk of cancer. Non-threshold chemicals are generally those that have a genotoxic, mutagenic or carcinogenic effect, such as arsenic. The research that explores these disease endpoints for arsenic exposure concentrates on high dose exposures where individuals receive very high levels of arsenic in their drinking water. The majority of these studies are concentrated in South East Asia and Taiwan where the impacts are very visible (see for example Argos et al., 2010). There is very little data available at low exposures. Some work has been conducted in Slovakia, Hungary and Romania where the exposure concentrations are much lower than in South East Asia (see for example Lindberg et al., 2006). This shows that there are higher rates of arsenic related diseases at lower exposures. However there are not a large number of such studies and details of the dose-response at lower exposures remains unclear. Indeed, to create a dose-response curve to understand expected risks associated with dose for low exposures would require huge populations to account for the larger confidence intervals associated with lower doses and lower risks; rendering them near impossible to create in the real world (Smith, 2004). Without such large datasets on lower exposures, it is necessary to assume linearity and take a precautionary approach to setting limits in policy (Meharg and Raab, 2010).

Further research has been done in order to understand the variation in impact between and within populations in order that impacts can be better understood and regulated. Epidemiological research is extensive on the issue of arsenic, although many uncertainties still exist. Usually, methylation is understood to be a detoxifying mechanism, however it must be noted that in some instances, methylated metabolites may indeed be more toxic than inorganic arsenic (Petrick et al,

2000). Additionally, the first step of methylation from inorganic arsenic to monomethylated arsenic may actually be an activation mechanism rather than a detoxification mechanism (Smith and Steinmaus, 2009). A person's genetic and metabolic characteristics can influence their ability to methylate arsenic and thus influence its toxicity. Such characteristics include ethnicity (see Brima et al., 2006), genetic polymorphisms (see Ghosh et al., 2008), and gender (see Lindberg et al., 2005). As a person ages, their ability to methylate arsenic can also change, although the exact relationships are not yet clear (Tseng, 2009). Furthermore, lifestyle factors can influence the body's ability to methylate. These factors include nutritional status (see Chandra Sekhal et al, 2003) including specific vitamins (see Cascio, 2010 for a discussion), BMI (see Islam et al., 2004) and smoking (see Tseng, 2005). The variable ability to methylate is demonstrated in Figure 2.2. It means that the impact from any given dose of arsenic varies on both an inter- and intra-individual scale. This leads to policy that must take a precautionary approach and set limits that are appropriate to sensitive receptors.

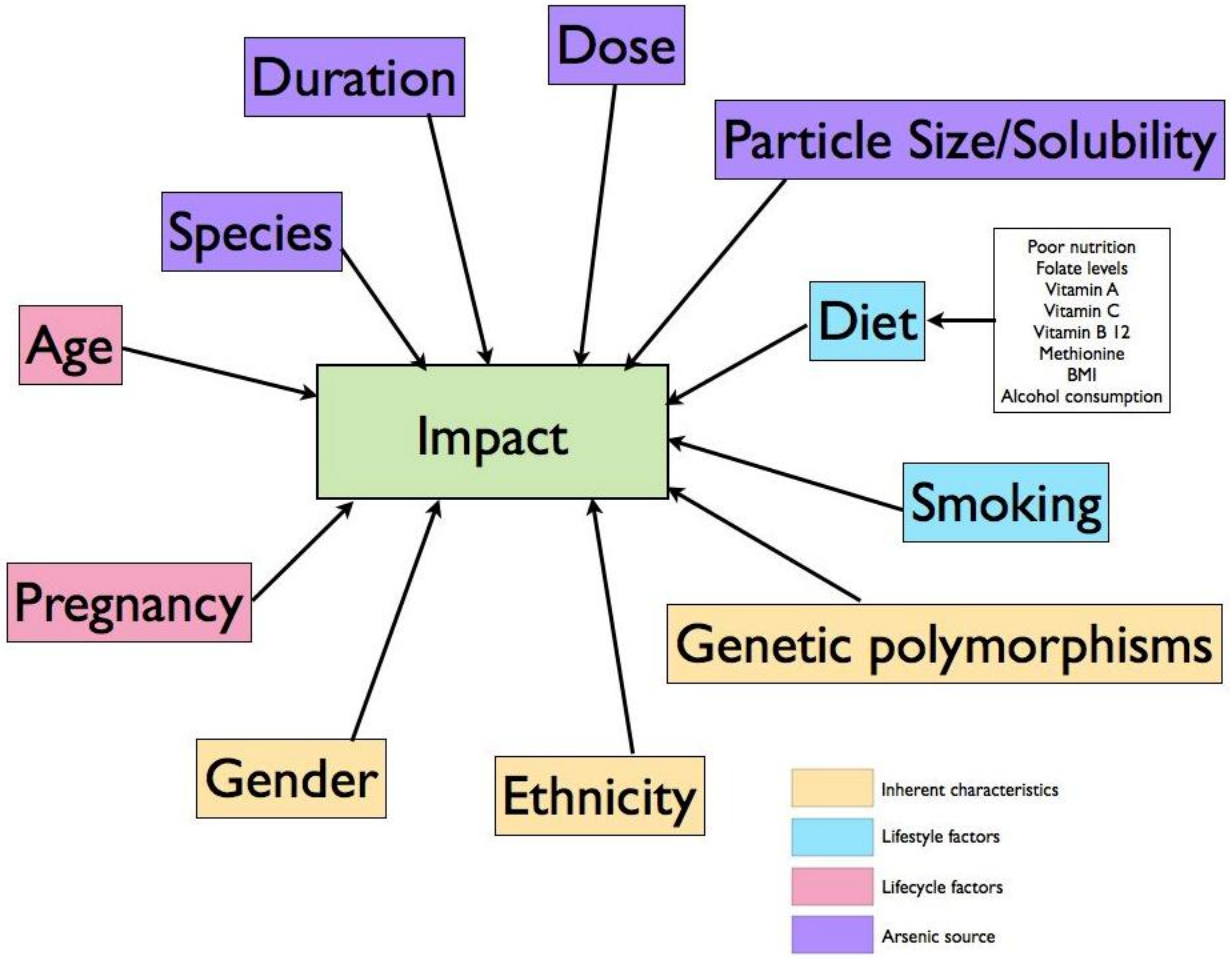

Figure 2.2: Factors affecting the impact of arsenic to humans. Modified from Cascio (2010)

Also providing research for policy design, numerous studies have outlined the multiple, and cumulative exposure pathways to arsenic and indicated areas for which policy may be required. Arsenic in drinking water is the most direct exposure pathway. But high levels of arsenic have also been reported in food, particularly in rice and rice based products (Meharg, 2004; Williams et al., 2005; Mondal and Polya, 2008). This is particularly significant to populations with predominantly rice-based diets (see Cascio, 2011). It is also concerning for babies consuming baby rice as the dose per kg body weight is proportionally higher (Meharg et al., 2008).

Inhalation exposure via industrial emissions in industrial workers, such as those near smelters in the US (see for example Milham, 1974) has been a long-established concern. However, newer concerns include the inhalation of particulate arsenic and of volatile arsenic. Particulate arsenic can be from natural sources, such as volcanoes. Mount Etna emits 100kg particulate arsenic per day (Calabrese, 2009). Volatile arsenic occurs particularly in rice paddies where the constant flooding of the soils, and the presence of organic matter create ideal conditions for volatilisation (Mestrot et al., 2009). All exposure routes of arsenic are cumulative, meaning that all intakes contribute to total intake, and total intake influences the health response. Arsenic was initially listed as a carcinogen by the IARC (1980) due to inhalation exposure. In 1990, arsenic was listed as a carcinogen by the IARC (1990) due to ingestion exposure. The separate listing for both inhaled and ingested arsenic suggests two separate impacts from the two separate pathways. However, both are listed as causing lung cancer. A number of studies have shown that urinary arsenic correlates with both inhaled arsenic and ingested arsenic and that the dose-response is similar for inhaled and ingested arsenic (see for example Smith et al., 2009), suggesting that arsenic from both sources affect the body in a similar way, cumulatively. This means that limits set in policy must consider the possibility of arsenic exposure from a variety of pathways, and must consider all pathways and apportion limits accordingly.

2.2.2. Research for Policy: Management Approach

In response to the health impacts and the policies around managing arsenic in drinking water, research has created tools and knowledge for ground level action. The development and pilot testing of remediation technologies has created management options for policy makers, and information about the physical conditions in which they work best. These tools include filtration

techniques that are suited to the physical requirements of the groundwater. For example, zero-valent iron filters have been developed and tested on groundwaters in Greece (Tyrovola et al., 2006). Iron based filters are not so efficient in high organic matter waters, and therefore aluminium-based filters have also been created to suit geothermal areas (Xu et al., 2002). Such aluminium filters are currently being developed and trialled in Romania (Mertens et al., 2008). Different technologies are also being developed and refined in order to reflect the nature of water distribution in different areas. For example, household level sand filters are extremely successful in Vietnam, where householders are able to control and manage their own well sources (Berg et al., 2006). Similar sand filters are being trialled in Hungary and Romania, but on a much larger scale in order to supply a town-wide piped distribution system (KÖRKÖVÍZIG, 2009).

Tools for understanding available resources are being developed to support decision-making. Both Winkel et al (2008) and Lado et al (2008) have developed approaches to hazard mapping for predicting arsenic levels in groundwater using surface parameters. This is an important way of providing information for the informed planning of well drilling. An exercise to validate both maps in the same area of Cambodia found that they both require significant refinement before they are of practical use (Sovann et al., 2010), but this is ongoing. In addition Disease Adjusted Live Years (DALYs) have been applied in studies in SE Asia to compare the disease burdens arising from both surface water pathogens and arsenic in groundwater, and thus help decision makers plan effective management strategies that account for risk substitutions. DALYs are a health measure which account for mortality at different ages and for the severity and duration of morbidity (Murray et al., 2002). They can be used based on economic and ethical principles to guide policies towards cost-effective, equitable health care (Murray and Acharya, 1997). Lokuge et al. (2004) use the DALY approach to compare the disease burdens resulting

from both shallow tube wells (high arsenic) and surface water sources (pathogen risk). They find that 0.3% of total disease burden in Bangladesh is attributable to consuming water with arsenic concentrations in excess of 50 ppb. Assuming that avoiding such water sources leads to an increase in the incidence water-borne pathogenic diseases of 20%, a 77% reduction in arsenic DALYs would be necessary before there was any overall benefit to mitigation measures (Lokuge et al 2004). The limitations to such calculations lie in the limited data available as input data (Lokuge et al., 2004). Additionally, the methods employed in collecting the input data, the selection and exclusion of certain health end points included and the exact calculation methodology can all affect the outcome of such calculations (Preedy et al., 2010; Mondal et al., 2008). However, they can still be of use in comparative exercises for decision-making. For example, Howard et al. (2006) complete DALY assessments for a range of mitigation options in Bangladesh including shallow tube wells, pond sand filters and deep tube wells. They examine the arsenic related disease burden and the pathogen disease burden for each option and conclude that deep tube wells are the safest option for delivering drinking water to the study population.

At the management level, there has also been research done into the social factors that shape how management approaches should be implemented. This is particularly important where consumers have immediate control over their drinking water source, for example in areas where water is supplied through personal or communal wells. The uptake of remediation technologies is often strongly influenced by the actions of important members of a community. Where role models or family members adopt a technology, this increases the likelihood of others in a community to do the same (Heri and Mosler, 2008; Tobias and Mosler, 2007). Indeed such opinion leaders play a key role in Diffusion of Innovation theory as they can tell or show other people the positive attributes of the innovation and are often influential in persuading initially

reluctant people to adopt the technology (Rogers, 1962). However, they are not the only factor in motivating people's drinking water behaviour. In a Bangladeshi study, health concerns motivated people's decisions over well use, even motivating people to leave wells that could actually be considered safe in a small number of cases (Opar et al., 2007). Complacency to risk is displayed around the issue of well water testing in a Canadian study by Jones et al. (2005). They find that where people felt their water was safe, they were unlikely to follow guidelines on the frequency of testing, even where the testing service was free. Indeed, where people do not identify the water as the source of a health risk, they will not change their behaviour (Hassan et al., 2005). Well owners are more likely to perceive their water as a risk, and to test their water, if they or a close family member or friend have experienced negative health impacts from the water (Jones et al., 2005). People are more likely to act on arsenic concerns if they have experienced either first hand, or in close contact, someone with an arsenic related illness (Hassan et al., 2005).

Because of the importance of health risk perception in influencing management success, research for policy includes research on the factors that shape health risk perception. Health risk perceptions may not be linked to the actual content of the water, or the actual risk posed by it. Indeed, many people will continue to drink water that exceeds policy limits for arsenic even in the knowledge that this is the case (Walker et al., 2006). Severtson et al. (2006) found in a US-based study that if people are given the information about the quantity of arsenic in their water, they will react differently based on it as people assign themselves different safety thresholds. This research suggests that health risk perceptions are not based on chemical content even where this is known by the consumer. Instead, current research shows that health perceptions are based on a complex interplay of factors. These include sensory experiences. Consumers are more likely to have a negative perception of water quality if there are organoleptic issues with their

water (Jones et al., 2005), particularly those associated with chlorine (Turgeon et al., 2004). Chemical balance is an important aspect in taste formation (Whelton et al., 2007; Lou et al., 2007). Besides such sensory issues, perceptions are informed by risk perception, knowledge and information, understanding of that information, and trust in the water suppliers (Doria, 2010). This perceived safety, combined with taste, influence the way in which people use and manage their drinking water sources (see for example Jones et al., 2005; de Doria et al., 2009; Jakus et al., 2009).

2.2.3.Research on Policy and Policy Effectiveness

Whilst the volume of research for policy suggests that implementation of arsenic legislation is technically feasible, there has been little in the way of empirical work to understand the effectiveness of policies. Some work has provided a critique of the policy approach. For example, Meharg and Raab (2010) argue that the lack of arsenic limits in food present a serious threat to human health. Other research has critiqued the policies that do exist. When the US limit for arsenic in tap water was reduced from 50 ppb to 10 ppb in 2001, work was done to examine the health and economic impacts of this change. Meeting the new 10 ppb standard required changes in the supply systems to approximately 13 million people (Lubin et al., 2007) at an annual compliance cost of US$270 million (Abernathy et al., 1997). Meeting the scientifically advocated 2 ppb limit would have cost US$2100 million per year (Abernathy et al., 1997). In addition to these evaluations, a small amount of work has then gone on to address the implementation of policies. Despite being passed by the final Clinton administration, the lowering of the arsenic standard from 50 ppb to 10 ppb in the US was delayed by the incoming Bush administration. These delays were over the political popularity of the expensive

remediation measures the legislation called for, and concerns argued by the Bush administration over the scientific justification behind the lowering (Smith et al., 2002). However, these findings are primarily based on non-empirical observations, and do little to understand where resistance was manifested and how it created delays. This is similar to emotive work around policy implementation in Cambodia; Sampson et al. (2007) voice frustrations that the Cambodian governance is inactive and aid agencies are slow to respond and investigate the source of emerging cases of arsenicosis, meaning that exposure pathways remain uncontrolled. Collectively, the sparseness of this research, and its lack of objectivity, demonstrate how little is understood about how governance systems cope with balancing the multiple technical considerations (despite the high level of knowledge around them) with political and financial considerations in order to implement policies for managing arsenic in groundwater.

2.3. Application to Causal Theory Deficits

Case studies examining causal theory deficits tend to be top-down studies that examine the state of science available for specific policy items. This can be on the level of policy formulation or design. For example, often in environmental health policy, there is insufficient epidemiological information available to populate dose-response curves and hence set threshold limits (Foster et al., 2000). In such cases, more research is needed, and the policy must take a precautionary approach in light of uncertainty (Foster et al., 2000). In these instances, the policies are not based on clear causal theory, providing the potential for type D deficits (see figure 2.1). Below the policy setting level, causal theory deficits relate to the absence of tools or knowledge available to implement the policy. These are examples of type B deficits, where the

policy output is unable to meet the policy goals. The Water Framework Directive (WFD) has received a great deal of attention in this field; perhaps because its holistic, ecosystem-led approach is designed to be respondent to ecological and hydrological processes (Kallis and Butler, 2001). The complex demands made on resource managers, including around monitoring and enforcement of the WFD means implementation is likely to be problematic due to the lack of available tools and techniques (Coquery et al., 2005; Dworak et al., 2005), and the lack of knowledge for linking indicators to goals; for example using collections of species as indicators of ecosystem health (Borja et al., 2004; Irvine, 2004). 'Life' research projects are EU funded projects for testing new policy-relevant technologies in the field of environmental and nature conservation legislation, in order to support implementation. Oliver et al. (2005) evaluate Life projects for the implementation of the WFD. They find that the projects fail to link into policy due to issues of time frame and geographical focus. The Life project's proposal, planning and execution phases often do not fit with policy needs, and they will be focussed at a spatial level that does not correspond with administrative boundaries (Oliver et al., 2005).

Explanations for the problematic availability of science for policy needs centre around communication. Quevauviller (2006) also presents evidence on the hindrance of timing in science-policy interfaces for the WFD; research projects are not run according to the same time frames as policy. Communications are also important in his experience-based findings. Both how results are communicated, and to whom are key factors that influence how successful the connections are (Quevauviller, 2006). As an example, Willems and de Lange (2007) find that communications between policy makers and water managers are limited, which means that tools that are developed are often not passed on to water users. Additionally, communication between science actors in different disciplines to create common, directional knowledge was found to be a

challenge in the AquaTerra project for understanding river-sediment-soil-groundwater systems (Gerzabek et al., 2007). The literature suggests that there is a perpetual misfit between the science and policy communities. The policy communities require that the science communicated must focus on the 'bigger picture', or provide workable tools for implementation. To do so, knowledge must be produced in response to the requirements of policy, such that policy also directs the scientific agenda to create issue-generated research. However, the two communities work according to different timescales and different interests; they also employ different languages and understand the problem in different ways (Vaughan and Buss, 1998). Whilst policy makers and implementers require details, they must also be translatable into messages and bottom-lines (Vaughan and Buss, 1998). This creates a demand for generalist (Mayda, 1999), or inter or trans-disciplinary scientists, who can piece together many small pieces of the puzzle (Pohl, 2008) and translate messages and demands between the communities. However, such generalists are not often created by current academic communities (Mayda, 1999).

These communication issues are a continuing theme in bottom up research, which highlights instances where policy has not responded to the evidence produced by science. This can be either that policy does not cover or target the right area, or is not comprehensive enough. The observation that policy has gaps with regards to arsenic (Meharg and Raab, 2010) falls into this category. In addition to an absence in legislation, policy can fail to respond to science if it does not allow for policy to fit to local conditions and environments. For example, Hellegers and van Ierland 2003 find that current EU water management policies do not encourage efficient use of groundwater in the specific economy structure of the Netherlands. The way water rights are awarded in the Netherlands means that EU policies to increase water use efficiencies are not targeted at the appropriate users or uses (Hellegers and van Ierland, 2003). In this case, the local

users of water have not been considered in the policy, resulting in causal theory errors. In some cases, this lack of consideration is about more than just a lack of communication. Scientific complexity means that difficult decisions have to be taken using interdisciplinary knowledge; whilst the knowledge might be there, there may well be political and social drivers that influence the actual policy output and outcome. For example, in the case of the UK, in deciding whether to adapt, mitigate, or ignore climate change (King, 2004), the science becomes a political issue, with uncertainties, ambiguities and inaccuracies used in politicised arguments, which can block science from fully shaping the policy agenda. This is also shown by McCright and Dunlap's (2003) study into the Conservative movement's impact on US climate change policy. The perceived lack of consensus in the science gives political actors reason to stall action. This occurs even though the level of consensus amongst the science community is actually much higher than would be argued by political climate change deniers (Oreskes, 2004). This is an example of a debate that becomes "largely political, while in substance ostensibly technical or scientific" (Ravetz, 1987 p. 105). This political nature of scientific debates also increases the roles played by the public and the media in helping or hindering the science policy interface, depending on whether it is an issue they support, are apathetic to, or reject. Furthermore, it means that the uptake of the scientific issue into the policy sphere can be heavily influenced by the politics of the controlling party and the nature of the institutions involved in policy making. In these latter cases, the problem is not just one of communication, but one of politicised communication.

2.4. Application to Administrative Deficits

The majority of implementation literature in the EU is top down and devoted to type A deficits. In terms of examining policy outputs, there has been a large amount of analysis looking at the national level policy outputs in response to EU directives, specifically the transposition of directives. Mastenbroek (2005) provides a comprehensive review of academic attention on transposition. She concludes that although official figures of transposition rates have improved in recent years, these are unlikely to be accurate due to mis-reporting and the fact that they focus on older pieces of legislation. In reality, the transposition deficit is one of timeliness (delayed transposition) and correctness of transposition, and remains a pressing problem (Mastenbroek, 2005). In terms of correctness of transposition, Treutlein (2009) analyses the way in which EU policy is transposed in fifteen member states in five policy areas between 1986 and 2002. She finds that in 10 of the states, less than 20% of the measures were passed through national parliaments; instead they become bureaucratic measures rather than legal processes. The problem associated with this is their subsequent enforceability and therefore, their effectiveness is weakened. Arguably, it is a type C deficit, where the policy output is not the best option for addressing the policy problem. Other researchers have found that it is not the problem of the form the transposition takes, but in getting it to happen at all. Across nine member states over the space of 10 years, Kaeding (2008) found that only 53% of national instruments in response to transport directives were transposed on time. Haverland and Romeijn (2007) found that in Germany, Greece, the Netherlands, Spain and the UK, 42.7% of more than 300 examples of social policy were delayed in their transposition. In 17.5% of cases, this delay exceeded two

years (Haverland and Romeijn, 2007). Such delayed, or in some cases absent, transposition is an example of policy output failing to meet EU policy goals (in the form of directives). Therefore in EU implementation research, the type A deficit has been operationalised as a failure or delay in transposition. It has proved a popular vein of research, and a Web of Science search performed in February 2011 for the key words " EU AND transposition" yields more than 90 articles produced in the last five years alone.

Quantitative transposition research examines transposition across various policies in various countries and has highlighted numerous policy infrastructure factors that lead to transposition delay. In a review of 29 transposition studies performed between 1995 and 2005, Mastenbroek (2005) finds that all the studies offer some variation of explanations relating to the national policy infrastructure. Quantitative studies examining transposition have found that a range of factors related to national policy infrastructure affect time to transposition. These include the decision-making process for choosing and formulating national transposition instruments; political flexibility and political stability (Lampinen and Uusikyla, 1998; Kaeding, 2008); the powers and influence of the ministry responsible for transposition; (Mastenbroek, 2003); the other policy actors included (Di Lucia and Kronsell, 2010); and the bureaucratic capacity of actors (Knill and Tosun, 2009). As an example, Borghetto and Franchino (2010) find that the involvement of sub-national actors in transposition prolongs the process due to the increased opportunities for disagreement and their weakened enforcement powers. However, the national policy infrastructure is not the only source of transposition failures. Other quantitative studies have found that the EU policy infrastructure also affects this implementation deficit (Haverland and Romeijn, 2007). This includes factors such as the decision-making procedure employed by the EU in formulating the directive; the amount of discretion allowed in the

directive (Kaeding, 2008); and the level of monitoring or control imposed by the Commission (Bauer, 2006). There are also studies that examine the way in which the EU and national infrastructures fit together. This 'goodness of fit' influences transposition because the degree of change required of a member state to meet EU requirements is a key variable affecting transposition (Mastenbroek, 2005).

Qualitative small-N research into transposition suggests that the issues of administrative or structural fit, or any other single policy infrastructure feature, do not act alone in delaying transposition. Where a Directive faces political opposition, even strong administrative coordination cannot secure timely transposition (Dimitrova and Toshkov, 2009). Indeed, in a study on the 1992 EU habitats directive in Ireland, Laffan and O'Mahony (2008) find that misfit in politics between EU and national actors leads to politicised compliance issues and increased resistance to transposition, which requires a large degree of political management by both sets of actors. If a country disagrees with a directive at its planning state, it is much more likely to delay transposition, which increases the role played by state preferences in transposition (Thomson, 2010). Additionally, the existing acceptance of the importance of the policy area in a country is important; transposition is much more timely in policy areas that match the priorities of the country (Thomson, 2009). For example, Sedelmeier (2009) finds that gender equality policies are much more swiftly transposed in countries where the issue was already supported by a range of civil society institutions. It seems therefore that, besides administrative structural fit, the fit between the policy goals and norms of the administration and of civil society are also important. Such compatibility is subjective; political actors must decide what a good fit is, which means that interpretation, inter-subjective understandings and discourse shape the notion of goodness of fit (Schmidt and Radaelli, 2004). This means that national administrative tradition plays a central

role in transposition (Knill, 1998). This has shifted recent research focus towards the former-socialist states that formed the new accession countries in 2004 and 2006. They have inexperienced policy infrastructures that are shifting from their former centralised regimes. Based on explanations for transposition deficits around fit between administrative structures and goals, hypotheses suggest that transposition deficits should be greater in number, and longer lasting, in the newer member states.

In fact, this assertion does not always hold, and instead highlights a limitation in our ability to understand implementation based on transposition research alone. Thomson (2009) performs a comprehensive analysis of transposition across member states finds that administrative fit is not influenced by cultural contexts. This is reinforced by more in-depth case studies. For example, Michelsen (2008) compares the transposition of organic agricultural regulations between old and new member states. He finds that while old member states adopted late, newer members adopted early (significantly pre-accession), and the content of transposed laws do not vary in quality between old and new members. This means that administrative traditions do not seem to shape transposition in the expected way in new member states. Indeed, for many directives, the ability of administrative tradition to play a role is limited; to secure accession to the EU, member states had to transpose legislation as a condition of membership. The Commission has played a stronger enforcement role in the new member states through closer monitoring and 'watching' of transposition (Steunenberg, 2010). There is, however, variation in the performance of new members. Knill and Tosun (2009) found that between 2004 and 2007, there was a variation in the transposition behaviour of new member states, with Lithuania, Hungary and Slovenia performing better than Bulgaria, the Czech Republic and Romania. This division was also found in relation to the transposition of gender equality directives in research by Sedelmeier (2009).

This partly matches the increased involvement of the EU in terms of monitoring and enforcement in Romania and Bulgaria (Trauner, 2009). Therefore, in the face of a decreased power to delay or neglect transposition, the role of administrative tradition has been diminished. This leads a number of researchers to state that it is enforcement and fulfilment of legislation, and not their transposition, that should be the focus of research in new member states (e.g. Trauner, 2009; Michelsen, 2008). Indeed, the transposition of legislation, but lack of enforcement has been termed a 'deception gap' (Lynch, 2000; Post, 2002).

Bottom-up research goes some way towards examining enforcement deficits. At levels below the national there are numerous research studies that identify factors that explain why transposition is occurring, but which find that failures are also still occurring. The factors include the role of other, conflicting priorities. For example, other priorities over land use and marine rights means that renewables targets are neglected (Kotzebue et al., 2010). The role of competing priorities is also shown by a study in forest policy where agricultural and conservation actors have conflicts over land use, which hinders forest policy enactment (Van Gossum et al., 2008). The conflicts among crucial implementing actors combine with cultural dimensions of integration in cases where local actors do not believe the need for a directive, as in the case of gender equality policies in Poland (Gerber, 2010). These issues then react with policy infrastructure features, such as the lack of power or capacity of enacting agencies. This is such a problem that in Lithuania, despite having a reputation as a swift transposer, the transposition authorities cannot cope with enforcement, meaning that enforcement is weak unless sanctions are applied (Maniokas, 2009). Prazan et al. (2005) also found that with regard to protected environments in the Czech Republic, accession to EU law posed severe challenges in the areas of policy development, administration and monitoring. This is an experience repeated particularly in new

member states; in the field of environmental legislation, the emergent institutional structures and the absence of national experts have limited the capacity of CEECs in the field of environmental legislation (Jehlicka and Tickle, 2004). It seems that the abrupt, wholesale changes to the requirements and structures of policy systems demanded by adoption of the body of EU legislation are met with inexperience and governance structures that cannot cope (Carmin and Vandeveer, 2004). This results in vertical disintegration, whereby policies are not translated into practice, and horizontal disintegration, whereby local priorities take precedence over supra-national priorities (O'Toole and Hanf, 1998).

2.5. Operational Definitions and Frameworks

Overall, the separation of research into specific definitions with fixed policy and actor focuses has served to shed spotlights on fragments of the governance system, yet fails to include proper consideration of the subsidiary policy system that includes a variety of policy levels. The principle of subsidiarity means that EU legislation will be translated over numerous levels so that actions are performed at the most local level appropriate. The separate approaches pursued by the research community for examining separate implementation deficits have created specific operational deficits for each type of deficit outlined by Jordan (1999), focussed at specific levels of the governance system. The matching of policy output to policy goals (type A) has been operationalised through research to mean transposition, or the adoption of EU policy into national goals. Type C deficits are also focussed at the national level, but are defined based upon the actions of lower levels of governance; the policy output fails to solve the policy problem because it doesn't give adequate powers to the appropriate actors. But this is only evidenced based on

actions at lower levels of the governance system. Type D deficits have been operationalised as those where policy itself is not scientifically informed; either it is absent, or based on precaution in the face of data uncertainty. Again, this is researched as a failure at the EU or national policy-setting levels. Type B deficits on the other hand have been researched at levels below the national, though the precise governance level is not clear, particularly in instances such as water management where enactment tasks will be spread across several levels. Research into deception gaps on enactment failures does not yet fit into this framework. The evidence presented implies that they are administrative in nature. However, the explorations show that there is a failure to produce a policy outcome because of inaction from actors below the national level, without making attempts to specify which levels or which actors are involved. Collectively therefore, the separate streams of research create operational definitions of implementation deficits (summarised in Figure 2.3) which only separate out the EU, and national levels and consider all levels below the national as a single, homogenous entity. Given the multi-actor, multi-level nature of policy in the EU, this is a significant barrier to understanding, and therefore fixing, such governance failures.

Table 2.2: Operationalised Implementation Deficits

	Impact	
Failure	**Policy output**	**Policy outcome**
Orientation to policy goals	A. Transposition Deficit. The framework directive is not transposed into national policy. EU-National Level	B. Tools and methodologies are not available. Below national
Orientation to policy problem	C. The policy instrument used for transposition does not assign correct rights to actors to ensure enforcement National Level	D. The policy is based on precaution in the light of uncertainty/ policy is absent EU Level

The research conducted to date has uncovered interdependencies between specific deficits, which suggests the need for a more holistic approach to examining implementation. For example, by examining the time taken to transpose legislation in a range of member states, Haverland and Romeijn (2007) find that ministerial coordination and administrative deficiency in member states were responsible for delays. This is due to the requirements and power of enforcement bound within the legal instruments, the organisation structure and expertise of the ministry involved, and the soundness or quality of the selected EU legislation (Haverland and Romeijn, 2007). Lack of soundness in the EU legislation is a causal theory, type B or D implementation deficit, where the EU legislation was based on weak causal theory and there was a resulting transposition delay. Indeed it is used as a reason to not transpose or adopt legislation

in some cases, as shown in the example relating to the lack of perceived consensus on climate change (see section 2.3 of this chapter). In addition, the legal instrument pursued is an important factor influencing transposition. As Treutlein (2009) shows, the legal instrument pursued affects the both time taken to transposition, and the effectiveness with which the resulting policy can be enforced. This suggests that type A and type C deficits are linked through this common influencing factor, and that this type C deficit influences deception gaps. King (2004) argues that political inactivity can impact upon the accuracy of the causal theory behind certain policies. In climate change policy, the failure of the US to adopt the Kyoto Protocol limits the abilities of signatories to meet its targets (King, 2004). Therefore, taken collectively, there is emerging evidence to suggest that a type B, C or D deficit can contribute to the formation of a transposition deficit. Additionally, the explanations offered in deception gap literature have striking similarities to the misfit themes explored in transposition deficits. Essentially the issue of misfit is played out as inexperienced institutions do not know how to fit with EU governance models. This suggests that the same factors are contributing to implementation failures at different levels of the governance system; in the case of transposition deficits, this is at the EU-national level, and in the case of deception gaps, at some point below this. However, academic focus on one type of deficit or another has limited the extent to which these interdependencies and commonalities have been explored. Exploring implementation failures requires the holistic exploration of all implementation failures and actors collectively, including consideration of their interdependencies.

3. Theoretical Explanations for Governance Failures in the EU's Multilevel Governance System

3.1. Policy in the EU Governance System

Implementation deficit research has largely failed to explain governance failures such as that in the case of the Hungarian implementation of the arsenic limits in drinking water. The deficits that have been researched are primarily those that occur at the EU and national policy levels. This does little to understand a failure to enact policies at levels of governance below the national. Limited work been conducted towards explaining enactment failures (or deception gaps), but this has been kept separate from the more analytical work at higher levels. It has been largely bottom-up work identifying the priorities and actions of the lower levels of the governance system, unfortunately with limited regard to how they relate to the wider governance structures and policies. The opposite is true of work conducted at higher governance levels. This research benefits from the characterisation of deficits in explaining the sources and impacts of implementation failures. However, each of these characterisations has been conducted separately though predominantly top-down research. This provides a wide variety of explanations for each implementation deficit, but does little to place them within their wider policy contexts. Wider policy actors are not considered, and linkages or relationships between deficits are not explored, despite emerging evidence to suggest common causes and interdependencies. If explanations are sought over why Hungary is failing to implement arsenic limits, consideration of the whole governance system is required. This demands a holistic approach that draws together both the policy actors and the policies in a hybrid of the top-down, bottom-up approach that is tailored to characteristics of the EU governance system.

The EU governance system represents a set of institutions. Institutions are "formal or informal procedures, routines, norms and conventions embedded in the organisational structure of the polity or political economy" (Hall and Taylor 1996, p. 6). They are formal structures that incorporate agency norms, ideas. However, both the structural and agency aspects of an institution are inseparable and deeply intertwined and shape each other; the material structure shapes and contextualises the choices and actions that individuals and agents take (Hall, 1993). Thus, the material institution is shaped by the actions taken, and the agents within it. At the same time, in bridging the structure and agency divide, the norms and values of agents and their subsequent actions are a product of the material institution (Lecours, 2005). In a governance system, this structure is the policies and the distribution of powers incorporated into the governance system, and the agency is the individual policy actors that are entwined within this policy. In this way, the institution incorporates norms and beliefs into the policies and the distribution of powers between policy actors, and these policy actors produce the actions and outcomes of the institution. The policies therefore provide an institutional fabric for policy actors to work within by incorporating norms and establishing structures. Within these structures, policy actors form the agency of the institution. The institution shapes their actions, but they are diverse in character, each with different areas of expertise, resources and interest. They also have their own philosophical perspectives. These are assumptions on the nature of the world and how we know about it (Schuh and Barab, 2008) which influence the priorities of an actor in terms of policy, its scope, approach and content. Therefore, they incorporate their own norms and beliefs, which in turn serve to shape the policy institutions. This creates a governance system whereby the network of policy actors is embedded within and shaped by the institutional fabric, and the

actors also function and operate according to their own dynamics (Lampinen and Uusikyla, 1998).

The widest scale of norms and beliefs that are incorporated into the EU governance system shape both the distribution of responsibilities between policy actors in the network, and the opportunities for competing beliefs to influence governance. These beliefs include the principles of decentralised, multilevel policy, meaning that policy implementation actually occurs over numerous levels of policy evolution and translation. The principle of subsidiarity pursued by the EU means that actions should be taken at the lowest effective level of governance. This is translated into systems of multilevel governance, which maximises the fit between the scale of a jurisdiction and the optimal scale of public good provision (Hooghe and Marks, 2003). The multilevel system intends that policy actors work according to differing geographical scales (national, regional, local, etc.) in order to take action most appropriate to that scale. However, the appropriate geographical scale for each environmental issue is different (e.g. river basin management compared to forest management) while the policy actors remain static, meaning that the 'fit' of policy actors is rarely ideal (Young, 2002). Multilevel governance works on the principle of decentralisation, by creating a dispersal of powers away from the national level of government (Hooghe and Marks, 2008). It does not completely remove national authority, instead it interacts, complements and competes with national government powers (Jordan et al., 2005). It distributes powers and responsibilities to the network of policy actors. This is done by creating tiers of policy, in which legislation translates into increasingly tangible actions as it moves towards the local level. Once legislation is transposed into national law, it is then transposed again on different levels. In the planning literature, such tiering of policy is often referred to as policy, plan, programme translation. In this tiered schema, the policy is the original

legislation at the national level; the plan is the refined outline for intended actions to meet the policy, created at the regional level; and the programme is the actions themselves taken at the local level. The actual tiering of policy is rarely this simple, and in fact, interaction between policies at different levels, and conflicting interests mean that different parts of a policy become a plan, or a programme at different geographical or administrative levels than others (Arts et al., 2005). The EU does not determine how this should be operationalised in each member state; but administrative levels are organised around national, regional and local levels (Jordan, 2000), depending upon the legislation (particularly in terms of environmental legislation) where the most suitable level and mechanism of legislative operationalisation will be shaped by the environmental system. For example, in water governance, ecological delineations (river basin, watershed, etc.) define the level at which policy becomes plans and programs (Pahl-Wostl et al., 2008; Moss and Newig, 2010). The power each actor has is dependent on the roles assigned, and is therefore fluid, with power changing depending on the system and the policy area (Rosamund, 2010). The same policy actors may play very different roles in different policy areas, and thus the opportunities for them to shape the norms and beliefs of governance varies with policy area.

Within the structures created according to beliefs around the distribution of responsibility within a governance institution, beliefs are incorporated at the EU level over the scope and approach of policies. These are beliefs about what the policy should cover, and how it should be covered. Such beliefs include core beliefs such as who should be protected from what, and on what basis; these are incorporated at the EU level during formulation of policy and are therefore passed on to member states. The EU has guiding principles on what will be covered in policy and how. In the field of environmental policy, these beliefs are shown in table 3.1. They are further supplemented with beliefs that the EU has adopted through agreements with other supra-

national (or supra-EU) governance systems, such as the Aarhus Convention of the United Nations Economic Commission for Europe (UNECE). The Aarhus convention includes the principles of public participation in order to increase governance accountability and transparency around environmental issues. As a signatory to the convention, the EU commits to including these principles within its own legislation. These principles about the scope and approach of policy are the product of negotiation between member states within the EU. They are largely enshrined within the current European Treaty which is the product of negotiation between member states within the European Council; meaning that the norms and beliefs represented are based on a compromise of philosophies of the member states that negotiated the treaty. For example, the principle of subsidiarity emerged in response to member states' concerns about the expansion of the Commission's legislative powers (van Kersbergen and Verbeek, 1994). Although, the philosophies of member states are only represented if they were member states at the time of treaty negotiation, and is dependent on individual voting and negotiation powers.

Table 3.1: Norms that Shape the Scope of EU Environmental Policy, adapted from Benson and Jordan (2010)

Category	Principle	Explanation
Environmental Management	Prevention	It is cheaper and fairer to prevent problems instead of remedying them after they occur
	Action at source	Minimise emissions

Category	Principle	Explanation
	Integrated pollution control	Consider the holistic environmental system, and prevent inadvertent adverse effects
Specification of Environmental Standards	Resource conservation	Environmental protection as a goal in its own right
	High level of protection	Aiming for the highest level of protection possible
	Precaution	Act to protect, even when the cause-effect relationship is not fully understood
Allocation of Authority	Appropriate level of action	Acting to protect at the right level
	Subsidiarity	Only act at the EU level when problems cannot be tackled at a domestic level
Policy Integration	Polluter pays	Polluter and not society should address problems
	Environmental policy integration	Integrate environmental considerations into other policy areas

The exact content of policies incorporates additional layers of policy beliefs and norms around determining what the actual policy is and how it should be enforced. These are evident in the content of legislation that emerges from the EU, and usually outlined in background

documentation to adopted policies. At the EU level, these beliefs are decided by the EU commission, meaning that they are not necessarily based on those of member states. Under the EU's codecision procedure, policy content is largely decided by civil servants of the European Commission and voted on by the European Council. The process means that member states only have influence over policies according to their voting power and have little opportunity to shape policy content. Indeed, this lack of opportunity for member states to influence policy content is termed a democratic deficit; the term has many definitions, mainly pertaining to the idea that decisions and actions in the EU are not accountable to, or representative of, member states and their populations (see Chryssochoou, 2010 for a discussion). The reason the codecision procedure induces such as deficit is that there is no common political identify between member states, meaning that Council or Parliament decisions cannot be seen as "expressions of democratic self-determination" (Decker, 2002, p. 258). The member states therefore cannot ensure that the beliefs surrounding policy content are based on their own philosophies.

Policy actors within a member state's governance network can adjust the beliefs incorporated into the policy institution only within the epistemological and ontological approaches handed to them by the EU level. Sabatier argues that policy actors can be grouped according to their beliefs and priorities around causal process and the way in which they should be addressed by policy (Sabatier, 1986). Whilst being part of the same institutional structure, each actor has differential access to various resources including finances, powers, knowledge, and influential external actors. These can be divided into deep-core beliefs, fundamental, normative beliefs; policy core beliefs about policy choices and causal theories; and secondary implementing aspects, which are the tools available to fulfil roles (Sabatier, 1988). This deep core is that which motivates an actor's stance on policy. These include central, fundamental

beliefs and ethics on the way the world in general should function (Jenkins-Smith and Sabatier 1994), and are therefore based on philosophical perspectives on the nature of the world. However, the realisation of these philosophically grounded beliefs is reliant on the policy core beliefs, those that the actor holds on the policy topic; and on the resources available to them (the secondary implementing aspects). Collectively, these actor beliefs contribute to the governance institution; policy actors use them during the refining of policy in the tiered policy system, in shaping how policies will be implemented at the actor's level of governance. Therefore, an actor's beliefs contribute to the structure of the institution by adjusting the beliefs that are incorporated into policy outputs.

The resulting governance institution is a complex network of norms and beliefs that are differentially represented by the institutional structure. Each actor in the governance network has a different set of beliefs that are based on their own experiences, expertise and philosophical grounding. However, they are not given equal opportunities for their beliefs to be incorporated into the institutional structure of governance. The beliefs incorporated into structure at the EU level predominate and provide boundaries which limit the ability of policy actors to incorporate different or conflicting beliefs; agency shapes structure which in turn shapes agency. Each member state has a different collection of policy actors that are engaged in the governance network. The extent to which they have contributed to the institutional structure at the EU level is very limited. Instead, these beliefs are used to shape policy output and outcomes at their own level, but within the boundaries set by policy actors at preceding levels; thus the structure shapes the agency of the actor which in turn shapes the structure that is passed to lower-level agents. Because the governance network varies between member states and policy subjects, the

institutional context of governance in the EU is a confusing and complex collection of intersecting policy beliefs and their interactions with institutional structures.

3.2. Institutional Change in the EU

The adoption of EU institutions into any member state's governance system, and the associated shifts in structure, norms and beliefs is unlikely to be a smooth process, particularly in the new member states. A critical juncture is a moment when substantial institutional change must occur and branch away from the historical trajectory (Hall and Taylor, 1996). In the EU, critical junctures are provided by new policies or legislation. In order to implement new policy, institutions need to change or adapt to the change in the policy environment, a change in the actors or their relative powers, or an improvement in the quality of the information about the policies or operational environment (Pollack, 1996). Series of critical junctures create incremental policy change in EU member states as they adjust their policy institutions and actors to match. However, more significant and sudden changes are demanded of policy institutions when there are shifts in the policy paradigm. According to Hall (1993), a shift in policy paradigm occurs when there is a change in all three components of policy; "the instrument settings, the instruments themselves, and the hierarchy of goals behind policy"(p. 279). A paradigm shift is therefore a complete change in the policy institutions, which requires a shift in both the structures and the norms and beliefs embodied within them. In Baumgartner and Jones' (1993) Punctuated Equilibrium theory of policy change, this shift in policy paradigm is prompted by occasional sudden changes in society, governance or understanding, which induce much larger changes in policy. An example of such a wholesale change is that of initial accession to the EU

of the new member states, comprising Central and Eastern European Countries (CEECs) in 2004 and 2007. In order to join the EU, they had to adopt the *Aquis Comunautaire*, (the body of EU legislation), meaning that they adopted both policy instruments and the hierarchy of goals over a short time period. Translation of legislation requires transformation of governance systems; this requires not only democratisation, but amongst others, decentralisation, multi-level governance and regionalisation, the ability to regulate private enterprises, and provisions to allow public involvement in decision making (Carmin and Vandeveer, 2004). Accession therefore represented a wholesale shift in policy infrastructure for the CEECs. The shift experienced was much greater for the CEECs than for other countries that had previously joined the EU; they had to address communist governance legacies that contrasted greatly with the principles of EU governance and emphasised centralised control while discouraging civil participation.

In Hungary, this change in policy paradigm represents a significant shift performed over a short space of time. Prior to 1989, Hungary had never existed as an independent, democratic state. The 20th century was a turbulent time for Hungarian governance systems which saw Hungary move from the Austro-Hungarian empire to a Soviet Republic following the end of World War One (WWI) in 1919; invasion by Nazi Germany in World War Two (WWII), followed by 'liberation' by the Russians. Under the peace treaties negotiated at the end of WWII, Hungary came under Stalin's rule, and in 1949, the People's Republic of Hungary was founded as a Soviet satellite. During the communist years, the governance system was a Soviet system of councils. Localised councils were simply the local branches of the single, centralised power. Local councils were given slightly more freedom during reforms of the planned economy in 1968, and following the modification of the Council Act in 1971, but this was limited. Therefore, Hungary had an ingrained institutional fabric as a centralised system with few localised decision

making powers. The regime was overthrown in 1989, and EU accession negotiations began almost immediately. Accession was achieved in 2004, just 14 years after the first ever democratic elections in the country. The changes that the country underwent during accession proceedings are well documented due to EU pre-accession assistance funds; Hungary benefitted from PHARE (Poland and Hungary: Assistance for Restructuring their Economies), SAPARD (The Special Accession Programme for Agriculture and Rural Development) and ISPA (Instrument for Structural Policies for the Pre-Accession). A detailed account of these changes can be seen in Fleischer et al. (2008). Such capacity-building resources were used to move the country away from a centralised governance system, to a EU system of governance. Following independence, in the early 1990s, governance reforms valued independence and local democracy, and afforded much more power to town councils, and the county level was effectively stripped of functionality. All settlements were given the right to establish local self-governments (municipalities). More than 3000 local governments were formed in place of 1600 county councils. The powers afforded to these municipalities were further extended in 1994 through the passing of Act LXIII on municipalities. It is this system of decentralised, local government that was charged with adapting to EU governance.

The historical evolution of the governance system influences the way in which the positive integration of EU institutions will impact upon existing institutions. Because policy actors are inseparable from a wider institutional fabric, both they and the institutions are resistant to change. The relationship between structure and agency mean that institutions are self-reinforcing. Because structure shapes agency, the structures and routines embedded within existing institutions prevent the easy adaptation of new institutional fabric (March, & Olsen 1989). This is because institutional change is "seen as the consequence (whether intended or unintended) of

strategic action (whether intuitive of instrumental), filtered through perceptions (however informed or misinformed) of an institutional context that favours certain strategies, actors and perceptions over others" (Hay and Wincott, 1998, p. 955). As institutions evolve, so the distribution of preferences will evolve (Thelen, 2004). This occurs as institutions affect and shape the options available to people, including the actors who are around to express their opinions (Thelen, 2004). Therefore, institutions are self-reinforcing and transform the impacts of further development (Pierson and Skocpol, 2002). This leads to the observation that institutions seem to have a life of their own once they have been created (Pollack, 1996), and to the assertion that the reaction to a critical juncture, such as the joining of the EU, is shaped by the state's historical trajectory (Knill and Lehmkuhl, 1999). Indeed, the wider political context influences whether a critical juncture prompts reinforcement of old patterns, a breakdown, or a conversion to new patterns (Thelen, 2004). This means that the pre-existing national context is essential in determining how member states adapt to the demands of participation in the EU (Goetz, 2000). It therefore explains why there is such great variation in the governance systems of all member states in the EU where diverse country histories have resulted in a diversity of policy systems (Zellei et al., 2005).

The success with which institutions are introduced to a member state within the EU, and the degree to which new institutions are absorbed, depends largely on the mechanism through which the new institution is introduced. The EU can produce punctuation to the equilibrium of domestic institutions in member states through three primary mechanisms: 1) Positive integration where the EU prescribes an institutional model; 2) negative integration where EU policy affects domestic institutions by altering the domestic opportunity structures; and 3) framing integration where the EU affects the beliefs and expectations of domestic actors,

precipitating institutional change (Knill and Lehmkuhl, 1999). In the case of the CEECs, including Hungary, the positive integration model is found to be most relevant model of institutional change because of the requirement to adopt the whole of the *Aquis* and to meet accession requirements while discontinuing values and beliefs that were deeply ingrained in the old policy structures (Carmin and Vandeveer, 2004). The different mechanisms for inducing change engage a differing level of involvement with policy actors. Negative integration and framing integration both work to induce institutional change by altering the beliefs of policy actors, who are the agents in the infrastructure. This in turn creates motivation for the agents to adjust the structures to meet their new beliefs and norms. However, positive integration does not directly alter the beliefs and actions of the policy actors. Instead it changes the structures and the beliefs that are incorporated within the policies, and it is intended that the beliefs of the agents will adjust to match them.

3.3. The Concept of Mismatch and Impact to Policy Implementation

A match between the beliefs of the policy actors and the institutional structure cannot be assumed, particularly where the change in the structure has occurred quickly. The extent to which the institutional structure shapes the beliefs of policy actors is not the same for every category of belief. The institutional structure, in the form of policies and the way it distributes resources, can most easily change the implementing aspects available to a policy actor. Conversely, it has little control over the deep core beliefs. These are likely to remain steady over long periods of time, even in the face of persistent institutions that do not change (Sabatier, 1988). The policy core beliefs of the actor fall somewhere in the middle in terms of their ease of

change. The institutional structure, in assigning resources and roles, can influence the policy core beliefs. Particularly by influencing the policy knowledge available to an actor, or shaping working relationships and thus the communication of beliefs between actors. However, this is not to say that they have complete control over these beliefs. Actors are likely to engage in behaviour that reinforces both deep core and policy core beliefs. This includes seeking out information and knowledge that is relevant to their viewpoint (Sabatier, 1988). This means that beliefs held prior to the adoption of a new institutional structure are resistant to change. Rather, a policy actor is likely to retain policy core and deep core beliefs that are formed during previous governance institutions, with policy core beliefs only partially modified in light of newly adopted institutional structures. Therefore, where a new institutional structure is adopted suddenly, and via positive integration, there is likely to be mismatch between the beliefs incorporated into this structure, and the beliefs displayed by the policy actors.

Usually, this explanation of policy actor beliefs is used to show how a mismatch between the policy beliefs of an actor and the policy structures lead to actor-induced policy change. In Sabatier's Advocacy Coalition Framework (ACF) the focus is mainly on analysing policy change in the US and Canada, and indeed was designed in these political systems. The ACF argues that in these countries, policy actors form a coalition around shared policy core beliefs that do not match with the policy core beliefs incorporated into policy and institutional structures. This coalition then secures policy change by influencing budgets and legal objectives, changing key elected officials, targeting public opinion, and influencing the beliefs of other policy actors by communicating policy relevant knowledge (a concise and useful explanation is found in Kubler, 2001). The ACF works in these federal political systems because the government in charge is responsive to the will of the populations. In the US federal system, the government's actions are

a reflection of the way it expects voters to vote (Downs, 1957). However, policy actors in the EU are much more constrained by the EU institutions than their counterparts in the US or Canada. Democracy is not as direct in the EU where power is removed from national governments, and decisions are made at a supra-national level that is remote to the electorate (Marks et al., 1996; Bache and Chapman, 2008). This means that the EU institutions constrain policy change and the actions of domestic policy actors to a much greater degree, and to the point that actors are unlikely to seek or to secure policy change. This limits the application of the ACF within member states themselves (Sabatier, 1998). If only the EU level is considered, the ACF has a certain, limited relevance, however it is heavily modified from the framework in the US (Peterson, 2001). Non-domestic policy actors form coalitions to seek policy change, however they engage with epistemic communities of professionals designed to build knowledge for policy (Haas, 1992). Advocacy coalitions draw issues to the attention of epistemic communities, who act as a bridge between them, the scientific community, and the policy makers, and effect a policy change that acts as a compromise between all interests. This serves to constrain the ability of policy actors to change policy where it does not match their own policy core beliefs.

Due to the decentralisation and dispersal of implementation powers in the EU, policy actors do have the ability to change their actions to match their own policy beliefs, and thus influence whether or not policies are implemented. If the roles they have been given in the institutional fabric are against their deep core or policy core beliefs, there is motivation for them not to fulfil their assigned roles, and in this case, policy will not be implemented. In the case of conflicting priorities, the actors are choosing to act on their own beliefs rather than those that are represented by the institutions of governance. This means that the normative aspects of an institution and its material structures must work in duality in implementation (Hay and Wincott, 1998), and a

mismatch between institutional fabric and actors can cause governance failures. Indeed, there is evidence of this occurring in deception gap studies where issues such as inexperience and conflicting priorities are given to explain non-enactment (see chapter 2). This theoretical framework would therefore suggest that these governance failures are caused because policy actors in new member states have policy beliefs that are aligned to old, pre-EU governance systems, and have not fully changed them in response to positive integration of institutional structures from the EU. Therefore they have not fully adopted the new institutions of governance and as a result, do not implement the EU policies. The Hungarian governance system matches this profile of being a new member state that has undergone rapid transformation to the EU system. Therefore, based on this theoretical discussion and the assumptions relating to Hungary that can be made based on it, the research aim of this thesis is to examine the extent to which the Hungarian governance failure around arsenic in drinking water is caused by policy actors holding beliefs that reflect those of institutions pre-dating EU accession.

3.4. Analytical Framework for Governance Failures

A mismatch between actor beliefs and those of the institution can occur at any point at which there is a policy actor required to perform an action or function. The policy actors are engaged in formulating and acting on policy. At every stage in the multilevel governance system, actors are involved in creating both a policy output and a policy outcome. The output is created by translating policy goals into a policy suitable for that particular governance level (e.g. a plan or programme). The outcome is a requirement to the next lower level of governance. The outcome of one level therefore becomes the policy goals of the next level below. This is repeated

until the point of taking action at the most local level; the final policy outcome. In this way, policy actors can create an implementation deficit at every level of the system. At each of these stages, there is an opportunity for a type A deficit if the higher level outputs are not transposed into policy at that level. There are also opportunities for type C deficits as the policy approach introduced at a level is not the most appropriate measure for the levels below. Furthermore, as the technical knowledge required for designing measures or enacting them evolves, there are opportunities for erroneous causal theory to be incorporated at every tier, and therefore opportunities for type B deficits as the output fails to meet the goals. This suggests multiple opportunities for the kind of implementation deficits outlined by Jordan's matrix in chapter 2, section 1, as demonstrated by table 2.2 (see page 43). They possess the same identifying characteristics, whilst the form they take evolves in line with the tier of policy. Because the policy is evolving through the layers of governance, deficits can be carried through. Each governance level can introduce an independent implementation deficit through failing to translate higher level policy into action (type A); through its own decision making process (type C); or through the failure to incorporate causal theory (type B).

However, some implementation deficits remain beyond the control of the policy actors because some deficits can be carried through the tiered policy system. At the highest level of policy, that of the EU, the policy output sets the goals for addressing the policy problem. Where this policy output (the legislation produced) is not based on sufficient or accurate causal theory, a type D deficit is introduced. This can only occur at the EU level because this is the location at which legislation is designed. Once such a deficit has been introduced, it will undermine the success of all proceeding tiers as even if no further deficits are introduced, they will either fail to meet policy goals or they will fail to address the policy problem. Therefore, even though type D

deficits are only introduced at the EU level they would be carried through the entire system. This can also happen with other types of implementation deficits, but in different ways. A type A deficit for example, would prevent action being taken at levels below; a type C deficit would serve to alter the distribution of roles and resources, and thus the institutional structure that lower tiers of actors interact with is altered. This means that implementation deficits in higher tiers of policy serve to complicate the actions of policy actors at lower levels. Firstly, they are given policy goals that cause them to perpetuate the deficits, whether their own beliefs clash with the institution or not. Secondly, they are given two sets of norms and beliefs with which to either conflict with or align to.

Table 3.2: The evolution of policy and implementation deficits in the EU governance system.

Level	**Orientation to Problem**	**Focus of Analysis**	
		policy output	**policy outcome**
EU	Orientation to policy problem	C	D
National	Orientation to policy goals	A	B
	Orientation to policy problem	C	
Regional	Orientation to policy goals	A	B
	Orientation to policy problem	C	
Local	Orientation to policy goals	A	B
	Orientation to policy problem	C	

Under this deficit framework, mismatch between policy actors and the policy institutions, induced by the incomplete adoption of EU institutions by policy actors, cause either single, or

multiple implementation deficits at multiple levels of the policy system. The structural aspects of the policy institution is created by the policy system which draws in policy actors and assigns their roles while providing formal operational rules and embedding beliefs about the way the resource should be managed. The policy actors engaged within this structure also have their own set of operating beliefs about the way the resource should be managed. In assigning roles to policy actors, policy outputs and outcomes are created, providing the rules by which policy actors should operate. It is these outputs and outcomes that provide the site for implementation deficits to occur. The incorporation of causal theories by policy actors, or the absent or inappropriate translation of policy goals into policy output creates implementation deficits. Because the institutional structure creates both policies and assigns agents at every tier of policy, implementation deficits can also occur at multiple levels of the policy system. Some deficits at a given policy level will not be caused by a mismatch in structure and agency at that level, but at one higher up; meaning that deficits can add together and overlap through the system. Therefore, in order to explore the role of mismatch in creating governance failures in the Hungarian governance system for drinking water management, the following objectives need to be fulfilled:

1. Characterise the structural institution.
    - What are the responsibilities and roles assigned in the governance system?
    - What are the policy outputs and outcomes at each level?
    - Which policy actors are engaged within the institutional fabric?
2. Characterise implementation deficits.

- Where do deficits occur?
- Are they administrative or based on causal theory?
- How are they carried through the system?
- What are the relationships between deficits?

3. Characterise the institutional agency.

- What are the beliefs held by the individual policy actors?
- What kind of beliefs are they (deep core, policy core, implementing aspects)?

4. Examine the role of structural and agency mismatch in the creation of implementation deficits.

- What are the points of mismatch between an actor's beliefs and those of the institutional structure?
- How do these points of mismatch create implementation deficits?
- Therefore, how is governance failure explained by non-adoption of institutions?

5. Examine the reasons for resistance to institutional adoption.

- What are the mismatched beliefs based on?

- Therefore, what are the barriers to institutional adoption?

4. Research Methodology: A Holistic Approach to Examining Implementation Deficits

4.1. Research Approach

The objectives identified involve investigations of both policies and policy actors in a case study methodology that allows for a hybrid approach using top-down and bottom-up methods. Objectives one and two related to the tangible structures of the institution as constructed by the tiered policy system. It demands a top-down approach to studying the policy and tracing its evolution through tiers of governance. Objective three is concerned with the policy actors and their beliefs. It is therefore concerned primarily with examining the actors in a bottom-up approach. Objective four pulls these two different perspectives together to explain implementation deficits. The methodology employed must therefore allow for two sets of methods that will provide a top down perspective and a bottom up perspective, which will be pulled together in a single context. This approach is depicted in figure 4.1 and is applied to a case study because the case allows for the application of multiple methods to a single case of implementation. Case study methodologies are based in the constructivist paradigm, by allowing the researcher to explore how participants construct the particular contexts and problems within that case (Baxter, 2008). They are appropriate when the researcher is working within the following criteria: they want to answer how or why questions; they cannot manipulate the behaviour of those involved in the study; they want to cover contextual conditions that are relevant to the phenomenon or context; and the boundaries are not clear between phenomenon and context (Yin, 2003). An explanatory case study allows explanation of causal links in real life, complex scenarios (Yin, 2003). It is therefore an approach that allows for the complexity of

institutions and influencing factors in the management of arsenic in drinking water. A 'case' is a phenomenon within a bounded context, meaning that the case is the unit of analysis (Miles and Huberman, 1994). The bounded context can be based on time, place, definitions, context and activity (Baxter, 2008). In this research, a governance network is bounded by the tiered policies and thus forms the 'case'. As these policies become increasingly tangible and localised, this bounds the case within a location. Therefore, this case study must examine the policies and policy actors involved in translating policy down to implementation in a specific location.

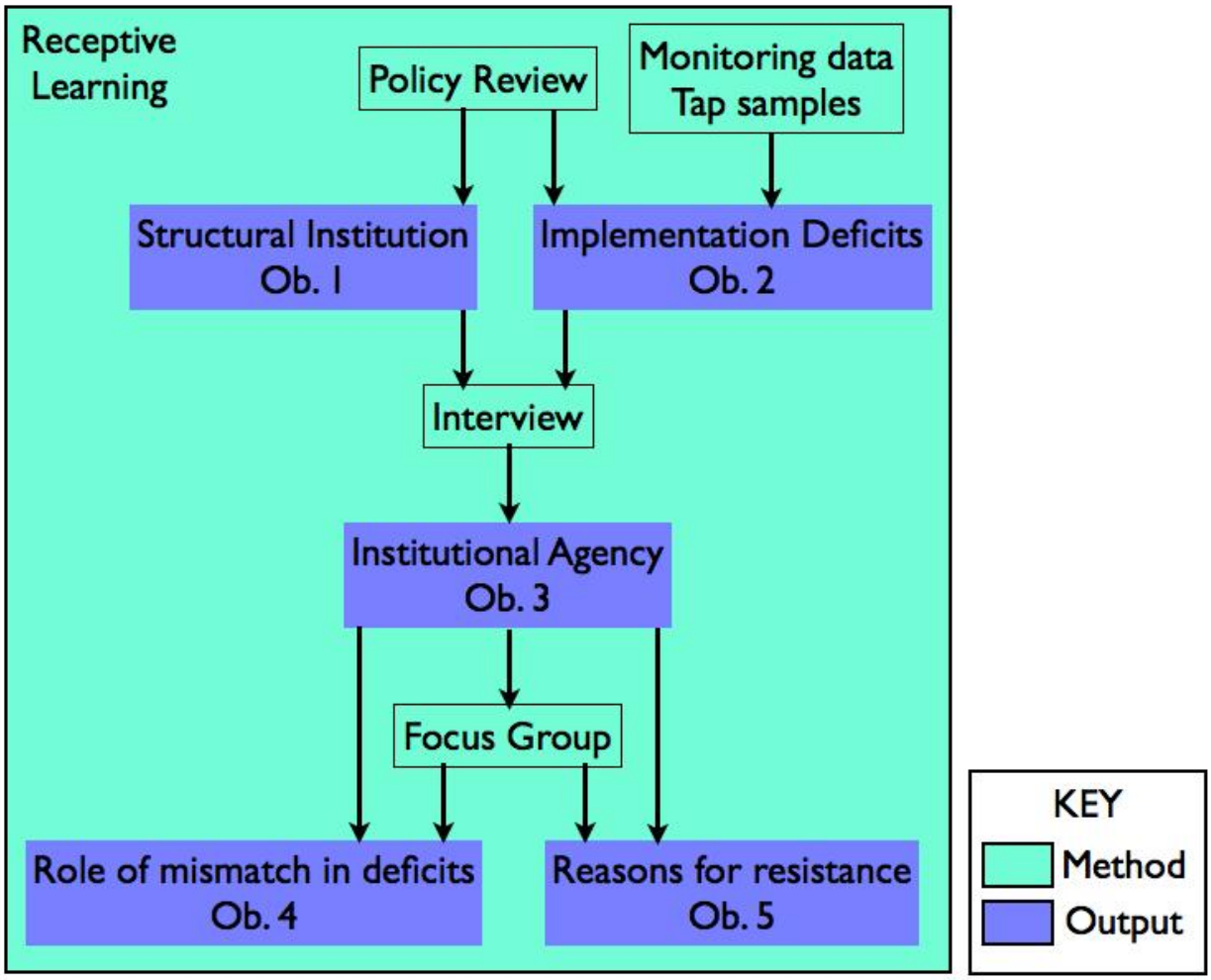

Figure 4.1: The Research Approach.

The specific location selected is that of Békés County in South Eastern Hungary, because it represents a hot spot in terms of failures to enact EU legislation. The intention of a hot spot case study is to reveal an interpretative understanding of the contexts and situations (Ragin, 2000). Focussing on a single case study introduces issues around the degrees of freedom in the research (George and Bennet, 2005); it cannot be sure whether the results found in each case study are due to chance or trend and there is no statistical confidence that these observations would be observed in other locations. However, concentrating on the policies and actors relating to the management in a specific location permits a thorough examination of all governance levels, policies and actors, and their contributions to governance failures. This deeper, empirical understanding is vital in this research as it is an essential first step in theory building, providing the basis for theorising when extended to other broader case studies (George and Bennet, 2005). In the county of Békés, it is estimated that 131,681 people (65% of the county's population) receive water through their taps that exceeds 10 ppb arsenic (ÁNTSZ, 2005). Long-term monitoring data from the public health authority (Állami Népegészségügyi és Tisztiorvosi Szolgálat - ÁNTSZ) reveals the number of wells where arsenic concentrations exceed 10 ppb (see figure 4.2). In addition to the tap water, scoping visits (November, 2008 and May/June, 2009) revealed a number of artesian wells in towns in the county that provide a direct and untreated access to this arsenic rich groundwater. Analysis showed that at times, the water exceeded 210 ppb (varying with location) and was high in organic matter (Rowland et al., 2011). These wells are being used by members of the population as a drinking water source, although they exceed the EU's drinking water parameters. The county of Békés is therefore a locality in which Hungary's adoption of the 10 ppb arsenic limit has thus far failed to prevent the population from exposure to arsenic exceeding 10 ppb in their drinking water sources.

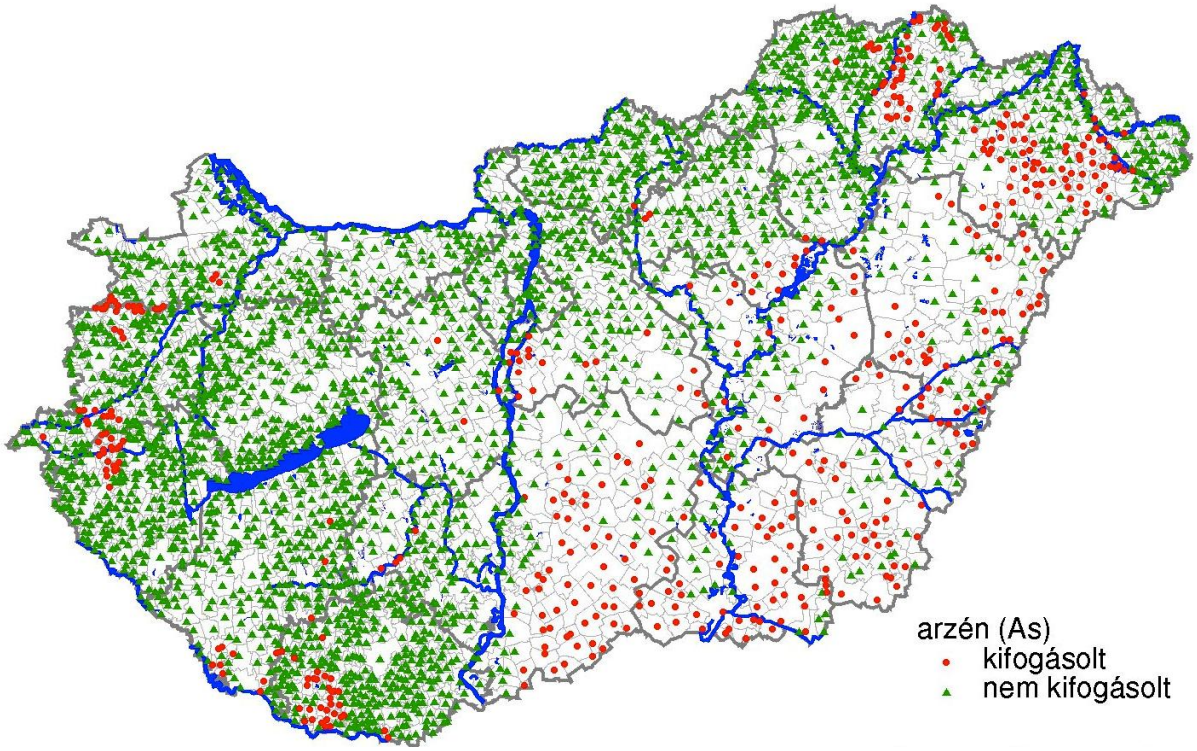

Figure 4.2: Arsenic concentrations in Hungary, Source: ÁNTSZ, 2007. Arsenic concentrations above 10 ppb are shown by red circles (Kifogásolt), whereas green triangles indicate concentrations below 10 ppb (nem kifogásolt).

The management of arsenic in drinking water in the county has been an evolving project that has required numerous shifts in both laws and governance approach. Arsenic in drinking water first became a management issue in Hungary in the 1980s. The presence of arsenic in water is a long-established fact. According to local archives in Békés County, arsenic was first discovered in local waters in the 1800s by local pharmacist Kiss Ferenc (Endre, 1977). However, it was not considered to be a threat to public health at the time. Arsenic in small doses was used for medical purposes, and there were well-documented accounts of the Austrian "arsenic eaters" in Styria (see for example, New York Times, 1885). The Styrians took regular doses of arsenic under the beliefs that it would facilitate their manual labour at high altitude in the Alps. There

was a proliferation of baths and spas built on thermal waters at the beginning of the 1900s. Their medical and health benefits were thought to be derived from the mineral rich, natural waters. Spa tourism remains an important industry. Gyula, for example has made much of its water history with decorative fountains and festivals around the castle baths. It attracts many visitors from Hungary, Romania, Croatia and Serbia. Many of the towns with thermal baths also had artesian wells drilled to make the deep groundwaters available to the public. Accounts of when wells were drilled vary, but centre around the early 1900s (see for example the account of the well in Békés town in Szegfü, 2008 p.78). Initially, such drillings were to supply the population with clean drinking water; prior to the wells being drilled, water was collected from the rivers. When tap water began to be available, the groundwater wells were maintained as a source of the health water that was feeding the baths. It was not until the 1980s that actions were taken to limit people's exposure to arsenic. It was first comprehensively surveyed in the Southern Great Plain by the public health authority in 1981. At the time, a 50 ppb limit was enforced in tap water. As a consequence numerous wells that did not meet this regulation were destroyed, although this was not done thoroughly and a number of wells remain that exceed 50 ppb arsenic. The county therefore has an ongoing history of managing arsenic in drinking water.

In order to ensure the separate data analyses are conducted in complementary paths within this case study, a receptive learning approach was followed. I took an approach, rooted in grounded theory (Glaser and Strauss, 1967), which ensures immersion in the research topic in order to provide the sensitivity required to guide the methods and research process (Charmaz, 2006). I spent a total of 30 days over the course of three months in the study area throughout the summer of 2009, and conducted other short visits between November 2007 and March 2010. During these periods, I spent time examining documents and maps in the local libraries

throughout the study area with the assistance of an interpreter. I examined local newspapers and if a town had a local newsletter, archives were also read through the library. Local librarians were happy helping to source information on local history in order that a thorough search could be conducted. I also encouraged local people to talk with me and a translator about the area and their own living memories, particularly if it concerned water supplies. There was no structured approach to such conversations, but if started talking to people in shops, libraries or other public places, I used conversations to increase my knowledge of the area, and took brief notes after the conversation concluded. I visited local museums and in one town (Szeghalom), the museum archives were searched by the curator for information on the local person who discovered arsenic in groundwater. Additionally, throughout the research, I attended meetings in Hungary about the arsenic issue. These meetings are listed in Appendix 1. Information collected during this receptive learning approach was in the form of documents and research notes which I filed according to key words relating to content and put into context with wider searches on the recent history of Hungary and its political and governance evolution.

A working relationship was fostered with all policy actors as I came into contact with them in throughout the course of the research. It was essential that I could return to research participants and other stakeholders as I moved between research phases, or to ask questions in light of new information, or have them send me new information as it came to light. Without exception, those participants that are part of formal organisations were involved in at least two face-to-face data collection episodes, and provided further information via email and/or telephone. Communication channels were kept open through the use of a general newsletter and personal emails. Participants were asked if they would like to receive updates on research progress. If they said yes, they were sent a letter, in Hungarian, approximately once every two

months. This provided details on ongoing progress and preliminary findings, along with details on how this fitted in with the overall research project. Readers were invited to contact me if they had comments or questions on any of the content. As part of this ongoing working relationship with participants, I also provided addition information around the topic of arsenic management to participants if they asked. As examples, I provided one organisation with information on research done on the health impact of arsenic in Hungary, and presented my own preliminary findings to a public health working group.

Due to the scientific knowledge required to critique policies and understand their causal theories, receptive learning was pursued in the physical science arena also. As a participant in the AquaTRAIN network, I was fortunate to participate in a number of scientific conferences and workshops devoted to the issue of arsenic in groundwater and drinking water, and its management. Regular contact with the other researchers in the network allowed me to hear updates on their research into all aspects of the physical science issue; from microbiology of arsenic release to techniques for remediation. I received additional training on geochemical modelling techniques and remediation technologies. I also attended conferences including the Goldschmidt geochemistry conference (2009), the Conference on Health and the Environment in Central and Eastern Europe (2008) and the AquaTRAIN final conference (2010). These workshops and conferences are listed in Appendix 1. Throughout all conferences and meetings I remained as an objective observer, and kept notes to increase my understanding of all aspects of the scientific process of arsenic contamination, impact and remediation. These were further supplemented by my role in the network as the only researcher working in the social science arena. My discussions and collaborations with other researchers were around this aim of

understanding the implications of network findings for policy and served to further develop my own background and deep knowledge into arsenic problems worldwide.

The data that I collected during this learning process was in the form of a detailed system of research notes and tagged documents that I used for iterative analysis to guide and shape the ongoing research. I employed a system of memo-ing (Glaser and Strauss, 1967) throughout the whole research period in order to develop explorations and keep the two halves of the research together. Data collected on implementation deficits and institutions was then used to shape data collection methods and sampling procedures during other parts of the research. Therefore, for every development made in the research, I spent time reviewing memos and analysing data to ensure an appropriate onward data collection approaches. For every implementation deficit identified, the data requirements to fully understand it were also carefully considered. As analysis was performed which contributed to answering objectives 1 and 2, it was immediately available to shape the research done towards objectives 3 to 5. For this to occur descriptions and notes were examined for concepts, which in turn shaped the need for, and collection of further data, and led towards theory building (Strauss and Corbin, 1998). I revisited these memos while pulling together the research findings for all objectives. In this way, the memos and note taking were used to develop theoretical sensitivity throughout the research process (Orland-Barak, 2002), and to tie findings and ongoing methods into the wider conceptual context.

4.2. Top Down Research

Objectives one and two depend largely on content data from policy documentation crosschecked with verbal accounts from policy actors. The results for objectives one and two are described in chapter 5, generated from content analysis of policy documentation. Both the structural institution and implementation deficits manifest themselves in the tiered system of policy outputs and outcomes. These are represented in written primary policy documentation at every level of the policy system. Primary policy documentation is the written, official policies and laws that have been adopted at any level of policy. These primary documents are supplemented with background, secondary policy documents. Secondary documents are those presenting the background or public communication of a policy. Secondary policy documents were used to provide the justification and formulation of primary policy documents; here the causal theories embodied in policies are explained. They are the background documentation or sources used in creating policies, or the documents produced in response to policies, such as monitoring reports. The collection and study of documents was facilitated and crosschecked with key informants. I asked the policy actors identified in documents for information on the documents or policies that they had access to, were involved in, or helped to write. These documents were usually donated voluntarily by policy actors, or provided following a specific request after they had been named in other documentation. In understanding the relevance of these documents and how they fitted together, I used verbal accounts. I asked actors about other policy actors that they worked with and why. I used scientific literature in order to understand the background and science to policies and supplemented this with verbal accounts from key scientific informants. There were eight key informants used at this stage from a municipality, a water company, national and regional public health services (ÁNTSZ), the Hungarian Geological

Institute (Magyar Állami Földtani Intézet - MAFI), the Environment and Water Research Institute (Környezetvédekmi és Vízgazdálkodási Kutató Intézet Nonprofit Kft. - VITUKI), the Ministry of Environment and Water (Környezetvédelmi és Vizügyi Minisztérium - KvVM) and the regional Inspectorate for Environment and Water (Körös-vidéki Környezetvédelmi és Vízügyi Igazgatóság - KÖRKÖVÍZIG).

Sampling of policy documents, scientific literature and key informants relied on an iterative snowball sample, whereby identification and analysis occurred simultaneously. I identified a core of policy documents using the internet and searching in both English and Hungarian; I learned specific keywords in Hungarian for this purpose. The located documents were limited in scope due to my limited language and limited internet availability of policy documents in Hungary. Therefore, those documents identified formed the start of a snowball sample. With the help of a native-Hungarian research assistant, I followed up references made in the documents and located further documents. This process was repeated until the documents located moved away from the policy topic (drinking water and arsenic), or until no new documents were identified. As policy actors were identified from these documents, I conducted background research to understand departments and individual people within it. I contacted the relevant department on the phone, using an interpreter as necessary, and requested the head of the department. The research was explained, and the department head was asked for a meeting. Occasionally, requests were passed on to find a person who felt they adequately knew the policies and operation of the actor. When a person was located, they were used as a key informant to help with understanding how policies were operationalised in Hungary. Additionally, as policies became clear, the points at which science was used also became clear. At these points, I searched the scientific literature using Web of Knowledge. Key informants to

help understand this scientific information, its foundations and its implications for policy were selected from the AquaTRAIN research network. Experts were chosen based on their expertise. They include Prof. David Polya on geochemistry; Prof. Andrew Meharg on health risk assessment; and Dr. Stephan Hug on drinking water technologies and supply systems. Their input was in the form of informal discussions around policy topics that I specified. They also provided ad hoc advice on specific questions as I needed.

In order to achieve **objective one**, analysis of documentation and factual information from informants was targeted to identify policy outputs and policy actors. All of the sub questions to objective one were answered through studying the content of documents to identify the actions and approaches it mandated and the other actors charged with these responsibilities. Where possible, the rationale and preceding policy basis was also identified. Therefore, the content of documents revealed the policy outputs, which policies engage which actors at each level, what goals they set for the level below, and what goals are translated from the level above. I then crosschecked these details with information presented by key informants. I directly asked the eight key informants about their involvement in policies, regulations they had to comply with, and for any documentation that explained their work. Where it was unclear, I also asked informants to explain the relevance of a document, or how it related to other documentation and policies. They were specifically asked to explain the policy outputs with which they were involved. I examined the answers to separate information presented as fact, and information presented as opinion. I was guided by the informant in terms of the division between fact and opinion and took cues from the way information was presented; facts were objective statements about role or policy content, whereas opinions included subjective adjectives to describe roles and policy content. Opinion data was fed into the analysis of policy actors, as outlined in section

three of this chapter. Factual data was crosschecked with the policy documentation. Where there was a conflict between key informants and policy content, it was noted. It was checked again with informants during the second research phase. If the conflict persisted it was interpreted as a point in the governance system where the beliefs of the policy actor clashed with the institutional structure and was fed into analysis for objectives four and five. Combining the policy analysis with key informant data meant that the structural institution could be mapped, providing a framework within which to identify deficits. Therefore, as actors emerged, their roles became clear and the distribution of responsibilities throughout the structural institution was unravelled. In this way, content analysis of the snowballing sample was used to collectively answer all three of the research questions in objective one.

The policy outputs and outcomes were then examined for their content, including what measures they prescribe and to whom responsibilities are assigned, links to other policy outputs and outcomes, and their scientific justification in order to identify deficits and achieve **objective two**. Through identifying links between policy outputs and outcomes, I identified the administrative, type A and type C, deficits. Where the measures outlined in a policy document do not correspond with the goals represented by the policy output from the tier above, then a type A deficit has occurred. Type C deficits are those where the policy pursued is not the most effective option. They occur if policy fails to secure appropriate action at lower tiers; the policy chosen could theoretically achieve goals, but fails to do so for some reason. Identification of these administrative deficits relied on identifying the links and broken links between policy outputs, outcomes and goals. Therefore, I mapped the links between policy outputs and policy outcomes and highlighted points where the measures outlined in a policy did not match the goals fed into it from preceding policy outputs. Type A deficits were noted where there was a clear

case of the measures (output) failing to meet goals. They were then used as flags to identify potential type C deficits at the higher policy level. I drew further on this policy map in identifying causal theory deficits. Type B deficits indicated by erroneous causal theory in the justification to a policy. Therefore, at all levels except the final policy outcome level, I examined such causal theory errors using policy background documentation, where available. I studied the justifications for policies and critiqued the methods and sources used through my own scientific literature studies. I performed targeted searches in response to the justifications and methods employed in the policy documentation. I used the same approach in exploring the possibility for a type D deficit at the EU level. In this research, a type D deficit would be evidenced by a flaw in the causal theory relating to the setting of the 10 ppb limit for arsenic in drinking water. I explored this potential using the background documentation to the EU legislation to examine the justification used when setting the 10 ppb limit and then critiqued it using a targeted search of scientific literature, cross-checking details with three scientific key informants.

At the most local level, where policy was translated into outcomes, I examined the existence of type B deficits, and the overall extent of governance failure, through tap water monitoring data. Knowledge of the actual content of arsenic in tap water was necessary in order to understand the way in which policy outcomes failed to meet policy goals. I therefore requested monitoring data and information on distribution systems and networks as part of my hunt for secondary policy documents. I concentrated on data collected since the improvements that had been made to the distribution systems in the 1980s. My discussions with key informants indicated that there is little variation between years in the content of arsenic because the distribution systems are not changed, and the concentrations in the aquifers are stable. Instead, small seasonal variations occur within the year due to variations in water demand, and therefore

the aquifers that are used. In addition, I collected tap water samples from various points around the county. Thirty-seven samples were collected from the point of consumption, as this is the point at which water must meet limits under the requirements of the EU drinking water directive. I chose the locations for water samples based on the basic knowledge of the distribution systems that I had at the time, and on the practical limitations around accessing sampling locations. I chose a number of towns that were easily accessible and took a sample from each. As I uncovered information about the distribution systems serving each town and the links between them, I modified by sampling campaign to ensure that I had multiple samples from various locations in each distribution system that I had initially covered. By taking multiple samples from each system I could account for any spatial variation in the parameters within a single system. This approach meant that not all distribution systems were covered by my sampling campaign, but it served to supplement official monitoring data. All samples were collected in July/August of 2009. This point of consumption was either a tap in someone's house, or a publicly accessible pump in the street. These pumps are painted blue and are ubiquitous throughout the study area. I checked with the water companies and the public health authority to ensure that they were connected to the drinking water distribution system. They deliver the same water as householders receive through their taps. The tap or pump was run for one minute and the water was checked to be running cold before the sample was collected. I ran the water into a glass which I had rinsed three times with the tap water, and then transferred 5ml to pre-acidified vials using a syringe that had also been rinsed three times. The acid in the vials prevented further oxidation or deterioration of the elements in the water. The vials were provided by a colleague (Dr. Stephan Hug) at EAWAG and were posted to EAWAG in Switzerland, where Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) analysis was conducted. I did not attempt this

analysis myself because I did not have access to such facilities in Hungary, and I am not trained to use the equipment. Instead, the highly skilled technicians at EAWAG ran the analyses and sent me the results. The results were in the form of mean arsenic concentration from each sample sent.

4.3. Bottom Up Research

Objective three largely requires discourse data to be collected via interview. The epistemology of discourse analysis is that knowledge is experiential, and language is situated within knowledge. Therefore, language is the site where meanings are created and changed (Taylor, 2001). It is situated within a particular social and cultural context, and therefore there are multiple realities and multiple truths. Discourse analysis is therefore a realist methodology as it asserts that meanings are real but embedded within structures and institutions. It is about finding the meanings and understanding how they are shaped by these structures. Indeed discourse forms the bridge between the structural and normative aspects of an institution (Schmidt and Radaelli, 2004). Discourse can therefore be used to represent the beliefs that policy actors hold, and how these complement or contrast with the structural aspects of the wider institution.

The sampling strategy and the exact data to be collected were decided in light of the results emerging from the policy analysis. The collection of discourse needed to rely largely on interviews. A research interview intends to gather descriptions of the life-world of the interviewee with the intention of interpreting the meaning of the described social phenomena (Kvale, 1983). It therefore serves to collect language data for the analysis of discourse.

However, the research interview was also used as a gateway to further documentation, particularly that which is not in the public domain. The interview needed to be largely unstructured in order to not exclude or emphasise certain beliefs and discourse through guiding questions. Instead, themes for questions were chosen in order to probe issues such as the role of the organisation, both generally and with particular regard to arsenic in drinking water; the actions of the policy actor with regard to managing arsenic in groundwater; and the perceived 'problem' of arsenic in groundwater. The way in which respondents chose to answer questions asked within these themes provided a deeper understanding of the role of the policy actors. However, questions on roles were informed by emerging results from the policy review and asking questions relating to implementation deficits relied heavily on identifying deficits to shape questions. Additionally, a small number of structured questions were necessary in order to clarify parts of the policy review, specifically around the formal rules and roles. This meant that prior to the outcomes of the first phase of research, the questions to ask could not be accurately formulated. Furthermore, prior to the identification of policy actors, sampling strategies and data collection methods to capture discourse representative to the actor could not be chosen. In some actors, but not all, the respondent was the key informant, but this depended on the actor. Therefore, sampling and methods were revised for objective three as objectives one and two were being completed, as shown in figure 4.1 (page 67). A total of 19 policy actors were involved in the research; 25 representatives from formal governance organisations and 309 local people were interviewed and 108 questionnaires were administered. The rationale behind these samples, the revised methods and the results are discussed in chapter 6.

In order to answer research **questions one and two** of objective three, interview transcripts were analysed using an iterative coding approach. I recorded the interviews, with the permission

of the participant, and I transcribed the interviews in English as soon as possible after the event. Throughout the interview I made detailed notes that acted both as prompts during the interview to guide my questions, and added context to the typed transcriptions. Although interviews were designed to be unstructured, the actor was allowed to guide the interview, with further questions following of the basis of what was previously said. This led to the construction of narratives by the respondents. These narratives are the topics about which the respondent chose to focus when discussing the management issue of arsenic in drinking water. They reveal the way in which their roles are presented, the priorities and their feelings around arsenic management. Therefore, each of these narratives contains multiple discourses that split the policy actors and represent their beliefs, thus answering question one of objective three. The discourse of an actor is shown through the specific words used and the way in which they present or explain their opinions and views. These discourses therefore encapsulate the beliefs and norms that the policy actors embody and are working to. Around these discourses, policy actors also offered explanations for why they held certain beliefs of discourses. These explanations were not confined to specific themes or discourses; they ran throughout the transcripts but were drawn on for reference in explaining viewpoints and beliefs, or in explaining actions and problems. Explanations were therefore used in answering question two of objective three. In order to identify these narratives, discourses and explanations, I spent time reading through the transcripts, and taking active notes. As more transcripts became available, the narratives, discourses and explanations offered by each actor were compared and contrasted. Similarities and differences were noted, and as more data became available, these were developed into codes. I grouped codes and split them in response to emerging data and repetitions of the coding process. As I identified new implementation deficits during the first research phase, and as I understood more about historical context, I

revisited and adjusted the codes as necessary. This process was facilitated through careful note taking. Ultimately, codes emerged as groups and subsets of discourse that could be attributed to the institution and compared between institutions.

This iterative coding and analysis was facilitated using referencing software, Sente. This software allowed multiple tagging and assignment of key words to each transcript, which were then stored as meta data. This allowed codes to be added, grouped and sub-divided as they appeared. Using computerised analysis in this way has its roots in a grounded theory paradigm that falls between deduction and induction (Gibbs, 2002) as it allows analysis to respond to emerging theories and concepts. The process of evolving coding allowed for ease of researcher response to the data, meaning that findings are created in response to the data, rather than forcing the data into existing codes. It therefore adds to the validity of the research (Welsh, 2002). Sente also allowed for a bridging between the structural features of the actor and its responses. Analysis of conversations demands a focus on the characteristics of the participants that are important in that conversation (Shegloff, 1997) and is particularly true when considering institutions and the discourse of institutional agency. To facilitate such considerations, filters could be applied to the Sente database of transcripts. This allowed transcripts to be viewed grouped by shared discourse or shared structural characteristics.

4.4. Pulling the Approaches Together

Objectives four and five were achieved by pulling the two parts of the methodology together and the results are detailed in chapter 7. In order to answer **objective four**, **question one**, the policy actors are considered in relation to their beliefs and actions. Their discourses and

their beliefs are contrasted to their institutionally assigned roles in order to identify potential clashes and answer **question one.** In order to answer **question two**, actors, beliefs and points of clashing are connected to the structure of implementation deficits created during the top down research section. This structure was examined in the context of all data collected so far in order to examine the forms of clashes in structure and agency and how they contributed to individual deficits and collectively to governance failures thus providing explanations of how governance failure is explained by non-adoption of institutions and answering **question three**. Once mismatches that contributed to deficits were highlighted, they were examined to identify their origin, and thus answer **objective five**. Each mismatching belief or structure was traced back to its origins in the discourses collected. These provided propositions for the origins of mismatch. These propositions drew strongly on the results from the bottom-up research section, as detailed in chapter 6. They were used to write questions for a focus group that was held in order to explore, validate and expand upon them, and thus answer **objective five**.

I planned a focus group in order to allow for a full range of participation from policy actors. The focus group discussions were held as part of a larger workshop towards the end of the research period. The workshop consisted of key policy actors and scientific researchers presenting their work around the arsenic problem in Hungary and further afield. Language was a problem for the delivery of the event because while some participants were comfortable in both English and Hungarian some participants spoke only one language, but I needed them to communicate with each other. These issues are considered in detail in section 4.5. A translator was present to ensure all participants followed the presentations, regardless of whether Hungarian or English was the language of delivery. The focus group followed after the presentations. Respondents from the previous stages of research were invited to attend the whole event.

Invitations were also extended to contacts of the respondents if they were requested. However, attendance was limited to one or two participants per policy actor. This was so that no actor was over represented in the discussions, and therefore the results. The full details of the number of attendees, the extent to which they represent the governance network, and the impact to findings is found in chapter 7. Invitations were sent in Hungarian, along with an information package about the event. This included the aims of the event, and travel information. The invitation was followed up with a telephone call in the lead up to the day. The workshop was held in Budapest because this was an accessible place for participants from national and regional institutions, and also for local participants. Collectively, the workshop and focus group were planned as a one-day event in order to allow time for detailed discussion, but to ensure that participants from outside of Budapest did not need to find accommodation. Participants from outside of Budapest were given instructions to allow them to claim reimbursement for their travel expenses. Catering (lunch and coffee breaks) was provided at the meeting location. The start and end times were planned in order to allow participants travelling from Békés County to catch convenient trains at hours that were not anti-social. No coercion to attend was offered, but the workshop and the topics of the discussions were planned to be informative to all participants. The workshop gave all participants an opportunity to learn about how their work fitted into wider arsenic and drinking water management topics. It was also held in conjunction with a meeting of the AquaTRAIN network, and many of the researchers attended the focus group. As specialists on geochemistry, remediation technologies and epidemiology, they were available to answer questions and make ongoing connections with water managers. This was an attractive resource for participants.

The focus groups were carefully managed to allow for full discussion that could reveal participant's views and points of agreement or disagreement. During the workshop, participants were asked to form small groups. People were allowed to exercise their own choices in this, although I encouraged people to engage with people that they did not already know. Those participants who only spoke Hungarian, or who were more comfortable only participating in Hungarian, formed one group. All other groups were a mixture of AquaTRAIN researchers and Hungarian water managers from all levels of governance. I assigned a spokesperson to each group. I chose the spokesperson based on people I trusted to take detailed notes, were confident, but were unlikely to be perceived as intimidating for other group members. Therefore I avoided choosing representatives from national level bodies as spokespeople in case other participants perceived to be the boss and therefore tailored their responses accordingly. Instead, I favoured researchers that I knew well from the AquaTRAIN network as the Hungarian policy actors could consider them neutral. For the Hungarian-speaking group, the spokesperson was the translator as she was not a policy actor and so could be considered impartial, but was also bi-lingual and confident translating between the two languages. Questions were asked for group discussion, based around the initial findings gathered during phase two, as depicted in figure 4.1 (page 67). Therefore, more details on participants and questions are in chapter 7. I asked the questions one at a time and they were written on a power point slide that was left visible throughout the discussion period. For each question, participants were given 15 minutes to discuss. After 15 minutes, participants were asked to reconvene. The spokesperson from each group presented the key findings or points of discussion to the entire group. Questions could be asked from other groups if they wished. I limited the time available for such questions in order to keep to schedule, and in order that participants did not lose interest.

The data collected during the day took a variety of forms. Information of interest to answer question five included how participants interpreted the questions, what they chose to speak about, the content of what they said and how this varied between different actors. Throughout discussions, I walked between the groups noting points of agreement and conflict and the topics being discussed while answering the questions. These notes also served as reflective notes on the impact of group dynamics on the data and results; I noted members of the groups that were dominating or remained quiet, and how participants were responding to each other in discussions. I used these reflective notes during analysis in order to consider the impact of working relationships within the groups and towards the spokesperson on my findings. When the spokesperson of each group provided a summary to the group, I took notes of this summary in order to explore content. I also noted what was asked in response and by whom as this revealed much about points of content disagreement or agreement between the groups. At the end of the day, the spokesperson submitted a short written summary in English of their group's discussions around each question. All submitted this within 2 hours of the end of the meeting while the discussions were still fresh in their minds. For the Hungarian-only group, I spent time with the spokesperson to make sure we had the same understanding of the summary. I interrogated the full collection of data for content that supported, conflicted with, or differed to the prepositions used to write the original questions. Points of agreement were identified, and where possible, used to add further texture to existing explanations of resistance to institutional adoption. Where there were points that challenged my findings I returned to my initial data. I looked to explore how or why that conflict was occurring. I paid particular attention to whether the conflict was based in responses from a respondent talking about themselves, or their perception of other policy actors. Where necessary, I collected further information from a variety of sources. This included

contacting participants, via email or telephone, with specific questions in order to clarify points, or returning to documents. In this way, I dealt with points of conflict on an individual basis.

4.5. Barriers and Ethics of the Research Methodology

4.5.1. Barriers

My lack of a Hungarian background was both an advantage and a barrier to my research. I am a British female and knew very little of Hungarian history, language, culture or politics before I began this research. My lack of background knowledge in relation to the Hungarian governance context meant that I could take a very naive starting approach to the research, and was likely to be seen as an outsider by participants. Such positionality can be advantageous in interviewing foreign elites in the way that I did in this research (Herod, 1999). The access to data is increased for two main reasons: The researcher is not viewed as a threatening authority figure by participant, and therefore sensitive information can be more forthcoming; and researcher needs to ask for clarification on issues that may be taken as obvious by an insider, therefore increasing the critical thinking of the researcher (Herod, 1999). Indeed, these advantages applied to this researcher project. Participants and informants started with the very basics when explaining things to me; they assumed I had no knowledge on any aspect of the topic. This was a great benefit to the research as it meant that my own starting assumptions did not limit data collection. Therefore, a much broader set of data was collected around the topic than if I had targeted it from the beginning. However, the issue of language in the research was not one that could be used to my advantage. I did need to grasp the language in order to conduct the research. Unless

documents are produced with or for international collaborators, they are produced in Hungarian. Additionally, many documents are not available unless they are specifically asked for, and many of these require a large amount of effort to locate. Below national government level, many people do not speak English. This makes it very difficult to locate information and participants without a working knowledge of Hungarian. I began taking lessons at the beginning of the research period. This included regular group classes, a private tutor and an intensive course. Independently, I also intentionally learned a range of keywords applicable to the research topic. These became helpful in searching for and identifying documents, and key portions of text that I needed to understand in greater detail. In addition, I recruited the help of a translator and a research assistant. The translator was paid for her time. She arranged interviews and accompanied me when the participant was unable or uncomfortable to speak English. She also assisted in translating documents and research materials. The research assistant was a master's student from a neighbouring university. She also assisted in locating documents and institutions and finding contact people. She was completing a master's degree in environmental science and had done her undergraduate dissertation on groundwater issues on Hungary. She therefore had a strong background in the issues being discussed

These assistants were closely managed in order to minimise and account for any potential biases or errors that they introduced to the research. They acted as gateways to the information, both in the way they searched for data and what they chose as important. They could also impact upon the respondent interviewed in the way they presented the research when they made contact. It was therefore important to ensure that they fully understood the wider research and the individual tasks they were working on. To ensure that the validity of the research was not threatened, and that they remained motivated to work, a lot of effort was put into training the

research assistants and matching work to their skills. Guidance was sought from Barrett and Cason (1997). Both assistants were given written information on the research project, and a list of keywords. The keywords meant that we all had the same understanding of the terms "groundwater", "policy" and so on. The translator had a clearly defined task over a set time period. She was therefore also given a 'job description', which was compiled with her cooperation and gave us the opportunity to agree on working style and her role before it began. The research assistant completed a range of smaller tasks within a longer time period. Therefore for individual tasks, she was provided with a written summary of any task agreed upon in order that she could refer back to it if necessary. These measures were designed to ensure that we all shared a common understanding of the project and how it was progressing. In addition, both the research assistant and translator were encouraged to ask questions whenever they wanted, and were asked to present all information, and not to disregard anything. I also encouraged regular feedback with both. With the translator, this took the form of discussing the upcoming meeting before it took place, and then again after in order that problems could be identified and addressed. With the research assistant, we met weekly to check up on task progress and discuss any problems.

The main problem with working with assistants to make contact was the impact to forming the working relationships necessary to conduct an iterative methodology. Because participants were receiving initial contact from an assistant, and talking through a translator, there was a danger that they would fail to associate me with the research. Some simple measures were employed to counter this. Emails about the research were always sent from my email address in order that there was a single point of contact, and it was associated with me. Additionally, in interviews and meetings, I always introduced myself in Hungarian, as well as being able to ask

and answer basic questions, and conclude the meetings in Hungarian. It was agreed with the translator in advance that she would always refer to the project as being my research, and that people should contact me, rather than 'us'. Additionally, I always sent newsletters (see this chapter, section 1) and information that included my signature. It was frustrating during interviews and meetings to feel as though I was not able to express my personality as this is important when establishing a relationship with a participant. However, both the translator and I kept notes in order to be able to reflect on the impact to research. Overall, we both felt that it was actually beneficial. I was given thinking space between questions. The stop-start nature of the interview also meant that it was easier to steer the questions and change the subject slightly because the respondent had to stop talking for translation to occur.

Working with a translator also helped to keep my involvement in the research objective. By interacting with participants, I became a small part of the governance network in Hungary. Building a working relationship with participants can introduce the problem of emotional attachment to the research, whereby the researcher loses objectivity and the results lose validity. On balance some level of involvement is inevitable and indeed necessary (Stanley and Wise, 1993; Hubbard et al., 2001). It provides deep insight into the issues at play. However, it was important to ensure that I remained impartial, in order that my results were not influenced by my own opinion formed during participation. I also needed to remain aware of the impact my participation might have on the responses given by participants. The use of a translator helped to maintain some form of distance, and certainly helped to keep objectivity in the interview scenario. Because there was a pause between asking and receiving an answer (as it was translated), I had more thinking time than usual. This helped me to stay focussed and not get caught up in a side-topic. In addition to this, the reflective notes kept during the whole research

process were used as a critical thinking tool. I frequently questioned why I held such opinions or thoughts, and reviewed them against the evidence available. In these ways, I became emotionally involved in the research, without becoming emotionally invested in the topic.

4.5.2.Ethics

The overall methodology presents a very low risk of harm to participants. Data collection is not invasive for participants, however the topic could be considered sensitive to some respondents. The discussion of breaching legislation could be potentially confrontational for policy actors. To ensure my questions were not perceived in this way, I was careful to introduce my research before starting questioning, and all participants were guaranteed anonymity. Participants were given prior written descriptions of my research in Hungarian. Where I met with them personally, they were given a verbal description at the start of the interview. I made sure that they understood that I was not judging the right and wrong of any actions or opinions; merely observing. They were invited to ask me questions at both the beginning and the end of the interview. Where local people were involved, I was careful not to raise the issue of arsenic. The idea that drinking water is contaminated with arsenic could be alarming for consumers of the water. Therefore, I framed my research as that of examining people's opinions on drinking water or well water and drinking water management. I was careful to avoid using the word arsenic. This proved rather unnecessary; I was asked multiple times if I was interested in the arsenic in the water.

Taking water samples raised a number of ethical questions over the responsibility to inform participants of the results. The main concerns were over what to do if the results showed an alarmingly high level of any element, or over how the results would be interpreted by

participants. There may be a tendency for participants to worry about the recording of any amount of a chemical in their water. I minimised these concerns by favouring the use of publicly accessible pumps rather than household taps. For those that were from households, volunteers were sought during interviews with local populations (see chapter 6). At this stage, it was explained that I would not be able to communicate the results of the analysis. Though I explained that should there be anything concerning in any of my results, I would inform the municipality and the relevant water authority. No participant was coerced into allowing me access to their water. All were left with a sheet explaining my research and my contact details. The anonymity of participants was guaranteed both verbally, and via the information sheet. Participant's personal details have not been stored, only contact details in order to make arrangements for the sample collection. I have taken appropriate measures to ensure this contact detail is not available to anyone else to use for any reason. The contact details of households where samples are taken, along with the corresponding sample number are kept in paper form and filed in my personal files at home; there is no opportunity for anyone other than me to locate and contact households. The chemical results are stored on a private hard drive in my possession and on the hard drive of Dr. Stephen Hug in Switzerland. I am the only person who has access to both sample location details and chemical results.

5. Policy Review: Multi-level Governance, Policies, Actors and Deficits in the Hungarian Case Study

5.1. Objective 1: Institutional Structure

5.1.1. Policy Outputs

EU level policy documents

The policy problem of arsenic in groundwater is defined by the EU in terms of a quantifiable target. The issue of arsenic in groundwater is not a problem in itself if that arsenic is naturally occurring (geogenic). The Water Framework Directive (2000/60/EC) and its daughter the Groundwater Directive (2006/118/EC) govern the quality of groundwater. They determine that the groundwater is of good quality if the concentrations of elements do not exceed natural background levels. This means that if the arsenic is geogenic, its presence in the aquifer is not framed as a policy problem. Instead, the problem occurs at the point of use. The Water Framework Directive requires that water must be suitable for its intended use, as governed by the relevant daughter directive. Where the water is intended for human consumption, the aim of the relevant directive is to protect human health. In the Drinking Water Directive (98/83/EC), this aim is operationalised by the target of a 10^{-6} excess lifetime cancer risk from non-threshold chemicals (such as arsenic). In other words, protecting human health means ensuring that no more than 1 additional cancer per 1000 000 population is caused by a non-threshold chemical. The problem of arsenic in groundwater is that drinking it causes a breaching of this 10^{-6} excess lifetime cancer risk.

In order to meet 10^{-6} excess lifetime cancer risk, the EU Drinking Water Directive (98/83/EC) provides a limit of 10 ppb (10 μg/kg) for arsenic in drinking water. The drinking water directive aims to protect human health from dangerous substances in drinking water by setting standards for water supplies. It sets maximum permissible concentrations for elements in water intended for human consumption that must be complied with at the point of consumption. The limits are in the form of parameters and indicator parameters. Parameters are strict, whereas the exceeding of an indicator value demands further investigation as to whether or not it actually poses a risk to public health. The original background document for the directive, were the limits are discussed and selected, is not available; it is not available online and key informants report that they have been unable to access such a document despite making requests to the Commission. However, the recent revision (2008) of the limit values has kept the 10 ppb value as it complies with the recommendations of the WHO (EC, 2003). The directive explicitly excludes natural mineral waters and medicinal waters as these are addressed under separate legislation. It also excludes water supplying less than 50 people, or supplying less than $10m^3$ per day. It nevertheless covers all water intended for use by individuals in the home, including for drinking, food preparation and other domestic purposes, and also for that intended for food production purposes, unless authorities are satisfied that the water will not affect the overall wholesomeness of the final product. The directive accepts that domestic supply systems (from distribution to tap) are not the responsibility of the water company, unless they are considered so under national legislation. Member states can request derogations to the limits of up to three years at a time, but must submit a review of progress towards meeting the requirements if and when they apply for a renewal.

Domestic policy documents

The parametric values applied in the Drinking Water Directive are relevant in varying degrees to Hungary. In the Accession Treaty, Annex X (Hungary), Section 8 (Environment), B (Water), part 2, grants Hungary a derogation to the parametric value of arsenic until 25th December 2009. The derogation allowance in the treaty was tiered. Initially, all water supplies exceeding 30 ppb had to be addressed from the date of accession. Therefore, the legal limit in Hungary was 30 ppb until 25th December 2009. Those exceeding 10 ppb, but below 30 ppb had to be remedied by this deadline. Beyond this date, if Hungary wishes to seek an extension to the derogations, it must apply to the EU, using the procedure outlined in the Drinking Water Directive, Article 9 (2). This allows for a derogation period not exceeding three years, only to be granted in exceptional circumstances. The Commission must rule on a decision within three months of receiving the application. The application must include descriptions of the grounds for the derogation, and plans for the remediation work that will be under taken to ensure that the derogation will not need to be further extended. Hungary did apply for an extension to their derogation. The key informants report being confused about whether they should apply for specific distribution systems or for a wider geographical scale. In March 2010, the Commission rejected their application based on a wider geographical scale, though the details of this decision and its justification have not been made publicly available.

The governance of drinking water, and therefore the implementation of the drinking water limits, the institutions involved and the functions held are all shaped by the Hungarian National Constitution and administrative acts. The shape of administration and governance is dictated by the Act on Local Governments (Act LXIV of 1990, modified by Act LXIII of 1994) and the

Hungarian constitution (Temesi, 2000). The constitution outlines the principles of local government, and the rights of eligible voters to manage local affairs. To operationalise these principles, the Acts on local governance awards the power of self-government to all settlements, allowing them to elect their own representatives to manage local affairs. Therefore, every settlement has a separate, elected local government, known as the municipality, and a local government covering a larger area, called a county. Geographically, the county covers a collection of municipalities, however they are separate designations. Both are awarded equal status under the Constitution, meaning that the municipality is not subservient to the County. Rather, they have different responsibilities. The County is responsible for services that cannot be fulfilled by the municipality, and those of geographical nature which extend beyond the bounds of the municipality. The services that the municipality is responsible for include drinking water provision as this is framed as a matter of local interest. The manner with which this must be fulfilled is regulated by further government acts, which assign regulatory functions to state actors and the regional and localised offices thereof. Therefore, in creating self-governance at the local level, the Acts have created two categories of local governance in Hungary: The bottom-up system of local government (municipalities and counties) and the top-down system of state bodies with regional and local offices (Temesi, 2000).

The regulatory responsibilities of state actors, and the terms of fulfilment of services are defined in the Water Act and its associated decrees. Government Act LVII of 1995 on water management (the Water Act) outlines the control measures and responsibilities to be employed for managing water, including for exploiting and maintaining water sources and delivering drinking water. The exploitation of water resources is regulated through a system of licences, whereby the state retains ownership of the water resource, but the exploiter accepts responsibility

to protect and maintain it, and deliver water that meets legislation relevant to its use. In the case of operating a hydraulic facility (such as drinking water extraction from a groundwater well), the operating license takes the form of an operating permit. The terms for applying for such a permit are outlined in Government Decree 72/1996 on the implementation of authority powers in water management (permits and operational permissions). The processes for application are outlined in the Ministry Decree (KHVM: Ministry of Transport, Communication and Water Management) 16/1996 on the application form and annexes for granting a water permit. Where the water is exploited for drinking water purposes, operators must also adhere to regulations governing the content of the drinking water. Government Decree 201/2001 is on drinking water quality requirements and control. This is the transposition of the EU Drinking Water Directive, and places threshold values on elements in drinking water at the point of consumption. The 10 ppb limit is introduced as of the 25th December 2009, and until this date, an interim value of 30 ppb limit is in place. The specific monitoring and regulation requirements to ensure adherence to these limits are outlines in the Decree of the Ministry of Transport, Communication and Water Management 21/2002 on the operation of public water supplies.

As owners of water resources, the state undertakes to maintain water resources. The maintenance of the source itself is regulated by Government Decree 123/1997 on the protection of actual and perspective sources and engineering facilities of drinking water supply. This identifies potential drinking water supply sources, identifies sources of risk to their viability, and designates protection areas around them. The list of prospective sources is accepted by joint instruction 8001/2000 from the Ministry of Transport, Communication and Water Management and the Ministry of Environmental Protection. To facilitate protection and the licensing process, various databases are created in the frame of the Water Act. Decree 22/1998 from the Ministry

of Transport, Communication and Water Management is on hydrographical activities of the water and regulates national and regional tasks around the assessment, evaluation and forecast of quality and quantity characteristics of both surface and ground waters. In doing so, it creates a hydrographical observation network, including obligations for data reporting, transfer, storage and communication. The products of this communication include hydrogeological reports, published cadastre data, a groundwater resources atlas, operational data from extraction wells and basic monitoring networks. All of these serve to guide water exploitation and monitor changes, thus prompting protection measures where necessary. This is further supplemented by Government Decree 219/2004 on an Environmental Registration System for Groundwater and the Geological Medium (FAVI).

The primary policy vehicle being pursued to address tap water failures introduces an additional governance actor at the regional level, alongside a number of new interactions at the local level. The Dél-alföldi Regionális Fejlesztési Ügynökség (DARFÜ) water improvement programme is a project designed and part-funded by the Ministry of Environment and Water (Környezetvédelmi és Vizügyi Minisztérium - KvVM). The earliest incarnation of the improvement programme, which ran from 2003, was scrapped, and the project was re-launched in 2005. The original project treated settlements exceeding 30 ppb separately from those exceeding 10 ppb. However, it was discovered that they could not be separated due to infrastructure that linked municipalities on both sides of the 30 ppb threshold, and therefore they all needed to be addressed collectively. For the revised programme, KvVM have sourced partial funding, and stipulated the procedures for implementation of a regional programme that will consolidate water supplies and facilitate service improvements. It is an 80 billion HUF (approximately 300,000,000 Euro) programme to improve the water supply infrastructure, and

ensure compliance with EU limits. The funding comes primarily from the EU, although the municipalities, as those responsible for water provision, must find some way to co-finance their involvement. The project is being run in phases that are being managed by the DARFÜ project management. This is a small project management committee brought together for this specific function. They work collaboratively to steer the project with a council comprising the affected policy actors: the municipalities and the water companies. In the first phase of this revised project (2005 to June 2010), municipalities must form associations with other municipalities, select management options to improve the water quality to all municipalities within the association, and prepare tender documents for this work to be executed. During this phase, consultants have been commissioned by the project management to prepare background studies of the hydrogeology, the existing infrastructure and viable technologies. In preparing their recommendations, the preferences of the municipalities are only one factor in the many that are accounted for when selecting the favoured management option. The second phase of the project should see contractors bidding on the basis of the tender documents, and the work carried out to improve drinking water supplies. At the time of research, the municipalities were negotiating and choosing associations. By the end of the data collection period (March 2010), the associations were not finalised, and therefore recommended actions had not been accepted, and tender documents had not been prepared. By the 22nd June 2010, five associations had been formed, accounting for 63 municipalities.

These policies, acts and projects described above combine to create an overall tiered system of policy outputs. These are shown, along with clarification on how they relate to other tiers of the policy system, in table 5.1.

Table 5.1: Policy Outputs and Institutional Structure

Level	Classification	Policy
EU	**Goal**	•10 ppb limit
	Output	•Drinking Water Directive
National	**Goal**	
	Output	•Water Act •Limit Values •Monitoring Requirements •Permit system •Protection of sources •Documentation of sources
Regional	**Goal**	
	Output	•Exploitation Licenses •Operational Permits •Data collection •Data Storage •DARFÜ Project
Local	**Goal**	
	Outcomes	•Water delivery •Infrastructure maintenance •Application for licences •Provision of data •Formation of Associations (DARFÜ)

5.1.2.Policy Actors and Roles

The policy documents themselves identify the specific policy actors that are charged with implementing policies. At the highest level of domestic policy, the government decrees, ministerial decrees and government acts engage ministries as policy actors. Ministries are in charge of drafting legislation, government acts, government decrees and ministerial decrees. The government introduces decrees to ensure public order, and public security, and therefore assigns responsibilities and general administrative procedures. The ministries introduce decrees in the area of their own expertise to complement and expand upon government decrees. In the field of drinking water management, the Ministries involved in designing and issuing the decrees pertaining to drinking water management are the Ministry of Transport, Communication and Water Management, and the Ministry of Environment. These ministries have not existed since 2002 when they were merged into one body: the Ministry for Environment and Water (KvVM). Drinking water protection and regulation therefore falls mainly under the responsibilities of the KvVM. The legal context creates a variety of roles under the remit of the Ministry of Environment and Water. The Water Act establishes regional water councils to manage tasks of regional significance. Decree 72/1996 on permits, also assigns roles to water and environmental protection inspectorates and directorates. The granting of operational permissions is split between the regional public health authority (ÁNTSZ) and the Inspectorate for Environment and Water (Környezetvédelmi és Vízügyi Igazgatóság - KÖVÍZIG). The KÖVÍZIG is a national state actor inspectorate, with regional offices whose domains are dependent on river catchment areas. In Békés County, the regional KÖVÍZIG is the KÖRKÖVÍZIG. At the local level, the Local Government Act introduces a range of different policy actors to the local level. Municipalities are policy actors as they hold the ultimate responsibility to deliver drinking water

in accordance with state regulations, and they are therefore engaged at the level of policy output. Finally, the DARFÜ project introduces the DARFÜ project management who coordinate and oversee its implementation. This skeleton governance network is shown in Figure 5.2. However numerous additional actors are introduced in the implementation of the policies that make this depiction far too simplistic.

Table 5.2: Policy Actors and their Position in the Institutional Fabric

Level	Classification	Policy	Actors
EU	**Goal**	•10 ppb limit	
	Output	•Drinking Water Directive	
National	**Goal**		
	Output	•Water Act •Limit Values •Monitoring Requirements •Permit system •Protection of sources •Documentation of sources	•KvVM
Regional	**Goal**		
	Output	•Exploitation Licenses •Operational Permits •Data collection •Data Storage •DARFÜ Project	•Regional KÖVÍZIG •DARFÜ Managers •Regional ÁNTSZ
Local	**Goal**		

Level	Classification	Policy	Actors
	Outcomes	•Water delivery •Infrastructure maintenance •Application for licenses •Provision of data •Formation of Associations (DARFÜ)	•Municipalities

The fulfilment of the data collection and cataloguing requirements of directives introduces specialist institutions to the governance network. The KÖRKÖVÍZIG offices collect monitoring data, and issue permits to exploit water resources in line with guidelines from the national KÖVÍZIG. Such monitoring data contributes to the data collection and presentation requirements in Decrees 22/1998 and 219/2004. However, also involved in fulfilling these commitments are the Hungarian Geological Institute (Magyar Állami Földtani Intézet - MAFI) and the Environment and Water Research Institute (Környezetvédekmi és Vízgazdálkodási Kutató Intézet Nonprofit Kft. - VITUKI), a publicly owned water consultancy company linked to the Hungarian Academy of Sciences. MAFI has performed a significant amount of research into characterising groundwater bodies. They were the project managers for the characterisation of water resources necessary under the EU Water Framework Directive. This provides a detailed resource-mapping baseline, which can be combined with their on-going and long-term work into hydrogeological exploration. They maintain and make available hydrogeological and geological maps for the territory of Hungary. They are particularly involved in Decree 219/2000 (FAVI). VITUKI are

especially concerned with Decree 22/1998. They maintain maps and databases on monitoring data for testing wells and extraction points all over Hungary. This data is submitted by the KÖRKÖVÍZIG and bodies with operational permissions. Data is collected regularly from operational extraction points. They also maintain a hydrogeological diary based on measurements collected when the extraction points are initially drilled. VITUKI coordinate and harmonise all the data that is submitted to them from a variety of sources and operators. Based on their work, they then maintain a number of publications and datasets available to the public or interested parties.

Despite the Ministry of Health not being involved in the writing of any of the decrees, state health actors are involved in their implementation. Ensuring that the parameter values stipulated in Decree 201/2000 are met is the function of the public health authority, ÁNTSZ. ÁNTSZ is a national state body with regional level offices. Each regional level comprises several smaller offices that do not correspond to county boundaries, but are collections of municipalities. The localised offices act as physical presences of the regional office on the ground. The regional offices regulate public water supplies by controlling and issuing operational permits for public water supplies. They also issue operational permits for other public water supplies, such as decorative fountains and medicinal water sources. They monitor and regulate these supplies by collecting their own data, and ensuring that water suppliers also comply with their own monitoring procedures. Drinking water suppliers must take regular samples and have them analysed using an accredited laboratory. Results must be submitted to the local ÁNTSZ who act as a department within the regional ÁNTSZ; for drinking water provision, regional and local offices are one entity and the local offices are just different working locations of the regional ÁNTSZ. This occurs because the regional ÁNTSZ is given full responsibility for topics that have

a wider geographical scope than individual locations. However, the local offices are used to collect samples and information at the local level. The regional office is in turn part answerable to the national ÁNTSZ. They work according to the guidelines and instructions from national ÁNTSZ. However, the regulatory functions are performed entirely by the regional ÁNTSZ. At the national level, a part of ÁNTSZ includes the Institute of Environmental Health (OKI). OKI performs research functions, adding knowledge to the design and implementation of monitoring and regulation procedures. This is used in the work of the national ÁNTSZ. The budgets, priorities and functions of the ÁNTSZ and OKI are decided by the Ministry of Health (EUM). Therefore EUM is also engaged in the governance network for drinking water provision.

They way in which the municipalities choose to fulfil their responsibilities influences the actors involved in the governance network at the local levels. Each municipality can act separately, according to their own priorities. Arguably, this also makes local populations part of the network as it is they who elect the municipality and this shape its actions. Additionally, local populations determine the policy outputs around artesian wells. In terms of operating the wells, municipalities apply for operational permission to maintain them as decorative fountains. Some municipalities will place signs next to the well warning that it is not intended for drinking water, or that it has high arsenic content. However, well drinkers continue to use them, meaning that it is they who influence the success of this measure. In terms of tap water provision, this responsibility can be fulfilled alone, via a municipal-owned company, or by contracting the management to an external company. Therefore, at the local level, each town has its own governance system, which is shaped by the way in which the municipality chooses to fulfil its responsibilities. An external company can either manage a single-town distribution system or can join the town into a larger distribution system. In the county of Békés, there are 75

municipalities, each with the right to control their own water supply system. The companies brought in to execute these responsibilities are also primary policy actors as it is they who carry out the actions. Their relationship to municipalities is complex and varies depending on how the responsibility is discharged. The municipality may part- or wholly own the company. All of them retain ownership of the infrastructure in their boundaries, and retain rights of control in decision-making and fee setting. However, the company operates the system from a technical point of view. This means that at the local level in Békés County there are 75 different governance networks incorporating 75 municipalities served by 40 distribution systems operated by 11 different companies. These companies can choose to be a member of MAVIZ, the Hungarian Water company trade association. This association is in place to represent the water companies at the national level, spread knowledge of innovations and encourage collaboration.

The governance function of each of these actors relates to a specific role within the tiered policy system. Whether or not an actor is involved in policy translation, creation or facilitation, the level at which it operates and the other actors it interacts with all define this role. At the local level, town populations produce outputs with regards to well water management. They also influence municipalities with regards to drinking water management priorities. Based on this, municipalities set the boundaries of operation for the water companies. Therefore, in creating their own policy outputs, municipalities and local populations also create policy goals for the water companies. The water companies then produce policy outcomes. At the regional level, the regional ÁNTSZ and KÖRKÖVÍZIG create policy goals for both the municipalities and water companies through their policy outputs, which are requirements for the monitoring of drinking water and operational permits. The DARFÜ project outputs create policy goals for the municipalities by requiring them to act on forming associations. At the national level, in creating

its own policy outputs, the KvVM provides policy goals to the DARFÜ project and to the information agencies KÖRKÖVÍZIG, VITUKI and MAFI. These produce outputs in the form of databases and information that should feed in to management initiatives such as DARFÜ or individual planning by municipalities and water companies. The EUM provides policy goals to the national ÁNTSZ in the form of the requirement to develop monitoring procedures and processes. This is developed, and passed on to the regional ÁNTSZ. Therefore, each actor is defined based on the tier of policy to which it is connected, and its role in creating policy outputs and policy outcomes. This is depicted in figure 5.3 where every policy output producer has a black arrow emerging from it and every policy outcome producer has a grey arrow emerging.

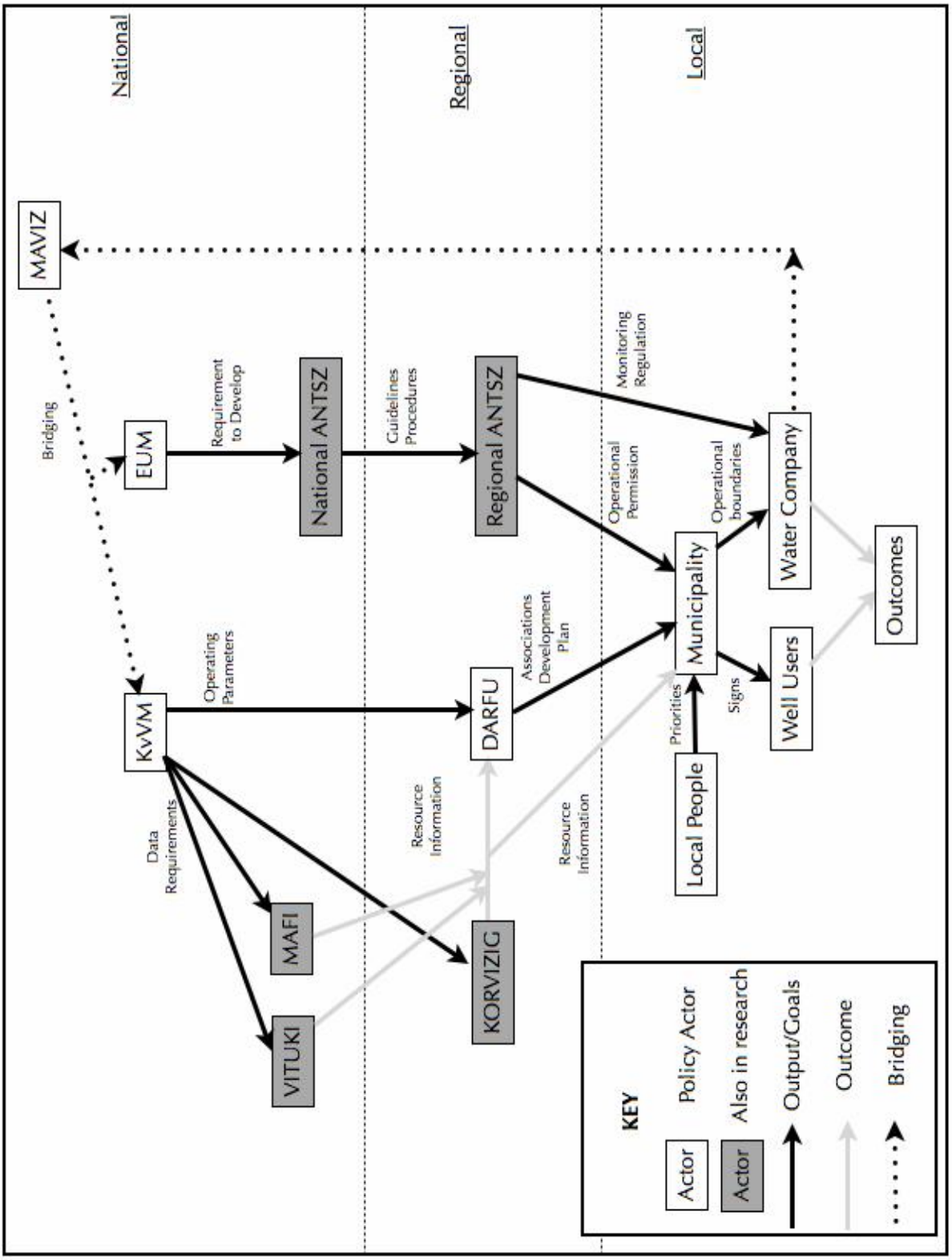

Figure 5.1: The Policy Infrastructure for Drinking Water Management in Hungary

Some actors also fulfil supplementary roles. For example, MAVIZ works as a bridging actor from the bottom to the top of the policy tiers. In figure 5.3, this bridging role is depicted as a dashed line. Other actors have been involved in additional research to feed into the policy process. At the local level, the Sustainable Management and Treatment of Arsenic Bearing Groundwater in Southern Hungary (SUMANAS) project was funded under the Life programme of the EU. This was a project led by the KÖRKÖVÍZIG, in cooperation with international partners from Finland, the Netherlands and Romania. It aimed to trial pilot remediation technologies in both Hungary and Romania. At the level of policy formulation, the Arsenic Health Risk and Molecular Epidemiology (ASHRAM) project was funded under the European Commission's 5th framework programme. This was a project led from the UK by the London School of Hygiene and Tropical Medicine. It had an international team of researchers, including the ÁNTSZ and OKI in Hungary. It studied the epidemiological impact of arsenic in drinking water in Hungary, Romania and Slovakia and was therefore a project aimed at improving knowledge for the higher levels of governance to shape policies. The actors that perform a supplementary research activity are shown in figure 5.3 with grey backgrounds.

5.2. Objective 2: Implementation Deficits

5.2.1. Causal Theory

<u>EU policies</u>

At the EU level, the setting of policy goals is the initial point in the policy system at which causal theory deficits are introduced. This is done via the setting of the 10 ppb limit in drinking

water. The EU sets as the policy problem the aim to achieve an excess lifetime cancer risk of 10^{-6} for non-threshold chemicals such as arsenic (EC, 1998). This means that the EU will accept 1 additional cancer per 1000 000 of the population to be caused by the consumption of arsenic in drinking water. The WHO, in their background documents to setting this 10 ppb limit, explore health risks and make recommendations on their management. They have collected research into the health risks posed by all arsenic consumption, and that specifically around consumption of arsenic in drinking water. This has been used in setting advisory limits, which have then been adopted by the EU for setting drinking water policy with regard to arsenic.

The causal theory used by the WHO in setting limits for chemicals in drinking water is provided by one of two methodologies, applied according to the nature of the health impact. Where the chemical is a non-threshold chemical, a multistage linearised methodology is used by the WHO. Study data is used to construct a dose-response curve for the points at which data exists. Where possible this is from human studies, however often animal studies are used. The studies used are often for high dose studies, and below this linearity is assumed unless there is evidence to suggest otherwise. Once the curve has been characterised, the lifetime excess cancer risk at lifetime average daily dose 1 mg/kg/day can be found. This is then used to create a Guideline Value (GV) by making assumptions on body weight and length of a lifetime. Where the chemical is a threshold chemical, a reference dose for the threshold effect is found. To calculate this reference dose, the NOAEL (No observed adverse effect level) or LOAEL (Lowest observed adverse effect level) is needed from a relevant study. Preferably this study would come drinking water ingested by humans, however in many cases animal studies are used. Therefore uncertainty factors (UF) and modifying factors (MF) are used in Threshold Daily Intake (TDI)

calculations to account for anticipated errors in translating the study used into reality. The calculation for TDI is shown in equation 1.

$$TDI = \frac{NOEAL(LOAEL)}{UF \times MF}\ mg/kg/day$$

Equation 1: Threshold Daily Intake (TDI) calculation

In the WHO background documentation, a non-threshold dose-response curve is considered that incorporates numerous problems. The WHO review shows that observations in a population drinking contaminated water indicated a limit of 0.00017 mg/l (0.17 ppb) for an excess lifetime skin cancer risk of 10^{-5} (Yamamura, no date, p.8). The WHO states that this limit likely to overestimate risk due to "possible dose-dependent variations in metabolism that could not be taken into consideration" (Yamamura, no date, p. 9). The data used for the WHO study is based entirely on research conducted on South East Asia on populations exposed to very high levels of arsenic in their drinking water. Little attention has been paid to areas in Europe where the intake tends to be lower and health impacts less immediately visible. Therefore, the dose-response curve at lower doses is based purely on extrapolation with no validation. To create a curve for low exposures would require huge populations to account for the larger confidence intervals associated with lower doses and lower risks, rendering them near impossible to create in the real world (Smith, 2004). Without data on lower exposures, it is necessary to assume linearity and take a precautionary approach to limit setting (Meharg and Raab, 2010). However, in the WHO limits, these precautions are undermined by the fact that all health impacts studied are cancers;

there is no consideration of the non-cancer effects, nor discussion of which end point occurs soonest. Therefore, the dose-response curve is not a curve of the first known health impact, rather it is a curve of the health impact chosen for study. As more research emerges relating other terminal diseases to arsenic consumption, such as chronic heart disease (Argos et al., 2010), these end-points are likely to need changing. Furthermore, the studies included in limit calculation have not considered non-drinking water exposure to arsenic, meaning that calculated limits allow the full arsenic dose to be achieved through drinking water alone. It is highly unlikely that drinking water will be a person's only exposure to arsenic. Overall, it is highly improbable that this dose-response curve yields a limit that is based on sound causal theory. Instead, it is an estimate that is based on some highly fallible assumptions.

Despite the anticipated threshold nature of arsenic impact, the background documentation also considers a limit calculated based on a TDI in order to compare with that calculated by the dose-response curve. To do so, they take an original Provisional TDI outlined by the WHO in the Joint FAO/WHO Expert Committee on Food Additives (JECFA) evaluation of certain food additives and contaminants (JECFA, 1983). This TDI is 0.15 mg per day. Using a LOAEL for arsenic in drinking water, the following assumptions are used in the calculation:

- Under normal conditions, air inhalation is a minor intake pathway (except for occupational exposure);
- The total intake from food is minute except in high-fish diets. In such instances, intake is primarily organic, and unlikely to be of concern (although monitoring data are recommended);

- Water is the most significant pathway of exposure, particularly in areas with high natural arsenic;

- People drink 1.5 l per day and weigh 75 kg.

In turning this TDI into a limit for drinking water, 20% of the total TDI is allocated to drinking water. They derive a recommended value of 0.013 mg/l (13 ppb). Whilst this approach considers cumulative impact, it is clearly problematic in that it uses a safe dose calculation for a non-threshold chemical. Furthermore, the original TDI has since been withdrawn. The TDI was acknowledged as possibly being "toxic in the long term to some individuals" (JECFA, 1983). In a JECFA review (JECFA, 2010), a benchmark dose lower confidence limit (BMDL) for a 1% increased incidence of lung cancer caused by arsenic was calculated using recent epidemiological data. The $BMDL_{01}$ identified is in the region of 0.3-8 μg/kg bw per day when accounting for the range of estimated total dietary exposure. The TDI of 0.15 mg per day would be an intake of 0.25 μg/kg bw for a 60 kg adult (the standard weight used in WHO limit calculations (WHO, 2003)). The proximity of the TDI to the $BMDL_{01}$ has prompted its withdrawal (CONTAM, 2010) and therefore any drinking water limit based on it should be considered inappropriate.

The limit finally adopted by the WHO, following consideration of both flawed approaches, fails to account for any causal theory at all. Ultimately, they base the limit of 10 ppb (10 μg/l) on no epidemiological data. The limit is justified in light of the "significant uncertainties" (WHO, 2003, p.7), in the risk assessment. Instead, practical considerations are cited as the basis on which the limit is set. These considerations are that 10 ppb can be monitored easily using basic laboratory equipment, and that it is practically achievable to reduce arsenic concentrations to this level using current technology. However, it is recognised that even this may not be achievable in

some locations, and in these circumstances, a higher rate may be allowable. This limit is much higher than that calculated using a dose-response curve, though slightly lower than that suggested by the discredited TDI. Overall, there is no evidence to suggest that this limit will approach the policy problem of achieving a 10^{-6} excess lifetime cancer risk. It therefore introduces a type D deficit into the EU policy output.

Domestic policies

The opportunities for causal theory deficits in domestic policy outputs are few. The national level policies do not introduce any measures that are not direct translations of the EU legislation. The current regional policies are those of monitoring and issuing permits. Monitoring procedures do not relate to the implementation of the 10 ppb limit, they merely show whether or not it is being achieved. The causal theory incorporated into monitoring procedures is important in designing effective monitoring. How often it is conducted, the sampling campaign and the analysis techniques used all influence the effectiveness of the monitoring procedures in keeping accurate records of tap water content. However, the monitoring procedures do not directly shape implementation of the 10 ppb limit. Therefore, errors in their causal theory do not constitute errors in the causal theory of the implementation of arsenic limits. The same argument can be made for database and record keeping requirements. The next point in the policy system at which causal theories are introduced is at the level at which management actions are chosen and taken. This includes the DARFÜ project plans for each association. However, because associations are not yet finalised, these plans have not yet been selected. Therefore, they cannot be scrutinised for implementation deficits. The current management approaches are available for scrutiny.

The current management processes and technologies that are in place do offer potential for causal theory deficits. Current management approaches in Békés County were designed with the intention to meet an arsenic limit in drinking water of 50 ppb. In the 1980s when the 50 ppb limit was introduced, management action in Békés county focussed on sourcing water which already met the limit, and mixing water sources in order to decrease the concentrations of arsenic. In order to make this possible, the pipe network was expanded and consolidated. This was done under a drinking water improvement programme instigated at the county level, which no longer exists as an actor in the governance network for drinking water. A large central water company was founded, alongside numerous smaller systems. This change can be seen in figure 5.4. In 5.4.a the old supply systems that breached the 50 ppb limit are shown. In 5.4.b the systems as formed by the end of the 1980s, and which remain today, are shown. Generally, the supply systems that remained separate and independent were those that already had a water source that complied with the 50 ppb limit. An iron-based filtration technology was employed in a smaller distribution system covering the towns of Szeghalom and Füszesgyarmat, where a source of low arsenic water was not available. This system works by causing the arsenic to co-precipitate onto oxidised iron, which is then filtered out of the water. The high organic matter of the raw water means that the filters do not work at optimal efficiency as the organic matter competes with the arsenic to precipitate with the iron. As a result, complete removal of arsenic is not possible with this filter, although it does bring the water within the 50 ppb limit.

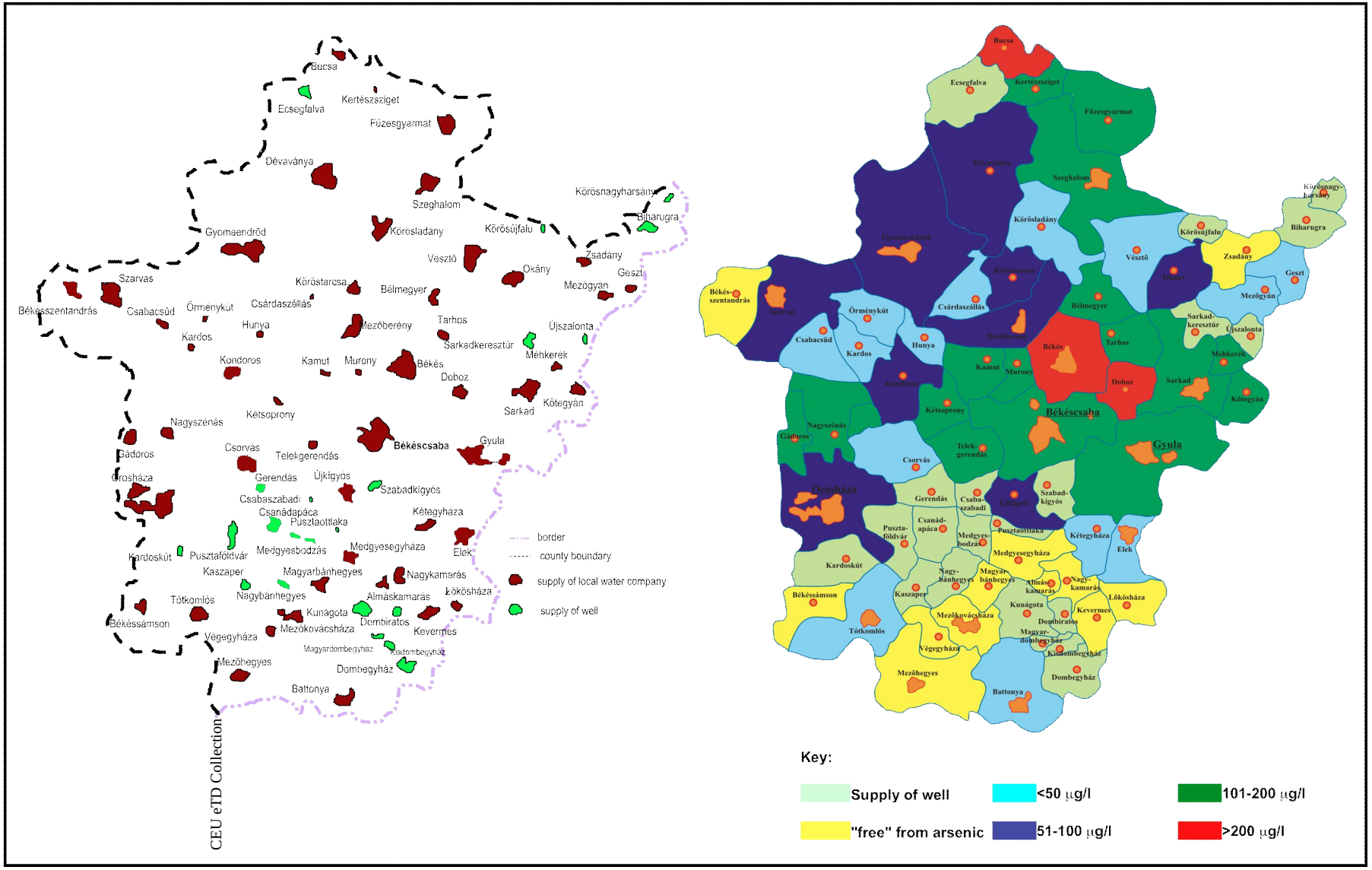

Figure 5.2a: Drinking Water Distribution and Arsenic Content 1980. Source: Maraczi and Musci, 2005

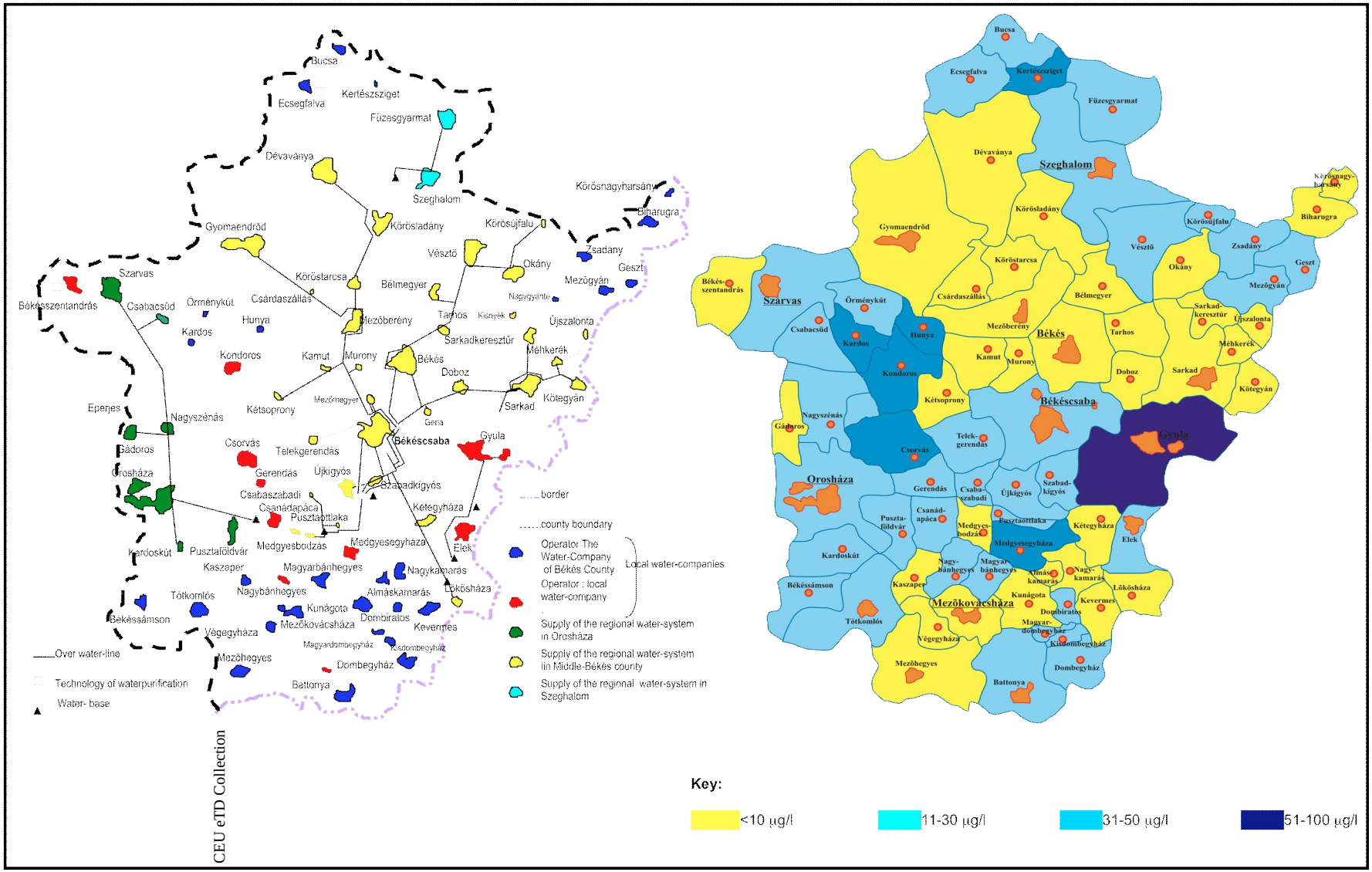

Figure 5.2.b: Drinking Water Distribution and Arsenic Content 2005. Source: Maraczi and Musci, 2005

5.2.2. Administrative

The current management of drinking water has administrative deficits only at the very local level. All of the legislation is in place in Hungary, and on paper it complies with the EU legislation. However, the local municipalities and water companies are failing to translate this into delivering water that meets the targets. This is shown by table 5.1, based on public health authority data, and figure 5.5, based on my samples. My data suggests lower arsenic levels than recorded by the public health authority data, although there is agreement between which towns or distribution systems exceed 10 ppb and which comply. However, my sampling points have not covered every location, or every distribution system. There are three likely reasons for the difference in concentrations. Firstly, the arsenic concentrations depend upon the current consumption of tap water, and on the different water sources that are feeding into the distribution system at that moment in time. My data is from a single sampling campaign and therefore is likely to represent a day when the arsenic levels were lower, whereas the public health authority's data is from a long-term dataset. Secondly, we may have employed different analytical techniques. I used ICP-MS, but I have no details on the methods employed by the public health authority or their laboratories, therefore the difference could be due to a difference in detection methods. Thirdly, there is a difference in monitoring points between the two sets of data. My data was taken at the tap; the point at which water leaves the distribution system. In the official data, monitoring is conducted as the water enters the distribution system. Given the high iron content of the water, it is highly likely that there is some level of oxidation and precipitation in the pipes. This means that arsenic co-precipitates build up on the inside of the pipes, preventing

arsenic from being in the water as it leaves the system. However, this presents a danger if there is a change in the flow rate in the pipes that causes mobilisation of the precipitates. Arguably, if the water companies and public health authorities followed EU requirements for monitoring at the point of consumption, the processes inside the pipe, or the seasonality of arsenic concentrations could ensure higher levels of compliance on most days, with occasions on which changes in the hydraulic regime of the pipes prompts flushing of very high concentrations of arsenic at the point of consumption. What both sets of data confirm is that there are instances whereby the arsenic content exceeds the EU limits, and therefore where the water companies and municipalities are failing to translate policy goals into action at their policy level.

Table 5.3: Local Management Approaches and the Impact of Causal Theory Deficits

Municipality	Population	Management
Arsenic Concentration <10 ppb		
Békés	20,647	BMV-KB
Dévaványa	8,273	BMV-KB
Gyomaendrőd	14,680	BMV-KB
Mezőberény	11,274	BMV-KB
Sarkad	10,619	BMV-KB
Bélmegyer	1,087	BMV-KB
Csárdaszállás	484	BMV-KB
Doboz	4,419	BMV-KB
Kamut	1,078	BMV-KB
Kétegyháza	4,261	BMV-KB
Kétsoprony	1,520	BMV-KB
Körösladány	4,829	BMV-KB
Köröstarcsa	2,676	BMV-KB
Kötegyán	1,446	BMV-KB
Lőkösháza	1,920	BMV-KB

Municipality	Population	Management
Medgyesbodzás	1,140	BMV-KB
Méhkerék	2,160	BMV-KB
Murony	1,326	BMV-KB
Okány	2,743	BMV-KB
Sarkadkeresztúr	1,647	BMV-KB
Tarhos	1,005	BMV-KB
Újszalonta	114	BMV-KB
Mezőhegyes	5,578	BMV-Local
Mezőkovácsháza	6,454	BMV-Local
Almáskamarás	880	BMV-Local
Biharugra	932	BMV-Local
Kaszaper	2,028	BMV-Local
Kevermes	2,187	BMV-Local
Körösnagyharsány	584	BMV-Local
Kunágota	2,768	BMV-Local
Nagykamarás	1,534	BMV-Local
Végegyháza	1,497	BMV-Local
Gádoros	3,881	BMV-O
Békésszentandrás	3,960	IND-Local
Arsenic Concentration 11 to 30 ppb		
Békéscsaba	64,852	BMV-KB
Vésztő	7,259	BMV-KB
Körösújfalu	638	BMV-KB
Pusztaottlaka	387	BMV-KB
Szabadkígyós	2,857	BMV-KB
Telekgerendás	1,626	BMV-KB
Újkígyós	5,537	BMV-KB
Battonya	6,131	BMV-Local
Tótkomlós	6,164	BMV-Local
Békéssámson	2,488	BMV-Local
Bucsa	2,356	BMV-Local
Dombegyház	2,232	BMV-Local
Dombiratos	614	BMV-Local

Municipality	Population	Management
Ecsegfalva	1,272	BMV-Local
Geszt	780	BMV-Local
Kisdombegyház	509	BMV-Local
Magyarbánhegyes	2,478	BMV-Local
Magyardombegyház	266	BMV-Local
Mezőgyán	1,146	BMV-Local
Örménykút	446	BMV-Local
Zsadány	1,692	BMV-Local
Orosháza	30,356	BMV-O
Szarvas	17,731	BMV-O
Csabacsűd	1,902	BMV-O
Kardoskút	931	BMV-O
Nagyszénás	5,370	BMV-O
Pusztaföldvár	1,776	BMV-O
Füzesgyarmat	6,133	BMV-Sz
Szeghalom	9,465	BMV-Sz
Elek	5,173	IND-Local
Csabaszabadi	366	IND-Local
Csanádapáca	2,783	IND-Local
Gerendás	1,418	IND-Local
Nagybánhegyes	1,269	IND-Local
Arsenic Concentration 31 to 50 ppb		
Hunya	711	BMV-Local
Kardos	682	BMV-Local
Kertészsziget	417	BMV-Local
Csorvás	5,441	IND-Local
Kondoros	5,465	IND-Local
Medgyesegyháza	3,891	IND-Local
Arsenic Concentration 51 to 100 ppb		
Gyula	32,016	IND-Local

Code	Meaning
BMV	Operated by Central Békés Company
IND	Operated by Municipality
KB	Linked to central distribution system
O	Linked to Oroshaza distribution system
SZ	Linked to Szeghalom distribution system
Local	Local distribution system

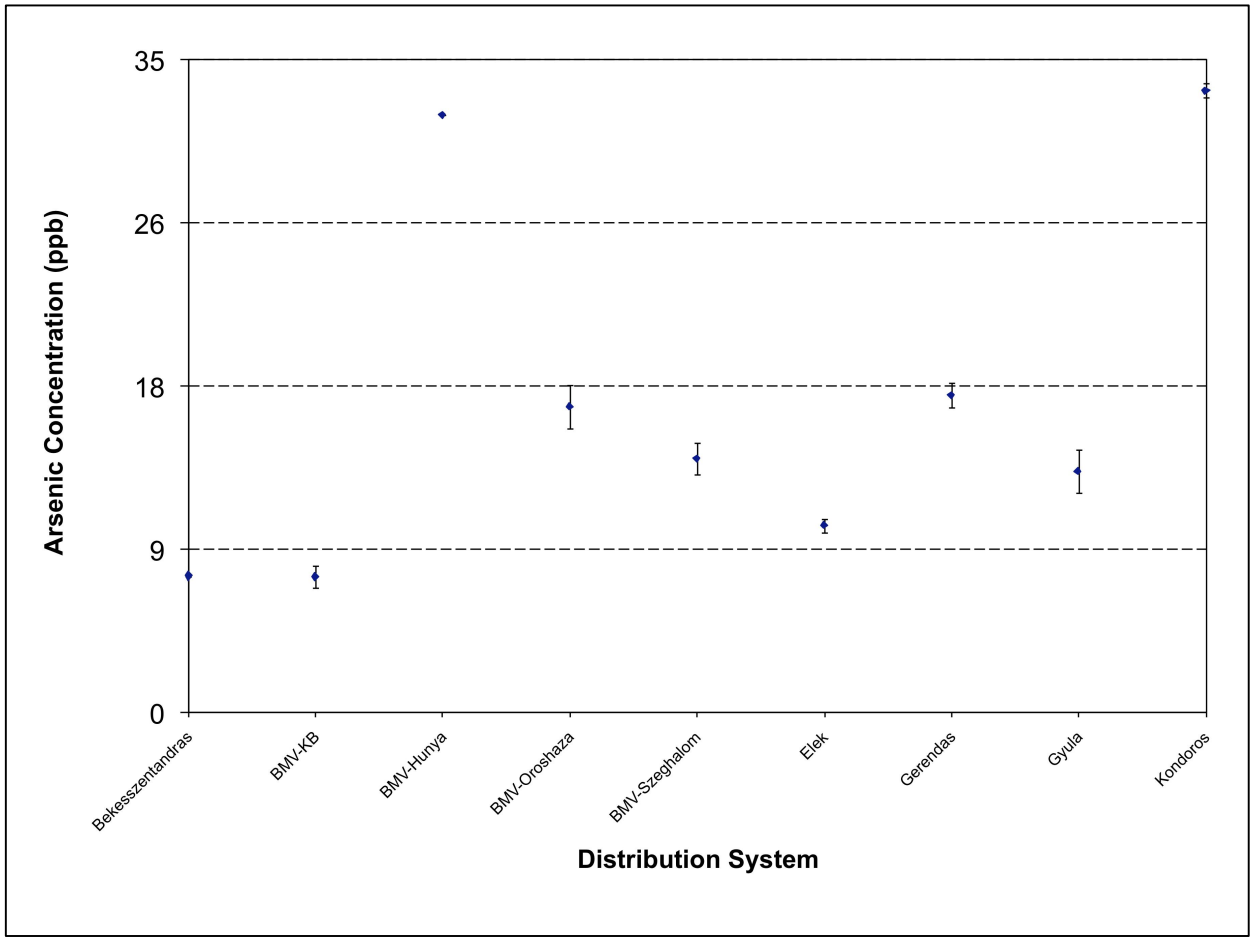

Figure 5.3: Arsenic at Tap (based on own samples)

The DARFÜ programme aims to remedy these type A deficits, but in doing so it incorporates a number of administration deficits in its translation through the policy system.

There is a solid type A deficit in the timescales that it sets out in the plans. The schedule only provides for the formation of associations and adoption of individual action plans before the end of Hungary's derogation period. It therefore fails to incorporate the targets adopted by national policy. However, even these timescales are unlikely to be met; the municipalities are reluctant to join associations. At the time of research, the municipalities were negotiating and choosing associations. By the end of the data collection period (March 2010), the associations were not finalised, and therefore recommended actions had not been accepted, and tender documents had not been prepared. By 22nd June 2010, five associations had been formed, including 63 of the 75 municipalities. This translates into a local level type A failure, where the municipalities fail to adopt the policy of the regional level. There are opportunities in the future for further type A deficits. These would occur if the municipalities did not accept the management plans that were proposed for them. This is currently impossible to predict. However, the DARFÜ project managers are working hard to avoid it; they have revised options and commissioned further studies as a result of dissatisfaction reported from the municipalities in response to emerging options.

The DARFÜ project has also experienced a number of type C deficits, some of which have been resolved, and others have not. The original project was to occur in two phases. The first round would concentrate on those settlements exceeding 30 ppb, followed by those exceeding 10 ppb in the second round. This became untenable because the infrastructure already in place, and the infrastructure required for both sets of settlements, made it impossible to separate them. In this case, the technical challenge of implementation meant that the approach was not the best option for management (type C deficit). Therefore, the project was relaunched to address both groups of settlements collectively. In doing so, it reinforced the type A deficit of failing to meet

the timescales in the legislation because the settlement exceeding 30 ppb were then remediated later. In addition, the project has had to change its approach because it initially did not allow associations to form across county boundaries. This was revised when it became apparent that it was technically desirable to allow associations with the nearest settlements, regardless of their county affiliation. The remaining type C deficit is still present in the project and was introduced because of the social challenge of implementing the project. It is evidenced by the type A deficit of municipalities being reluctant to join associations. The associations proposed by the project management were based entirely on technical considerations, and the optimal technical approach for changing drinking water infrastructure. These failed to account for the desires of the municipalities and existing working relationships. This means that the associations proposed were not the best management approach from the point of view of the municipalities (type C deficit), and this has induced the type A deficit of municipalities failing to form associations.

The management of artesian wells introduces administrative deficits over multiple policy levels. The first is over their operational status. In many locations, the wells have been closed or destroyed so that they are no longer accessible. In others, the wells continue to be functional. The management approach of the municipalities that operate wells are to place signs on the wells, though these signs are not on every well. Where they are present they either say that the water is not intended for human consumption, or that the water has a high arsenic concentration. Examples of these signs are shown in figure 5.6. Regardless of the signs, members of the local population continue to use the wells as a source of drinking water, and some of them as a primary source. In this case, they are displaying a type A deficit whereby they fail to heed the policy output of the municipalities. The reasons for their continued use of wells are explored in chapter 6, but this type A deficit also implies a type C deficit in the municipalities; they are failing to

implement management that accounts for the actions of the well drinkers. The placing of signs is evidently not sufficient to prevent the consumption of well water, and yet the municipalities are failing to take any other approach. There is little incentive for them to do so. The operation of these wells is via operational permission granted by the regional ÁNTSZ. They are run as decorative wells because they are not intended for human consumption. This means that at the regional level, there is not an appropriate policy mechanism to control the operation of the wells. This regional type C deficit is linked to the national level where there are no laws or regulations to induce a regional policy mechanism to control wells. Therefore, there is also a type C deficit at the national level in terms of the absence of well control procedures.

Figure 5.4: Wells with Signs in Gyula (top) and Békés (bottom)

5.2.3. Relationships

The existence of one deficit at a policy level flows into proceeding policy tiers, contributing to deficits further down the governance system. In terms of both wells and the DARFÜ program, the type C deficits flow into further type C deficits, or into type A deficits. This is caused because in this context, the type C deficits are the result of policies that do not reflect the actions or wishes of the policy level below. Therefore, they fail to control actions and prompt type C or type A deficits at the level below. The type B deficit also creates a knock-on effect into the policy level below. The type A deficit of municipalities and water companies failing to meet the 10 ppb limit is caused by physical limitations on their actions. The current infrastructure in place for drinking water provision does not allow 41 municipalities in Békés county to deliver water that consistently meets the 10 ppb limit. Changing this is a huge financial and technical commitment. Therefore, the current type A deficit at the local level is caused because the management approaches are based on causal theory that is intended to secure a higher limit of 50 ppb. In this way, deficits at lower tiers of policy are likely to have causes that include the previous deficits, combined with additional causes from the policy level at which they occur.

In addition, there is carry-through in the deficits. This occurs when there is a type A or a type D deficit. These deficits do not directly induce deficits at the proceeding policy tier; the next level continues to translate the goals it is given regardless of the presence or absence of a type A or D deficit. However, even when they act appropriately and without additional deficits themselves, the type A or D deficit from above will influence the success of any outputs from that level. Type A deficits can prevent the policy from producing any output at all. If the policy is not translated, the levels below have no policy goals to which they need to act. This occurs

with the municipalities in the DARFÜ project; they have not translated the DARFÜ project into associations, and therefore the improvements cannot be implemented, and the water companies cannot deliver water that achieves the 10 ppb limit. Alternatively, a type A deficit can introduce an error that is carried forward. For example, the timescales in the DARFÜ project do not meet those in the derogation in national legislation. Therefore, none of the actions prompted by the DARFÜ project will meet these national timescales. It is this second kind of influence that is experienced in terms of carry-through of the type D deficit. The error in causal theory at the EU level means that even if every subsequent tier were perfectly implemented, the final outcome would not solve the policy problem of 10^{-6} lifetime excess cancer risk.

The properties of flow and carry-through mean that deficits can be grouped according to their relation to a specific management focus and such groups collectively explain governance failures. One category of deficit is that which refers to current management of tap water. These are all the deficits that dictate that currently, tap water exceeds 10 ppb. The next category relates to the drinking water improvement programme. These are all deficits that occur in the policy mechanisms through which the current management will be brought in line with the 10 ppb limit. Finally, the third category relates to the management of wells. These are all the deficits that exist that cause the availability of untreated, high arsenic waters to the population via artesian wells. This grouping of deficits is shown in figure 5.7 where each of these categories is shown in a different colour, and flow is indicated with arrows. The only deficit that belongs to all categories is the type D deficit at the EU level and this exhibits carry-through into all groups. The 10 ppb limit set by the EU forms the policy goal for everything underneath. It dictates that wells need managing because they provide a source of drinking water that exceeds 10 ppb. It dictates that tap water needs managing to bring concentrations of arsenic below 10 ppb. Therefore it also

feeds into the DARFÜ project by creating the necessity for the programme and guiding its actions. This means that the type D deficit built into the 10 ppb limit is fed into every category of deficit. This grouping means that the causes of deficits cannot be considered in isolation. Rather, each group of deficits needs to be seen as a chain of individual events, rather than as isolated occurrences.

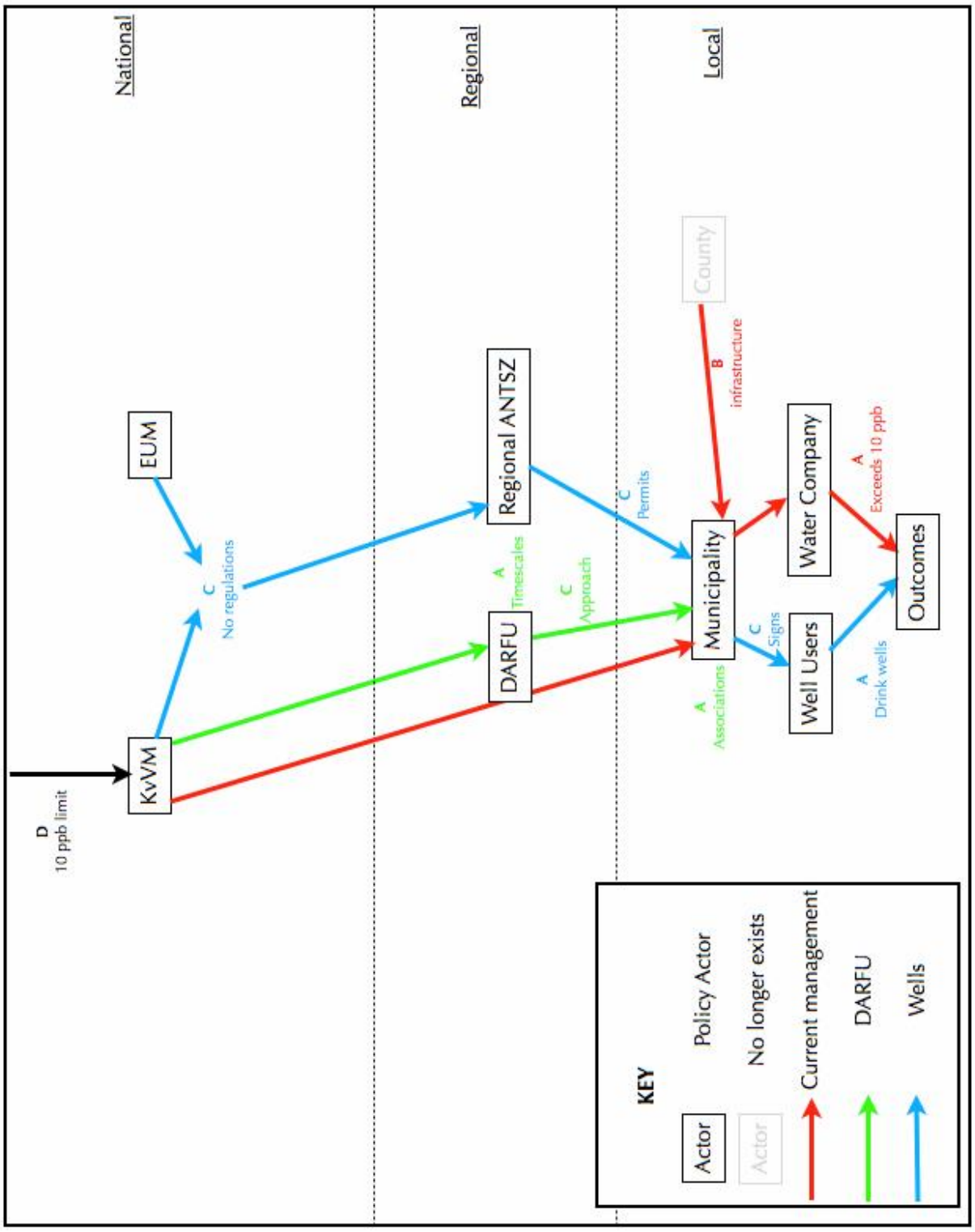

Figure 5.5: Chains of Implementation Deficits and Involved Actors

6. Policy Actor Review: Discourse, Beliefs and Actions

6.1. Refined Sampling and Methods

6.1.1. Policy Actors

Due to the data requirements for this study, the number of municipalities involved was narrowed in response to the identification of policy actors. The volume of data required for each town made it impossible to involve all 75 municipalities, 11 water companies, and the populations of 75 towns. It was also not entirely necessary because each town had a separate governance network below the regional level. Therefore, including all towns would mean that 75 governance networks were studied. Instead, I studied a smaller collection of municipalities in order to compare and contrast their networks and their successes and failures. This was intended to lead to a better consideration of how different causes of failures were dealt with differently between governance networks. Between the municipalities, there are two different approaches to management (independence or joining with a company), and various degrees of management success. Therefore I chose 4 different towns that cover both approaches and the range of successes. These towns are shown in table 6.1. Here the governance failures are indicated in red.

Table 6.1: Selected Case Study Towns and their Local Governance Networks

Town	Population	Distribution Type	Tap Water As concentration* (ppb)	Known wells	Local institutions
Békés	20,647	Central company, system serves many towns	<10	2	•Municipality •BMV •Population
Békésszentandrás	3,960	Municipal company, single town system	<10	0	•Municipality •Municipal company •Population
Gyula	32,016	Municipal company, single town system	50<	3	•Municipality •Municipal company •Population
Szeghalom	9,465	Central company, system serves two towns	11<>31	0	•Municipality •BMV •Population

* Tap water arsenic concentrations are according to ÁNTSZ data.

For the majority of policy actors, an elite interviewing approach (Dexter, 1970; Richards, 1996) was the best way to gather discourse representative of the whole actor. Where the actor was a formal organisation with specific, mandated functions, it was possible to locate a single person to act as a respondent who could represent the discourse and have sufficient knowledge to talk about functions, roles and policy. This approach of elite interviewing is often used to provide

a key insight into the workings of an organisation as viewed from those who exert the most power and control within it (Goldstein, 2002). To use the method in this way, the respondent needed to have a position that gave him/her significant influence over the institution, in order that their discourse could be considered indicative for the wider organisation. Additionally they needed extensive knowledge on how the organisation functioned. Therefore, I contacted the most senior person within an organisation. Where the organisation was multi-departmental (e.g. a ministry), the most senior person in the department that dealt with drinking water issues was contacted. Occasionally, requests were forwarded until a respondent who matched the requirements, and who felt comfortable being interviewed, was found. Often, the respondent was also the key respondent involved in the policy review section of the research. This meant that the respondent was aware of the nature of the research, and a good working rapport had already been established. A list of policy actors that supplied respondents (and the number of people interviewed) is shown in table 6.2, along with information of whether or not an interpreter was used, though names are not provided due to the promise of anonymity. The questions asked of these respondents were unstructured and according to the themes outlined in chapter 4.

Table 6.2: Elite Interviewing Respondents

Policy Actor	Policy Tier	Number of Respondents	Language
KvVM	National	1	English
EUM	National	1	English
MAVIZ	National	1	English
VITUKI	National	2	English

Policy Actor	Policy Tier	Number of Respondents	Language
MAFI	National	1	English
National ÁNTSZ	National	3	English
KÖRKÖVÍZIG	Regional	3	English
DARFÜ	Regional	1	English
Regional ÁNTSZ	Regional	2	Hungarian (with translator)
Békés Municipality	Local	2	Hungarian (with translator)
Békésszentandrás Municipality	Local	1	Hungarian (with translator)
Szeghalom Municipality	Local	3	Hungarian (with translator)
Gyula Municipality	Local	1	Hungarian (with translator)
Central Békés Company (BMV)	Local	1	Hungarian (with translator)
Békésszentandrás Company	Local	1	Hungarian (with translator)
Gyula Company	Local	1	Hungarian (with translator)

6.1.2.Local populations

A much broader data collection technique was required for local populations where no single respondent could represent the whole population. Local populations do not form a formal organisation, and therefore the responses of one cannot be considered representative of all. Instead, I contacted larger numbers of people with the aim of gathering a range of discourses that existed in the population. The number of people that held each opinion was not relevant in order to understand the various beliefs and discourses that existed within the population. It was just necessary to know what discourses exist and how this shapes behaviour towards drinking water. It was therefore necessary to collect a sample of respondents that allowed scope to cover all possible discourses and drinking water behaviours. I conducted semi-structured interviewing campaigns at wells in the study towns and on the street in order to capture a wide range of local populations with varying discourses around water management. For the on-street interviews, locations and times were varied and chosen to allow a broad range of society to participate. In each town, locations with a large number of passers-by were selected. In Gyula and Békésszentandrás this included outside the local market. The markets were not as regular and popular in Békés and Szeghalom, so alternative locations were chosen. In all towns, locations in the town centre and in the residential areas were used. Interviews were conducted both during the working day, and in the evenings and weekends. All respondents were asked where they currently lived and non-residents were not interviewed as they were not considered to be a part of the local population. The total numbers of interviews conducted in each town and at each well are shown in table 6.3. In line with the grounded theory approach of this research, the number of interviews was not pre-determined. Instead, interviews with new respondents continued until no new discourses were being collected, thus allowing for the generation of explanations rather than

a quantification of their generalisability to the whole population (Glaser and Strauss, 1967). Where this point was achieved after only a few respondents, interviews continued for a number of new participants in order improve confidence that a full range had been collected.

The questions were constructed so as not to guide responses. People who are asked specifically for problems relating to a topic are more likely to find problems, whereas they might not have considered them as problems before the question. Understanding the priorities and concerns of water users instead of asking them to conform to predefined categories was important. Therefore, in response to tips outlined in Kvale (1994), questions were written to allow responses that indicated how the respondent had interpreted questions. The interview began with a brief introduction explaining that I wanted to learn about drinking water behaviour and the reasons behind these choices. I explained that I was not an official of any kind and therefore would neither be reporting responses to anyone, nor would I have the power to change water services. All participants were asked what water they drank and why. The why question allowed respondents to highlight only those factors which motivated their own behaviour. Follow up questions were formulated in response to answers given. The participant therefore largely determined interview length and content. With the assistance of a translator, questions such as "what do you think about tap water?" or "do you have any concerns about tap water?" were only asked later on in the interview. In both the street and well interviews, responses were noted by hand. Particular note was made over discourse that was prompted (later questions) or freely volunteered (early questions). There was always time allowed between respondents to allow detailed note taking while information was fresh in my mind. At the end of each day, I typed-up the notes and clarified any uncertainties with the translator. The disadvantage of this approach was that direct quotes could not be used in analysis, except in exceptional cases where I

had been able to transcribe exactly. This disadvantage is outweighed by the flexibility and speed of the approach that allowed me to gather a wide range of discourses in a short space of time without being invasive to the participant.

Interview data was used to identify categories of local population based on shared narratives and discourse around water use and management. By categorising local populations according to location and shared discourse, conflicts in discourse within a single town were accounted for, allowing all viewpoints to be included in the research. Therefore, the local populations were split into further sub-categories of policy actors. Narratives were then explored for each of these categories. In creating these categories and analysing narratives, there were no pre-defined codes, but patterns were spotted and coding was refined in response. Because of the semi-structured interviewing approach, results between participants were not comparable. Questions may have been asked of one participant, but not of another. It was therefore not possible to say definitely that these categories of policy actors reflected an actual division because it was possible that all the people in one category had been asked a question that people outside the category had not been asked. This lack of comparability also meant that exploration of correlations between discourse and water use behaviour was limited, and therefore the data was limited in its ability to explain the role of the local population in the creation of implementation deficits. The interviews produced rich descriptive data, but further confirmation of patterns was required in order for them to be of maximum use to the research.

In order to explore identified relationships and confirm categorisations and coding of the interview data, a small number of quantitative surveys were conducted based on the interview results. The questionnaire can be seen in Appendix 2. Questions are based on the codes

identified from the interviews. Topics and themes were used to write questions, and the individual codes were used to create multiple-choice answers. In order to assess level of concern for specific water parameters or characteristics, respondents were asked to state a number between 1 and 5. To keep with Hungarian conventions, 5 was very concerned, and 1 very unconcerned. Similarly, respondents had 5 options for rating tap water quality, including very good, good, middle, bad, and very bad. Responses were analysed using Excel to create frequencies for each response in each town. At this time, the 5 categories of response for opinions were reduced to three. Very good and good were combined to 'positive', and very bad and bad combined to 'negative'. 1 and 2 were 'not concerned', and 4 and 5 were 'concerned'. I felt that distinguishing between very bad and bad was not meaningful; it was more important to see whether it was positive or negative. Opinions on tap water quality in each town were compared by calculating the percentage of respondents in each reduced category. In order to examine the impact that concerns for each parameter had on water quality perception, correlation calculations were not conducted. Correlation coefficients are not mathematically meaningful for two sets of categorical variables, particularly where there are only three categories in each variable. Additionally, the sample was neither large enough nor representative in order to do such calculations. Therefore, comparisons were done graphically. The percentage for each quality category was plotted alongside the percentage concerned for each parameter in each town and relationships were explored visually.

The sampling approach for the questionnaires was to place them in local libraries in each town. The libraries in each town are popular and there are always many people there. They are centrally located in the towns and provide many people with internet access and community information. In addition, they host community meetings and events. Placing the questionnaires

in the libraries meant that they would be available to a broad range of the population. They were accompanied with an introductory notice about the study, and the librarians were given information on the project in case they were asked. I also displayed my contact details in case anybody had any concerns or queries. They were collected from the libraries after 2 months. The final sample size is small (see table 6.3), and despite the popularity of libraries, the sample cannot be considered representative of the overall population. However, there are sufficient data to explore trends identified during the interviews.

In addition to exploring discourse, a limited amount of organoleptic data was collected for the tap water in order to provide context to the narratives of local populations. Organoleptics are discussed in chapter 2 in terms of their influence on health and quality perceptions of drinking water. Therefore, a background understanding of the organoleptics and chemical properties of the water would add context to discourse provided, particularly from local policy actors. Common components that contribute to organoleptic issues, or to breaches of EU legislation set in the Drinking Water Directive in order to protect consumer acceptability were analysed. Organoleptic compounds include compounds of chlorine or free chorine, formed during chlorination treatment. They are also formed by organic matter reactions within the water. In addition, Iron (Fe), Sodium (Na) and Calcium (Ca) can contribute to the salinity or metallic tastes of water. Testing was done simultaneously to that described in section 2 of this chapter.

Table 6.3: Interviews with Local Populations and Well Users

Town/well	Sample size (interviews)	Sample size (questionnaire)
Békés - Asztálos utca well - Main square well	41 - 70 - 51	23
Gyula - Part utca well	84 - 5	31
Békésszentandrás	29	26
Szeghalom	29	28

The elements Fe, Na, Ca were analysed in Switzerland using ICP-MS on water in the pre-acidified vials according to the sampling and methods identified in chapter 4. At each sample site, Free and Total chlorine were measured using SenSafe^{TM} test strips. A basic smell and taste test were conducted, using the smell-taste wheel to identify likely compounds (Suffet et al., 2004). This test (see figure 4.2) allows for the identification of groups of compounds responsible for distinct smells and tastes, though not for individual compounds within this. Such detail on individual components is not necessary, it is enough to understand what the smells and tastes are. The test can be subjective, despite the categories of taste being quite wide. To tackle this, I conducted the test, and the translator repeated it separately. I knew the categories in advance, and the translator did not, meaning that her descriptions were not tailored to the categories. Our notes compared and discussed for the final results immediately after the test.

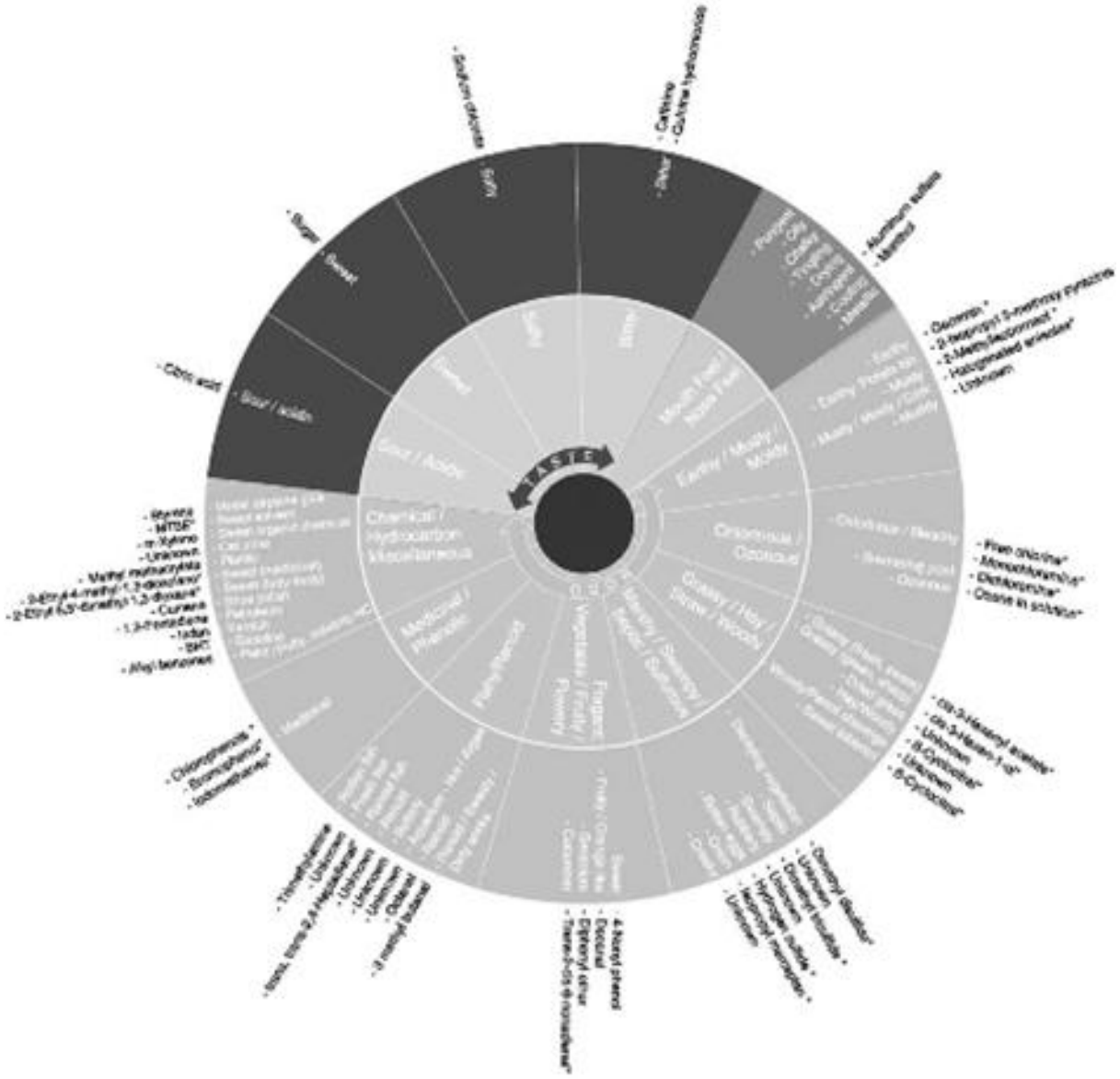

Figure 6.1: Smell-Taste Wheel. Source: Suffet et al., 2004.

6.2. Narratives

6.2.1. Local People

Sources of Variation in the Narratives of Local People

The starting narrative of all unprompted street interviews is that of drinking water behaviours. In all towns, street interview respondents identified themselves according to whether they drank only bottled, mineral water, only tap water, only well water, or a combination of these options. This information was gleaned from both direct questions, such as *"do you drink the tap water?"* and *"what do you drink?"*, as well as less direct questions, such as *"what do you think of the tap water?"* or *"what is your opinion of drinking water in your town?"*. These questions would prompt responses around drinking water behaviour, including opinions of the chosen source, and motivations behind this choice. The number of respondents identifying in each category is shown in table 6.4. The use of well water was higher in the towns that had wells than in the towns without. However, for the other water behaviours, proportions are similar across all towns. Sample sizes are not large enough to state whether or not there is any real and significant difference between drinking water behaviour in each town, and it is suggested that the behaviours are similar across all towns. Between 39 and 48% of respondents in each town rely entirely on non-tap sources (well and mineral water).

This categorisation of drinking water behaviour shapes the narratives of respondents around drinking water management. This is shown in the way in which respondents chose to speak about their chosen, and other, drinking water sources. With regards to each water source, respondents either spoke in a positive manner, a negative manner, or a neutral manner.

Alternatively, they expressed no particular opinion in any direction. Indifferent opinions and no expressed opinions were both deemed to be indifferent, on the basis that if strong opinions in either direction were held they would be voiced. Figure 6.1 (a, b, and c) shows the perception of each water source categorised by the primary drinking water source of interview respondents. They show that the mineral water drinkers are mainly indifferent (or have no opinion) about well water and mineral water, but are negative about tap water. The well water drinkers are unique in their responses in that they are not only negative about tap water (similar to the mineral water drinkers), but they are also mainly positive about well water. This positive opinion of their chosen water source separates them from mineral water drinkers who are indifferent to their chosen water source. Of those who drink tap water, either wholly or as one of their mixed sources, there are some positive responses to tap water, though these are few. The questionnaire responses indicate that this varies with each town, with Békésszentandrás receiving the lowest percentage of respondents with a positive perception of water quality. This is shown in figure 6.1. However the majority remain indifferent to all water source options. Well water drinkers are therefore the only group that have strong enough positive opinions of their chosen source to state them. This separates them as a distinct category, with tap and mineral water users in a second category.

Table 6.4: Drinking Water behaviour by count (% respondents in each town in brackets)

Town	Tap water (%)	Well water (%)	Mineral water (%)	Mixed (%)
Békés	10 (32)	4 (13)	8 (26)	9 (29)
Békésszentandrás	11 (38)	0 (0)	10 (34)	8 (18)
Gyula	9 (31)	0 (0)	14 (48)	6 (21)
Szeghalom	16 (20)	4 (5)	35 (43)	25 (32)
TOTAL	46 (27)	8 (5)	67 (40)	48 (28)

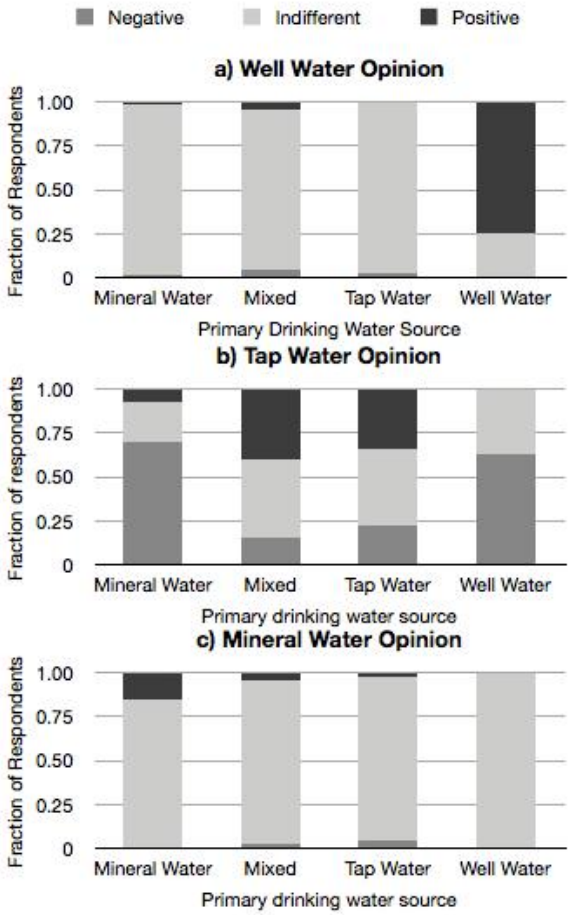

Figure 6.2 a, b, and c. Expressed overall opinion of water sources grouped by respondents' primary drinking water source.

The Narratives

The positive opinions of water in the artesian wells, held by the well users, is based on the perception that the water is clean and natural, with positive organoleptic qualities and a benefit to health.. Local people using the wells in Békés talk in depth of the many health benefits of drinking the untreated well water. They state that the water is rich in minerals, and is good for the throat and the stomach. People often speak of feeding their animals the well water to keep them healthy and productive. This includes both farm animals such as chickens and pigs, and their pets. People will often refer to elderly relatives who have been drinking the well water since they were a child, and are still fit and healthy into old age. I encountered one group of people working at a care home who came to the wells to collect the water for some of the elderly people who lived in the home. They refused to drink anything else, on the grounds of both taste and health. The well water is seen as health water because it is natural and clean, and without added *"chemicals"*. It seen as having a pleasant mouth feel and taste, and some even state that no other water will slake their thirst.

Well use has additional motivating factors for well users that suggest that it is based on more than just preferences or beliefs. It is related to habit. People talk about the great many years that they have been visiting the well, and about the people they regularly meet there. However, it is also more than just habit and is related to a sense of pride and attachment to the resource. Local people in Békés are proud of the quality of the thermal water. One respondent has described it as a "Gift from God". Many respondents, both well users and purely tap users, feel that more should be made of it, by improving the thermal baths or improving access, and one respondent spoke of lobbying her local councillors to do so. Some people reported that the local

mayor and the MP were planning to do some work around the Asztálos utca well *"because of the quality of the thermal water there"*. Well users are proud of their water resource, and frequently talk about people who travel great distances to use it. Well use is therefore motivated by factors relating to the wider lives of well drinkers. It is a lifestyle rather than just a preference or activity. These findings are also supported by the questionnaires. In both Békés and Gyula, people indicate that they use the well for reasons of health, taste, cleanliness and habit; many tick more than one option. This is highlighted in table 6.5.

Table 6.5: Reasons for Well Use, Indicated in Questionnaires

Reason	Békés Well Users (total 9)	Gyula Well Users (total 12)
Health	2	7
Cleanliness	1	1
Taste	4	7
Habit	5	0

Negative opinions of tap water are based on organoleptic properties that are often linked to a perceived 'industrial' nature of water distribution. For the well users, the negative opinions of tap water are partly based on the absence of those properties that make the well water special. Whereas respondents like the smell and taste of well water, they dislike the smell, taste or colour of the tap water and link it to the non-natural or *"industrial"* nature of extraction and distribution. However, those non-well users who held a negative tap water opinion also share these concerns. These organoleptic concerns were repeated in all towns, as shown in figure 6.4. The smell of

chlorine and the fact that it was added to water was a popular concern; almost 20% of the interviewees, unprompted, raised the issue of chlorine in a negative way. In the questionnaires, the level of concern for chlorine varied from 16% to 46%, as shown in figure 6.3. However in interviews these concerns were often coupled with other concerns relating in particular to the distribution and treatment process. Narratives included that the drinking water distribution process was industrial, not natural, and involved the addition of chemicals (including chlorine) that were a potential health concern. Besides the addition of chlorine, people were concerned about the maintenance of the pipes, and the state of the water towers and storage facilities. The idea that tap water distribution was an *"industrial operation"* which turned the natural water into a product with *"added [undesirable] chemicals"*, giving it a bad smell and taste was often cited (unprompted) by respondents.

Some non-well users develop this argument further by suggesting that the negative characteristics are to do with a poor quality of the distribution system that cannot be improved because of a lack of finances. A number report friends or family members who work for the water utilities or an associated operation. They state that they *"know"* or *"have seen"* that the infrastructure and practices are not up to standard. One reports seeing dead animals in the water towers. A small number report rust in their water, or frequent pipe breaks. In Békésszentandrás, many respondents talk about sales people who have visited their homes to try to sell in-house water filters. According to these respondents, the sales people show the filter working, and then show the *"dirt"* that was filtered out. This has led these residents to consider that the water company is not cleaning the water supply in the best possible way. These respondents who voice concerns over the state of the infrastructure also state a desire for investment for it to be improved. However, most of the respondents, both well users and non-well users feel that tap

water is already too expensive. They are all concerned about any possible future price rises in the water services. A small number went as far as to show me examples of their water bills and ask my opinion.

Such negative narratives of tap water, held by both well and non-well users, do not necessarily equate to a belief that the water is bad quality. This is initially shown because the questionnaire data on tap water quality seems to contradict the interview data. The percentages of people that say they think the water is bad quality is lower than that suggested by the negative opinion narratives offered by interview respondents. However, the levels of concern for individual parameters are higher than the negative opinion of tap water quality, as shown in figure 6.2. This conflict indicates that no individual concern parameters, nor a combination, are causing negative quality opinions. However, it also suggests that people do not consider negative quality to be synonymous with negative opinion. Rather the quantitative and qualitative data combined suggest that negative opinions are formed around sensory issues and preferences, and respondents do not automatically think that offensive sensory parameters indicate bad water quality. In the interviews, respondents reporting bad quality mentioned issues to do with water content included particles or suspected bacteria. Those people who did think the tap water was bad quality tended to state that they had been made sick by the tap water.

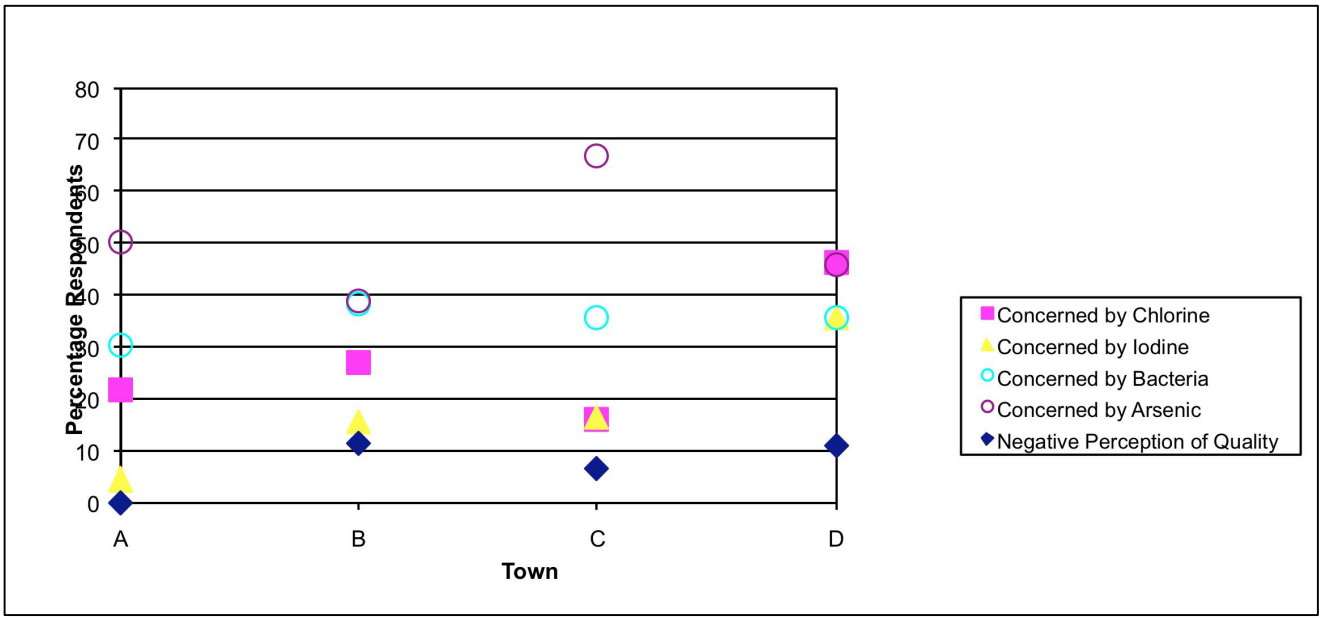

Figure 6.3: Chemical Concerns and Quality Perceptions

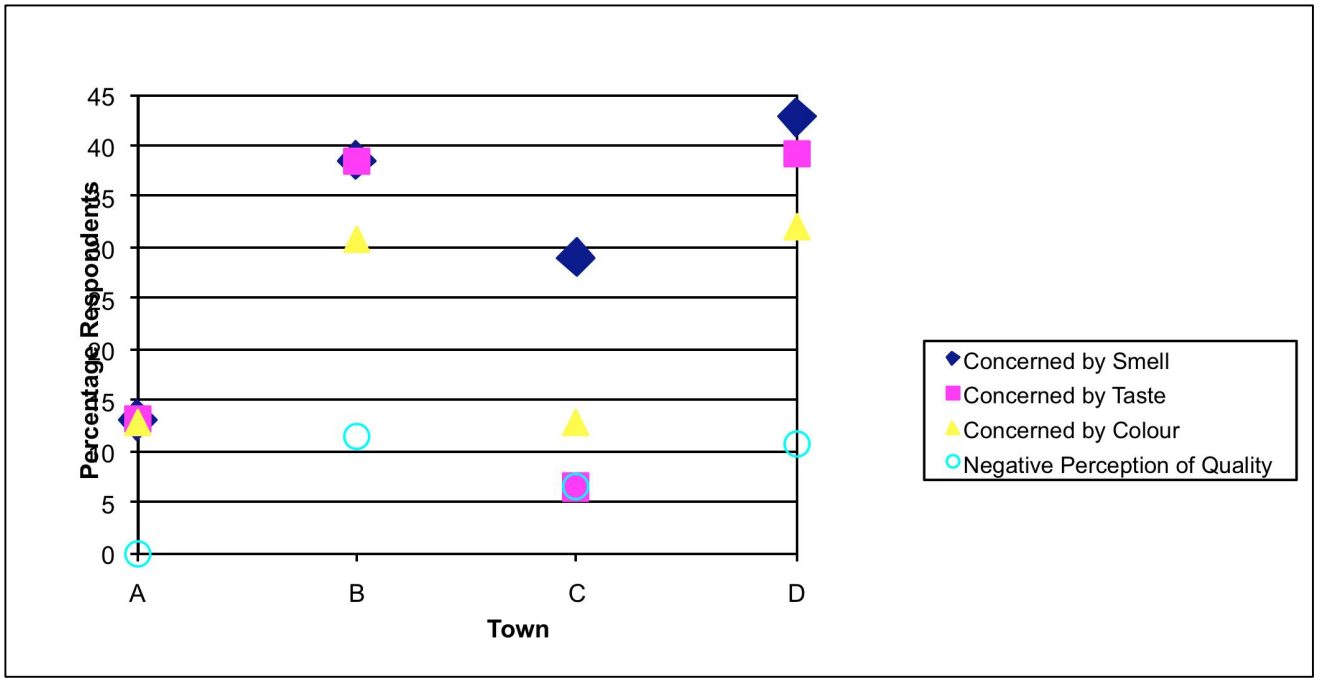

Figure 6.4: Sensory Concerns and Quality Perceptions

The positive opinions of tap water quality, held by some non-well users, are based on practicality. Respondents who are positive about tap water are not enthusiastic about it in the way that well water users are positive about well water, or the way negative respondents are negative about tap water. Instead, their responses are fairly non-specific in terms of reasoning, for example *"its good enough for me"*. Those people who respond positively about tap water have not experienced any problems first hand; they report that they have never been made sick from the tap water, and do not perceive any particular smell or taste problems. Positive respondents feel that the tap water is worth the cost because of the convenience aspect. Some respondents remember a time before they had tap water to their house, and describe how much easier it is now that they do not have to travel to a well to collect water. Some even weigh up their opinions between the tap water and the well water. They argue that the water is similar, so *"why would I travel to the well when I have good enough water here?"*.

The extent to which arsenic is a concern to the local populations varies greatly. In the questionnaires, arsenic concern varied with the town and is fairly high, as shown in figure 6.2. This conflicts slightly with the unstructured interview responses. In the interviews with both well users and on the street, respondents would mention arsenic in their water source without being directly asked. However, this was often as a closing or passing comment, and could rarely be classed as a concern. It was seen as being a fact that everyone knew about. Well users tended to believe that tap water and well water were equally affected by arsenic. Those respondents who were concerned often drew upon their memories or experiences to explain the concern. For example, one person for whom arsenic was a worry, said that in the 1980s the town was provided with water from a tanker because of the arsenic. This had made her wary of it. Similarly, those who were not concerned also drew on their own experiences or observations. Many people (both

well respondents and street respondents) said that elderly people who had drunk well water all their lives were suffering no ill health effects and lived to be very old. This was given as the reason that arsenic was not concerning to them. There was some level of ignorance around what arsenic was; statements such as *"I am not an expert"* and *"what is arsenic anyway?"* were common. Such comments were raised particularly when talking about the presence of the signs at wells; respondents stated that they did not understand what these signs meant, particularly if they just referred to high arsenic in the water. Therefore, local people's perception of the arsenic problem was based on an absence of clear information, combined with their own observations, which suggested to them that they should not worry about a health impact.

Local populations report feeling separated from the rest of the policy actors. There was a very low response rate to questions on both who to contact, and where information is received from in the questionnaire; respondents chose to leave this section blank. Interview respondents report that they do not receive any information unless they actively seek it. If they do seek it, most feel that they would be most confident in approaching their municipality. However, if there were a specific problem, they would either contact the water works or the regional public health service. Those that have done so in the past indicate that they found them very helpful and friendly. However, the communication is instigated only by the respondents and not by the official bodies. Overall, this data suggests that local people are not well connected to the management of the water unless they themselves perceive a problem.

Narrative Context

In all towns, the smell and taste tests indicate the presence of phenols in the water supplies of all the towns. There was no colour, sediment or particles in the samples taken. All

householders confirmed that the sample could be considered an example of how their water usually is. The householders describe the smell as a chlorine smell. However, there was no free chlorine identified in any tap water sample, and the total chlorine was 0.2 ppm. This means that all of the chlorine added to the drinking water has either combined with organic material in the water, or with nitrogen; there is no excess chlorine in the water (Lorene, 2009). However, the smells detected were 'medicinal' with no particular mouth feel or taste. These measurements are shown in table 6.6. According to the Suffet et al., (2004) smell and taste wheel, and supported by the lack of detected free chlorine, this smell represents chlorophenols, iodophenols and/or bromophenols. This means that the chlorine is reacting with the organic matter to create these odours. It is these smells and tastes that are being interpreted as chlorine and are proving off-putting to water users.

The other parameters measured in tap water did not suggest any further explanation for organoleptic issues with the water. Iron and calcium in the water were not in excess of recommended limits, and there were no metallic or blood-like tastes associated with high iron. The levels of sodium were low in all samples, except for those collected in Szeghalom. Here the concentrations recorded are between 243 and 258 mg/l. This exceeds the 200 mg/l indicator limit outlined in the Drinking Water Directive. This 200 mg/l is an indicator parameter in the directive, meaning it is set on the basis of taste and consumer acceptability of the water. Where the level of an indicator parameter exceeds that outlined in the directive, the member state must ensure that it does not pose a threat to human health, or impact the acceptability of the delivered water. In this case, the levels are still low, despite exceeding the limit. There is no salty taste detectable in the smell and taste tests, and no respondent reported any. This suggests that despite

slightly exceeding the indicator limits in tap water, the sodium is not adversely affecting the organoleptic properties of the tap water.

Table 6.6: Smell and Taste Test Results

Sample Location	Cl total	Cl Free	Taste	Smell	Colour
Gyula	0	0.05	None	None	None
Gyula	0.1	0.05	None	None	None
Gyula	0	0.05	None	None	None
Gyula	0.1	0.05	None	None	None
Gyula	0	0	Sour	None	None
Gyula	0	0	Slight eggy	Very eggy	None
Békésszentandrás	0	0.05	Slightly sweet	None	None
Békésszentandrás	0.1	0.05	felt soapy in the mouth	Earthy/swampy	Slightly brown
Békésszentandrás	0	0.05	felt soapy in the mouth	Earthy/swampy	Slightly brown
Békésszentandrás	0.1	0.1	felt soapy in the mouth	Earthy/swampy	None
Békésszentandrás	0.1	0.05	felt soapy in the mouth	Earthy/swampy	None
Békésszentandrás	0.1	0.1	felt soapy in the mouth	Earthy/swampy	None
Békés	0	0.05	None	None	None
Békés	0.1	0.05	None	None	None
Békés	0.2	0.5	None	None	None
Békés	0	0.05	None	None	None
Békés	0	0.01	Metallic	None	None
Békés	0.1	0.05	None	None	None
Békés	0.1	0.1	None	None	None
Békés	0.1	0.05	None	slightly earthy	Slightly brown
Békés	0	0.1	slight earthy after-taste	Weak smell of thermal baths	None
Békés	0.1	0.05	slight earthy after-taste	Weak smell of thermal baths	None
Szeghalom	0.2	0.1	soapy taste and feel	Medicinal	Cloudy
Szeghalom	0.1	0	slight soapy feel, slight medicinal after-ta	Medicinal	None
Szeghalom	0.1	0.1	medicinal after-taste, sweet feel	Medicinal	None
Szeghalom	0.1	0.1	Medicinal	Medicinal	None

6.2.2.Local Actors

Arsenic is not often described as being a major concern to the local municipalities or water companies. The municipalities and water companies are aware that they need to meet the law. However, they do not perceive that there is any major health impact that necessitates prioritising the issue over other concerns. The local actor's perception is similar to that of the local populations; they cannot see people dying from the effects of arsenic, and so it is hard for them to believe that the 10 ppb limit is really necessary. However, the local policy actors also dispute the legislation in another way. They argue that the 10 ppb limit is too strict and is not relevant to them because they do not eat sea fish. They argued that the levels were set by the EU in countries where sea food was consumed and formed a major arsenic exposure pathway. In Hungary, seafood consumption is low, and therefore a higher amount of arsenic can be permitted through the drinking water. This is a story that was recounted by every representative interviewed at the local level in all water companies and municipalities:

"He says that the experts are kind of divided in this area, because some of them just consider that in nations surrounded by sea, people are eating sea fish. So they have a multiple intake of arsenic from that. And in Hungary people mostly have the arsenic intake from the water." - Interview with Szeghalom Municipality (though translator).

"So the EU set the directive by examining and measuring how much arsenic intake can intake in a healthy human body. The intake can be from different sources, from food, from drink, from all sorts. So he mentions that it differs in the regions or countries, and the arsenic in sea creatures can be much higher in other types of food. So the impact varies in Hungary, and the middle parts of the US. So he mentions that if you have higher intake with food, you already kind

of use your capacity, so you can take less in food... So, he mentioned that when it was set the deadlines, when Hungary was joining the EU, OKI made some research. And they wanted to ask for 30 [ppb], and they[Sic.] are easily reached in Hungary. And the EU rejected it on the basis that if tourists would come to Hungary, and they would drink tap water, and they would stick to sea food, they would have higher intake. And in this case, there would be competition between industries in Hungary and in the rest of the EU." - Interview with Gyula Water Works (through translator).

"He thinks that the 10 ppb is not a realistic limit because it's too strict. He thinks [it was set]because the consumption of sea fish is higher in Western Europe. And Hungarians are not really eating sea fish. And fish has a high arsenic level." - Interview with Gyula Municipality (through translator).

This EU focus on the 10 ppb limit is considered, at the local level, to be unnecessary and misleading. Indeed, every local actor interviewee stated the "we don't eat fish" narrative. They also argue that the legislation used to be 50 ppb before accession, and they cannot see that a reduction 10 ppb would be significantly safer than 50 ppb, although it will cost a lot more. In addition, Szeghalom municipality has a public health scenario that they are more concerned about than arsenic: that of iodine. The water in their system is very unusual in that it is high in naturally occurring iodine. They feel that they have a lack of information and support around this issue because all the higher authorities are preoccupied with arsenic. They therefore argue that arsenic takes up too much attention when other issues need to be considered.

The municipalities are strongly influenced in their priorities and actions by the wishes of the local populations. The Municipalities Government Act that awarded them ownership of

water infrastructure, and the responsibility for delivering drinking water is often mentioned. They state that the delivery of drinking water is a primary responsibility of the municipalities. All four municipalities refer to the act as allowing them to represent the needs of their population in their drinking water provision. Some frustration is voiced at the population; for example Békés municipality stated that people will always find something to complain about, and therefore they cannot always please their population:

"People like to cry. And more often when you ask them to cry. Like everybody has an opinion on that, and they have a bad opinion." - Interview with Békés Municipality (through translator).

However, municipalities are attuned to the fact that their constituents elect their leadership. This means that they place a great deal of importance on how they think local people will receive actions. They unanimously show reluctance to raise prices for water, and state that it would be very unpopular with the local population:

"As people feel that they have the right for clean and safe water, its kind of a constitutional right, so they don't like politicians who increase water prices." - Interview with Békés Municipality (through translator).

The local municipalities and public health authorities continue to operate and maintain wells in recognition of the strong attachment local people have to them. Both Békés municipality and the regional ÁNTSZ refer to the popularity and the attachment of people to the wells as a reason that their closure would be extremely unpopular in the town. They refer to the pressure placed on them by populations to keep the wells open. Additionally, in Gyula, new wells were

installed during my research period. There are signs in three languages (Hungarian, English, German), advising that they were not for drinking water. When I asked about these wells to the Gyula water company, which had drilled them, I was told that they were drilled under an operational permission for a decorative fountain, but they are designed to look like traditional drinking water pumps. The reason given for this is that it is in celebration of Gyula's water heritage, and if people chose to drink from them, this is their prerogative:

"...he says that these are normal water, so people can drink from it. But they don't meet the standards, so the arsenic content is higher than 10, and ammonia and stuff, so it differs. But there are signs that it is not drinking water.. .but the people can drink from it... He mentioned that there is a sign on each cigarette box that it causes death." - Interview with Gyula Water Works (through translator).

There is a narrative amongst actors about the clash in aims between the municipalities and the water providers. The municipalities do not have the technical expertise required to operate the supply systems. This is provided by the water providers. The contracted companies present very technical and analytical summaries of drinking water provision. They have been contracted on the basis of their technical expertise, and their management priorities are around developing the best technical solutions for water supply. This presents a difference in operational aims between the water companies and the municipality. The water company wants to invest in infrastructure improvements. The water companies cannot increase the cost of water to fund improvements without the permission of the municipalities. The municipalities are reluctant to fund such changes because it would mean passing the costs on to the consumer:

"They are different parts [factors] that the municipalities take into account. The first part is where is cheaper the water. The second which is becoming more important is what is the quality of water and the safety of the provision. And there is a third factor now. Which is the reconstruction. And under which system can they provide for the reconstruction of the distribution system." - Interview Central Békés Water Company (through translator).

The smaller water companies (Békésszentandrás and Gyula) are affected by the conflict more acutely than the Central Békés Company (BMV), which can spread the costs over a number of municipalities. The smaller municipalities feel the financial constraints more acutely than the larger ones; here the financial costs are borne by a smaller number of people. For Békés and Szeghalom, this economy of size is used to explain the benefits of working with a larger water company. However, for Gyula and Békésszentandrás, this same aim conflict translates into a wish to remain independent so that the needs of their population are not lost amongst the needs of others:

"Because of course in this case, the municipality has a kind of higher control over the activities of the company. Not mainly the technical or professional part, but they have more control over the budget, over setting fees for the citizens" - Interview with Békésszentandrás Water Company (through translator).

"...because the municipality is responsible for the citizens, they can control the prices through their own company. So they have an influence on the fee. That's why independence is important. Of course there is a danger as well. If the operation would need a bigger investment, it means a bigger burden on the municipality as well. And the municipality is making investments from taxes, and if the costs are bigger of the investment, the locals have to pay more tax. So until

certain point, its worth to stay independent." - Interview with Gyula Municipality (through translator).

This protection of local interests is presented as a key factor in delays in surrounding the DARFÜ project. The first stage of the project requires the formulation of associations of municipalities so that they can initiate joint solutions. The regional ÁNTSZ and the DARFÜ project managers state that they spend a large amount of time attending meetings trying to reach agreements and negotiate associations. There is one large association forming, which includes the counties of Szeghalom and Békés and will be operated by the Central Békés Company. It is described as a bureaucracy that creates more bureaucracy by Békés municipality. Decisions take a long time to make, and there is always a lot of discussion because every municipality in an association wants to have their interests and opinions represented in the association:

"the problem solving capacity of this company is kind of slow. He used a word that means that they stop at every minor problem... It means like circumstances, they grab every tiny unimportant thing, and they can't cope with it. So they concentrate on that instead of the big issue. So they are not so proactive." - Interview with Békés Municipality (through translator).

Gyula avoided joining the large association on the basis of independence, and the decreased bureaucracy implications of a smaller association. If they were part of a big association, they feel that their opinions and wishes would be lost against those of the other municipalities and of the operator. Additionally, by remaining small, the Gyula association is able to progress faster:

"So for example, they [the big association] have to submit their application directly to Brussels. So public procurement cannot be done directly in Hungary, they have to submit it for approval to Brussels, because of the size of the project. So they have a smaller project, so the decision on that project will be made in Hungary." - Interview with Gyula Municipality (through translator).

For this reason, Gyula municipality voice frustration at the large association; Gyula has finalised their small association (with Elek) and drawn up legal documents. However, they are unable to progress with implementation until the larger association is also at the same point in planning. They are therefore critical of the approach of the DARFÜ project based on its approach and its administrative slowness.

Resistance to joining the big association is also explained through historical narratives. Gyula municipality states that joining the large association would be very unpopular with the population due to an ongoing rivalry with Békéscsaba, where the association leaders are based. Until the 1950s, Gyula was the county town, and then this status was removed from them and awarded to Békéscsaba. This has created a sense of resentment from Gyula towards the larger town, and Gyula considers itself separate and self-sufficient:

"It has a longer history. Gyula used to be the County seat. In the middle of the 50s the seat was transferred to Békéscsaba. Its not sure that Gyula was satisfied with this decision...But Gyula used to have very good extraction wells, and Gyula could provide relatively good quality service alone." - Interview with Gyula Municipality (through translator).

Instead, there are narratives about historical yet positive working relationships that run through discussions about the associations and plans that are emerging under the DARFÜ project. Gyula's association with Elek is based on the fact that their extraction wells are near Elek, and they have always collaborated closely with Elek on the topic of water provision. In the large association, the Central Békés Company would like to establish a relationship with Arad County in Romania, and share water and expertise. This is explained as a long-term relationship since the company helped Arad with water supply issues at the end of Ceauşescu's[1] regime.

"Fortunately they have a good relation with the Arad water works since the 90s. So the reasons for that that are actually the collapse of the Ceausescu system. They had serious water problems and shortages, and the Hungarian water works helped them out." - Interview with Central Békés Water Company (through translator).

The DARFÜ project is unpopular amongst the local actors due to its limited scope. It places rules around what actions can be pursued and those that cannot, including the rule that cross-border collaborations are not possible. The company sees this as an illogical constraint as this option would solve many water delivery problems. In addition, Békésszentandrás feels excluded from the project because they have good quality water. The supply company state that they would like to join; the current supply system is good, but it is ageing, and if the population continues to grow, they will need to open a new well which will decrease the quality of the water. However, because they have been delivering water that meets requirements since accession, they are not included in the project plans. They consider the scope of the DARFÜ project to be too limited and short-sighted:

[1] Nicolae Ceauşescu headed the Romanian dictatorship until the fall of Romanian communism in 1989. The fall of his regime left the country with little in the way of functioning infrastructure.

"So the thing is that the project only focuses on arsenic issues and nothing else, so they are kind of excluded. And each settlement needs to change its technology every 15-20 years, and they are kind of this way excluded from developments and investments, although they have problems with other materials." - Interview with Békésszentandrás Water Company (through translator).

6.2.3.Regional Actors

The narratives of the DARFÜ project management and the regional ÁNTSZ display a sense of connection to the local policy actors, and their actions are influenced by the wishes of local municipalities. The DARFÜ managers recognise that the local municipalities are very protective of their rights to operate the utilities for their populations. They state that early on in the project, they realised that they needed support from the local actors. To this end, the management procedures include a committee made up from representatives from local municipalities. In order to accommodate their wishes, the DARFÜ management have rearranged associations, changed deadlines and commissioned extra studies. They state that they are aware that their reputation has suffered with the local actors because of delays in the early incarnation of the project:

"But finally, they had to spend three years with that. So it was like 2002 from the planning until 2005. And in 2005 they practically they started it once more. So that's why a lot of people from the municipalities, the town leaders, they are quite... how to say it... they say that we waste the time because this program has been going on for such a long time. But its like that we had to start it over again." - Interview with DARFÜ Project Managers (in English).

The regional ÁNTSZ also highlight their awareness of the constraints that the municipalities face. The regular appearance of the regional ÁNTSZ at the meetings and forums for DARFÜ provide many opportunities for them to interact with the municipalities and the public on this topic. This means that they are aware of the challenges the municipalities face through the DARFÜ project, and of their conflicting priorities. The regional ÁNTSZ also speak of a pressure from municipalities and their populations in order to keep the wells open. They argue that the population can make an informed decision on whether or not to drink from the wells; there are signs on the wells and they recently published some articles on the health impact of arsenic in the County's local newspaper.

"there was a pressure on the authorities to leave open some artesian wells in some towns for drinking water. [The pressure] it's primarily from the local population, and the municipality kind of supports this, so it comes through them too. And the municipality tries to meet this goal as far as they can, against the public health institutions." - Interview with Regional ÁNTSZ (through translator).

The way in which the arsenic problem is presented varies with the regional actors. DARFÜ state that to them, it is not important how much the water exceeds the limit by, or whether or not it has any significant change in impact; these are the regulations, they must be met, and the DARFÜ project is the vehicle through which they must be met. To them, the issue is one of compliance. The regional ÁNTSZ hold this opinion to a limited extent. They also talk of the necessity to meet the limits, but they are more critical of what these limits are. Like the local actors, they use the phrase *"we don't eat fish"* to argue that there is a low dietary intake of arsenic in Hungary, and therefore 10 ppb may be too low. However, they do not dispute the need

for a stricter limit than 50 ppb. They have been involved in the ASHRAM research project, and so have seen data that confirms that there is a health impact in the county caused by arsenic in drinking water. However, they also feel that this does not answer all of their questions; particularly around the differences in impact between water concentrations of 10, 30 or 50 ppb. They argue that they are sure a health impact could be found for any level of arsenic, including 10 ppb. Therefore, they do not see that it is worth the extra costs and benefits to reduce any further than 30 ppb. To the Regional ÁNTSZ, the arsenic issue is one of health, but also of compliance to overly strict regulations:

"They would like to see research which is a continuation [of ASHRAM]. Which looks at different levels of arsenic, and drinking and eating habits, and it [impact} could be calculated. So they should control direct and indirect intake of arsenic for different levels" - Interview with Regional ÁNTSZ (through translator).

The KÖRKÖVÍZIG presents narratives that are distinct from those of DARFÜ and the Regional ÁNTSZ. They are not connected to the local agencies, have little involvement in drinking water provision, and are not involved in any aspect of the DARFÜ project. They therefore do not have perceptions or narratives around these topics. They do have an opinion on the arsenic issue that is the same as the local actors: that of *"we don't eat fish"*; they see the limits as being not relevant to the location. However, this perception does not influence their role or actions. Their work is particularly concerned with technical aspects of arsenic management as part of their wider water management role. In monitoring and mapping groundwater resources, they are aware of the physical resource constraints with arsenic management. They have also led the SUMANAS research project, testing a pilot remediation technology. However, this is not

linked into DARFÜ, and the KORVIZIG does not have a working relationship with any of the local bodies. They are better connected to the national level and report good working relationships with MAFI, particularly around groundwater monitoring and mapping.

6.2.4.National Actors

Amongst national policy actors, there is a strong narrative about the lack of power over the municipalities. This lack of power prevents them from ensuring implementation of policy and therefore hinders fulfilment of their own roles and aims. The KvVM states these frustrations over lack of engagement powers. They state that they cannot force the municipalities to join the DARFÜ project because they are autonomous, and this means that the KvVM cannot fulfil their own function of executing this improvement project. The EUM have the same problem as they cannot force the municipalities, or even other actors to do anything that they do not want to do. They have no power, and so rely on the fact that the law comes from the EU; they report this reference to a higher power to be how they try to influence the actions of the municipalities and other actors:

"But you can say at all, this is European standards, we have to have it, there is not a question. We joined to European Union, so… So that's the only power the ministry of health has. We use it, but its not enough without resources." - Interview with EUM (in English).

This lack of power is also extended to mean that actors have little control over the actions of other actors in the governance network. ÁNTSZ state that all the authority is at the regional level, and they actually have no role in regulating the water. Therefore, they cannot safeguard public health in the way they want. MAVIZ, who should act as a bridge between the national and

the regional levels feel that their presence carries very little weight with the ministries. Whilst they want to represent the views of their members at the national level, they are often not given enough time to respond to consultations, and when they do it is rarely reflected in the outcome. For example, they wrote to the ministries to say that the accession treaty deadline would not be met, and they needed assistance and an extension; but they feel this was not acted upon. MAFI give the example of their leadership of the characterisation of all groundwater resources under the Water Framework Directive; despite being coordinators, they were not able to get the information from all collaborators because they had no power over the collaborators, and therefore could not enforce collaboration even though it was to meet EU and national law. The lack of clarity over structure of the consortium for the project, and the distribution of responsibilities means that the entire project was delayed. This lack of connection and collaboration between actors is seen as a hindrance to achieving policy goals:

"We can only ask for, but not receive information that we need. So we had to do the characterisation without information from the national parks. But then the characterisation does not have the correct ecosystem information, which means that the quantitative status is wrong." - Interview with MAFI (in English).

There is a narrative about the lack of connection with the local policy actors despite this being where the national actors perceive power to be held. EUM and ÁNTSZ use the regional public health authorities as the bridge to the local level:

"[we don't have much contact to the local level] Because we have the public health service, which belongs to the ministry. I mean they have a report system from the local public health

service, and then to the regional one, and then to the national." - Interview with EUM (in English).

KvVM are also disconnected and rely on the regional DARFÜ management who they have specifically contracted to implement the DARFÜ project. They therefore have no need to communicate at the local level because it is handled through the regional agency. MAFI feels that this lack of connection means that the local KÖRKÖVÍZIG is underused. It has a lot of expertise and detailed knowledge, but it is not used for resource planning. Instead this is done centrally by a ministry that wants to retain some level of control. MAVIZ say that they are well connected to their local members. However, they say that while their members deliver approximately 85% of drinking water in Hungary, they include only 25% of the firms. This means that their membership is primarily the larger companies in Hungary, and not the small, independent ones, implying a lack of connection to the smaller companies such as those in Békésszentandrás and Gyula.

In addition to the disconnection to the local level, national actors present narratives around disconnection amongst themselves and the different sectors of water management. This means that work is repeated and does not feed into other policy actors, or help in achieving policy aims. EUM talk of separation between and within policy sectors in Hungary. Within the health sector in Hungary, this means that the public health agencies are separate from the national health insurance agencies; prevention is separate from cure, and regulation is separated from financial resources. This makes addressing holistic problems in environmental and public health protection problematic. Between sectors, the EUM is separate to the KvVM. They both have roles around the regulation of drinking water, but EUM as the regulator is separate from KvVM

who manage the resources. In this case, regulation is separate from management and financial resources. EUM state that often, jobs are repeated, or overlap without collaboration.

"we have a problem of silo thinking. But this is my budget, this is your budget and they are strictly divided. You have different budget, different people, different way of thinking. And you… its very hard to rearrange…" - Interview with EUM (in English).

"But really, the ministry of health has no financial tools to intervene very much into drinking water quality. We are accepting the regulation, we are checking the drinking water quality, we are erm…we…are writing up reports and evaluation and so on. But the department which as the financial possibilities which are direct control over the drinking water er production is the ministry of environment." - Interview with national ÁNTSZ (in English).

The separation narrative is one that is also used by MAFI and VITUKI. Both of these actors say that similar work is done by multiple actors around the characterisation of water resources, and the maintenance of databases, but that this information is not used enough in policy or resource planning. This separation means that often management occurs separately from research activities. MAFI say that their characterisation of water resources would be very helpful in resource planning. Their work on arsenic release, the quality and quantity of groundwaters, recharge rates and interactions with other natural elements should help resource managers in planning sustainable drinking water solutions. However, the drinking water improvements required by the directives and laws are needed before the characterisation will be available, meaning that opportunities for such integrated planning will be missed. Additionally, the ASHRAM project on health impacts was carried out only with actors at the national level. ÁNTSZ and KvVM say that the results of the ASHRAM project should be used to help educate

the local policy actors about the health impact of arsenic. However, the results are not yet published or available for dissemination.

Some actors argue that shifts in the management approach are necessary for improving drinking water provision. According to MAFI, this includes changing the way in which groundwater characteristics are monitored; currently they do not account for interdependencies between water bodies, nor across administrative boundaries. This is not an optimal approach for resource planning. MAFI feel that if resource planning were improved, the approach to drinking water management could be less reliant on technical solutions, and therefore a shift in management approach would be precipitated. ÁNTSZ also advocate a shift to better forward planning and forecasting. They are working towards implementing water safety management plans in Hungary, in order that long-term management aims and risks are identified and work is planned accordingly. MAVIZ say that the DARFÜ project is not a good approach because of its size, duration and cost. They say that water companies would do better by being creative and securing their own solutions. KvVM feel that the investment of power in the municipalities is not the best approach as the municipalities also need to weight up other priorities and financial considerations. This means that they cannot prioritise meeting arsenic regulations. This is echoed by EUM and MAVIZ. EUM say that the municipalities do not have the resources or expertise. They say that giving such powers to an elected body is ineffective because the municipalities will not do something that is unpopular. Instead, the municipalities have an incentive to avoid dealing with arsenic regulations until the next elections when responsibility is likely to be handed to another political party. MAVIZ argue that the Municipalities' Act was an *"idiotic"* law because it gave specialised jobs to non-experts. However, ÁNTSZ, MAVIZ and EUM all state that the law is one that cannot be over-turned. It was a symbolic law that gave

power back to the people after the political transition. To remove these powers would be hugely unpopular and logistically very difficult:

"And it was crazy. That assets were given to settlements, and the way of deciding who to operate. Sometimes a baker or greengrocer was given the operation... It is very difficult to take it back because there are many employees and it is personally difficult." - Interview with MAVIZ (in English).

The way in which the arsenic problem is framed by national actors varies. ÁNTSZ very strongly present arsenic as a serious health threat. They say that their research findings from the ASHRAM project reveal a significant health impact in Hungary from water that exceeds 5 ppb. They therefore feel that the 10 ppb limit is relevant and necessary. Both MAFI and VITUKI argue that 10 ppb is too strict and quote the *"we don't eat fish"* argument. MAVIZ also quote this argument, although they acknowledge that new research has emerged which challenges this. They nevertheless feel that it is too strict for the Hungarian context. Both the KvVM and EUM feel that it does not matter whether or not the regulations are too strict or relevant; they are the regulations and they need to be fulfilled. EUM say that they are aware that there is probably a lack of evidence, but that this should not matter in achieving the limits. They argue that the lack of acceptance of this limit is because everyone accepted the old 50 ppb limit. They argue that people would rather believe the old limit was right than have to change to implement the new limit. Thus for KvVM and EUM, the arsenic problem is one of compliance.

"But if, in European Union there is 10, who cares what the evidences are. Because you have to fulfil the requirements." - Interview with EUM (in English).

The consumption of drinking water through wells is not considered to be a problem at the national level. There is either a denial of the practice, or an argument that it is not relevant to public health protection. Both ÁNTSZ and KvVM say that this is not widespread, and as long as people have drinking water to their homes, then they are receiving safe drinking water. ÁNTSZ say that the wells are kept open for historical reasons.

"There were some triers in the public health institute. They wanted to prevent the people from drinking this water, but there were big upheaval, because they are sort of historical wells and they are all sticking to possibility of drinking this water. And they cannot be convinced that it can be adverse, it can have adverse health impacts." - Interview with national ÁNTSZ (in English).

6.3. Objective 3: Characterising Institutional Agency

6.3.1. Discourse: The Basis of Policy Beliefs

Discourse on Institutional Structure

Emerging from the narratives are three discourses relating to the 10 ppb limit in EU legislation. Firstly, the narratives reveal the discourse that the levels of arsenic in the study area are not a health threat. This discourse is ubiquitous across the local level policy actors, and is held by varying degrees with actors at the regional and national level. Amongst local people, this discourse is held on the basis of experiential knowledge (they do not see people getting ill from drinking the water). Many of them do not know what arsenic is in order to form any other opinion on it. Amongst the local policy actors, the discourse is based on both experiential

knowledge, and a particular understanding of the epidemiological evidence on which the legislation is based; that the 10 ppb is relevant to coastal countries, and that Hungary can allow more arsenic in its drinking water. This is a perception that is shared all the way to the national level by some actors. It is held in light of a lack of any information to argue against experiential knowledge. Where this discourse is held, it leads to a rejection of the 10 ppb, and a feeling that it is too strict. Conversely, those actors who accept the limit base their acceptance on two discourses. The first discourse is one of rules; the legislation says 10 ppb and therefore it must be complied with. The second is that of arsenic posing a health risk; the national ÁNTSZ hold this discourse based on research that they have been involved in that they feel proves the relevance of the legislation in Hungary. The regional ÁNTSZ neither accept nor reject the 10 ppb limit; they have a hybrid discourse based on limited access to both experiential and research knowledge.

There are two discourses that refer to the distribution of responsibilities within the institutional structure built around drinking water management. There is the discourse that power is distributed inappropriately, which thus limits actor's ability to instigate effective management. The national actors reject the distribution of powers given under the laws and legislation, and argue that it was for purely historical and symbolic reasons rather than being an effective arrangement. Linked to the rejection of institutional structure is a second discourse pertaining to the approach of the DARFÜ project. The local actors in particular are unhappy with the DARFÜ project because they feel that it represents a diminishing of their autonomy and responsibilities. These actors hold the discourse that power should be located with the local actors, and that they should be able to act as they see fit in order to best serve their populations.

There are also discourses relating to the way the institutional structure functions and the presence or absence of working relationships in the governance network. At the local level, two of the municipalities hold a discourse of independence. The other two municipalities hold a discourse of collaboration. Both these discourses are based on historical events and working relationships, and the perceived impact these have on the municipalities' ability to meet the needs of their populations, as evidenced by Gyula joining with Elek and the desired collaboration of the Békés Central Company with Arad. There are also closely intertwined discourses of exclusion, separation and overlap. Békésszentandrás municipality and water works feel excluded from DARFÜ. They also feel under represented by MAVIZ, as do the water works company in Gyula. Exclusion discourses lead into a discourse of separation, whereby actors are expected to fulfil their role without sufficient input or support. The separation discourse is not so relevant at the local level for those actors that are in a consortium. However, many other actors, particularly at the national level, experience it. Whilst the national level actors that hold the separation discourse see collaboration as valuable between sectors and actors, it is not something that happens for them. Such separation can occur on a single actor level between policy sectors, or between policy actors in the same sector across different governance levels. The actors perceive that their separation limits the effectiveness of their work and that functions are repeated and do not feed into each other in the way that they should. The separation discourse therefore leads into a discourse of role overlap.

Discourse on Actions

There is a discourse running through all narratives of competing priorities that influence actors' actions with regard to their assigned drinking water management roles. Such competing

priorities can occur between an actor and the institutional structure. Local people want to see their tap water quality improve in terms of organoleptics, but are anxious to keep costs low. Their priorities are based on their experience of their tap water, and as they have no knowledge of negative experiences from arsenic, they are not concerned about arsenic. There is therefore a conflict between the priorities of the local people and the problem that is prioritised in the institutional structure. A similar situation is true for the water companies. They have their goals and actions constrained by the municipalities who are wary of spending money, but the companies want to spend money to improve infrastructure. Where an actor's priorities clash with the institutional structure, the conflict highlights that the actor has policy core beliefs over the content or approach of policy that do not match with those in the institutional structure. However, conflicts can also be experienced by actors who find themselves town between two other actors that they are answerable to or dependent on. The local municipalities experience priority conflict because of their need to juggle the priorities of the local people that they serve, and the policy goals that they need to fulfil. Their ability to implement arsenic management is constrained by their priority of keeping costs acceptable to the population. The ministries (KvVM and EUM) are aware of the priorities of other actors, but their priorities are to fulfil EU legislation. The regional actor DARFÜ is torn in its priorities as it recognises both those of the ministries and of the municipalities and water providers. All actors acknowledge that clashes of priorities are limiting the ability of the governance approach to fulfil the arsenic legislation.

The conflicting priority discourse also feeds into discourses explaining actions taken by actors around managing wells. The discourse of well use as a lifestyle is displayed predominantly by local people and local actors in the towns that have wells. This discourse shows that their continued use is based on a strong identity as a well user and is based on

tradition and history as well as a feeling that the water is healthy and clean. The lifestyle choice is recognised by the local municipalities and the regional ÁNTSZ who allow the wells to operate because they are aware of how unpopular it would be to close them. However, the well use is also influenced by the discourse that it is not a problem that needs any action. Numerous actors hold this opinion, though it is based on different reasons. Amongst local people and local policy actors it is not considered to pose a health risk. Local people feel the opposite, that it is a benefit to health. This opinion is based on experiential knowledge, and the lack of information on arsenic and its impacts. At the national level, the discourse is based on a lack of experiential knowledge. The national policy actors are not aware of the extent to which wells are used. They are therefore able to discount them from their management considerations because everyone has access to tap water. The regional ÁNTSZ again come in the middle of these stances. They think that it is not a big problem to worry about, but nonetheless have tried to improve awareness of the local populations.

6.3.2.Policy Actor Beliefs

Deep core beliefs of policy actors are revealed through discourses relating to the distribution of responsibilities in the institutional structure. The actors that display discourses about rejecting the institutional structure are highlighted in table 6.7, column 1. These actors hold beliefs around which actors should hold what powers in a governance system and on what basis or on the level of autonomy they should be afforded in fulfilling their responsibilities. These indicated beliefs are not necessarily specific to a single item of policy. Instead, they relate to the wider governance principles incorporated into the institutional structure. Therefore, beliefs on how powers should be allocated and on what basis and are central and fundamental beliefs on

the way the world should function (Jenkins-Smith and Sabatier, 1994), meaning that they are deep core beliefs. Other discourses presented by the policy actors do not reveal any further deep core beliefs beyond these statements of how responsibilities should be distributed; there is implicit agreement with the other deep core beliefs that are incorporated into the institutional structure.

The discourses highlight actors' policy core beliefs about the approach, content and scope of policy for managing arsenic in drinking water. Each of the discourses relating to working relationships indicates beliefs about the most appropriate management approach. The independence and collaboration discourses each represent a mutually exclusive belief around whether the policy actor believes it is most effective to work alone or with others. The discourses of exclusion, separation and overlap represent instances when the actor feels that the current institutional structure is not functioning in the way it should and therefore hold the belief that a different approach is necessary. The specific beliefs that actors hold about policy approach are highlighted in table 6.7, column 2. Each of the discourses relating to the 10 ppb limit reveal beliefs about the content of arsenic management policies. Those actors who use the rationale "we don't eat fish" hold a policy core belief that the way to manage the health impacts of arsenic is through a limit that is higher than 10 ppb. These actors do not question the need to manage arsenic or impose limits, but they believe that it should be done through a different limit. The actors that accept the 10 ppb limit believe that it is the best way to achieve policy goals, either on the basis of health impact, or on the basis that the EU requires it. The actors who hold hybrid discourses around the 10 ppb limit indicate unformed policy beliefs about the content of policy. The specific beliefs about policy content that each actor holds are shown in table 6.7, column 3. Discourses on well use highlight beliefs about the scope of policy for achieving policy goals.

Those actors who hold the discourse of well use as a lifestyle hold the belief that well use does not need to be regulated because it causes no harm and is a cultural activity. Those actors who hold the discourse of denying well use also hold the belief that well use does not need to be regulated. The beliefs each actor holds about policy scope with regards to wells are shown in column 4 of table 6.7. Collectively, these beliefs about approach, content and scope all refer to how the current policies should be achieving policy goals, meaning that they are policy core beliefs as defined by Sabatier (1988).

Discourses also reveal policy core beliefs around the priorities of policy that shape implementation aspect beliefs of some actors. Local people hold the belief that organoleptics and cheap water supplies are the policy priority. Local municipalities hold the discourse that it is more important to follow the wishes of the population than to fulfil the 10 ppb limit. Both of these actors hold beliefs around the priority of policy, which is a policy core belief because it refers to the way that policy should achieve goals. The local companies are forced to adopt the same policy core beliefs on priorities as the municipalities because the municipalities can limit the resources available to the companies, and thus force them to act according to their own policy core beliefs. Actors that recognise the conflicting priority discourse in other actors, despite not hold it themselves, are also constrained in their actions by the policy core beliefs the conflict represents because fulfilling their own role requires the cooperation of actors that are experiencing a conflict and are therefore reluctant to act. Implementing aspect beliefs are defined by Sabatier (1988) as the resources and tools available to an actor. Therefore, the priority beliefs of local people and municipalities influence the implementing aspect beliefs of other actors by shaping the tools available to them and their ability to act. The actors whose policy core beliefs

or implementing aspect beliefs are influenced by discourses around priorities are shown in table 6.7 column 5.

Table 6.7: Policy Actor and Beliefs Summary

Actor	1. Inst. Approach	2. Management Approach	3. Policy Content (10 ppb)	4. Wells as a lifestyle	5. Conflicting Priorities
Békésszentandrás local people	None	None	Reject - no health impact	None	With policy problem
Békés local people	None	None	Reject - no health impact	None	With policy problem
Békés well users	None	None	Reject - no health impact	Lifestyle	With policy problem
Gyula local people	None	None	Reject - no health impact	None	With policy problem
Gyula well users	None	None	Reject - no health impact	Lifestyle	With policy problem
Szeghalom local people	None	None	Reject - no health impact	None	With policy problem

Actor	1. Inst. Approach	2. Management Approach	3. Policy Content (10 ppb)	4. Wells as a lifestyle	5. Conflicting Priorities
Békésszentandrás municipality	Rejection	Independence	Reject - no health impact	None	Local priorities and policy problem
Békés municipality	Rejection	Collaboration	Reject - no health impact	Lifestyle	Local priorities and policy problem
Gyula municipality	Rejection	Independence	Reject - no health impact	Lifestyle	Local priorities and policy problem
Szeghalom municipality	Rejection	Collaboration	Reject - no health impact	None	Local priorities and policy problem
Central Békés company	Rejection	Collaboration	Reject - no health impact	Lifestyle	Municipality priorities and own desired actions AND Recognition
Békésszentandrás company	Rejection	Independence & Exclusion	Reject - no health impact	None	Municipality priorities and own desired actions AND Recognition

Actor	1. Inst. Approach	2. Management Approach	3. Policy Content (10 ppb)	4. Wells as a lifestyle	5. Conflicting Priorities
Gyula company	Rejection	Independence & Exclusion	Reject - no health impact	Lifestyle	Municipality priorities and own desired actions AND Recognition
DARFÜ leaders	None	None	Accept - rule	None	Municipality priorities and policy goals AND recognition
Regional ÁNTSZ	None	None	Hybrid - health impacts	Lifestyle	Recognition
KÖRKÖVÍZIG	None	None	Reject - no health impact	None	Recognition
MAVIZ	Rejection	Separation	Hybrid - health impacts	None	Recognition
VITUKI	None	Separation	Reject - no health impact	None	Recognition
ÁNTSZ	None	None	Accept - is a problem	Denial	Recognition
Ministry of Health	Rejection	Separation	Accept - rule	Denial	Recognition

Actor	1. Inst. Approach	2. Management Approach	3. Policy Content (10 ppb)	4. Wells as a lifestyle	5. Conflicting Priorities
Ministry of Environment	Rejection	None	Accept - rule	Denial	Recognition
MAFI	Rejection	Separation	Reject - no health impact	None	Recognition

7. Combining the Methods: Institutional Mismatch, Impacts and Origins

7.1. Objective 4: The Role of Institutional Mismatch in Implementation Deficits

7.1.1.Points of Mismatch

Each of the policy beliefs about institutional approach, management approach and policy content, held by each actor, represent either a clash or a match with the institutional structure. The institutional structure incorporates a range of policy beliefs: the goals of policy are represented in the 10^{-6} excess cancer risk; the content of policy is shown by the 10 ppb limit; the institutional approach is shown by the distribution of responsibilities in the structure; and the management approach is embodied by the management vehicle of the DARFÜ project. As described in chapter 6, the policy actors also hold beliefs around the content and approach of policy. None of the actors has presented any evidence to suggest that they reject the overall goal. However, in terms of policy content, those actors who reject the 10 ppb limit display a mismatch in core policy beliefs with the institutional structure; there is an agency-belief to institution-belief mismatch. Similarly, those actors who display the approach beliefs associated with the discourses of exclusion, independence and separation display beliefs that clash with the institutional structure; there is an agency-belief to institution-structure mismatch. The structure requires actors to work together and collaborate, but they are resisting or failing to do so. Those actors that hold approach beliefs associated with the discourse of collaboration do not clash with the institutional structure because they embrace the requirement to collaborate. Those actors who reject the distribution of powers in the institutional structure, and hold deep core beliefs around the institutional approach, clash with the institutional structure. Such a clash is a further agency-belief to institution-structure mismatch.

Conflicting priority discourses are indicators of a contagious mismatch between actor policy core beliefs and the institutional structure. Those conflicts that are between an actor's own priorities and those outlined in policy are clear mismatches between agency-belief and institution-belief. In these instances the policy infrastructure does not match the beliefs on priorities that the actor itself has. The mismatch is spread to other actors by the institutional structure because of the distribution of responsibilities; where an actor with controlling power over another actor holds a mismatched priority belief, the second actor will adopt a mismatched belief. This is experienced by the municipalities who the beliefs of the local people because the local people hold election powers. The municipalities in turn spread the mismatch by giving the water companies implementing aspect beliefs that do not allow them to fulfil the roles assigned under the institutional structure. Therefore, the spreading of policy priority agency-belief and institution-belief mismatches creates mismatches of implementing aspects in agency-belief and institution-structure.

The discourses around well use are unique in that they represent an internal mismatch between institutional structure and institutional goals, which leads to a more conventional mismatch between actors' policy core beliefs about policy scope and those in the institutional structure. The policy beliefs of national actors around scope of policy clash with the reality of well use. Therefore, the institutional structure does not assign roles or responsibilities around the management of wells and creates an internal mismatch for the institutional structure. The institutional structures and roles do not match with the policy goals of the institution. All of the policy actors' beliefs are in agreement with this absence; no actor sees the need to deal with the wells. Their policy beliefs about the scope of policy clash with the institutional structure beliefs

around policy goals, but they do not clash with the institutional structure beliefs around the management approach and scope.

Each policy actor displays a range of mismatches between its beliefs and those in the institutional structure that highlight the extent to which the policy actor has adopted the policy institution. Each form of mismatch can be considered individually, as depicted in the header rows of table 7.1. The table demonstrates that most actors display multiple mismatches between their beliefs and the institutional structure and beliefs, though there is a lot of diversity between actors as each adopts different forms of mismatch. Where an actor displays a mismatch, they have failed to adopt the beliefs incorporated into the institutional structure, and mismatches therefore highlight incomplete institutional adaptation around that point. But each actor has adopted the institution in a different way, as is shown when the actor is considered in light of all of the mismatches that it displays. Each actor adopts some parts of the institution, and rejects others. There is not a complete rejection of the institution although there are instances where the introduction of the institutional structure has failed to stimulate changes in deep core, policy core and implementing aspect beliefs. Some actors can be grouped according to their shared mismatches, and thus shared extent of institutional adoption. These groupings are discussed in more detail in section 2 of this chapter, in the context of explaining the barriers to institutional adoption.

Table 7.1: Policy Actors and their Institutional Adoption

Discourse		10ppb: Reject (no health impact)	Structure: Reject (approach)	Structure: Reject (role distributio n)	Priorities (own and structure)	Priorities (Others clashing and structure)	Priorities (others clashing and own)	Functional structure: Exclusion	Functional Structure: Separation	Wells: Lifestyle	Wells: Denial
Actor	Mismatch	Belief-Belief	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Inst. belief-Inst. Struc.	Belief-Belief
Békésszentandrás local people											
Békés people											
Szeghalom People											
Gyula people											
Gyula well users											
Békés well users											
Békésszentandrás municipality											
Szeghalom municipality											
Békés municipality											
Gyula municipality											
Central Békés company											

Discourse		10ppb: Reject (no health impact)	Structure: Reject (approach)	Structure: Reject (role distribution)	Priorities (own and structure)	Priorities (Others clashing and structure)	Priorities (others clashing and own)	Functional structure: Exclusion	Functional Structure: Separation	Wells: Lifestyle	Wells: Denial
Actor	Mismatch	Belief-Belief	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Belief-Structure	Inst. belief-Inst. Struc.	Belief-Belief
Békésszentandrás company											
Gyula company											
DARFU leaders											
Regional ANTSZ											
KORKOVIZIG											
ANTSZ											
Ministry of Health											
Ministry of Environment											
MAFI											
MAVIZ											
VITUKI											

7.1.2.Mismatch and the Creation of Deficits and Governance Failure

Matching Mismatch to Implementation Deficits

In the chain of deficits relating to well use, the clash between the policy core beliefs of the ministries relating to well use and those of the institutional structure plays a key role in allowing other mismatched policy beliefs to shape management and create failure. The ministries do not believe that there is sufficient well use to justify controlling the wells. They have therefore created no roles or responsibilities to directly deal with wells. Therefore, this mismatch creates the first implementation deficit about there being no regulations (type C). This creates the mismatch in the institutional beliefs and structure, and the operational permissions system is allowed to persist. This creates the second implementation deficit of the operational permits (type C). Although this deficit is at the level of the regional ÁNTSZ, they do not actively contribute to its formation; the lack of institutional structure means that they are fulfilling their role and are provided with no structure with which to clash. Rather, they act as an intermediary to pass on this mismatch. Such continued use of operational permissions allows for the beliefs of well users to dominate over policy beliefs at the site of the municipalities. The municipalities adopt the beliefs of the well users that wells are a lifestyle and as such cannot be closed. The municipalities exploit the lack of institutional structures in order to allow these adopted beliefs to dominate. This creates the deficit whereby wells are operated with only signs to control their use (type C). This deficit in turn facilitates dominance of well users beliefs over institutional beliefs and therefore helps to create the deficit of well users drinking the well water (type A). The role and flow of mismatches in this deficit chain is shown in figure 7.1.

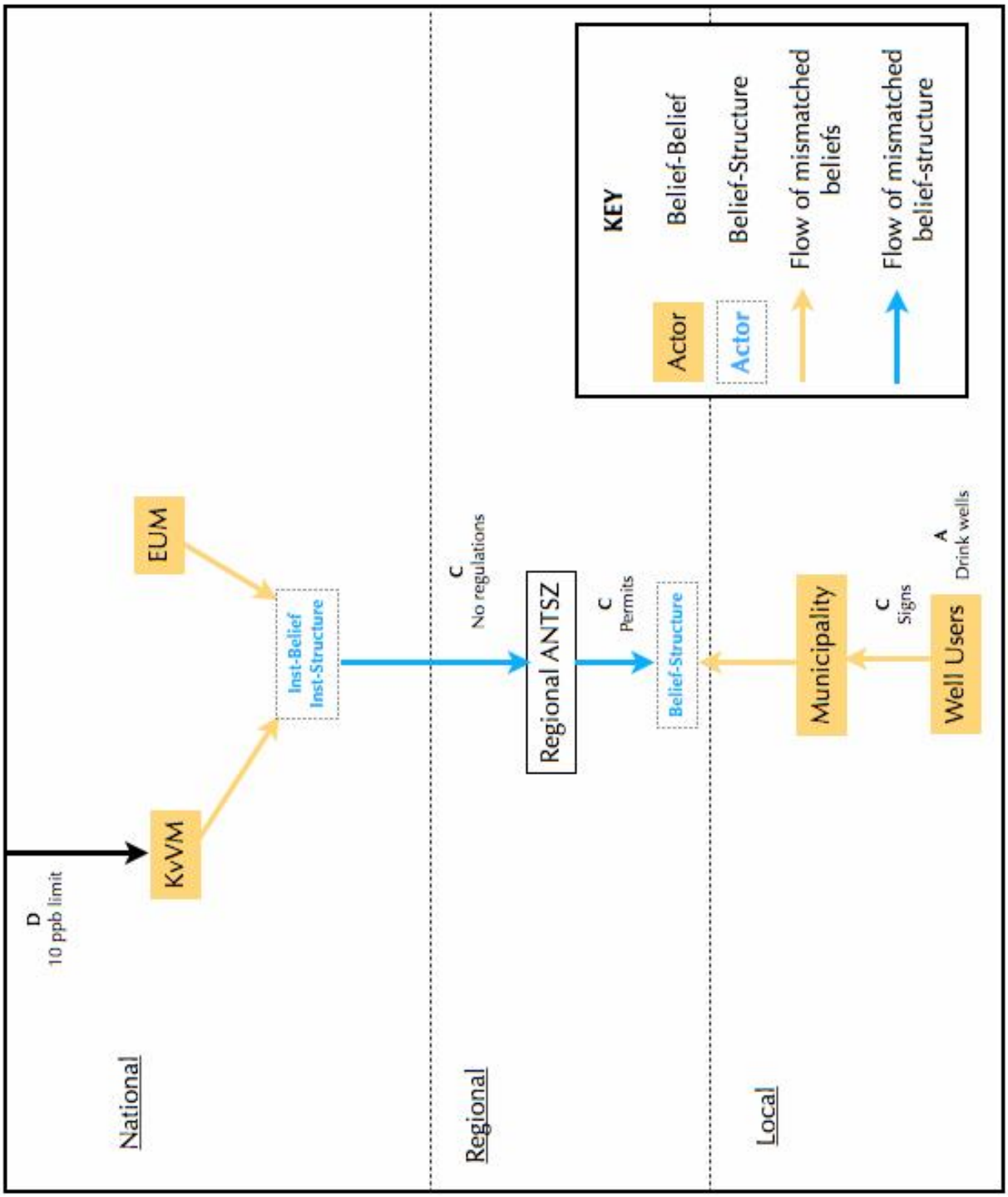

Figure 7.1: Mismatch and the Well Use Implementation Deficit Chain

The chain of deficits relating to the current management approach is dominated by the belief-belief mismatch between the policy core beliefs of the municipalities about the priorities of policy, and those incorporated into the institutional structure. The municipalities adopt the priorities of the local people, which prioritise organoleptics over arsenic management the associated and financial investments. These are the beliefs that are then forced into the water companies by the municipalities. This mismatch interacts with the causal theory deficit (type B) incorporated into the current infrastructure. In combination, they trap the local water company. The company cannot act against the wishes of the municipality to change the causal theory incorporated into the infrastructure, and the infrastructure that it is in operation will not allow it to meet the 10 ppb limit. Therefore, the companies also display a belief that does not match with those incorporated into the policy institutional structure, and in doing so, deliver water that exceeds 10 ppb (type A). The two water companies (Békés and Békésszentandrás) that do not display this deficit display the same belief-structure mismatch, but have infrastructure in place that already delivers water that meets the limits. They are therefore not trapped by the type B deficit interacting with the belief-structure clash of the municipality. The role and flow of mismatches in this deficit chain are shown in figure 7.2.

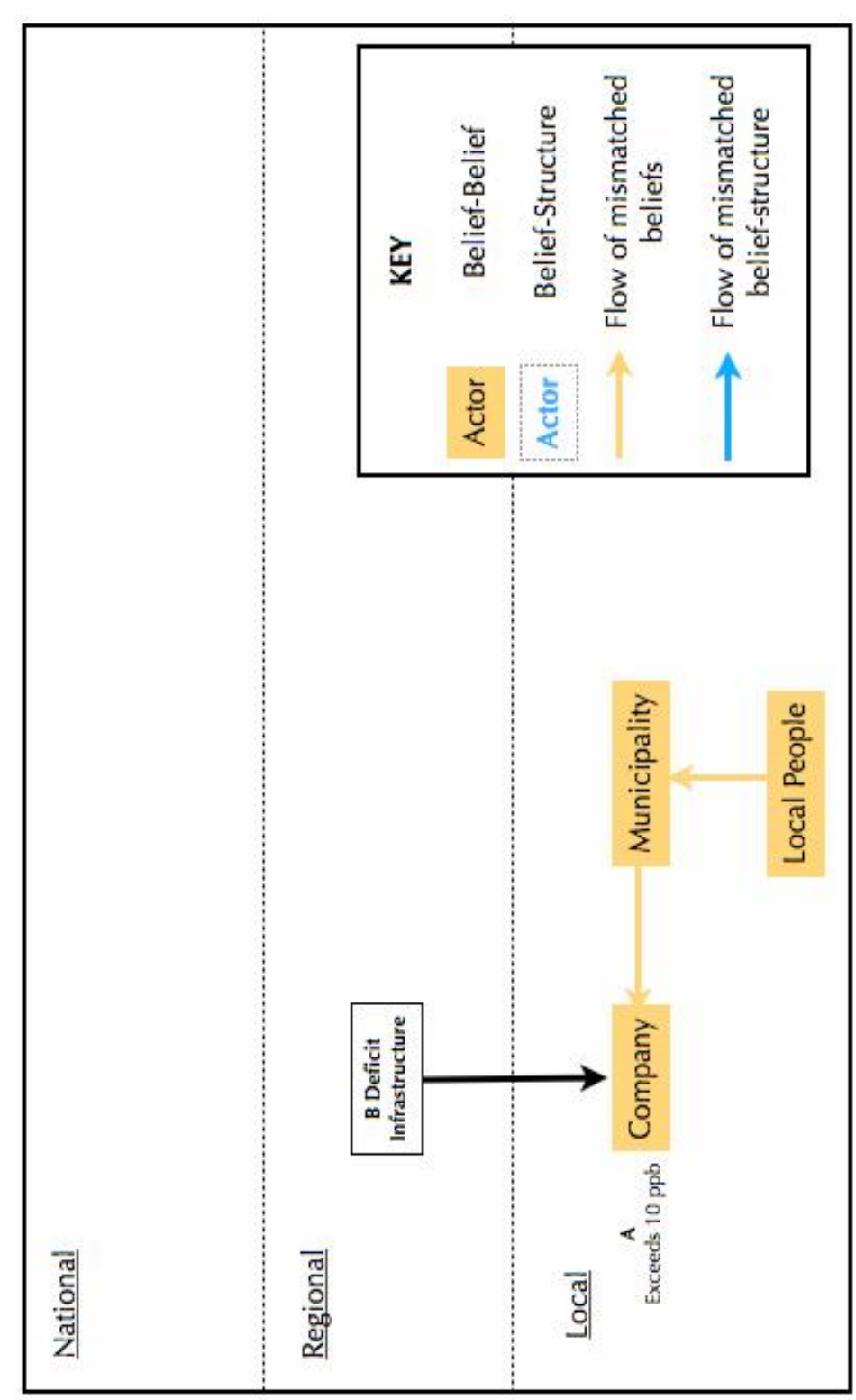

Figure 7.2 Mismatches and the Current Management Implementation Deficit Chain

Around the DARFÜ project, the mismatch of the municipalities' policy core beliefs about management approach and the approach of the institutional structure plays a central role. The initial type A deficit of timescales is partly the result of the prior failed management approach. This approach was the earlier incarnation of the project, which categorised settlements and dealt with them in separate groups. This type B deficit does not exist anymore, but it delayed the implementation of the project. Therefore its effects are still felt. However, these are exacerbated by a mismatch between beliefs and structure of the DARFÜ managers. Specifically, in being sympathetic to the municipalities' wishes, work has been conducted by the DARFÜ management, and deadlines shifted, which have caused the timeframes of the project to be moved. The reason this has happened is that the municipalities hold mismatches between beliefs and structure, induced by the mismatch in their beliefs and those of the institution. The municipalities are resistant to the approach of the project, and do not believe that it is the best approach. Their beliefs around the approach therefore clash with the structure, meaning that the project approach requiring associations is inappropriate for the situation (type C deficit) and therefore the associations are not being formed (type A deficit). This belief-structure mismatch takes different forms amongst the municipalities. For the municipalities of Szeghalom and Békés it is that the management of the association is too slow, or that they are not permitted to follow their preferred management option. However in Gyula, the mismatch is that they are not allowed to remain independent. This mismatch is further compounded for all the municipalities' by their policy core beliefs over the need to take action at all. Their belief that there is no health impact builds into their resistance; they do not want to take action that they do not see to be in their best interests over an issue that they do not see to be important. The role and flow of mismatches in the DARFÜ chain of deficits is shown in figure 7.3.

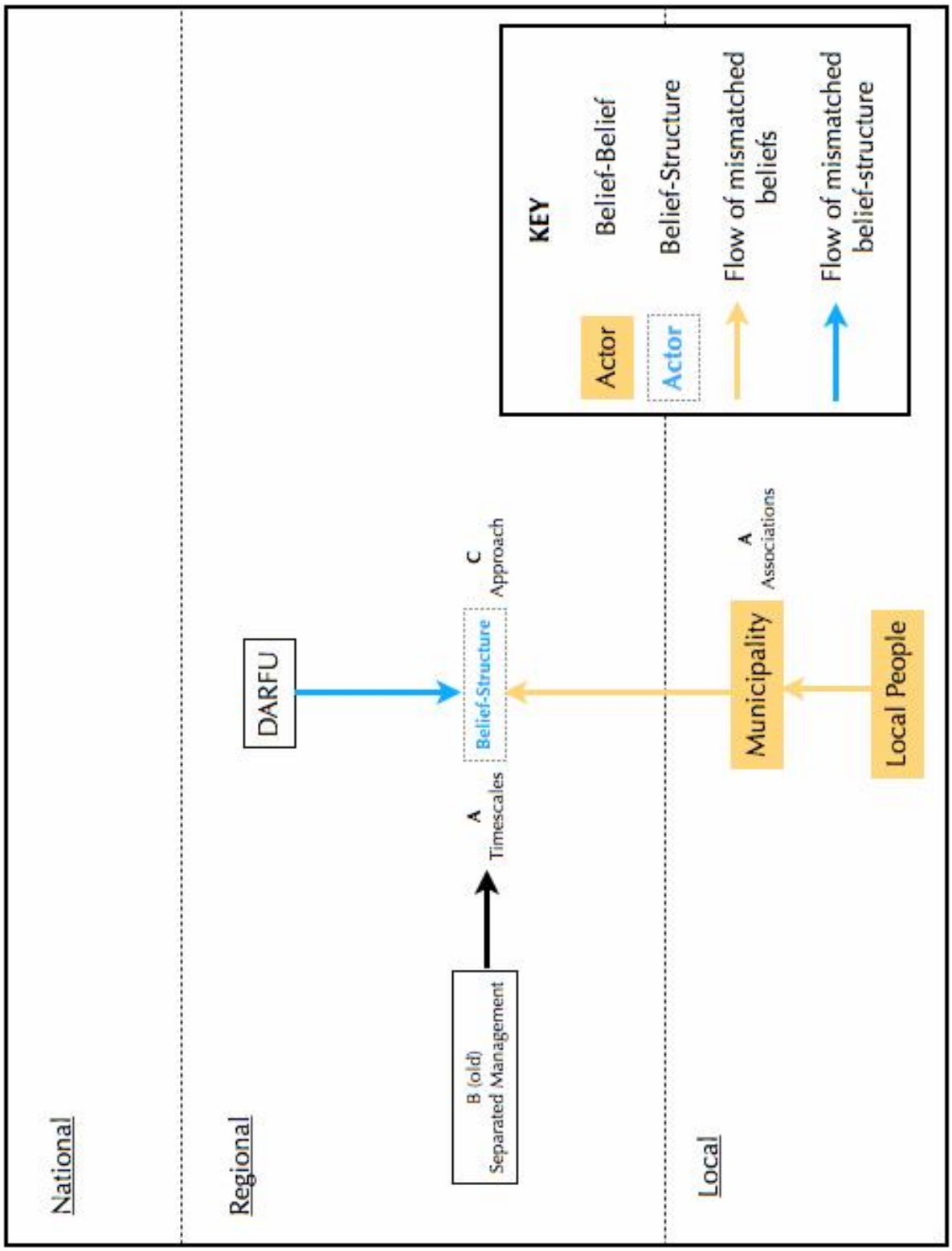

Figure 7.3: Mismatches and the DARFÜ Implementation Deficit Chain

Explaining Governance Failure through Institutional Non-Adoption

The incomplete adoption of the institution by municipalities plays a critical role in the formation of all chains of implementation deficit. The municipalities play a central, critical role in every deficit chain because the responsibilities they have been given mean that all management approaches need the support of the municipalities. However, municipalities are also responsible for representing their populations. Indeed, it is their ability to do so that prompted the assignment of drinking water provision to them. It is the junction of responsibilities from actors above and from local populations below that means that municipalities are the nexus of beliefs and responsibilities represented within the institutional structure. In this case, the beliefs that dominate, and that are adopted and acted on by the municipality, are those of the population and not the institution. Such prioritisation is justified by municipalities on the basis of their policy core beliefs on policy content. The narrative of "we don't eat fish", and the discourse of the 10 ppb limit being too strict, signify the failure of municipalities to adopt the institutional beliefs around policy content, which creates a belief mismatch that plays a key role in the creation of governance failure. Thus, in common with existing research into deception gaps in new member states, the municipality is the critical point at which governance failure is enacted.

The enactment of governance failure caused by the municipalities' incomplete institutional adoption is moderated by implementation deficits that provide physical barriers to implementation. The type B deficit in the water supply network prevents other actors from working against the municipalities. It is a physical barrier that cannot be changed without the support and financing of the municipalities. This physical barrier determines whether or not it matters that the municipalities, and therefore the water companies, do not see the need to

implement a 10 ppb limit. Even though all the municipalities hold the key belief mismatch, only two of them translate this mismatch into governance failure because two of them have access to distribution systems that are not affected by a type B deficit and already deliver water that meets the limits. Where the type B deficits mean that the infrastructure does not meet the 10 ppb limit, a physical barrier is provided; the water companies lack the implementation aspects necessary to act alone and fulfil their own roles. Similarly, the existence of wells at all creates a physical barrier to implementing the 10 ppb limit. They cannot be easily decommissioned. The presence of the wells, and their decorative role therefore create sites at which municipalities are able to exploit their beliefs by acting according to them, and not according to those of policy. Therefore, the wells remain open despite delivering water that does not meet the 10 ppb limit. Therefore, these physical barriers lead to implementation deficits when actors are not awarded with sufficient resources to overcome them, or are prevented from accessing resources by other actors who do not believe in the beliefs incorporated into policy. Thus the municipalities are constrained in their ability to implement policy by the resources that are available to them, supporting current top-down explanations for deception gaps.

However, the municipalities are not the only actors that contribute to creating governance failure; incomplete institutional adoption by other actors in the governance network creates individual implementation deficits which act as opportunities for the municipalities' to act according to their own (mismatched) policy content beliefs. At every point in the governance system where an implementation deficit occurs, it can be explained by mismatches between agency and institutional structure. However, each of these deficits creates the opportunity for the municipalities to act according to their own beliefs rather than to those of the institutional structure. The DARFÜ project has no enforcement power or means through which to force

participation. Instead, the implementation deficits in the project have allowed the municipalities to alter timescales, and have created an approach that the municipalities will not join in with. This means that the belief-structure mismatches incorporated into the DARFÜ project, as a result of incomplete institutional adoption, combined with limited implementation aspects in terms of powers for enforcement, are playing a facilitating role to the municipalities' actions. A similar facilitating role is played by the belief-belief mismatch of the ministries around wells. This mismatch is caused by an incomplete institutional adoption around the scope of policy and results in the absence of any structures to control the actions of municipalities. Overall, the incomplete adoption of institutional structures create individual mismatches which create individual implementation deficits; these individual deficits create a wider, macro-level mismatch between the roles incorporated into the institutional structure, and the implementation aspect beliefs of policy actors. Therefore, the incomplete institutional adoption of (non-municipality) actors creates opportunities for the municipalities to act according to their own (non-institutional) policy content beliefs, and create governance failures. Indeed, current emphasis in the wider research arena on local level actors for explaining failures in new member states are insufficient because a multitude of other actors at other governance levels create the conditions for governance failure by failing to adopt institutions.

7.2. Objective 5: The Barriers to Institutional Adoption

7.2.1. Propositions: The Basis of Mismatched Beliefs

According to the ACF, knowledge is a key factor in explaining the policy core beliefs held by policy actors (Sabatier, 1988) and the narratives collected during interview support this assertion. The critical clash of municipalities' beliefs and those of the policy institution is around the necessity of the 10 ppb limit. All policy actors in the network were working towards 50 ppb as the limit in their drinking water prior to EU membership. To accept that 10 ppb is correct means accepting that 50 ppb was wrong and that 10 ppb is right. At the local level, many actors find that it is not possible to observe people in the area who are dying or suffering from arsenic related diseases. The lack of observable impact is very relevant to the local populations and the well users. In the case of well users, this disbelief is demonstrated through the description of elderly family members who lived long lives and were fit and healthy. These local actors do not have access to scientific information to demonstrate that their experiential knowledge is wrong, and therefore the beliefs they base upon it need changing. However, at the national level, those actors who accept the 10 ppb limit do so on two bases: that of rules, or that of acceptance that there is a health impact. Those who accept it just because it is a rule do not engage with the validity of the limit at all. However, the national ÁNTSZ accepts the 10 ppb limit on the basis that it is necessary and applicable to the study area. The reasons that they give for their support are related to their own experiences in conducting research on arsenic epidemiology. The regional ÁNTSZ hold an unformed belief based on their recognition of both research evidence and observations. In the case of this research, the availability and form of knowledge shape

whether or not a policy core belief about policy content is changed in response to a new institutional structure.

However, because structure shapes agency in an institution, and because actors are unlikely to actively self-seek knowledge that challenges their policy core beliefs , the institutional structure plays a key role in knowledge distribution. The institutional structure ensures that the municipalities, who are the critical links in the creation of governance failures, only have working relationships with other local actors including the local populations and the water companies. Both of these actors hold the same knowledge on arsenic impact and therefore the same policy beliefs on content. The municipalities do work with the regional ÁNTSZ, but they are not fully convinced of the need for the 10 ppb limit and so cannot pass knowledge onto the municipalities. Additionally, the municipalities have lots of contact with the DARFÜ project managers through the collaborative management committees. However DARFÜ accepts the 10 ppb on the basis that it is a rule and do not have arsenic-impact knowledge to pass on. The municipalities have very little direct contact with the national actors that do hold relevant scientific knowledge. Indeed, all the municipalities report that they have not received any official information on arsenic health impacts and there is actually a lack of information available generally, particularly in Hungarian language. Therefore, in light of a lack of any more objective or policy-orientated information, the local actors use their localised, experiential knowledge to create a persistence in pre-existing policy beliefs. A very similar situation around the role of knowledge and its institutional distribution is found relating to well use. The belief of the ministries around wells is held on the basis that they do not know that the wells are being used. Their denial of well use as a lifestyle is based on their lack of awareness that wells even exist. The ministries do not have contact with local populations, or have opportunities to observe well

use. There is no upward flow of information directly to the ministries from the local level. The only direct link is via MAVIZ, but they work on the behalf of water companies, and do not therefore consider well use. In other words the relationships and structures of the institution are preventing the change of policy core beliefs.

The specific shape of the institutional structure in Hungary, and therefore the way in which it facilitates institutional adoption, is the result of deep core beliefs held in response to wider political contexts, combined with a gentler historical evolution. The award of primary responsibility to the municipalities was done following the change in regime from socialist to democracy. Therefore the Municipalities Act and the Constitution were efforts to decentralise power following decades of centralised rule. The distribution of roles is considered by many respondents to be symbolic. While the central government has made attempts towards modifying the responsibilities of municipalities in recent years, these have been met with resistance, and as yet all attempts have been unsuccessful. The lack of success is because such a role distribution represents deep core beliefs held in reaction to the historical oppressive governance of previous regimes. Such deep core beliefs are not easily changed by any institutional structure (Sabatier, 1988). A process of ongoing evolution over time then further shapes the way the resulting institutional structure functions. The split of work between the actors VITUKI and MAFI has evolved as they have worked together, received different contracts and created their own skills and expertise which the institutional structure has responded to in its division of roles. The associations forming under the DARFÜ project are further examples of historical relationships influencing ongoing structures. For Gyula municipality, the motivation behind forming an association with Elek is the existence of an ongoing cordial relationship around water management. This is in contrast to the ongoing hostilities with Békéscsaba, which provides a

disincentive for forming an association in that direction. A similar ongoing relationship is evident around the desire of the Central Békés Company to work with Arad in Romania. The institutional structure that has emerged in Hungary in response to EU requirements is therefore a product of its historical path dependency, meaning that it can be modified further over time, but the impact of changes will continue to be shaped by the previous impacts of historical events (Thelen, 2004).

7.2.2. The Focus Groups

Data Collection

The questions presented to the focus group aimed to generate discussion that would either expand upon or negate these explanatory propositions. Asking direct questions based on knowledge and history would be likely to guide and narrow the discussions held. It would therefore be unlikely that any other issues would be revealed, and could potentially place too much emphasis on these explanations. It was necessary to allow opportunity for them to be disproved. Therefore, the questions were planned to allow for discussion amongst the groups about why they thought management was failing, and therefore what their own policy beliefs were based on. This differed from previous interviews that had focussed on the roles, actions and opinions of the actor. The focus group questions (see below) required them to think about the collective management of drinking water, including their own roles and that of others. Question 1 was intended that they would draw out those factors that contribute to forming beliefs around the 10 ppb limit. Question 2 allowed discussion to highlight the reasons for governance failures from the perspectives of the participants. This was combined with question 3 in intending to grasp how the participants viewed the current governance approach and why. Question 3 used

'should' questions in an attempt to discover how participants think drinking water could be managed effectively in the Hungarian context. By highlighting the practices that participants felt could be changed, it highlighted those points in management that they considered to be inappropriate or ineffective, and why. Therefore, rather than ask directly about the role of knowledge and history in creating mismatch and therefore deficits, participants were asked to explain problems with governance from their perspective. The questions asked were:

1. Should we manage arsenic in drinking water and why?
    - Is 10 ppb a good limit?
2. How can we control arsenic in drinking water?
    - How effective are our current attempts?
    - What are the best options and why?
    - Do we need new technologies, techniques and approaches?
3. How should drinking water be handled?
    - Which institutions play a role?
    - How could this be more effective?
    - How should governance be structured in order to manage water?

The participants that attended the focus group represented most of the governance network with the exception of the local level participants. The list of participants is shown in table 7.2,

though in keeping with the promise of anonymity, names are not provided. Usually, the participant was the same person who had been interviewed, with only one or two exceptions and additions to this. The local populations, municipalities and the two independent water companies were not present. The local populations were not invited as it would not have been logistically possible to select representative participants, and host sufficient numbers. The municipalities and independent companies were invited but chose not to attend, though they all expressed an interest in seeing the outcomes from the day. As detailed in chapter 4, a number of non-governance, research actors did participate. The focus group was therefore not representative of the whole governance network. The science actors cannot be considered to change the representative nature of the group; they were present as discussants, and performed this role. At the event, there was one discussion group of science-only respondents. Their outputs were not considered in the analysis, only the ways in which other participants responded to them. However, of the governance actors that were present, the network is only represented from the regional level upwards. This was both a limitation and an opportunity. The limitation was that the critical actors, the municipalities, were not present to present their views. This could potentially mean that their opinions were excluded from the findings. However, it also meant that regional and national actors were much freer to discuss their limitations in working with the municipalities. This means that despite not representing the whole network, the results are still able to offer interesting insights. Therefore, while full exploration of the explanations for mismatch was not possible, the data did offer opportunities for expansion or refinement of the propositions already made.

Table 7.2: Focus Group Participants

Policy Actor	Policy Tier	Number of Attendees
KvVM	National	1
EUM	National	1
MAVIZ	National	2
VITUKI	National	1
MAFI	National	1
National ÁNTSZ	National	1
KÖRKÖVÍZIG	Regional	1
DARFÜ	Regional	1
Regional ÁNTSZ	Regional	2
Central Békés Company	Local	1
Szeged University	Science	1
AquaTrain	Science	12

Results

On the question of whether arsenic should be managed in drinking water, the 10 ppb limit was the focus of all discussions. Every group reported doubts over the health impact of arsenic, and worries that the focus on arsenic was diverting attention from other problems. Two of the

groups stated that education on the 10 ppb limit was required, particularly at the local level. The other group argued that the municipalities do not have enough knowledge about the health impacts of arsenic to be able to prioritise it. Particularly, groups felt that the limits were not reflective enough of the local situation such as dietary habits or other environmental risk factors, and the "we don't eat fish" theme was recalled. However, the discussions went further by raising suspicions about the EU directive. There was a lot of awareness around the idea that the EU directive was lacking in scientific evidence. All the groups questioned the validity of the 10 ppb limit, stating that the background to it is unclear, and not necessarily based on any clear health evidence. The group that contained the representative from the National ÁNTSZ did argue for the limit, based on their findings within the ASHRAM research project. However, many other respondents still felt that this data was lacking and was too generalised to provide any clear basis for the limit in Hungary. There was an argument made that it was not appropriate to force such a significant financial investment in Hungary without proper evidence to suggest that 10 ppb was any more appropriate than 30 ppb. Participants agreed that health investigations were needed before such a strict limit was committed.

On the question of how arsenic in water should be managed, participants confirmed the role of knowledge in shaping actions and beliefs, but highlighted how it contributed to facilitating wider deficits than just the key deficits. They highlighted their preferred options for management, and the barriers that they faced in pursuing them. Technologies were not favoured due to their high costs. However, it was recognised that it some cases they may be necessary. All participants stated that they would prefer to be able to use water that was naturally within the quality requirements of the EU. However, the knowledge required for this is not in place. Not enough is known about the water sources and their long term forecasts in order to be able to plan

to use them in the preferred way. Similarly, there has not been sufficient work done on piloting remediation plants and understanding how they work with the water chemistry in the area. These emerging narratives support the idea that the knowledge available shapes policy core beliefs relating to the appropriate course of actions, and therefore knowledge shapes the actions of policy actors. It indicates that the lack of integration of knowledge produced by MAFI, MAVIZ and VITUKI (and to some extent the KÖRKÖVÍZIG) hinders the development of effective management actions.

On the question of how arsenic in drinking water should be governed, most participants stressed the idea that there were too many actors with too many separate responsibilities and opinions. Most participants agreed that a greater level of commitment was needed from the municipalities. Their lack of action on their assigned roles was seen to be explained by a lack of engagement. This was felt to be partly related to the controversial nature of the 10 ppb limit, in that municipalities were not proactive enough in understanding why arsenic would need to be managed. Disconnection was also discussed around the EU in general. It was felt by one group in particular that the EU was misunderstood at the local level, and that its instructions were not specific enough to engage local actors. A solution to this was the idea that the regions should play a greater role with greater powers. Certainly, the lack of enforcement or punishment was felt to be a problem by most participants. They desired the ability to enforce decisions from a regional level, and therefore prevent the municipalities from holding the ultimate control over water management. However, it was also noted that punishment is futile if the resources and capacity to act are not present at the local level. Therefore, it was noted that municipalities also needed greater awareness and engagement around the funds and facilities available to them in order to overcome the physical barriers to management.

7.2.3. Resistance to Institutional Adoption

The results indicate that role of knowledge as a source of resistance to institutional adoption is more complex than initially outlined. The focus group discussions do support the proposition that an actor's knowledge about the health impact shapes their policy beliefs. Indeed, the idea that municipalities need more education on such matters highlights that actors perceive such knowledge to be essential in the successful management of arsenic in drinking water in Hungary. However, in light of this lack of knowledge, the actors are suspicious of the basis for the EU limit. They think that there is no evidence on which to base a 10 ppb limit, and therefore that there is no knowledge to give to the municipalities to convince them to act. These arguments emphasised that it is not necessarily the need for a limit that is being questioned by actors, rather it is the validity and justification of the specific 10 ppb limit. The emphasis on justification shifts the basis of the resistance away from that purely of knowledge, and towards the initial type D deficit that exists at the EU level. The failure to base the limit on clear causal theory creates doubts in policy actors within the Hungarian governance system. These doubts create barriers to the implementation of the adopted policy because the actors are resistant to adopting a limit that they cannot fully believe is necessary. Therefore, the initial type D deficit creates mismatch, which creates implementation deficits. In this way, the type D deficit is carried through the system, not just in the way that it influences the ability of any subsequent policies to solve the policy problem, but also in the way that it influences the likelihood of institutional adoption and therefore implementation of the policies.

The focus group discussions verified the critical role played by the municipalities in the governance network and developed the role of Hungary's institutional structure in creating

mismatch. The data collected demonstrate that other actors in the network feel that they are unable to fulfil their own roles, or see the benefits of their own actions, because the municipalities hold all the power in this situation; thus they are lacking the necessary implementation aspects. The municipalities are unable and unwilling to act, but their autonomous status means that other actors in the network are unable to react and hold them accountable. The other actors do not have the sufficient powers to ensure that their own roles are fulfilled because they have no powers of enforcement over municipalities. Therefore, the municipalities can undermine the success of the other actors by failing to act on decisions or policies. This means that the institutional structure that has been created in Hungary fails to match powers with responsibilities, and fails to match both with the policy core beliefs that influence actions. It also fails to allow the efficient spread and sharing of useable knowledge. For example, the outputs of the KÖRKÖVÍZIG, MAFI and VITUKI are not effectively integrated into policy, despite this being an intention. The useable policy tools that are being created are not available for use by those actors that need them to shape their policy decisions and actions. This means that even though such actors are not directly involved in the creation of implementation deficits, they are also not fully involved in the effective implementation of policy. In this way the institutional structure serves to perpetuate the non-adoption of beliefs by preventing knowledge from being communicated between actors.

The role of historical evolution in shaping the institutional structure was neither expanded on, nor negated during the focus group discussions. None of the discussions included reference to any historical contribution to structure or role distribution, or to working relationships. This does not mean that historical events do not play a role in shaping structures and beliefs. Instead, it is likely to be related to the questions asked of the group, and the absence of the local actors.

The questions asked were very focussed on the present and the future, without specific reference to asking why arsenic is managed in its current way. Unfortunately this meant that they invited very little discussion of the way in which policies or historical evolution have led to the current situation. Furthermore, in terms of working relationships, it is mainly the local actors to whom ongoing working relationships play important roles. As the local actors were not represented in the focus group, they were not able to contribute their views to discussions. The lack of reference to historical shaping of the institutional structure does not necessarily mean that the concept does not apply in this situation. It suggests that perhaps such issues are not perceived to be important in shaping working relationships by actors above the local level. Therefore, the way in which the governance network functions as a network is perceived by the actors to be primarily shaped by the roles outlined in the policy documentation. However, the quality of working relationships, and therefore collaborations to fulfil roles at the local level depends largely on established relationships.

The findings indicate that the barriers to institutional adoption are mainly related to the institutional structure in terms of both the erroneous causal theories incorporated within it, and the responsibilities and relationships that have evolved over time. Indeed the role of structure in shaping institutional adoption is demonstrated visually in Table 7.1 (pages 187-188). The table is structured to group together actors that share the same forms of mismatch and thus the same inconsistencies in institutional adoption. Local people and municipalities only differ in their mismatched beliefs depending on whether there are artesian wells in the town or not. The two small water companies also match each other's fit. The other actors that match each other are the ministries at the national level. It is only those actors who act as bridging actors between national and local that do not clash with the institution-beliefs in some way. The similarities in mismatch,

and therefore extent of institutional adoption, between actors sharing roles and governance levels indicates the institutional structure influences adoption in the way it distributes the conditions necessary to facilitate a change in beliefs. In the case examined here, the conditions necessary to facilitate change are convincing and transparent arguments for the basis of policy content beliefs that are incorporated into the institution. Such evidence cannot be provided because of the causal theory errors incorporated into the 10 ppb limit. Therefore barriers to institutional adoption by policy actors are located within the causal theory beliefs and path dependencies that have shaped the institutional structure.

8. Conclusions

8.1. Arsenic Management Governance Failures: Explanations and Implications

8.1.1. Explaining Governance Failures Hungary

The results presented here show that governance failure in Békés County around arsenic in drinking water is the result of incomplete adoption of the institution created in response to EU membership. Overall, governance failures in Békés County are caused by multiple instances where the policy actor has failed to adopt the beliefs of EU institutions for managing arsenic, and therefore the agency and structure of the governance institutions clash. This failure occurs in three ways: 1) because the institutional structure assigns roles which do not match with the implementation aspect beliefs of the policy actors; 2) because the institutional structure assigns roles which do not match the policy actor's policy core beliefs around how policy should be achieved; 3) and because the institutional structure incorporates, as a central belief on policy content, a statement of causal theory that the policy actors do not believe in. The policy actors in the network are limited in their ability to change the policy in response to their rejection of it. They are only able to slightly change the institutional structure at their own level of policy, creating implementation deficits and altering the structure at levels below it. These alterations create opportunities for inaction and barriers to action for actors at lower levels of policy, creating chains of implementation deficits. The municipalities are the actors responsible for ownership and operation of drinking water supplies and therefore act as a nexus for all implementation deficit chains. They therefore play a key role into translating these barriers and opportunities into governance failure because when they fail to adopt the institution, they modify

their own role away from that given by the institutional structure, and therefore management actions are not instigated and management fails.

Underlying the incomplete adoption of the institution are causal theory errors in the policy content beliefs that the institutional structure incorporates. Shaping the actions of the municipalities, and therefore providing motivation of the translation of deficits into governance failure, is their disbelief of key policy actors in the content of the legislation itself. This belief is held because they have a lack of evidence that the 10 ppb limit induces health impacts, and because they have their own observational evidence that people in the area are not affected by arsenic. This underlying rejection of the beliefs incorporated into policy causes the municipalities to neglect the implementation of the policy itself. When faced with the conflicting priorities of the 10 ppb policy and that of the local populations, combined with the lack of repercussions for failure to enact the 10 ppb policy, their policy core beliefs of rejection of the 10 ppb limit prompt municipalities to act against the legislation. So not only do the policy core beliefs of the municipality clash with that of the policy, but this mismatch occurs at a critical point whereby the implementation beliefs clash with structurally assigned roles, thus creating an opportunity for the belief-belief mismatch to influence actions. This causal theory error means that the institutional structure for drinking water generates its own source of resistance to institutional adoption by policy actors. Therefore, failure of policy actor's to adopt institutions is not purely the result of persistent actor beliefs formed prior to EU accession, but is also related to the type D implementation deficit incorporated at the EU level.

Furthermore, the functional institutional structure and links between actors created in Békés County prevents the adoption of EU policy beliefs by policy actors. The policy actors interact

with institutional structure in order to give the downloaded values and structure a particular domestic shape. The way structures are initially downloaded and interpreted by actors, individually and collectively, is dependent on historical legacies. Previous governance systems have shaped the deep core beliefs of policy actors on who should hold which powers and why. This influences the way in which multi-level governance is applied to share roles, responsibilities and powers in the domestic governance system. When translating policy, actors have the opportunity to incorporate their own beliefs about how policy goals should be achieved. Therefore the institutional structure is then further refined by the beliefs of the policy actors at every stage of the tiered policy system in terms of who they work with and why. This reshapes the distribution of resources and responsibilities and refines the institutional structure. Thus the agency shapes the structure by incorporating its own beliefs and provides an explanation for why EU governance adopts its unique character in Hungary. In doing so, an institutional structure is created which limits the spread of information between certain actors, particularly between national and local tiers of governance. Therefore, the governance failures around arsenic in drinking water are exacerbated by working relationships in the institutional structure that have emerged in response to historical evolution.

The case study research findings contribute to explanations of governance failures around arsenic in drinking water for the whole of Hungary. The particular perfect storm examined here is created by the distribution of powers, knowledge, histories and capacities has occurred as a result of institutional evolution and adaptation that is specific to the institutional structure that is created in Hungary, and the institutional agents at national, regional and local levels relating to the county of Békés. These specific explanations are unlikely to occur in other national settings, and possibly not in other locations within Hungary. However, the specific details of the

mismatches and the findings can be used to explain failures in the specific municipalities included in the study. They can also go some way towards explaining failures in the whole of Békés County and indeed the Southern Great Plain region. The resistance of the municipalities around the DARFÜ project causes the whole project to stall. Other municipalities are unable to enact changes under the project until all associations are formed. Therefore, while the specific mismatches might not hold true for other municipalities that weren't included in the research, their existence still impacts upon governance in the same way. Therefore, the explanation of governance failures caused by incomplete institutional adoption is applicable at least to the Southern Great Plain region. How well this explanation accounts for governance failures in the Northern Great Plain, or in other locations throughout Hungary is unknown. However, if the Southern Great Plain region does not implement legislation, then Hungary as whole will continue to fail to meet EU limits. Therefore, the findings that institutional structure stalls institutional adoption by policy actors contributes to understanding why arsenic governance is failing in Hungary.

8.1.2. The Wider Implications of Findings for Arsenic Management

In the case of arsenic management, it is possible that similar mismatches in beliefs are creating governance failures in other member states, or even in countries outside of the EU system of governance. Key in determining implementation success is whether or not policy actors with responsibilities have been given the information to convince them of the need for the 10 ppb limit. In the case studied here, this depends on the distribution of resources and responsibilities, which is in some way shaped by the historical evolution of the country's governance system. But the fundamental issue of whether or not resources are used and

responsibilities met, is the availability of policy knowledge and its communication to key actors. In this case study, the lack of this knowledge in the legislation being adopted underpinned the governance failures. However, this lack of knowledge, and this type D deficit, is present in the legislation for every member state. How each member state reacts to these uncertainties and how they influence policy actor beliefs, how this interacts with roles assigned, and therefore the influence on the success of governance therefore warrants further consideration in the wider EU. The conditions under which this uncertainty creates a problem to governance, and the conditions under which it either does not influence the beliefs of policy actors, or such clashing beliefs are not able to prevent implementation need to be further understood. Similarly, such conditions and interactions must be considered in governance systems outside of the EU. The EU's 10 ppb limit is based on that of the WHO. The influence of the WHO is global public health protection means that the type D deficit is also present for a much wider range of countries. There is potential therefore for it to induce implementation failures in other locations. The way in which such beliefs interact with policy actors and contribute to governance success or failure therefore also warrants further investigation in non-EU institutional contexts in order to understand the role of causal theory failings in arsenic management worldwide.

In terms of the governance failings examined here, the required targeted intervention in science should be around the elimination of the type D deficit incorporated into EU legislation. Firstly, this deficit means that even where the legislation is enacted and enforced, it will not achieve the targeted 10^{-6} excess lifetime cancer risk. Assuming a linear dose-response curve, epidemiological data suggests that the limit would need to be far lower to achieve this target. This is particularly true where sensitive receptors are also exposed to arsenic via their food or the air that they breathe. Alternatively, if dose-response is not linear, then this target is likely to be

far too stringent, and will prompt massive unnecessary spending in seeking to achieve it. It is clear that further knowledge is required in this policy area in order to improve the accuracy of policy limits. This needs to be around dose-response at low doses, and in determining the dietary contribution to arsenic exposure. It could be argued that until such data is available, a precautionary approach should be followed. However, the current limit is not precautionary if it is considered too high based on existing data. Rather, it is a limit is neither set to achieve stated targets nor to over-protect public health. Secondly, the limit as it stands, based on shaky scientific justification, is a key factor underlying the formation of governance failures. Therefore, in order to improve the management of arsenic in all member states, new epidemiological data should be generated to help in the setting of limits

In order to improve the implementation of arsenic legislation in Hungary, and ensure that future member states implement limits smoothly, the way in which the limit for arsenic in drinking water is communicated to policy actors must be improved. It is currently not made clear to policy actors that this particular limit is set on any basis other than clear causal theory. Instead, actors are faced with very little real information about the basis of the limit. This leads to a rejection on the basis that it is not relevant to them, and that they do not believe in the basis of the 10 ppb limit. This D type deficit is then the basis of governance failure. To prevent this threat, action is required from both the EU level, and other policy actors within the Hungarian governance system. The EU needs to be clear about the basis on which limits are set. At the very least, the background justifications for limits need to be easily accessible to anyone who wants to view them. It is unacceptable, inappropriate, and ultimately damaging, to not provide member states with the background to the policies they are expected to adopt and action. Clarity about the actual basis of limits and why they are applicable to Hungary would serve to provide a

better motivation for action amongst policy actors. **The first policy recommendation** of this thesis to make EU level background documentation freely available and accessible to all policy actors (and interested parties) in member states. Actors within the Hungarian governance system can also improve upon the communication of knowledge around policy. The national ÁNTSZ has research to show the impact of arsenic on their populations, but has so far not made it available to those policy actors with responsibility to instigate management. A significant step forwards in improving governance in Hungary would be the sharing of such information and knowledge. **The second policy recommendation** of this thesis is that collectively, the EU and the policy actors within Hungary need to be more proactive in ensuring that those actors who are expected to act on legislation are also given knowledge about the need and justification for that action.

The recommendation for sharing knowledge indicates the need for a wider change in the relationships between policy actors in the governance system, to recognise the distribution of powers and responsibilities. The way in which Hungary has implemented the institutions of multi-level and network governance has given key control of drinking water supplies to municipalities. However, this has not been complemented with any decision making contribution, or even communication about policies. It is one way communication, with limited opportunity to request information or voice concerns. This is a dictatorial relationship, with central actors telling the local actors when and how to act. This does not serve to adjust the policy core beliefs of the municipalities. It also means that improvement programmes are planned without accounting for the wishes or limitations of the municipalities. This lack of two-way engagement with key actors also means that the national actors have little understanding of the water use behaviour in the municipal areas. Therefore behaviours remain unchecked.

Improving this situation is in the best interests of all actors in the system, and will improve the overall governance success. Improving this situation requires a move away from top down instructions on what must be done, and towards a dialogue in order to facilitate that action. Bottom-up communication channels within the Hungarian governance system must be improved. If the municipalities are to implement policies, they should be able to participate in planning how this will happen. Therefore, **the final policy recommendation** of this thesis is to improve the amount and form of participation opportunities available to municipalities, to allow involvement in policy planning at all domestic policy tiers.

8.2. Contributions to Implementation Deficit Research

8.2.1.Explanations of Implementation Deficits

The explanations that governance failure is the result of mismatched policy beliefs between actors and institutional structures expand our understanding of the ACF in the EU context. From this single case study explanation, it is not possible to conclude that all beliefs incorporated into all policy actors and structures can be categorised as deep-core, policy core or implementation aspects; nor that resistance to institutional change is a product of the beliefs incorporated within the agency of the institution, and the way in which the structures account for and address them. However, the research findings suggest that the categorisation of policy actor beliefs in the ACF allows for examination both of why institutional change is resisted, and of why policy actors do not enact policies. The ACF usually describes how policy actors form coalitions around joint beliefs in order to secure a change in policy. In the EU context, the decentralisation of implementation powers mean that this process does not occur. Rather, the policy actors use their

beliefs in two ways to alter the policy institutions. They can either further shape the distribution of roles and implementation aspects in the institutional structure, or they can fail to fulfil their own role. Therefore, instead of clashing beliefs leading to the formation of advocacy coalitions for policy change, in the EU context they lead to individual actors creating incidences of institutional modification.

In creating these explanations of failures as mismatched policy beliefs, the results presented here challenge current implicit conceptualisations of implementation deficits as isolated failures occurring at single points in a governance system. There are numerous implementation deficits in the multi-level governance system that manages arsenic in drinking water in Békés County. There is an initial causal theory deficit incorporated into EU legislation, whereby the 10 ppb limit is unlikely to meet the 10^{-6} excess lifetime cancer risk set by the EU. Once this limit has been translated into national law, the failure to meet it is caused by numerous domestic implementation deficits. These chains create three forms of governance failure: 1) the current drinking water supply does not meet the 10 ppb limit; 2) local people are accessing wells for drinking water that exceed 10 ppb and are not controlled; and 3) the improvement programme for addressing current failures is stalled. Each of these different failures is part of a sequence of deficits that occur at different tiers of the policy system as the initial law is translated downwards into increasingly tangible actions. Individually, each implementation deficit occurs because of a mismatch between the role assigned by a higher policy tier and the ability of a policy actor to fulfil that role. However, the implementation deficit serves to allow the policy actor alter the institutional structure and thus provide barriers to action, or opportunities for inaction to for other actors. In the deficit chain relating to well use, type C deficits fail to provide management structures for the municipality to comply with; in the case of the DARFÜ project, type C and type A deficits

provide municipalities with an inappropriate management structure; and in the case of current drinking water management, a preceding type B implementation deficit prevents the municipalities from taking action by providing a technical infrastructure which cannot be easily corrected. Therefore, governance failures in a multilevel governance network are actually the result of chains of interlinked implementation deficits.

The results presented here also challenge current explanations that local policy actors create governance failures, or deception gaps, based on inexperience and a lack of capacity. The specific distribution of implementation powers to actors is influenced by the desire of Hungarians to move away from centralised control, thus giving the municipalities autonomy, ownership of drinking water infrastructure, and the primary responsibility to deliver drinking water to their populations. These beliefs cause the structure to give power and autonomy to the municipalities, and means that the other actors in the governance network can do little to directly influence or change the behaviour of the municipalities. In this way, the findings corroborate existing research on deception gaps, which place the blame for failures on local policy actors. However, the findings from this research indicate that the reason that municipalities fail to take the necessary actions is related to their beliefs around the content of policies and their beliefs about the institutionally required approach for achieving this content. Therefore, governance failures and deception gaps cannot be explained entirely in terms of deficient capacity or experience at the local level; these factors are likely to be compounded by a lack of willingness to implement policies according to their content and approach.

These findings have implications for how directing efforts to prevent or remedy implementation deficits in new and prospective EU member states. The reason that the

municipalities hold the beliefs they do around policy approach and content are related to the fact that they are not given any justification of the policy content, and that their policy beliefs around approach have been shaped by historical events. For example, previous disagreements and governance systems have left a legacy in the willingness of municipalities to adapt to new governance requirements; particularly over the necessity to collaborate and form associations in the DARFÜ project. The current EU governance approach fails to tackle these foundations for policy beliefs. The democratic deficit of the EU ensures that member states are expected to adopt policy content and approaches with very little exposure to the formulation process, and therefore to any background rationale. This is particularly acute in new member states where the policies adopted were formulated prior to a country's accession, thus denying them any opportunity to participate. It is this lack of accountability that is problematic to implementation; without accountability for decisions, there is no motivation to provide information and justification for policies. Furthermore, current approaches to address the democratic deficit in new member states do not address this lack of accountability, nor tackle policy beliefs around approaches for implementation. Currently, in order to help new members to adapt to EU legislation, the states undergo a process of capacity building during the accession process. This includes twinning projects where established member states collaborate on specific projects with new members, or the availability of funds to help with institutional change. The way in which capacity building is operationalised in the EU is top-down; the capacity builders decide upon the scope and focus of capacity building projects (Carmin & Vandeveer, 2004). Therefore, the focus of capacity building tends to be on skills and abilities, as well as making sure that the correct institutional structures are in place. These approaches fail to account for policy actor's beliefs of barriers to belief adoption and are therefore unlikely to address all barriers to institutional adoption and

prevent all implementation deficits. Rather, the scope and content of capacity building needs to be decided collaboratively with policy actors on a case-by-case basis.

8.2.2. Research Implications

The findings of this thesis provide the foundation for more detailed explanations of governance failures throughout all policy areas in all EU countries. A rich descriptive explanation has been created to explain governance failures as multi-level, interlinked implementation deficits that are both the result of, and exacerbate, the incomplete adoption of policy institutions by the institutional agents in the governance network. While the specific failings and deficits presented here are peculiar to arsenic management and Békés County, there is nothing to suggest that the theoretical principles should be limited to arsenic management, nor to Hungary. Every member state implements EU legislation according to the principles of multi-level, networked governance. This means that there is a range of domestic policy actors engaged over multiple tiers of policy in every member state, around every policy area. The shape of the institutional structure, and of the network and therefore the policy actors and their beliefs will vary with the state and the policy area. However, all systems will present opportunities for multi-level mismatches between actor and structure, and therefore for multi-level implementation deficits. Indeed, this challenges the assumption of many deception gap studies, that failures of this kind are a result of the new member states lacking experience and capacity. Rather, policies can be adopted, and then not implemented by any member state where the policy actor's beliefs clash with the institutional structure. This clash is based on legacies from old institutional structures, and on features of the new institutional structure. Every member state has a historical legacy, and ever member state will be confronted with a new institutional structure, at least in

terms of policy goals, when new legislation is introduced. Therefore such clashes can occur whenever any member state is required to adopt new legislation and these clashes have the potential to lead to non-implementation.

In order to expand upon these foundations and build upon emerging theories, further research is required that examines governance systems in terms of both structural and agency beliefs and their relationships, meaning that the analytical frameworks provided by the ACF need to be expanded into wider EU contexts. The findings here demonstrate that current institutional theories need to expand upon understandings of the various forms of norms and beliefs that are displayed in both institutional agency and structure, and examine how these interact with each other. The current recognition that norms and beliefs are an integral part of the institution does not go far enough to explain the institution in this case; instead it is suggested that in institutions for policy, norms and beliefs can take different forms around the principles by which governance should occur, what should be managed and how. The classification provided by the ACF allows for a much more detailed and powerful examination of how structure and agency interact and on how they shape each other. It provides an understanding of the beliefs that the policy actor seeks to incorporate into the institutional structure. It therefore gives greater context to structure-agency interactions and their role in governance failures. The analytical frameworks of the ACF should therefore be trialled in a much wider range of governance failures in the EU in order to generate case studies in a variety of policy areas and countries so that they can be compared and theories can be generalised.

In order to implement such frameworks, studies of implementation failure in EU member states need to examine the whole of the governance system, in a holistic (top down and bottom

up) approach. The current focus on single policy actors, or on single stages in the policy process has been shown in this thesis to be inadequate. Failures do not occur in isolation, nor take just one form; they are administrative failings, and they are scientific failings; they form interconnected chains of deficits; and their causes lie both in the policy actors and in the institutional structures. Therefore examination of a single type of failure, a single policy tier, or from a single top-down or bottom-up approach cannot be considered to be a complete explanation of governance failure in a EU governance system. The methods pursued in this research have provided a holistic approach, although they are not without problems. The iterative, dual approach methodology pursued here has allowed all aspects of the governance institution to be examined. The focus group was an essential addition to tie together and develop findings. The focus group was also essential because it help to account for some of the lack of comparability that results from the unstructured interviews with policy actors. Unstructured interviews were essential in order to remain open to the views of policy actors, and thus pursue a bottom-up approach that generated theories. However, it does mean that the outcomes are not necessarily comparable; an actor may have raised the same discourse as another if they had been asked the exact same questions. The focus group allowed actors to confirm, dispute or join into a discourse that they may or may not have had the chance to raise at an earlier stage. Organising such a focus group requires all actors to be suitably engaged in the research topic, and I was fortunate that arsenic in drinking water is a pertinent topic in Hungary. Where a focus group is not possible, a similar revisiting of discourses could be achieved by formulating a structured questionnaire on the basis of the preliminary results, in much the same way as I confirmed the discourses of local populations.

Taking a grounded theory approach and ensuring that data collected is wider than a pre-defined, targeted collection allows the two sets of methods to remain coherent and focussed on a single research aim. Immersing myself in the governance context of arsenic in Békés county allowed me understand how single pieces of data fitted into the bigger picture of arsenic governance in Hungary. By constantly contextualising and responding to data from both research approaches, I was able to ensure that the bottom-up methods (discourse analysis) could respond to outcomes from the top-down methods (policy review) and vice versa. My outsider position in the governance context helped me to remain objective, and was reinforced by the use of a translator and research assistant (as outlined in chapter 4), and by my own careful reflection through the writing of field notes and research memos. However, in addition to combining two research approaches, I was also combining two conceptualisations of the policy problem: The causal theory as represented by the scientific knowledge of arsenic, and the institutional representation of the arsenic problem. The integration of conceptualisations was greatly aided by my involvement in the AquaTrain network, which provided access to a wide range of scientific knowledge and discussion. Such multi-disciplinary networks or scientific communities have the potential to provide implementation researchers with essential contextual information on the policy topic being explored. However, to fulfil this potential topic based networks will need to be extended to a wider variety of policy topic areas and country contexts in order to help with our understanding of governance failures in the EU, and with targeting interventions in both scientific knowledge and the governance system, in order to improve policy implementation.

References

Abernathy, Calderon & Chapell, 1997, *Arsenic: exposure and health effects,* Chapman and Hall, London.

Ahmann, D., Krumholz, L.R., Hemond, H.F., Lovley, D.R. & Morel, F.M.M., 1997, Microbial Mobilization of Arsenic from Sediments of the Aberjona Watershed, *Environmental science & technology*, 31(10), pp. 2923-30.

Al Rmalli, S.W., Haris, P.I., Harrington, C.F. & Ayub, M., 2005, A survey of arsenic in foodstuffs on sale in the United Kingdom and imported from Bangladesh, *The Science of the total environment,* 337(1-3), pp. 23-30.

Amini, M., Abbaspour, K.C., Berg, M., Winkel, L., Hug, S.J., Hoehn, E., Yang, H. & Johnson, C.A., 2008, Statistical Modeling of Global Geogenic Arsenic Contamination in Groundwater, *Environmental science & technology*, 42(10), pp. 3669-75.

ÁNTSZ, 2007. *Ivóvizünk minösége.* Available online at http://www.oki.ÁNTSZ.hu/ivoviz.html.

Argos, M., Kalra, T., Rathouz, P.J., Chen, Y., Pierce, B., Parvez, F., Islam, T., Ahmed, A., Rakibuz-Zaman, M., Hasan, R., Sarwar, G., Slavkovich, V., van Geen, A., Graziano, J. & Ahsan, H., 2010, Arsenic exposure from drinking water, and all-cause and chronic-disease mortalities in Bangladesh (HEALS): a prospective cohort study, *Lancet*, 376(9737), pp. 252-8.

Arts, J., Tomlinson, P. & Voogd, H., 2005, EIA and SEA tiering: the missing link? *Position Paper Conference on International experience and perspectives in SEA*, International Association of Impact Assessment, 26-30 September, Prague.

ATSDR (Agency for Toxic Substances and Disease Registry), 1990, *Case Studies in Environmental Medicine. Arsenic Toxicity.* US Public Health Service, US Department of Health and Human Services, Atlanta GA.

Bache, I. & Chapman, R., 2008, Democracy through multilevel governance? The implementation of the structural funds in South Yorkshire, *GOVERNANCE-AN INTERNATIONAL JOURNAL OF POLICY AND ADMINISTRATION*, 21(3), pp. 397-418.

Ballantyne, J.M. & Moore, J.N., 1988, Arsenic geochemistry in geothermal systems, *Geochimica et Cosmochimica Acta*, 52(2), pp. 475-83.

Baker, R.S., Barrentine, W.L., Bowman, D.H., Hawthorne, W.L. & Pettiet, J.V., 1976, Crop response and arsenic uptake following soil incorporation of MSMA, *Weed Science*, 24(3), pp. 322-6.

Barrett, C.B., & Cason, J. W., 1997, *Overseas Research a Practical Guide*, Baltimore, The John Hopkins University Press.

Bauer, M. & Blodau, C., 2006, Mobilization of arsenic by dissolved organic matter from iron oxides, soils and sediments, *The Science of the total environment*, 354, pp. 179-90.

Bauer, M.W., 2006, Co-managing programme implementation: conceptualizing the European Commission's role in policy execution, *J EUR PUBLIC POLICY*, 13(5), pp. 717-35.

Baumgartner & Jones, 1993, *Agendas and instability in American Politics,* The University of Chicago Press, Chicago.

Benson, A. & Jordan, A. 2010, Environmental Policy, in M Cini & N Perez-Solorzano Borragan (eds), *European Union Politics,* Oxford University Press, Oxford, pp. 359-73.

Berg, M., Luzi, S., Trang, P.T.K., Viet, P.H., Giger, W. & Stüben, D., 2006, Arsenic Removal from Groundwater by Household Sand Filters: Comparative Field Study, Model Calculations, and Health Benefits, *Environmental science & technology*, 40(17), pp. 5567-73.

Brima, E.I., Haris, P.I., Jenkins, R.O., Polya, D.A., Gault, A.G. & Harrington, C.F., 2006, Understanding arsenic metabolism through a comparative study of arsenic levels in the urine, hair and fingernails of healthy volunteers from three unexposed ethnic groups in the United Kingdom, *Toxicology and applied pharmacology*, 216(1), pp. 122-30.

Brunazzo, M., 2010, Regional Europe, in M Cini & N Perez-Solorzano Borragan (eds), *European Union Politics,* Oxford University Press, Oxford, pp. 291-305.

Borghetto, E. & Franchino, F., 2010, The role of subnational authorities in the implementation of EU directives, *Journal of European Public Policy*, 17(6), pp. 759-80.

Borja, Franco, J., Valencia, V., Bald, J., Muxika, I., Jesús Belzunce, M.A.A. & Solaun, O., 2004, Implementation of the European water framework directive from the Basque country (northern Spain): a methodological approach, *Marine Pollution Bulletin*, 48, pp. 209-18.

Borzel, T.A. & Panke, D. 2010, Europeanization, in M Cini & N Perez-Solorzano Borragan (eds), *European Union Politics,* Oxford University Press, Oxford, pp. 404-4117.

Burlingame, Dietrich Andrea M & Whelton Andrew J, 2007, Understanding the Basics of Tap Water Taste, *Journal of the American Water Resources Association*, 99(5), pp. 100-11.

Calabrese, S., 2009. *Atmospheric deposition of volcanogenic major and trace elements on Mt Etna, Sicily*. PhD Dissertation, University of Palermo, Italy.

Carmin, J. & Vandeveer, S.D., 2004, Enlarging EU environments: Central and Eastern Europe from transition to accession, *ENVIRONMENTAL POLITICS*, 13(1), pp. 3-24.

CASCIO C., 2010, *Report on uptake of geogenic elements by humans - diet and other controls*, AquaTRAIN, Manchester.

Cascio, C., Raab, A., Jenkins, R.O., Feldmann, J., Meharg, A.A. & Haris, P.I., 2011, The impact of a rice based diet on urinary arsenic, *Journal of environmental monitoring : JEM*, 13(2), pp. 257-65.

Cavar, S., Klapec, T., Grubesic, R.J. & Valek, M., 2005, High exposure to arsenic from drinking water at several localities in eastern Croatia, *The Science of the total environment*, 339, pp. 277-82.

Chandra Sekhar, K., Chary, N.S., Kamala, C.T., Venkateswara Rao, J., Balaram, V. & Anjaneyulu, Y., 2003 Risk assessment and pathway study of arsenic in industrially contaminated sites of Hyderabad: a case study. *Environment International*, 29, 601.

Charlet, L. & Polya, D.A., 2006, Arsenic in Shallow, Reducing Groundwaters in Southern Asia: An Environmental Health Disaster, *ELEMENTS*, 2(2), pp. 91-6.

Charmaz, K, 2006, Constructing Grounded Theory, A Practical Guide Through Qualitative Analysis, Sage Publications, London.

Chryssochoou, D.N., 2010, Europe's Contested Democracy, in M Cini & N Perez-Solorzano Borragan (eds), *European Union Politics,* Oxford University Press, Oxford, pp. 375-389.

CONTAM, 2010, Scientific Opinion on Arsenic in Food, *EFSA Journal*, 7(10), p. 1351.

Coquery, M., Morin, A., Bécue, A. & Lepot, B., 2005, Priority substances of the European Water Framework Directive: analytical challenges in monitoring water quality, *TrAC Trends in Analytical Chemistry*, 24(2), pp. 117-27.

Dalal-Clayton & Sadler, 2005, *Strategic Environmental Assessment: A Sourcebook and Reference Guide to International Experience,* Earthscan, London.

Danielopol, D.L., Gibert, J. & Griebler, C., 2006, Efforts of the European Commission to improve communication between environmental scientists and policy-makers, *Environmental Science and Pollution Research*, 13(2), pp. 138-9.

Decker, F., 2002, Governance beyond the nation-state. Reflections on the democratic deficit of the European Union, *Journal of Public Policy,* 9 (2) pp. 256-272).

Dexter, L., 1970, *Elite and Specialised Interviewing*, Northwestern University Press, Evanston.

Di Lucia, L. & Kronsell, A., 2010, The willing, the unwilling and the unable - explaining implementation of the EU Biofuels Directive, *Journal of European Public Policy*, 17(4), pp. 545-63.

Dimitrova, A. & Toshkov, D., 2009, Post-accession compliance between administrative co-ordination and political bargaining, *EUROPEAN INTEGRATION ONLINE PAPERS-EIOP*, 13.

Doria, 2010, Factors influencing public perception of drinking water quality, *Water Policy*, 12(1), pp. 1-19.

de Doria, M.F., Pidgeon, N. & Hunter, P.R., 2009, Perceptions of drinking water quality and risk and its effect on behaviour: A cross-national study, *The Science of the total environment*, 407(21), pp. 5455-64.

Downs, 1957, *An economic theory of democracy,* Harper and Row, New York.

Dworak, T., Gonzalez, C., Laaser, C. & Interwies, E., 2005, The need for new monitoring tools to implement the WFD, *Environmental Science & Policy*, 8(3), pp. 301-6.

EC 1998, Council Directive 98/83/EC on the quality of water intended for human consumption. *Official Journal of the European Communities* L330/32-54.

EC 2003, *Scientific Synthesis Report: Drinking Water Seminar,* Brussels 28th and 28th October 2003.

Elmore, R.F., 1979, Backward Mapping: Implementation Research and Policy Decisions, *Political Science Quarterly*, 94(4), pp. 601-16.

EPA (Environmental Protection Agency, US), 1996, Proposed Guidelines for Carcinogen Risk Assessment, *Federal Register* 61 (79) pp. 17960-18011.

Fleischer, T., Futó, P., Horváth, G. & Kovács I.P., 2002, Multi-level Governance and the Impact of EU Integration in Hungarian Regional and Environmental Policies, *Hungarian National Report of EU Enlargement and Multi-Level Governance in European Regional and Environmental Policies: Patterns of Institutional Learning, Adaptation and Europeanization among Cohesion Countries (Greece, Ireland and Portugal) and Lessons for New Members (Hungary and Poland)*, ADAPT, Budapest and Pécs.

Francesconi KA, Edmonds JS. 1997. Arsenic and marine organisms. In: *Advances in Inorganic Chemistry.* Academic Press Inc., San Diego, CA. 44, 147-189.

Foster, K.R., Vecchia, P. & Repacholi, M.H., 2000, Science and the Precautionary Principle, *Science*, 288(5468), pp. 979-81.

FSA (United Kingdom Food Standards Agency), 2010. http://www.food.gov.uk/multimedia/faq/hijikiqanda/

George, C., 2001, Sustainability appraisal for sustainable development: integrating everything from jobs to climate change, *Impact Assessment and Project Appraisal,* 19 (95) pp. 106.

Gerber, A., 2010, The letter versus the spirit: Barriers to meaningful implementation of gender equality policy in Poland, *WOMENS STUDIES INTERNATIONAL FORUM*, 33(1), pp. 30-7.

Gerzabek, M.H., Barceló, D., Bellin, A., Rijnaarts, H.H.M., Slob, A., Darmendrail, D., Fowler, H.J., Négrel, P., Frank, E., Grathwohl, P., Kuntz, D. & Barth, J.A.C., 2007, The integrated project AquaTerra of the EU sixth framework lays foundations for better understanding of river-sediment-soil-groundwater systems, *Journal of environmental management*, 84(2), pp. 237-43.

GHOSH, P., BANERJEE, M., GIRI, A. K. & RAY, K. (2008) Toxicogenomics of arsenic: Classical ideas and recent advances. *Mutation Research/Reviews in Mutation Research*, 659, 293-301.

Gibbs G.R. 2002. *Qualitative Data Analysis: Explorations with NVIVO.* Berkshire: Open University Press

Glaser, B.G. & Strauss, A., 1967, *Discovery of Grounded Theory: Strategies for qualitative research*, Hawthorne, Aldine de Gruyter

Goetz, K.H., 2000, European integration and national executives: a cause in search of an effect? *WEST EUROPEAN POLITICS*, 23(4), pp. 211-31.

GOLDSTEIN, K. (2002) Getting in the Door: Sampling and Completing Elite interviews. *PS Political Science and Politics,* 35**,** 669-672.

Gurzau, E.S. & Gurzau, A.E., 2000, Arsenic in drinking water from groundwater in Transylvania, Romania: an overview, *Arsenic exposure and health effects: proceedings of the Fourth International Conference on Arsenic Exposure and Health Effects,* July 18-22, San Diego, California

Haas P. 1992. Introduction: Epistemic Communities and International Policy Coordination. *International Organization.* Vol. 46 (1) pp. 1-35.

Hall, P.A., 1993, Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain, *Comparative Politics*, 25(3), pp. 275-96.

Hall, P.A. & Taylor, R.C.R., 1996, *Political Science and the Three New Institutionalisms*, Public Lecture to the MPIFG Board, June.

Hassan, M.M., Atkins, P.J. & Dunn, C.E., 2005, Social implications of arsenic poisoning in Bangladesh, *Social Science & Medicine*, 61(10), pp. 2201-11.

Haverland, M. & Romeijn, M., 2007, Do member states make European policies work? Analysing the EU transposition deficit, *PUBLIC ADMINISTRATION*, 85(3), pp. 757-78.

Hay, C. & Wincott, D., 1998, Structure, Agency and Historical Institutionalism, *Political Studies*, 46(5), pp. 951-7.

Hellegers, P. & van Ierland, E., 2003, Policy Instruments for Groundwater Management in the Netherlands, *Environmental and Resource Economics*, 26(1), pp. 163-172-172.

Heri, S. & Mosler, H.J., 2008, Factors affecting the diffusion of solar water disinfection: a field study in Bolivia, *Health education & behavior : the official publication of the Society for Public Health Education*, 35(4), pp. 541-60.

Herod, A., 1999, Reflections on interviewing foreign elites: praxis, positionality, validity, and the cult of the insider, *Geoforum*, 30 (3) pp. 313-327.

Hill, M., 1997, Implementation theory: yesterday's issue? *Policy & Politics*, 25(4), pp. 375-85.

HJERN, B. & HULL, C., 1982, Implementation Research as Empirical Constitutionalism, *European Journal of Political Research*, 10(2), pp. 105-15.

Hooghe, L. & Marks, G., 2003, Unraveling the Central State, but How? Types of Multi-Level Governance, *The American Political Science Review*, 97(2), pp. 233-43.

Hooghe, L. & Marks, G., 2008, European union? *WEST EUROPEAN POLITICS*, 31(1-2), pp. 108-29.

Howard, G., Ahmed, M.F., Shamsuddin, A.J., Mahmud, S.G. & Deere, D., 2006, Risk assessment of arsenic mitigation options in Bangladesh, *Journal of health, population, and nutrition*, 24(3), pp. 346-55.

Hubbard, G., Backett-Milburn, K. & Kemmer, D., 2001, Working with emotion: issues for the researcher in fieldwork and teamwork, *International Journal of Social Research Methodology,* 4 (2) pp. 119-137

IARC (International Agency for Cancer Research), 1980, IARC *Monographs on the Evaluation of Carcinogenic Risks to Humans: Arsenic and Arsenic Compounds, Summaries and Evaluations*, Vol 23. IARC, Lyon.

IARC (International Agency for Cancer Research). 1987, *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Overall Evaluation of Carcinogenicity: An Updating of IARC Monograph; International Agency for Cancer Research*: IARC, Lyon. 7–42, (suppl. 7).

IARC (International Agency for Cancer Research), 1990, *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Arsenic and Arsenic Compounds, Summaries and Evaluations*, Vol 23. IARC, Lyon.

Irvine, K., 2004, Classifying ecological status under the European Water Framework Directive: the need for monitoring to account for natural variability, *Aquatic Conservation: Marine and Freshwater Ecosystems*, 14(2), pp. 107-12.

Islam, L.N., Nabi, A.H., Rahman, M.M., Khan, M.A. & Kazi, A.I., 2004, Association of clinical complications with nutritional status and the prevalence of leukopenia among arsenic patients in Bangladesh. *International journal of environmental research and public health* [electronic resource]. 1, 74.

Jakus, P.M., Shaw, W.D., Nguyen, T.N. & Walker, M., 2009, Risk perceptions of arsenic in tap water and consumption of bottled water, *Water Resour Res*, 45(5), pp. W05405-.

JECFA 1983, *Toxicological Evaluation of Certain Food Additives No. 18*. World Health Organisation, Geneva.

JECFA 2010, *Seventy-second meeting of the JECFA, Summary and Conclusions.* World Health Organisation, Geneva.

Jehlicka, P. & Tickle, A., 2004, Environmental implications of eastern enlargement: The end of progressive EU environmental policy? *ENVIRON POLIT*, 13(1), pp. 77-+.

Jenkins-Smith, H.C. & Sabatier, P.A., 1994, Evaluating the Advocacy Coalition Framework, *Journal of Public Policy*, 14(02), pp. 175-203.

Jones, A.Q., Dewey, C.E., Doré, K., Majowicz, S.E., McEwen, S.A., Waltner-Toews, D., Henson, S.J. & Mathews, E., 2005, Public perception of drinking water from private water supplies: focus group analyses, *BMC public health*, 5, p. 129.

Jordan, A., 1999, The implementation of EU environmental policy: a policy problem without a political solution? *ENVIRON PLANN C*, 17(1), pp. 69-90.

Jordan, A., 2000, The politics of multilevel environmental governance: subsidiarity and environmental policy in the European Union, *ENVIRONMENT AND PLANNING A*, 32(7), pp. 1307-24.

Jordan, A., Wurzel, R.K.W. & Zito, A., 2005, The rise of 'new' policy instruments in comparative perspective: Has governance eclipsed government? *POLITICAL STUDIES*, 53(3), pp. 477-96.

Jovanovic, D., 2010, *Arsenic Exposure in Northern Serbia (an ecological survey)*, Presentation given to Working Group 4 Ad hoc meeting of Meteau (COST action 637), working group 4, Budapest, March.

Kaeding, M., 2008, Lost in translation or full steam ahead - The transposition of EU transport directives across member states, *EUR UNION POLIT*, 9(1), pp. 115-43.

Kallis, G. & Butler, D., 2001, The EU water framework directive: measures and implications, *Water Policy*, 3(2), pp. 125-42.

King, D.A., 2004, Climate Change Science: Adapt, Mitigate, or Ignore? *Science*, 303(5655), pp. 176-7.

Knill, C., 1998, European Policies: The Impact of National Administrative Traditions, *Journal of Public Policy*, 18(1), pp. 1-28.

Knill, C. & Lehmkuhl, D., 1999, How Europe Matters. Different Mechanisms of Europeanization, *European Integration online Papers (EIoP)*, 3(7), pp. 1999-007.

Knill, C. & Tosun, J., 2009, Post-accession transposition of EU law in the new member states: a cross-country comparison, *EUROPEAN INTEGRATION ONLINE PAPERS-EIOP*, 13.

Kotzebue, J.R., Bressers, H.T. & Yousif, C., 2010, Spatial misfits in a multi-level renewable energy policy implementation process on the Small Island State of Malta, *Energy Policy*, 38(10), pp. 5967-76.

Kouras, A., Katsoyiannis, I. & Voutsa, D., 2007, Distribution of arsenic in groundwater in the area of Chalkidiki, Northern Greece, *Journal of hazardous materials*, 147(3), pp. 890-9.

KÖRKÖVÍZIG, 2009, Final Report, *Sustainable management and treatment of arsenic bearing groundwater in Southern Hungary (SUMANAS),* KÖRKÖVÍZIG, Gyula.

Kübler, D., 2001, Understanding policy change with the advocacy coalition framework: an application to Swiss drug policy, *Journal of European Public Policy*, 8(4), pp. 623-41.

Kurttio, P., Pukkala, E., Kahelin, H., Auvinen, A. & Pekkanen, J., 1999, Arsenic Concentrations in Well Water and Risk of Bladder and Kidney Cancer in Finland, *Environmental Health Perspectives*, 107(9), pp. 705-10.

Kvale, 1994, Ten standard Objections to Qualitative Research Interviews, *Journal of Phenomenological Psychology*, 25(2), pp. 147-73.

Kvale, S., 1996, *InterViews: an Introduction to Qualitative Research Interviewing,* London, Sage.

KvVM, 2006, *Groundwaters in Hungary,* KvVM (Ministry for Environment and Water), Budapest.

Lado, L.R., Polya, D., Winkel, L., Berg, M. & Hegan, A., 2008, Modelling arsenic hazard in Cambodia: A geostatistical approach using ancillary data, *Applied Geochemistry*, 23(11), pp. 3010-8.

Laffan, B. & O'Mahony, J., 2008, 'Bringing Politics Back In'. Domestic Conflict and the Negotiated Implementation of EU Nature Conservation Legislation in Ireland, *JOURNAL OF ENVIRONMENTAL POLICY & PLANNING*, 10(2), pp. 175-97.

Lampinen, R. & Uusikyla, P., 1998, Implementation deficit - Why member states do not comply with EU directives? *SCAND POLIT STUD*, 21(3), pp. 231-51.

Lindberg, A.L., Goessler, W., Gurzau, E., Koppova, K., Rudnai, P., Kumar, R., Fletcher, T., Leonardi, G., Slotova, K., Gheorghiu, E. & Vahter, M., 2006, Arsenic exposure in Hungary, Romania and Slovakia, *Journal of environmental monitoring : JEM*, 8(1), pp. 203-8.

Lindberg, A.-L., Kumar, R., Goessler, W., Thirumaran, R., Gurzau, E., Koppova, K., Rudnai, P., Leonardi, G., Fletcher, T. & Vahter, M., 2007, Metabolism of Low-Dose Inorganic Arsenic in a

Central European Population: Influence of Sex and Genetic Polymorphisms, *Environmental health perspectives*, 115(7).

Lecours 2005, Introduction, in Lecours (ed), *New Institutionalism: Theory and Analysis,* University of Toronto Press, Toronto,.

Leygues, J-C., 2001, Multi-Level Governance: Linking and Networking the Various Regional and Local Levels, *Working Group IV.c. Report,* European Commission, Brussels.

Lokuge, K.M., Smith, W., Caldwell, B., Dear, K. & Milton, A.H., 2004, The Effect of Arsenic Mitigation Interventions on Disease Burden in Bangladesh, *Environmental health perspectives*, 112(11).

Lorene, L., 2009, Chlorination, *Tech Brief,* National Environmental Services Center, West Virginia

Lou, J.-C., Lee, W.-L. & Han, J.-Y., 2007, Influence of alkalinity, hardness and dissolved solids on drinking water taste: A case study of consumer satisfaction, *Journal of environmental management*, 82(1), pp. 1-12.

Lubin, J.H., Beane Freeman, L.E. & Cantor, K.P., 2007, Inorganic Arsenic in Drinking Water: An Evolving Public Health Concern, *Journal of the National Cancer Institute*, 99(12), pp. 906-7.

Lynch, D., 2000, Closing the deception gap: accession to the European Union and environmental standards in East Central Europe, *The Journal of Environment & Development*, 9(4), p. 426.

Maniokas, K., 2009, Conditionality and compliance in Lithuania: the case of the best performer, *EUROPEAN INTEGRATION ONLINE PAPERS-EIOP*, 13.

Manojlovic, D., Popara, A., Dojcinovic, B.P., Nikolic, A., Obradovic, B.M., Kuraica, M.M. & Puric, J., 2008, Comparison of two methods for removal of arsenic from potable water, *Vacuum*, 83(1), pp. 142-5.

Maraczi G and Mucsi G, 2005, 'Békés Megye ivóvizének arzén-tartalma' Poster presented at the *Integrált minőségbiztosítási és élelmiszerbiztonsági rendszerek kiépítési működése a V4 országban, nemzetközi tudományos konferenciá*, Szentes, October 3rd-5th, 2005. Copy available from G Maraczi, ÁNTSZ Dél-Alföldi Regionális Intézetének, 5600 Békéscsaba, Gyulai út 61, Hungary.

March & Olsen, 1989, *Rediscovering Institutions: The Organizational Basis of Politics,* Free Press, New York.

Marks, G., Hooghe, L. & Blank, K., 1996, European Integration from the 1980s: State-Centric v. Multi-level Governance*, *JCMS: Journal of Common Market Studies*, 34(3), pp. 341-78.

Masson, M., Schäfer, J., Blanc, G. & Pierre, A., 2007, Seasonal variations and annual fluxes of arsenic in the Garonne, Dordogne and Isle Rivers, France, *The Science of the total environment*, 373(1), pp. 196-207.

Mastenbroek, E., 2003, Surviving the deadline: The transposition of EU directives in the Netherlands, *EUROPEAN UNION POLITICS*, 4(4), p. 371.

Mastenbroek, E., 2005, EU compliance: Still a 'black hole'? *Journal of European Public Policy*, 12(6), pp. 1103-20.

Matland, R.E., 1995, Synthesizing the Implementation Literature: The Ambiguity-Conflict Model of Policy Implementation, *Journal of Public Administration Research and Theory*, 5(2), pp. 145-74.

Mayda, 1999, Policy R&D: toward a better bridge between knowledge and decision making, *Science and Public Policy*, 26(6), pp. 395-402.

McCright, A.M. & Dunlap, R.E., 2003, Defeating Kyoto: The Conservative Movement's Impact on US Climate Change Policy, *Social Problems*, 50(3), pp. 348-73.

Meharg, 2004, Arsenic in rice - understanding a new disaster for South-East Asia, *Trends in Plant sciences*, 9, pp. 415-7.

Meharg & Raab, 2010, Getting to the bottom of arsenic standards and guidelines, *Environmental Science and Technology*, XX(XX), pp. XX-.

Meharg, A.A., Sun, G., Williams, P.N., Adomako, E., Deacon, C., Zhu, Y.-G., Feldmann, J. & Raab, A., 2008, Inorganic arsenic levels in baby rice are of concern, *Environmental pollution (Barking, Essex : 1987)*, 152(3), pp. 746-9.

Mertens, J., Rowland, H.A.L., Jimenez, C., Wehrli, B., Baciu, C., Hug, S. & Furrer, G., 2008, Arsenic contamination of groundwaters in the Tisza river basin and treatment of well waters with Al nanoclusters, *Central European Journal of Occupational and Environmental Health,* 14 (7) p. 65.

Mestrot, A., Uroic, M.K., Plantevin, T., Islam, M.R., Krupp, E.M., Feldmann, J. & Meharg, A.A., 2009. Quantitative and qualitative trapping of arsines deployed to assess loss of volatile arsenic from paddy soil. *Environmental Science and Technology*, 43(21), 8270-8275.

Michelsen, J., 2008, A Europeanization deficit? The impact of EU organic agriculture regulations on new member states, *Journal of European Public Policy*, 15(1), pp. 117-34.

Milham, S. & others, 1974, Human arsenic exposure in relation to a copper smelter, *Environmental Research,* 7(2), pp. 176-82.

Millward, G.E. & Liu, Y.P., 2003, Modelling metal desorption kinetics in estuaries, *The Science of the total environment*, 314-316, pp. 613-23.

Mondal, D., Adamson, G.C., Nickson, R. & Polya, D.A., 2008, A comparison of two techniques for calculating groundwater arsenic-related lung, bladder and liver cancer disease burden using data from Chakdha block, West Bengal, *Applied Geochemistry*, 23(11), pp. 2999-3009.

Mondal D., Polya D.A. 2008. Rice is a major exposure route for arsenic in Chakdaha block, Nadia district, West Bengal, India: A probabilistic risk assessment. *Applied Geochemistry*. 11, 2987-2998.

Moss, T. & Newig, J., 2010, Multilevel Water Governance and Problems of Scale: Setting the Stage for a Broader Debate, *ENVIRONMENTAL MANAGEMENT*, 46(1), pp. 1-6.

Murray, C.J.L. & Acharya, A.K., 1997, Understanding DALYs, *Journal of Health Economics*, 16(6), pp. 703-30.

Murray, Salomon, Mathers & Lopez, 2002, *Summary Measures of Population Health: Concepts, Ethics, Measurements and Applications,* World Health Organisation, Geneva.

Nicole, N., Lee, R., Heitkemper, D.T., DeNicola Cafferky, K., Haque, A. & Henderson, A.K., 2006, Inorganic arsenic in cooked rice and vegetables from Bangladeshi households, *The Science of the total environment*, 370, pp. 294-301.

Neumann, R.B., Ashfaque, K.N., Badruzzaman, A.B.M., Ali, M.A., Shoemaker, J.K. & Harvey, C.F., 2009, Anthropogenic influences on groundwater arsenic concentrations in Bangladesh, *Nature Geoscience*, 3(1), pp. 46-52.

New York Times, 1885, Arsenic Eaters, published in the *New York Times*, 26th July, 1885.

Oliver, M., Sorkin, L. & Kaschl, A., 2005, Science and policy interface: the LIFE programme and its links to the EU Water Framework Directive, *Environmental Science & Policy*, 8(3), pp. 253-7.

Opar, A., Pfaff, A., Seddique, A.A., Ahmed, K.M., Graziano, J.H. & van Geen, A., 2007, Responses of 6500 households to arsenic mitigation in Araihazar, Bangladesh, *Health & Place*, 13(1), pp. 164-72.

Oreskes, N., 2004, The Scientific Consensus on Climate Change, *Science*, 306(5702), pp. 1686-.

Orland-Barak, L., 2002, The Theoretical Sensitivity of the Researcher: reflections on a complex construct, *Reflective Practice*, 3 (3) pp. 263-278.

O'Toole & Hanf, 1998, Hungary: Political Transformation and Environmental Challenge, *ENVIRONMENTAL POLITICS*, 7(1), pp. 93-112.

Pahl-Wostl, C., Gupta, J. & Petry, D., 2008, Governance and the Global Water System: A Theoretical Exploration, *GLOBAL GOVERNANCE*, 14(4), pp. 419-35.

Parsons, 1996, *Public Policy: An Introduction to the Theory and Practice of Policy Analysis,* Edward Elgar, Cheltenham.

Peterson, J., 2001, The choice for EU theorists: Establishing a common framework for analysis, *EUROPEAN JOURNAL OF POLITICAL RESEARCH*, 39(3), pp. 289-318-318.

Petrick, J.S., Ayala-Fierro, F., Cullen, W.R., Carter, D.E. & Vasken Aposhian, H., 2000, Monomethylarsonous Acid (MMAIII) Is More Toxic Than Arsenite in Chang Human Hepatocytes, *Toxicology and applied pharmacology*, 163(2), pp. 203-7.

Pepper, D., 2006. Bangladeshis poisoned by arsenic sue British organisation, *The Lancet*, 367 (9506), pp. 199-200.

Pierson, P. & Skocpol, S., 2002, Historical Institutionalism in Contemporary Political Science, in Katnelson, I. & Milner, H. (eds), *Political Science: the State of the Discipline*, Norton, New York pp. 693-721.

Pohl, C., 2008, From science to policy through transdisciplinary research, *Environmental Science & Policy*, 11(1), pp. 46-53.

Pollack, M.A., 1996, The New Institutionalism and EC Governance: The Promise and Limits of Institutional Analysis, *Governance*, 9(4), pp. 429-58.

Polya, D.A., Gault, A.G., Diebe, N., Feldman, P., Rosenboom, J.W., Gilligan, E., Fredericks, D., Milton, A.H., Sampson, M., Rowland, H.A.L., Lythgoe, P.R., Jones, J.C., Middleton, C. & Cooke, D.A., 2005, Arsenic hazard in shallow Cambodian groundwaters, *Mineral Mag*, 69(5), pp. 807-23.

Post, D., 2002, Closing the Deception Gap: Accession to the European Union and Environmental Standards in East Central Europe, .

Prazan, J., Ratinger, T. & Krumalova, V., 2005, The evolution of nature conservation policy in the Czech Republic--challenges of Europeanisation in the White Carpathians Protected Landscape Area, *LAND USE POLICY*, 22(3), pp. 235-43.

Preedy, V.R. et al 2010, Quantification of Deaths and DALYs Due to Chronic Exposure to Arsenic in Groundwaters Utilized for Drinking, Cooking and Irrigation of Food-Crops, in *Handbook of Disease Burdens and Quality of Life Measures,* Springer New York, pp. 701-28.

Pressman & Wildavsky, 1973, *Implementation: How Great Expectations in Washington Are Dashed in Oakland; Or Why It's Amazing That Federal Programs Work at All,* University of California Press, Berkeley.

Provan, K.G. & Kenis, P., 2008, Modes of Network Governance: Structure, Management, and Effectiveness, *Journal of Public Administration Research and Theory*, 18(2), pp. 229-52.

Quevauviller, P., 2006, Science-policy interfacing in the context of the WFD implementation, *Journal of Soils and Sediments*, 6(4), pp. 259-61.

Rahman, M., Ng, J. & Naidu, R., 2009, Chronic exposure of arsenic via drinking water and its adverse health impacts on humans, *Environmental geochemistry and health*, 31(0), pp. 189-200-200.

Ravetz, J.R., 1987, Usable knowledge, usable ignorance: incomplete science with policy implications, *Science Communication*, 9(1), p. 87.

Rhodes, R.A.W., 1996, The New Governance: Governing without Government, *POLITICAL STUDIES*, pp. 652-67.

Richards, D., 1996, Elite Interviewing: Approaches and Pitfalls, *Politics*, 16 (3), pp. 199-204.

Richardson, J., 1994, EU water policy: uncertain agendas, shifting networks and complex coalitions, *ENVIRONMENTAL POLITICS*, 3(4), pp. 139-67.

Roberts, L.C., Hug, S.J., Dittmar, J., Voegelin, A., Kretzschmar, R., Wehrli, B., Cirpka, O.A., Saha, G.C., Ali, M.A. & Badruzzaman, A.B.M., 2009, Arsenic release from paddy soils during monsoon flooding, *Nature Geoscience*.

Rogers, E.M., 1962, *Diffusion of Innovations,* Free Press, New York.

Rosamund, B. 2010, New Theories of European Integration, in M Cini & N Perez-Solorzano Booragan (eds), *European Union Politics,* Oxford University Press, Oxford, pp. 105-22.

Rowland, H.A., Omoregie, E.O., Millot, R., Jimenez, C., Mertens, J., Baciu, C., Hug, S.J. & Berg, M., 2011, Geochemistry and arsenic behaviour in groundwater resources of the Pannonian Basin (Hungary and Romania), *Applied Geochemistry*, 26(1), pp. 1-17.

Roychowdhury T. 2010. Impact of sedimentary arsenic through irrigated groundwater on soil, plant, crops and human continuum from Bengal delta: Special reference to raw and cooked rice. F*ood and Chemical Toxicology.* 46, 2856-2864

Sabatier, 1988, An advocacy coalition framework of policy change and the role of policy-orientated learning therein, *Policy Sciences*, 21(2/3), pp. 342-53.

Sabatier, P.A., 1986, Top-Down and Bottom-Up Approaches to Implementation Research: a Critical Analysis and Suggested Synthesis, *Journal of Public Policy*, 6(01), pp. 21-48.

Sabatier P.A. 1998. The advocacy coalition framework: revisions and relevance for Europe. *Journal of European Public Policy.* Vol 51 pp. 98-130.

Sampson, M.L., Sosamrach, K. & Shantz, A., 2007, Policy Response and the Discovery of Arsenicosis in Cambodia, *Workshop on Arsenic in Groundwaters of South-East Asia with Emphasis on Cambodia and Vietnam,* Manchester University 29th-30th October.

Sauer, P., Kreuz, J. & Dvorak, A., 2009, Methodology for Assessng the Effectiveness of Environmental Policy Implementation, *DSM Business Review*, 1(1), pp. 9-20.

Schmidt, V.A. & Radaelli, C.M., 2004, Policy change and discourse in Europe: Conceptual and methodological issues, *WEST EUROPEAN POLITICS*, 27(2), pp. 183-210.

Schuh, L.K. and Barab, A.S., 2008, Philosophical perspectives, in Spector, J.M., Merrill, M.D., Merrienboer, J.V. and Dirscoll, M.P. (Eds.), *Handbook of research on educational communications and technology* (3rd edition) pp. 69-80, Taylor and Francis, New York.

Sedelmeier, U., 2009, Post-accession compliance with EU gender equality legislation in post-communist new member states, *EUROPEAN INTEGRATION ONLINE PAPERS-EIOP*, 13.

Severtson, D.J., Baumann, L.C. & Brown, R.L., 2006, Applying a health behavior theory to explore the influence of information and experience on arsenic risk representations, policy beliefs, and protective behavior, *Risk analysis : an official publication of the Society for Risk Analysis*, 26(2), pp. 353-68.

Shegloff E.A. 1997. Whose text? Whose context? *Discourse and Society* vol. 8 (2) pp. 165-187

Signes-Pastor AJ, Deacon C, Jenkins RO, Haris PI, Carbonell-Barrachina AA, Meharg AA. 2009. Arsenic speciation in Japanese rice drinks and condiments. *Journal of Environmental Monitoring.* 11, 1930-1934.

Smedley, P.L. & Kinniburgh, D.G., 2002, A review of the source, behaviour and distribution of arsenic in natural waters, *Applied Geochemistry*, 17(5), pp. 517-68.

Smith, A.H., Lopipero, P.A., Bates, M.N. & Steinmaus, C.M., 2002, PUBLIC HEALTH: Enhanced: Arsenic Epidemiology and Drinking Water Standards, *Science*, 296(5576), pp. 2145-6.

Smith, A.H. & Smith, M.M., 2004, Arsenic drinking water regulations in developing countries with extensive exposure, *Toxicology*, 198(1-3), pp. 39-44.

Smith, A.H. & Steinmaus, C.M., 2009, Health Effects of Arsenic and Chromium in Drinking Water: Recent Human Findings, *Annual Review of Public Health*, 30(1), pp. 107-22.

Smith, A.H., Ercumen, A., Yuan, Y. & Steinmaus, C.M., 2009, Increased lung cancer risks are similar whether arsenic is ingested or inhaled, *Journal of exposure science & environmental epidemiology*, 19(4), pp. 343-8.

Sovann et al, 2010, AquaTRAIN Interntional Conference on Geogenic Chemicals in Groundwater and Soils, *Arsenic in Shallow Groundwaters around Tonle Sap Lake and in the coastal provinces of Cambodia.* AquaTRAIN MCRTN, BRGM, Orleans,.

Stanley, L., & Wise, S., 1993, *Breaking Out Again: Feminist Ontology and Epistemology,* London, Routledge.

Steinmaus, C., Yuan, Y., Liaw, J. & Smith, A.H., 2009, Low-level Population Exposure to Inorganic Arsenic in the United States and Diabetes Mellitus: A Reanalysis, *Epidemiology*, 20(6).

Steunenberg, B., 2010, Is big brother watching? Commission oversight of the national implementation of EU directives, *EUROPEAN UNION POLITICS*, 11(3), pp. 359-80.

Strauss, A.L. & Corbin, J.M., 1998, *Basics of qualitative research: techniques and procedures for developing grounded theory*, Thousand Oaks, Sage Publications.

Suffet, I.H., Schweitze, L. & Khiari, D., 2004, Olfactory and chemical analysis of taste and odor episodes in drinking water supplies, *Reviews in Environmental Science and Biotechnology*, 3(1), pp. 3-13.

Taylor, S., 2001, Locating and Conducting Discourse Analytic Research in Yates, S., Taylor, S. & Wetherell, M., *Discourse as data: a guide for analysis,* Milton Keynes, The Open University Press.

Temesi, I., 2000, Local Government in Hungary in Horvath, T.M, *Decentalization: Experiments and Reforms, vol. 1*, Budapest, Open Society Institute

Thelen, K., 1999, HISTORICAL INSTITUTIONALISM IN COMPARATIVE POLITICS, *Annu Rev Polit Sci*, 2(1), pp. 369-404.

Thomson, R., 2009, Same effects in different worlds: the transposition of EU directives, *Journal of European Public Policy*, 16(1), pp. 1-18.

Thomson, R., 2010, Opposition through the back door in the transposition of EU directives, *EUROPEAN UNION POLITICS*, 11(4), pp. 577-96.

Tobias & Mosler 2007, The psychology of sand filter use, *EAWAG Annual Report,*2007, p. 21.

Trauner, F., 2009, Post-accession compliance with EU law in Bulgaria and Romania: a comparative perspective, *EUROPEAN INTEGRATION ONLINE PAPERS-EIOP*, 13.

Treutlein, D., 2009, Zooming in on Transposition: National Execution Measures for EU Directives 1986-2002, *CESIFO ECONOMIC STUDIES*, 55(1), pp. 94-109.

Tseng, C.-H. 2005 Blackfoot Disease and Arsenic: A Never-Ending Story. *Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis and Ecotoxicology Reviews,* 23, 55 - 74.

Tseng, C.-H. 2009 A review on environmental factors regulating arsenic methylation in humans. T*oxicology and Applied Pharmacology,* 235, 338-350

Turgeon, S., Rodriguez, M.J., Thériault, M. & Levallois, P., 2004, Perception of drinking water in the Quebec City region (Canada): the influence of water quality and consumer location in the distribution system, *Journal of environmental management*, 70(4), pp. 363-73.

Tyrovola, K., Nikolaidis, N.P., Veranis, N., Kallithrakas-Kontos, N. & Koulouridakis, P.E., 2006, Arsenic removal from geothermal waters with zero-valent iron--Effect of temperature, phosphate and nitrate, *Water research*, 40(12), pp. 2375-86.

Ujevic, M., Duic, Z., Casiot, C., Sipos, L., Santo, V., Dadic, Z. & Halamic, J., 2010, Occurrence and geochemistry of arsenic in the groundwater of Eastern Croatia, *Applied Geochemistry*, 25(7), pp. 1017-29.

Van Gossum, P., Ledene, L., Arts, B., De Vreese, R. & Verheyen, K., 2008, Implementation failure of the forest expansion policy in Flanders (Northern Belgium) and the policy learning potential, *Forest Policy and Economics*, 10, pp. 515-22.

Van Kersbergen, K., and Verbeerk, B., 1994, The Politics of Subsidiarity in the European Union, *Journal of Common Market Studies,* 32 (2), pp. 215-236.

Van Meter, D.S. & Van Horn, C.E., 1975, The policy implementation process: A conceptual framework, *Administration & Society*, 6(4), p. 445.

Varsányi, I., Fodré, Z. & Bartha, A., 1991, Arsenic in drinking water and mortality in the southern Great Plain, Hungary, *Environmental geochemistry and health*, 13(1), pp. 14-22.

Varsányi, I. & Kovács, L., 2005, THE ROLE OF GROUNDWATER FLOW IN CONTROLLING THE ARSENIC CONCENTRATION IN THE SOUTHERN PART OF THE GREAT HUNGARIAN PLAIN, *Acta Mineralogica-Petrographica*, 46, pp. 47-52.

Vaughan & Buss, 1998, *Communicating social science research to policymakers,* Sage, Thousand Oaks, CA.

Wallace, H., 2000, Europeanisation and Globalisation: Complementary or contradictory trends? *New Political Economy*, 5(3), pp. 369-82.

Walker, Shaw & Benson, 2006, Arsenic Consumption and Health Risk Perceptions in a Rural Western US Area, *Journal of the American Water Resources Association*, pp. 1363-70.

Weale 1992, Implementation: a suitable case for review, in Lykke (ed), *Achieving Environmental Goals,* Belhaven Press, London, pp. 43-63.

Welch, A.H., Stollenwerk, K.G., Webster, J. & Nordstrom, D. 2003, Geothermal Arsenic, in *Arsenic in Ground Water,* Springer US, pp. 101-25.

Welsh E. 2002. Dealing with Data: Using NVIVO in the Qualitative Data Analysis Process. *Forum: Qualitative Social Research* vol. 3 (2)

Whelton, A.J., Dietrich, A.M., Burlingame, G.A., Schechs, M. & Duncan, S.E., 2007, Minerals in drinking water: impacts on taste and importance to consumer health, *Water Science and Technology*, 55 (5) pp. 283-291.

Willems, P. & de Lange, W.J., 2007, Concept of technical support to science–policy interfacing with respect to the implementation of the European water framework directive, *Environmental Science & Policy*, 10(5), pp. 464-73.

Williams PN, Price AH, Raab A, Hassain SA, Feldman J, Meharg AA. 2005. Variation in Arsenic speciation and ceoncentration in paddy rice related to dietary exposure. *Environmental Science and Technology*. 39, 5531-5540.

Winkel, L., Berg, M., Amini, M., Hug, S.J. & Annette Johnson, C., 2008, Predicting groundwater arsenic contamination in Southeast Asia from surface parameters, *Nature Geosci*, 1(8), pp. 536-42.

World Health Organisation, 2003, *Arsenic in Drinking Water. Background document for development of WHO guidelines for drinking water quality.* World Health Organisation, Geneva.

Xu, Y.-H., Nakajima, T. & Ohki, A., 2002, Adsorption and removal of arsenic(V) from drinking water by aluminum-loaded Shirasu-zeolite, *Journal of hazardous materials*, 92(3), pp. 275-87.

Yamamura S., No date. Drinking Water Guidelines and Standards. *United Nations Synthesis Report on Arsenic in Drinking Water.* World Health Organisation, Geneva.

Young, O., 2002, *The institutional dimensions of environmental change: fit, interplay, and scale*, Massachusetts Institute of Technology, Massachusetts.

Zellei, A., Gorton, M. & Lowe, P., 2005, Agri-environmental policy systems in transition and preparation for EU membership, *LAND USE POLICY*, 22(3), pp. 225-34.

Appendices

Appendix 1: Meetings and Workshops for Science-Based Learning

Meeting	Focus	Capacity	Date
AquaTRAIN: Arsenic in South East Asia	Geochemistry and impact	Attendee	October 2007
AquaTRAIN: Geostatistics	Hazard mapping	Participant	February 2008
AquaTRAIN: In Field Measurements	Soil and water sampling	Participant	June 2008
CEECHE: Conference	Environmental health threats and impacts	Attendee/Presenter	October 2008
SUMANAS: Stakeholder meeting*	Remediation and Hungarian groundwaters	Attendee	November 2008
Goldschmidt: Conference	Geochemistry	Attendee/Presenter	July 2009
METEAU: Working Group Meeting*	Health risk assessment and EU legislation	Participant	March 2010
AquaTRAIN: Conference	Arsenic geochemistry, health risk, remediation	Attendee/Presenter	July 2010
METEAU: Conference	Drinking water management	Attendee/Presenter	October 2010

* the meeting was based in Hungary and had a focus on the Hungarian management of arsenic in groundwater.

Appendix 2: Local Population Questionnaire

Bevezetés

Leventon Julia vagyok, a budapesti Közép-Európai Egyetem doktorandusz kutatója. A felszín alatti vizek használatát és minőségét kutatom Kelet-Magyarországon. Ez a felmérés egy nagyobb kutatási project része, amey a felszín alatti vizekben található természetes eredetű ásványi anyagokat vizsgálja. A kutatásom Magyarország uniós csatlakozás utáni vízgazdálkodását vizsgálja.

Ez a kérdőív abban segít nekem, hogy megértsem az Ön településének a lakosainak a vízfogyasztási szokásait. Arra vagyok kíváncsi, hogy az emberek miért azt a vizet isszák, ami isznak, hogy Ön aggódik-e valami miatt a vízminőséggel kapcsolatosan, és mit tart Ön jó vagy minőségi ivóvíznek. Az Ön részvétele rendkívüli módon segítené a kutatásomat (help my research), és nagyon köszönöm az erőfeszítését előre is.

Ön természetesen teljesen Önkéntesen vehet részt a kutatásban. Ha hajlandó megválaszolni a kérdéseket, akkor a válaszait fel tudom használni a kutatás során. Magától értetődően a nevét sehol sem fogom megemlíteni és a válaszait anonímán és bizalmasan kezelem. Az adatokat következtetésekként fogom összegezni és jelentéseket fogok készíteni, így az egyéni válaszait senki sem láthatja és senki sem tudja majd visszakeresni.

A www.aquatrain.eu című internetes oldalon találhat több információt a kutatásomról, sajnos csak angolul. A Közép-Európai Egyetemről a www.ceu.hu honlapon találhat több információt. Ha kérdése van, vagy szeretne többet megtudni a kutatásomról, akkor nyugodtan keressen meg akár magyarul a megadott elérhetőségi címen.

Nagyon köszönöm, hogy rám szánja az idejét.

Julia Leventon
Doktorandusz hallgató
Közép-Európai Egyetem
Környezettudományi és Környezetpolitikai Tanszék
1051 Budapest
Nádor utca 9.
Email: Leventon_julia@phd.ceu.hu
Telephone: +36 70 406 7280

Személyes adatok

1. Életkor:_____

2. Iskolai végzettség (legmagasabb):

Alapfokú □

Középfokú □

Felsőfokú □

Vezetékes csapvíz

3. Van otthon vezetékes csapviz?

Igen □ Nem □

4. Milyen vizet iszik (kérem, válassza ki az összeset, amely igaz Önre)?

Csapvíz □ Szódavíz □

Ásványvíz □ Artézi kútból származó víz □

Kérem, válassza ki a fenti lehetőségek közül, melyik a fő ívóvíz forrása, és jelölje aláhúzással

5. Összességében milyennek találja a vezetékes csapvíz minőségét az Ön otthonában?

Nagyon jó □

Rossz □

Jó □

Nagyon rossz □

Közepes □

6. Kérem, értékelje, milyen fontosak az Ön számára az alábbi dolgok egy 1 és 5 közötti szám kiválasztásával. Az 5 jelenti a nagyon fontosat és az 1 az egyáltaán nem fontosat.

Kérem jelezze, ha ez valami olyan dolog, ami nyugtalanítja Önt az otthoni csapvízzel kapcsolatosan és tegyen egy jelet az utolsó oszlopba.

Probléma/dolog	**Fontosság**	**Ez a dolog nyugtalanítja az otthoni csapvízzel kapcsolatosan?**
Klór tartalom		

Arzén tartalom		
Jód tarttalom		
Baktérium tartalom		
Szag		
Íz		
Szín		

7. Ha adódna bármi problémája a vezetékes csapvízzel, akkor hol jelentené be?

Vízművek □ Önkormányzat □

ÁNTSZ □ Sehol □

8. Tudja-e, hogyan találhatja meg őket?

Igen □ Nem □

9. Kapott-e valaha bármilyen információt a vezetékes csapvíz minőségével kapcsolatosan az alábbi Kérem, jelölje meg az összes választ, amely igaz Önre:

TV/Rádió □

Brossúrák □

Újság □

Számlák □

Internet □

Barátok/Rokonok □

Levél □

<u>(Artézi) kútvíz</u>

10. Ha használja az artézi kutakat, kérem válaszolja meg a következő kérdéseket:
Milyen gyakran keresi fel a kutat hetente?

1 □ 4 □ 7 □

2 □ 5 □ alkalommal vagy többször□

3 □ 6 □

11. Egy alkalommal (átlagosan) mennyi vizet visz? 1 nagy ásványvizes üveg 1,5 liter.
_____Liter

12. Mi a fő oka annak, hogy a kút vizét használja?

Egészségmegőrzés □

Jó íz □

(Meg)szokás □

Egyéb (kérem, nevezze meg) □ _____

_____