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**ASSEMBLING THE ATOM:
DEVELOPMENT LEGACIES, DIALOGUE AND THE PROCESS OF
NUCLEAR DEVELOPMENT IN POMERANIA, POLAND**

Stéphanie Alice Garstin

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Abstract

Nuclear power is currently receiving a great deal of attention in the international arena as nations seek to tackle the joint energy challenges of supply security and sustainability. Discussions have focused on questions of efficiency, cost, waste disposal and the safety profile of the technology. Within the social sciences attention has been given to the decision making processes surrounding nuclear technologies, and to themes of dialogue and participatory decision making. This body of research conceptualises nuclear industries as products of social and political processes. In this thesis, I have conceptualised the Polish nuclear industry as the product of social, political, but also material forces which together co-shape dialogue surrounding the pursuit of nuclear development.

The thesis presents a case study of nuclear development in Pomerania, northern Poland. During the 1980s, the Communist government of the People's Republic of Poland began to construct the first of a series of nuclear power plants beside Lake Żarnowiec in the north of the Province. However, following protests and political upheaval in the region, construction work was abandoned and the site left empty for nearly twenty years. Since 2009, Lake Żarnowiec has once again taken centre stage as Poland seeks to construct a nuclear facility in Pomerania. This thesis examines the agency of the infrastructural assets of the original development, landscape changes, notions of identity, and the social and political processes which underpin decision making surrounding the pursuit of nuclear development within the region. It demonstrates the presence of a complex entanglement of social, material and conceptual elements present in dialogue surrounding contemporary nuclear development. The research calls attention to the forces and pressures, both seen and unseen which together shape political and social attitudes towards nuclear development.

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“With arms around it, I’ll take the summit

With arms around it, I’m home”

(Hell Is For Heroes ‘I Can Climb Mountains’, 2003)

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1.0 Introduction

“Nuclear power is an investment which is unnecessary for the Polish energy system over the course of the next ten or twenty years. Even then, it is not clear whether nuclear energy will be needed in Poland” (Tadeusz Mazowiecki, first post-communist Prime Minister of Poland, 4th September 1990).

On the 4th September 1990, following nearly twenty years of research and development in the Polish nuclear energy sector, work on the construction of Poland's first nuclear power plant (NPP) came to a halt. With it, so too did an extensive programme for the creation of a network of nuclear power plants across the country; a programme which it was hoped would have enabled Poland to diversify energy supplies, increase supply security and sustain both existing industry and future economic development (Kozłowski, 2006).

By September 1990 vast sums of capital had been invested, concrete laid, orders for reactors placed, and the construction work was largely complete. The Communist government of the People's Republic of Poland had seen a great need for nuclear power, regarding the electricity supply from nuclear as both affordable and reliable. Indeed, the economic profile of nuclear was a characteristic of the energy source which had long been one of the central driving forces behind development during the 1970s with the perception of 'energy too cheap to measure' (Gamson & Modigliani, 1989).

Yet by the time of project abandonment in 1990, the economic viability of nuclear power in Poland was the subject of intense debate. Combined with the political shifts which were taking place throughout the region of Central and Eastern Europe and the associated and increasingly vocal environmental opposition movement led by two groups, the Freedom and

Peace Movement (*Ruch Wolność i Pokój*) and the Movement for an Alternative Society (*Ruch Społeczeństwa Alternatywnego*), the rising economic, environmental and technical challenges associated with nuclear power presented a final insurmountable hurdle to a development which from its inception had been plagued by controversy (Kołodziejski & Kozłowski, 1989; Skiba et al, 2011).

Despite Poland's historical experience with nuclear development and the position of the original development site within contemporary development plans, with a few notable exceptions there is very little Polish or English language material available on the subject (see Sagan, 1991; Waluszko, 2011a, 2011b; Szulecki, 2013¹). This is perhaps as a result of timings; Poland's abandonment of the nuclear project at Żarnowiec coincided with a period of upheaval and transformation both at home and throughout the wider region of Central and Eastern Europe. Within the social sciences and particularly within the fields of Area Studies and Political Science, the socioeconomic, political and cultural changes taking place within the region came to take centre stage (Gros & Steinherr, 1995; Sachs, 1996; Burawoy & Verdery, 1999; Kaufman, 2007; Lavigne, 2000; Kornai, 2001).

In addition, given the immediate socioeconomic challenges of the time, the lack of concern for and attention to a technology which has often been plagued by opposition and uncertainty is perhaps unsurprising. Poland's domestic coal industry, with existing power plants subsidised to compensate for EU environmental levies, has been able to provide a substantial

¹ Iwona Saga, Professor of Geography at the University of Gdańsk has written on the resettlement of the villagers of Kartoszyń as a result of the construction of Żarnowiec NPP (Sagan, 1991). Janusz Waluszko, an historian at the University of Gdańsk & 1980s Gdańsk based opponent to the original Żarnowiec NPP has written on youth culture and opposition in Gdańsk during the 1980s (Waluszko, 2011); Kasper Szulecki at the Hertie School of Governance, has written on the subject of the national protests which took place nationwide during the 1980s, and has written a key article on 1980s Polish green opposition titled 'From Czarnobyl to Żarnobyl' (Szulecki, 2013).

part of Poland's energy requirements (Suwala & Labys, 2002; Europe Economics, 2006). Moreover, the scaling back of previously intense industrial activity in Poland resulted in reduced energy demands (Fischer & Gelb, 1991; Meyers et al, 1994; Markandya et al, 2006). Both of these factors enabled Poland to meet domestic energy demands through the use of established energy technologies and infrastructure. Up until 2005, nuclear was simply not on the agenda.

However, nearly twenty-five years after project abandonment, the situation is changing. In 2005, Poland announced that nuclear power is essential for economic progress, energy security and environmental protection (UMWP, 2011), and since 2010 has begun discussions surrounding the creation of a consortium of partners, headed by Polish energy behemoth PGE (*Polska Grupa Eneretyka*) to collaborate on the marketing, construction and operation of a facility in Pomerania (Ministerstwo Gospodarki, 2010). Furthermore, at the end of January 2014, the Polish Council of Ministers officially adopted a program for the construction of Poland's first two nuclear power plants with a revised completion date of 2035 (World Nuclear News, 2014).

The final location of Poland's first nuclear power plant has yet to be announced. Throughout the course of this research, the provisional date for a decision on the location of a facility has been repeatedly delayed and at the time of writing is set for announcement in 2016. However, since late 2011, two sites in Pomerania Province and one in West Pomerania Province have been shortlisted. In order of preference, these three locations are Żarnowiec, Choczewo-Lubiatowo and Gąski (Wyborcza, 2011b; See figure 1.1 for a map indicating the locations of the three proposed development sites).

The re-emergence of nuclear power as a component of Poland's future energy mix first became apparent in January 2005 with the publication and adoption by the Polish Council of Ministers of the document 'Energy Policy of Poland until 2025' and was confirmed once more in an update, published in 2009, 'Energy Policy of Poland until 2030' (Ministerstwo Gospodarki i Pracy, 2005; Ministerstwo Gospodarki, 2009). As such, Poland's intention to revisit nuclear power stretches across a period of governance led by three separate political parties: the Democratic Left Alliance (Communist successor / Social Democratic), Law and Justice (Conservative right), and since 2007, Civic Platform under the incumbent Prime Minister Donald Tusk (Liberal centre right).

The pursuit of nuclear development in Poland across twenty years of Communism and three consecutive post-communist parliaments indicates that in Poland, the motivation to construct a nuclear power plant and develop a nuclear industry lies deeper than institutional or political ties. Indeed, as the latter part of this chapter will show, it is motivated by Poland's resource scarcity, especially in the north of the country, together with a pressing need to diversify energy resources away from coal as the nation's coal based power plants approach the end of their lifespans. In order to meet the joint energy challenges of supply security and sustainable development, in 2005 nuclear was selected as the central pillar of Poland's future energy mix, together with the exploration of shale gas, and the continued use of both coal and renewable technologies (Ministerstwo Gospodarki, 2009; UMWP, 2011).

Given that nuclear power has been selected as a component of Poland's future energy mix, the decision to pursue the first round of development in Pomerania Province is by no means a coincidence. Nuclear as a technology requires large bodies of water for cooling purposes and as such, suitable locations are limited to the north coast due to the region's lakes and the Baltic coastline.

However, Poland's intention to revisit the possibility of developing the first of a series of nuclear power plants on the original development site of Żarnowiec NPP raises a number of questions: If nuclear development was abandoned at the site during the 1980s as a result of widespread social and environmental opposition then what, if anything, has changed between project abandonment in September 1990 and the present day to reshape attitudes towards nuclear power and shine a light once more on the Żarnowiec site?

Public opinion surveys have been conducted on behalf of the Polish Council for Atomic Energy every two years since 2003, indicating a lack of widespread opposition at the national level to the prospect of nuclear development in Pomerania (Atomistyka, 2007). In addition, more recently the Pomeranian Special Economic Zone (see Chapter 4) commissioned a study by a team of researchers based at the University of Toruń. The study focused on the counties of Puck and Wejherowo in which the top two proposed development sites are situated (see figures 1.1 & 1.2). Once again, the research indicated a lack of widespread local opposition, with a higher acceptance rate for development plans (71% of respondents) than that of the general population of Poland (63% of respondents) (PSSE, 2011).

However, it remains unclear why and how attitudes towards nuclear power and nuclear development have changed in the region of Pomerania. In addition, it is unclear how the presence of development legacies – in the shape of sunk investments in infrastructure, knowledge, and altered socio-economic landscapes – influences attitudes towards and narratives surrounding the construction of a nuclear power plant within the region. As such, this thesis is concerned with examining attitudes towards nuclear development in Pomerania, with a focus on the many processes and elements which influence public interest, perceptions of and engagement with discussions surrounding nuclear development.

1.1 Research Gap & Contribution

Nuclear power as a technology has been the subject of a broad range of studies, with particular attention from within the disciplines of economics, physics and engineering. Studies have addressed the economics and efficiency of generating electricity from nuclear (see *inter alia* Tarjanne & Rissanen, 2000; Ramana et al, 2005; Kennedy, 2007; Deutch et al, 2009), reactor designs and fuel processes (*inter alia* Bittermann et al, 2001; Forsberg et al, 2003; Bhardwaj, 2006; Mathieu et al, 2006; Sinha & Kakodkar, 2006), and options for the reprocessing and management of nuclear fuels (*inter alia* Shoesmith, 2000; Rao, 2001; Von Hippel, 2001; Saltelli & Tarantola, 2002; Ewing et al, 2004; Dey & Bansal, 2006).

However, despite the intense focus on nuclear technologies from within the natural and physical sciences, social scientific research on the development of nuclear industries remains a valuable line of enquiry due to ongoing debates surrounding the inclusion of nuclear within nations' fuel strategies, and the controversial nature of nuclear power.

There is an increasing need for open and transparent dialogue between 'scientific' and 'lay' communities surrounding the continued use of nuclear power, and an awareness of the manner in which communities and landscapes come to be 'entangled' with technological development trajectories through infrastructural arrangements and previous historical experiences with the technology. Very few nations seek to develop a nuclear industry from scratch, but rather have complex histories with either military or civilian applications of the technology (Josephson, 2000; WNA, 2014). The creation of regional 'zones' for nuclear development is common with nations seeking to develop successive generations of nuclear power plants on or around the same hyper-local sites. For example in the UK, Hinkley Point in Somerset and Sizewell in Suffolk house existing reactors and both sites have been

earmarked for continued development in the future (EDF, 2014). In Lithuania the planned Visaginas nuclear power plant, if constructed, will be located on the site of the country's decommissioned Ignalina facility (VAE, 2014) and in Slovakia too, future nuclear development plans are tied to the existing nuclear zones of Bohunice and Mochovce (WNA, 2013). Such siting decisions are of little surprise; the challenges associated with the management of radioactive waste means that waste materials are often stored 'on site', and remain in situ following nuclear decommissioning. However, the nature of Poland's apparent entanglement with the Żarnowiec site in Pomerania is perplexing as construction work was terminated before reactors could be installed. The physical bind between landscape and radiation is therefore absent yet, as the empirical material presented in this thesis shows, the status of Lake Żarnowiec as a nuclear 'zone' remains.

Despite these experiences there have yet to be any studies conducted on the role of historical development legacies and the creation of nuclear 'zones' as a result of nuclear development. In Chapters 4 and 5, this thesis contributes to the literature through an examination of the extent to which the hyper-local area surrounding Lake Żarnowiec has been transformed by historical nuclear development, illustrating the sense of 'entanglement' which can emerge between a trajectory towards nuclear development and the physical, socio-economic and cultural landscapes in which development takes place.

In contrast to the absence of a large body of research on the role of development legacies in shaping attitudes towards nuclear power, within the social sciences considerable attention has been granted to the social and political elements and processes which shape contemporary development narratives. For example, human geographers and applied social scientists have examined public perceptions of nuclear power and the motivations behind public opposition to nuclear development (Kraft & Clary, 1991; Welsh, 1993; Sjöberg, 2003; Chilvers, 2008;

Pidgeon et al, 2008; Venables et al, 2009; Jenkins-Smith et al, 2011). This body of research has been particularly concerned with unpacking the unhelpful ‘NIMBY’ (Not In My Back Yard) model of public opposition in order to open up spaces of dialogue between institutions and communities.

In relation to the aforementioned work on ‘NIMBYism’, a significant strand of social scientific research has begun to address the manner in which governments, institutions, technical specialists and scientists communicate with the public when siting a nuclear facility (Wynne, 1996; Bickerstaff et al, 2008; Chilvers & Burgess, 2008). As Chapter 2 will show, these discussions are not limited to nuclear, as wind (Devine-Wright, 2005; Devine-Wright & Howes, 2010; Van der Horst, 2007; Walker et al, 2010) biomass (Upreti & Van der Horst, 2004; Walker et al, 2010) and contentious chemical industries (Ringquist, 1997; Bolin et al, 2000; Bickerstaff & Agyeman, 2009) have also been popular research topics.

Research in the social sciences on both nuclear and renewables has begun to break down institutional and industrial misconceptions of public understandings of science, and to highlight the ways in which different communities and the general public are engaged with (or disengaged from) the decision making processes surrounding the use of controversial technologies. This latter body of research forms a key motivation to the study of nuclear development in Pomerania, and in particular the extent to which, in addition to the presence of material-conceptual development legacies, narratives on contemporary nuclear development are also shaped through processes of scientific-lay communication and dialogue. However, the focus of much of this research has to date been placed on the processes and elements which shape public opinions and development narratives, seeking to understand motivations behind social and environmental opposition to the siting and operation of controversial industries. Though this line of enquiry is of great political value, calling for a more

democratic and participatory experience of scientific-lay communication and decision making, it has focused on understanding the motivations which lie behind public opposition rather than those which underpin public neutrality and institutional support.

This thesis contributes to the literature by exploring the extent to which processes of scientific-lay communication and the spaces through which discussions take place can actively limit participation and social and environmental activism, thus creating a false illusion of support for nuclear development due to the absence of a space in which publics and local communities can voice their concerns. It is to these themes that Chapter 6 will turn.

In order to encompass the broad range of elements involved in this study, I have used an overarching conceptual framework provided by recent human geographical thinking on ‘assemblage’. Assemblage provides a useful framework for studying process and a conceptual and methodological toolkit through which it is possible to examine the manner in which the social and material worlds shape one another. The approach is inherently relational, with an emphasis on the contingency of social (humans, policies, social and political forces), material (infrastructure and nuclear as a technology), and conceptual elements (for example notions of landscape identity, institutional-consortium-community dialogue and perceptions of knowledge). Rather than limiting analysis to the study of social and political actors, institutions and processes, an assemblage framework questions a broader network of elements and processes, both human and non-human, seeking to understand the combined agency or *milieu* of a web of social, material and conceptual elements.

In this thesis I conceptualise the Polish nuclear industry as a ‘sociotechnical network’ which is constantly in the process of being assembled. I argue that the process of contemporary nuclear development in Pomerania, Poland is continuously shaped by the interplay of social

and political processes and contexts, but also by ‘material’ and ‘conceptual’ elements in the shape of development legacies from the construction of Żarnowiec NPP during the 1980s. These are themes which I expand upon in greater detail in Chapter 2.

To date, much of the debate which surrounds ‘assemblage’ thinking has been focused on concept building (see Chapter 2), and by contrast there are relatively few examples of studies which have utilised the approach (see Chapter 3 for a discussion of methodological applications of assemblage). However, the conceptual framework for this research has been motivated in particular by Bennett’s (2005) use of assemblage to examine electricity networks and the North American blackout of August 2003, and by Li’s (2007) research on the manner in which forest management practices are ‘assembled’.

Under an ‘umbrella’ framework provided by assemblage, this thesis also builds on research by Walker (1999; 2000) on the long-term entanglement of the UK government with a Thermal Oxide Reprocessing initiative in Cumbria (THORP), by Graham & Marvin (2001), Star (1999) and Jordan (2012) on the manner in which layers of social agency or ‘sedimented sociality’ (Jordan, 2012 p.15) come to be embedded in infrastructural arrangements; and by Burningham et al (2007) and Walker et al (2010) and their work on public engagement and ‘imagined publics’ within scientific-lay communication activities (see also Chapter 2).

1.1.1 Aim and objectives

This thesis aims to understand how it is that a trajectory towards nuclear development is being sustained within the region of Pomerania. The research examines the role of development legacies and the design of spaces for public engagement in the shaping of narratives on contemporary nuclear development. This thesis is concerned with understanding why the

hyper-local area surrounding the original development site of Żarnowiec NPP has come to be bound up with a nuclear development trajectory.

In order to achieve the aim of this thesis, I have outlined three objectives:

1. To examine how the 'Żarnowiec' development site has come to be 'entangled' within a trajectory towards future nuclear development

In Chapter 4, this thesis examines the means through which layers of social and political activity have come to be 'sunk inside of' (Star, 1999 p.381) the infrastructure of Żarnowiec NPP.

2. To explore how these socio-material entanglements shape narratives surrounding contemporary nuclear development

In Chapter 5, this thesis examines the continued relevance of the infrastructural artefacts from Żarnowiec NPP for the municipalities which surround the lake.

3. To identify the role of knowledge communication between 'scientific' and 'lay' communities in shaping narratives surrounding the pursuit of nuclear development

In Chapter 6, this thesis turns to spaces of engagement and science-public communication in the wider region of Pomerania.

1.1.2 National vs. Regional: Placing the Focus

The decision to pursue nuclear power as an energy source has been advocated by three distinct political parties since 2005. In addition, plans remained unshaken by the nuclear accident at Fukushima in March 2011, an event which triggered intense international debate on the continued use of nuclear technologies.

In France, a nation which currently depends on nuclear power as a primary source of electricity, and which has long enjoyed a strong relationship with its nuclear industry, the election of President François Hollande in May 2012 marked a dramatic turning point. Hollande's socialist party pledged to reduce France's dependence on nuclear by phasing out ageing nuclear reactors and focusing on renewables development to meet the short fall of future energy demands (Le Monde, 2012). Meanwhile, in Germany Chancellor Merkel announced the full closure of Germany's existing fleet of plants by 2022 (Der Spiegel, 2011), and in Italy, over 90% of voters responded with a 'no' vote to a referendum held in 2011 on whether to restart a nuclear programme which, as with development beside Lake Żarnowiec, was abandoned during the 1980s (Time, 2011).

However, despite the hesitations expressed within the wider European context, Poland has remained steadfast with nuclear development plans. What marks Poland apart from European nations who intend to maintain their existing nuclear industries or allow the construction of new reactors is the absence of an existing base of reactors. Unlike neighbours Czech Republic (CEZ Group, 2014), Slovakia (SEAS, 2014) and Lithuania (IAE, 2014), where future developments pivot around sites with an installed base of reactors, Poland has only a legacy of nuclear development, but as yet no operational capacity.

Whilst the question of nuclear development is a matter of national policy, planned, directed and executed by national government, both the Polish Ministry of the Economy (*Ministerstwo Gospodarki*) and the Marshal's Office for Pomerania (*Urząd Marszałkowski Województwa Pomorskiego*) have recognised the roles played and need for support by both regional and local government in Pomerania, together with small businesses and the communities surrounding the proposed development sites (Ministerstwo Godspodarski, 2010; PSSE, 2011).

Despite the apparent absence of opposition – both nationally and within the communities of Puck and Wejherowo - to contemporary development proposals as indicated by recent studies (PSSE, 2011), the region of Pomerania and specifically the proposed development site of Żarnowiec has a colourful history with both nuclear development and social and environmental opposition (Gliński, 1998; Kozłowski, 2006; Burka, 2011; Skiba et al, 2011; Waluszko, 2011a).

As Prime Minister for Poland Donald Tusk has noted (Gazeta Wyborcza, 2011a), if Poland is to situate a nuclear facility within the region of Pomerania, then careful consideration must be given in order to avoid a repeat of the scale of opposition experienced with the construction of Żarnowiec NPP during the 1980s. As the following empirical chapters will demonstrate, great care is being taken to manage public perceptions of nuclear power as a technology in Pomerania, and to reduce the chance of mounting opposition to the Ministry of the Economy and PGE's development plans. Efforts to maintain a positive or neutral profile for nuclear power in Pomerania are seen as critical to the achievement of targets in Poland's 'Energy Policy to 2030' (Ministerstwo Gospodarki, 2009).

As such, the focus of this thesis is placed not on national dialogue surrounding nuclear development or nationwide perceptions of nuclear power, but on the motivations which lie behind attempts by institutions, government bodies and local business owners within the Province of Pomerania to shape an image of the region as a 'good place to invest'.

1.2 Pomerania Province: Situating the research

This thesis is concerned with both historical and contemporary discussions surrounding nuclear development in Pomerania. Key to these discussions is Lake Żarnowiec in the north of the province. It was here that construction work on Poland's first nuclear power plant took

place during the 1980s, and it is here, once again, that dialogue on nuclear development has come to be focused.

Pomerania Province is a region of great geographic, cultural and political interest. The physical geography of northern Pomerania Province is characterised by undulating terrain, thick forests, glittering lakes and miles of golden sand. It is an area of outstanding natural beauty, and home to three large national parks. The small monastic village of Żarnowiec is situated just 7km from the Baltic coast of northern Poland, in the rural administrative district of Gmina Krokowa (see map in figure 1.1). The village gives name to one of the largest lakes in the region, Lake Żarnowiec (*Jezioro Żarnowieckie*), and borders the national coastal landscape park (*Nadmorski Park Krajobrazowy*), a protected area established in 1978 which hosts a diverse ecosystem (*Nadmorski Park Krajobrazowy*, 2010). Further to the west lies the UNESCO biosphere reserve of Słowiński National Park (*Słowiński Park Narodowy*) with its rare moving sand dunes and protected wetland environment (see figures 1.3, 1.8 & 1.9).

In addition to its proximity to the national landscape parks, Lake Żarnowiec also lies in the west of Kashubia (*Kaszuby*), a historically recognised language area within the contemporary bounds of Pomerania Province which, together with Silesia on the Polish border with Germany and the Czech Republic holds particular linguistic and cultural interest for Poland (Majewicz, 1996; Kurczewski, 2007; Nestor & Hickey, 2009; Muzeum Kaszubskie, 2013). With regards to energy developments in Pomerania Province, the cultural region of Kashubia holds great significance as the people of Kashubia have managed to withstand periods of great upheaval throughout Poland's turbulent history (Perkowski, 1966; Davies, 2005; Kemp-Welch, 2008; Nestor & Hickey, 2009). Many Kashubians self-identify as both Polish and Kashubian and have a strong sense of belonging, place attachment and separation from both German and Polish heritage (Kurczewski, 2007; See figure 1.4). It is this sense of belonging

which, as Chapter 4 shows, presented unforeseen challenges to national nuclear development plans.

The Tricity (comprised of the three cities of Gdańsk, Sopot and Gdynia) is the main urban area of the region. The agglomeration is flanked on one side by the Bay of Gdańsk and on the other by the Tricity Landscape Park (*Nadmorski Park Krajobrazowy*). The city of Gdańsk is both the capital of Pomerania Province and the largest city within Kashubia (see figures 1.5, 1.6 & 1.7). During different periods of time the city has been under German and Polish control, and between the two world wars stood as a Free City. It was at Westerplatte in Gdańsk that the first shots of World War II were fired in September 1939, and in August 1980, the city's shipyards gave birth to the Polish 'Solidarity' movement which less than a decade later brought about the collapse of Polish Communism (Davies, 2005; Kemp-Welch, 2008).

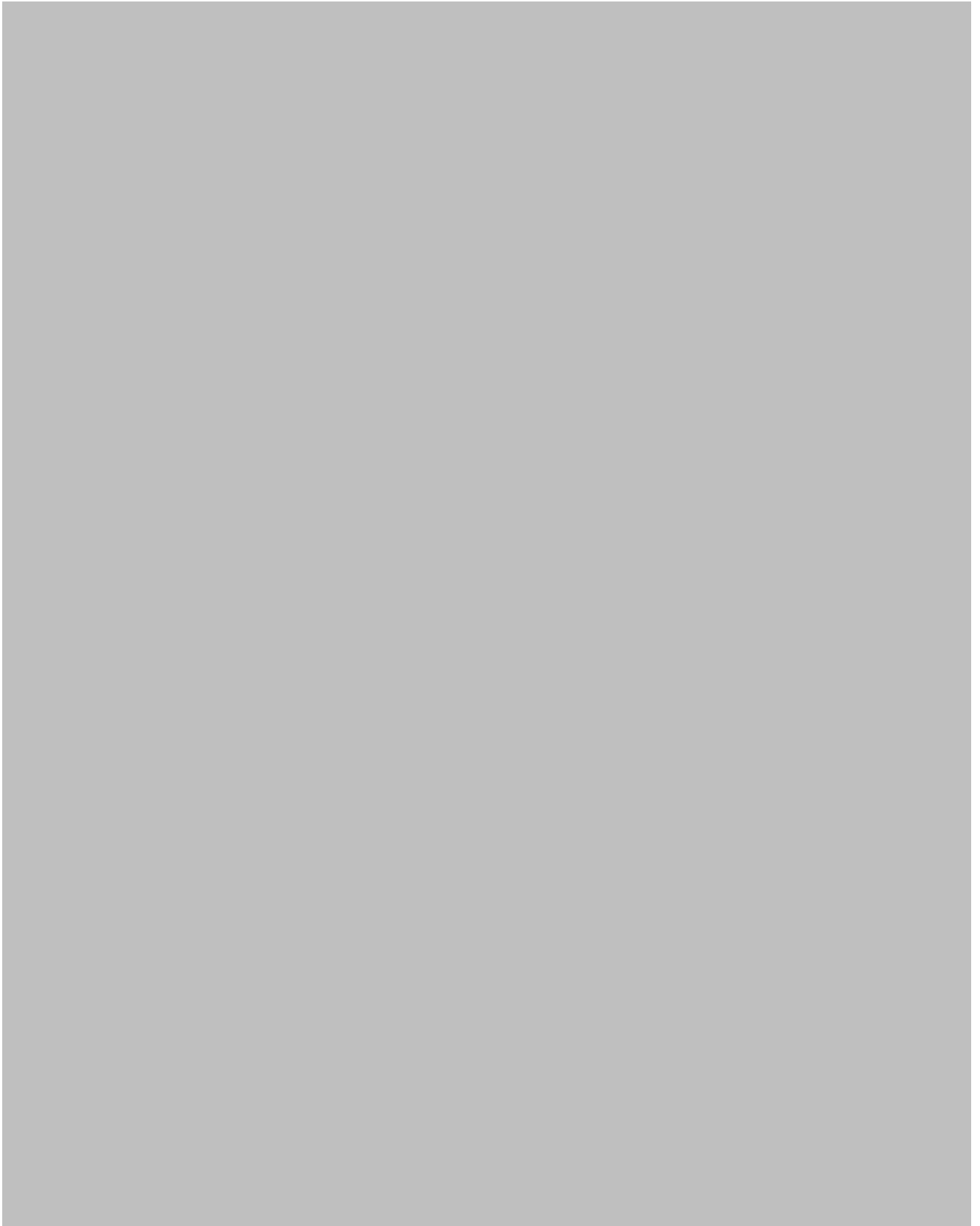


Figure 1.1 A map indicating the boundaries of Pomerania Province (dotted), the location of the Tricity and the location of the top three shortlisted nuclear development sites: Żarnowiec (**A**), Choczewo-Lubiatowo (**B**) and Gąski (**C**) in neighbouring West Pomerania Province. (Map by Google; Annotations by author)



Figure 1.2 A map indicating the boundaries of the counties (*powiaty*) of Wejherowo (**A**) and Puck (**B**) within which the proposed development sites of ‘Choczewo-Lubiatowo’ and ‘Żarnowiec’ are situated. (Map by Google; Annotations by author)



Figure 1.3 Rare moving sand dunes at Słowiński Park Narodowy, Łeba, to the west of the proposed development sites of Żarnowiec and Choczewo-Lubiatowo (see also *figure 1.1*). (Photograph by author, August 2013)



Figure 1.4 Chapels at Kalwaria Wejherowska, on the outskirts of the Kashubian town of Wejherowo. The chapels are on a pilgrimage route which winds through the towns and villages of northern Pomerania during the spring and summer months. (Photograph by author, February 2011)



Figure 1.5 Looking east over the Gdańsk district of Oliwa from a viewing tower in the Tricity Landscape Park (*Nadmorski Park Krajobrazowy*). (Photograph by author, July 2011)



Figure 1.6 The remains of Gdańsk's historic granaries on Granary Island (*Wyspa Spichrzów*) on the Motława River in 'Old Town' Gdańsk. The granaries were destroyed by bombing at the end of WWII, and at the time of writing stand as a reminder of the city's past amongst the reconstructed 'Old Town' (*Stare Miasto*). In 2013, scaffolding appeared on the ruins, as Gdańsk City Council prepares for investment and reconstruction on the island. (Photograph by author, February 2012)



Figure 1.7 The view down the Motława River with the reconstructed façade of ‘Old Town’ Gdańsk. (Photograph by author, February 2012)



Figure 1.8 Looking north over the Tricity Landscape Park (*Nadmorski Park Krajobrazowy*) having just taken off from Gdańsk Lech Wałęsa Airport. (Photograph by author, August 2013)



Figure 1.9 On the coast between the two cities of Sopot and Gdynia. (Photograph by author, May 2011)

1.2.1 A brief overview of the political subdivision of Poland

Since 1999 Poland has been subdivided into three levels for administrative purposes. The highest of these is the voivodeship (*województwo*) equivalent to a region or province, of which there are 16. Nested within each voivodeship are a number of counties (*powiaty*; singular: *powiat*). The smallest and most local tier of administration in Poland is the commune or municipality (*gmina*).

Whilst counties are often divided into a larger number of municipalities, sometimes just comprising one small village and lots of open countryside, larger urban areas form a singular administrative unit. Gdańsk, as the largest city within Pomerania is therefore home to both the offices of regional government and also the city authorities of Gdańsk City Council.

As a result of the manner in which administrative responsibilities have been divided between regional government and the two tiers of local government, counties are not responsible for matters relating to planning and development. With regards to nuclear development, the regional administrative bodies most closely associated with the decision making process are the Pomeranian Voivodeship (*Województwo Pomorskie*) and the local municipalities of Krokowa and Gniewino in which the top two shortlisted development sites are situated (see figure 1.2).

1.3 Poland's nuclear industry in context: A brief history

This thesis is concerned with both historical and contemporary experiences of nuclear development in Poland. In order to place the political frustrations which led to widespread social and environmental opposition to the development of Żarnowiec NPP in the 1980s in context, it is necessary to draw attention to the specific political, social and economic climate of communist era Poland in which nuclear development was being pursued. In particular, it is important to note the political and economic ties the communist People's Republic of Poland held with the Soviet Union, the impact of these connections upon everyday life in Poland, and the manner in which the communist authorities dealt with opposition and the ongoing and varied waves of social protest movements which were experienced from the 1950s right through to the collapse of the Soviet Union and the establishment of a post-communist administration in the late 1980s.

1.3.1 Polish Communism and Poland's relationship with the Soviet Union

Following the realignment of Poland's borders further west after World War II and the formation of the People's Republic of Poland (Davies, 2005), in January 1949 Poland joined the Council of Mutual Economic Assistance (COMECON). COMECON was designed to enable interaction and economic cooperation between the Soviet Union, the states of the Eastern Bloc and communist states outside of the region for the purpose of trade and economic development (Loktev, 1969; Brine, 1996). The overall balance was such that the Soviet Union provided raw materials which were abundant within its territories whilst the communist states within Central and Eastern Europe provided goods and finished products.

For Poland this arrangement resulted in a substantial growth in heavy industry in the post war period, fuelled primarily by coal (Lipton et al, 1990; Suwala & Labys, 2002; Zientara, 2009).

However, though coal dominated the Polish energy mix, communist Poland's industrial programme created a dependency upon the Soviet Union for the supply of natural gas. 79 % of Poland's natural gas imports were provided by the Soviet Union during communism, a trend common throughout Central and Eastern Europe and a means by which the Soviet Union could ensure continued dependence on and allegiance to the Soviet system (Ůrge Vorsatz et al, 2006). As a direct result of the entangled relationship between Poland and the Soviet Union, Poland became dependent on subsidised energy supplies in order to maintain industrial output, and to support district heating and public transport networks. These elements were considered essential components of the communist economy (Ůrge Vorsatz et al, 2006; Bouzarovski, 2009b).

During the Stalin years of the Soviet Union (for Poland, from 1949 – 1952), the pressures presented by economic entanglement were particularly demanding (Kemp-Welch, 2008). By the 1950s, despite the promise of industrialisation, living conditions had not improved and many Polish workers began to question the communist economic model (Erich, 1959; Sturmthal, 1961, Kemp-Welch, 2008).

Following Stalin's death in 1953 and the relative 'thaw' of Krushchev's leadership of the Soviet Union, many Poles began to hope for the introduction of a more flexible communist economic model to better suit Polish demands and circumstances. The first call for the liberalisation of the communist system in Poland came with the workers strikes in Poznań in June 1956. With demands for wage increases and improved leave and social welfare provisions, 100,000 people engaged in demonstrations. However, the communist state responded with violent repression, leading to the loss of many lives (Seleny, 1999; Davies, 2005; Kemp-Welch, 2006; Kemp-Welch, 2008). Though the leadership of the Soviet Union

had changed after Stalin's death, Poland's economy and society were still heavily influenced by the socioeconomic and political models of Stalin's years in power.

However, due to the scale of the protest in Poznań, it became clear to the Polish communist government that some degree of appeasement would be necessary in order to avoid a full scale loss of confidence and prolonged strike action. As a result, in the October of 1956 the structure of the Polish communist party began to shift and break in two, divided by an awareness of a need for change to avoid further bloodshed. These political divisions led to the 'Polish October Revolution' and the selection of Władysław Gomułka, who had led the party for five years from 1943, as the head of the Communist party. Gomułka was seen to strike a balance between the pressures of economic entanglement with the Soviet Union on one hand, and a growing demand for more localised applications of state communism which could be sensitive to Poland's requirements on the other (Erich, 1959; Davies, 2005; Kemp-Welch, 2008).

Despite the economic ties and interdependencies between Poland and the Soviet Union, and the promise of change under Gomułka's leadership, after a brief period of respite the years following the 1956 protests and administration changes brought with them persistent shortages, triggering both anger and resentment towards the communist system (Kemp-Welch, 2008). In 1968, a new wave of protests began. In Poland, these protests were sparked by the banning of a play which was deemed to be anti-Soviet in sentiment and sustained by an increasingly challenging socioeconomic climate. Once again thousands protested and once again, despite the 'thaw' of the Polish October Revolution, the communist state reacted violently and with oppression (Ost, 1991; Osa, 2003; Kemp-Welch, 2008).

The 1970s were characterised by further shortages and social frustrations. In 1970, mass social opposition broke out once more following the dramatic increase of food prices. Gomułka had attempted to keep opposition under control throughout the 1960s by artificially suppressing the cost of basic food items, but the approach was unsustainable in the long term due to Poland's spiralling economic challenges and entanglements with the Soviet Union (Davies, 2005). It was during this period of time that Polish citizens began to push for an alternative more equitable alternative to state communism.

In 1979, the newly instated Pope John Paul II returned to Poland for a tour of the major cities. Visiting Gdańsk, he gave endorsement to the formation of independent groups within society, encouraging a sense of community in the face of mounting socioeconomic and welfare challenges² (Weigel, 2003; Davies, 2005). In August 1980, just over a year after Pope John Paul II's tour of Poland, a strike by workers in Gdańsk's now historic shipyards led to the creation of the 'Solidarity' (*solidarność*) movement and the final decade of Polish Communism. Though it is beyond the scope of this thesis to expand in great depth on the events which shook and shaped Polish society between the 1950s and the election of the first Solidarity government in 1989, the broader context and milestones of social opposition during the communist years provide an essential backdrop to the social and environmental opposition which emerged in response to the construction of Poland's first nuclear power plant beside Lake Żarnowiec (Ash, 2002, Skiba et al, 2011). It is to these events that Chapters 4 and 6 return.

² Pope John Paul II's 1987 visit to the City of Gdańsk has been commemorated in the 'Zaspa' district he visited. A park 'Park im Jana Pawła II' and main road 'Aleja Jana Pawła II' have been renamed after him, and a multi-storey mural adorns the side of a building in one of the district's housing estates which doubles as a public art gallery – Murale Gdańsk Zaspa. Throughout the Tricity there are monuments and statues of Pope John Paul II, surrounded by a sea of constantly tended coloured glass lanterns.

1.3.2 ‘Freedom and Peace’ and the ‘Movement for an Alternative Society’

The Freedom and Peace Movement (RWiP) and the Movement for an Alternative Society (RSA) were central to the evolution of social and ecological opposition in 1980s’ Gdańsk, and the main organisational units behind a well-managed series of oppositional activities and events. In ‘Artists, Lunatics and Anarchists’ (Skiba et al, 2011) Polish punk-rock musician and activist Krzysztof Skiba documents the history of the emergence and activities of alternative youth culture in 1980s Gdańsk, its impact on the political system and contributions to the changes which, together with the Solidarity movement would shake the city and country come 1989 and 1990.

A group whose foundations had been laid in opposition to compulsory military service and the associated oath of allegiance to the Soviet Union, the national Freedom and Peace Movement came to hold strong views on a number of environmental issues (Burka, 2011; Waluszko, 2011b). However, following the nuclear accident at Chernobyl in April 1986 and experiences with a combination of both realities and perceptions of nuclear accident mismanagement by the Soviet Union (Josephson, 2000), Freedom and Peace began to focus attentions on the nascent Polish nuclear energy industry, and in particular on the construction of Żarnowiec NPP. Though the members of the movement were primarily concerned with the proliferation of nuclear weapons, one central theme underpinned opposition: those involved in the protest movement held the belief that the decision making process had from the outset been conducted in an unacceptable manner and that accidents such as Chernobyl proved that nuclear energy was a dangerous technology which put the wellbeing of the communities surrounding nuclear power stations at risk.

Whilst RWiP became the socially acceptable corner stone to nuclear opposition in Poland, RSA being regarded with a higher degree of apprehension due to its anarchist associations, with time other groups of environmental and social activists became involved with both organisations. Through a series of events and activities, and using their own haphazard assemblage of tools, tactics and visual materials, these groups worked tirelessly to present the image of an alternative zone to that which was being realised through construction work at Żarnowiec (Interview: Marta, March 2011).

1.3.3 Energy interdependencies and the origins of the Polish nuclear industry

As has already been discussed, one major aspect of COMECON was the exchange and redistribution of energy resources and goods, a system which was designed to maximise efficiency by reducing the total number of production sites for each goods item (Ürge Vorsatz et al, 2006). In reality, however, the system led to mounting inequalities developing between the Eastern Bloc satellite states providing both raw materials and products for redistribution throughout the combined territories, and Soviet Russia providing hydrocarbons. Moreover, planning failures led to significant shortages of certain products and oversupply of others. Rather than increasing efficiency as was hoped, COMECON and the system of distribution created vast inefficiencies and waste within the region (Haynes & Romy, 2002; Ürge-Vorsatz et al, 2006).

For Poland, COMECON membership meant that significant quantities of coal resources were redirected towards the Soviet Union as well as finished products from industry (Ürge-Vorsatz et al, 2006). Whilst counter flows of resources arrived from the Soviet Union, the Polish administration was unable to fully react to public opposition to the inadequacies and inequalities of the Soviet system due to the complex and binding economic ties; an attractive

situation to the Soviet Union as it ensured the politically volatile and resistant Poland would be maintained as a communist ‘buffer zone’ to the rest of Western Europe (Osa, 2003). It was in this light during the 1970s that the communist government of Poland, seeking distance from the Soviet Union and without adequate resource availability began to seek an alternative energy source through the development of a nuclear industry (Moreton, 1982).

1.3.4 Geopolitics and networked infrastructure

Figure 1.10 below shows a map produced in 1973 by the Polish atomic agency with the proposed locations of nuclear reactors in Poland in red. The map is part of archival material made available to the public by the Polish National Centre for Nuclear Studies (NCBJ, 2009).

Poland’s original nuclear development site on the edge of Lake Żarnowiec is indicated by the arrow (added by author for clarification). The diagram offers a visual indication of the distributive imbalance of generational capacity between northern and southern Poland. The map depicts Poland’s dependence on coal and lignite as primary energy sources, together with the location of fault lines and major coal and gas deposits in the south. The absence of sufficient generational capacity in northern Poland, as shown on the map, presented a significant challenge to continued industrial growth in Gdańsk and the Tricity region.

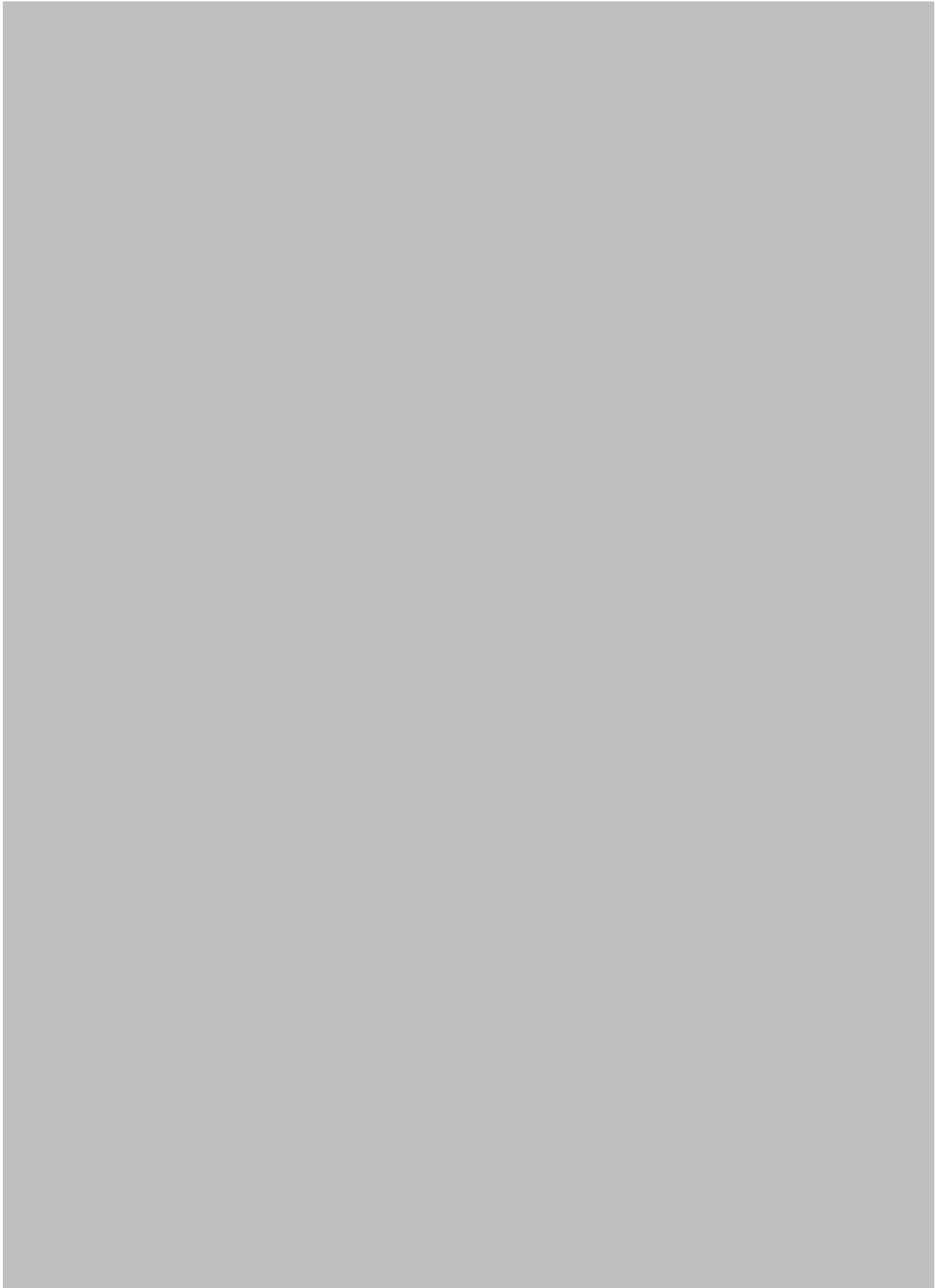


Figure 1.10 ‘Location of power plants with 300MW generational capacity: Turbine, hydro, nuclear’ (NCBJ, 2009)

Translation of key rows top & bottom; left to right: Existing or in construction / Planned to 1990: Heat, hydro, nuclear



Figure 1.11 Map of Polish energy grid showing existing and planned distribution network together with minimal network presence in the north when compared to the south of Poland (Global Energy Network Institute 2013).

1.4 Supply Security and Contemporary Energy Pressures in Poland

Over twenty years have now passed since the collapse of communism in Poland, yet many of the factors which motivated the communist authorities of the People's Republic of Poland to pursue nuclear development in Pomerania remain. Though the 'People's Republic of Poland' and the 'Soviet Union' have given way to the 'Republic of Poland', the 'Russian Federation' and other post-communist states, traces of the historical political structures and geopolitical arrangements persist in the shape of networked infrastructure. Figure 1.11 shows a striking similarity to the map produced in 1973 (figure 1.10), though forty years separate the two images.

Furthermore since 2005 Poland has found itself on the precarious edge of a series of regional pipeline disputes between Russia and members of the Commonwealth of Independent States (CIS). In March 2005, Russia increased to market price the cost of natural gas for CIS members. This decision removed the programme of subsidisation which had been in place following the breakup of the Soviet Union in 1991. The decision by Russia's Gazprom to increase the cost of natural gas had a significant impact on Ukraine's ability to repay existing debts and cover future energy bills, and in both January 2006 and January 2009, Russia responded to Ukraine's non-payment for natural gas by first reducing the pressure of gas transiting Ukraine, and in 2009 by terminating supplies. These disputes had a serious impact on perceptions of the security of natural gas supplies from Russia, and highlighted the importance of both resource diversification and energy independence for the 'transit' nations of Central and Eastern Europe (Pirani et al, 2009).

Partly as a result of these supply challenges, and partly because the existing, Soviet era pipeline infrastructure was in need of modernisation (Bouzarovski, 2010), the 'Nord Stream'

pipeline has been constructed beneath the Baltic Sea, linking Russia's gas fields with Western Europe via Germany (see figure 1.12). It is hoped that Nord Stream will enable the uninterrupted supply of gas to Western markets. However, Nord Stream has not provided a solution for the CEE states which remain downstream of Ukraine and Belarus and Poland has expressed concern for the Nord Stream project and its effective bypass of current 'pipeline' states including Poland (Bouzarovski & Konieczny, 2010).

The construction of Nord Stream has highlighted the challenges Poland faces with regards to the geographic distribution of resources and mechanisms for their provision. However, in addition to the challenges Poland faces with regards to historical-infrastructure entanglements with the Former Soviet Union, the nation's own turbulent history has provided additional incentive to maintain a state of energy independence. During peak discussions surrounding the development of Nord Stream, the agreement between Germany and Russia was compared by Radek Sikorski, the Polish Minister of Foreign Affairs, with the Molotov–Ribbentrop pact³ (New York Times, 2009), adding an extra layer of historical and political tension.

Whilst Poland has historically dealt with energy supply challenges and the need for energy independence through the use of substantial domestic coal reserves, the challenges of future supplies are in modern times compounded by environmental concerns. Poland's existing and rapidly ageing coal fired power plants currently receive environmental subsidisation from the EU (Europe Economics, 2006). However, it was given as a condition of accession in 2004 that similar support mechanisms will not be extended to new build coal plants. Poland can continue to use coal, but in addition to the environmental concerns associated with the

³ The Molotov-Ribbentrop Pact was a pact concerned with the division of 'territories' signed by Nazi Germany and the Soviet Union on 23rd August 1939. The signing of the pact between the two powers was followed on 1st September 1939 by Nazi Germany's invasion of Poland and the beginning of WWII.

resource, the prolonged use of coal will prove, over time, to be less of an attraction economically. As such, Poland's modern energy security challenges are increasingly heightened by concerns for economic and environmental sustainability.



Figure 1.12 indicating the location of natural gas infrastructure transiting Central and Eastern Europe (The Economist, 2008)

1.5 Chapter Outline

In **Chapter 2** I introduce the assemblage framework which underpins this thesis. This chapter presents a discussion of how decision making processes surrounding energy choices and technological 'solutions' to social challenges are the product of an entangled mass of elements that range from the political and social (the socioeconomic and political climate within which development takes place, the design of spaces of science-lay engagement), to material (for example infrastructure past and present, the physical landscape of Lake Żarnowiec) and

conceptual (themes such as landscape identity, understandings of truth or knowledge, and the hopes and fears associated with development).

In **Chapter 3**, I discuss methods. The chapter describes the application of ‘methodological assemblage’ and the selection of techniques including semi-structured interviews, participant observation, informal discussions with participants and the retrospective use of visual materials to further illustrate the processes which surround nuclear development in Pomerania. In addition, the chapter reflects on the process of conducting research abroad.

In **Chapter 4** I explore how the hyper-local area surrounding Lake Żarnowiec has been critically altered through sunk investments in site specific knowledge, the resettlement of the traditional Kashubian farming and fishing villages of Kartoszyno, Czymanowo and Nadole, and the construction of two large energy facilities; Żarnowiec NPP and a hydroelectric load balancing plant, Żarnowiec Hydroelectric. The chapter examines the historical processes and conflicts which surrounded the construction of Poland’s first nuclear power station and demonstrates visually how the land on the southern tip of Lake Żarnowiec has been transformed into an energy ‘zone’.

In **Chapter 5** I address the continued relevance of the artefacts and their agency within the process of nuclear assemblage which is taking place within Pomerania. The chapter explores how the municipalities of Gniewino and Krokowa in which the infrastructure is situated have adapted to the uncertainty which surrounds nuclear development in the area, and the extent to which their adaptive measures have led to a deeper state of entanglement and path dependency.

In **Chapter 6** I unpack the social elements, contexts and processes which have shaped contemporary attitudes towards nuclear development in the wider region of Pomerania. The

aim of this chapter is to examine the role of public communication and scientific knowledge in the process of nuclear assemblage, and explore how the design of dialogue spaces has resulted in the inequitable distribution of agency between the institutions and organisations responsible for the promotion of nuclear development in Pomerania and both the opposition movement and concerned lay publics.

Chapters 4 – 6 form the empirical basis of the thesis. The themes of these chapters have been motivated by the objectives set out earlier in this introductory chapter. Furthermore, whilst Chapters 4 and 5 focus on the process of assemblage at the hyper-local level of Lake Żarnowiec and the surrounding communities, chapter 6 considers the process of assemblage within the wider region of Pomerania.

Chapter 7 concludes the thesis. Whilst I draw conclusions surrounding the research objectives within each of the empirical chapters, in Chapter 7 I reflect on the use of assemblage as a theoretical and methodological toolkit through which to examine the process of nuclear development. The chapter highlights the elements and entangled relationships within the nuclear assemblage which is taking shape in Pomerania, and considers possibilities for future research.

2.0 Theoretical Framework: An Assemblage of Elements

As highlighted in the introduction, the aim of this thesis is to examine how it is that a trajectory towards nuclear development is being sustained within the region of Pomerania. The thesis examines the processes which surround the configuration of a nuclear industry in the region, in light of Poland's troublesome history with the technology and both regional and international opposition to the use of nuclear power.

With nuclear development in Pomerania, past and present, multiple elements appear to interact with one another in order to shape development paths: The social and political context within which development takes place; demands for resource diversification; existing and historical land use patterns and the state of the built environment; the nature of spaces for dialogue on nuclear development; notions of landscape identity and how a space should be used. Together these social, conceptual and material elements present as a tangle of pressures which shape development trajectories. However, to date research has focused on each of these elements in turn rather than addressing the manner in which the entangled 'whole' of a nuclear industry is created. In this thesis I have used a hybrid theoretical approach to unpack the pressures and processes which surround nuclear development in Pomerania.

The following chapter attends to the different ways in which the relationships between the social and material worlds and society and technology have been conceptualised in the academic literature. The chapter presents the theoretical framework through which this thesis examines the extent to which the Polish nuclear industry is shaped by a range of elements.

2.1 The Social Construction of Science, Technology and Knowledge

There are many different ways to conceptualise the relationship between society and technology, society and 'nature', or the social and material worlds. A range of approaches

emerging from Political Economy and Science and Technology Studies place analytic emphasis on the impact of social and political structures and processes on the human experience of the material world (Kuhn, 1996; Bijker, 1987; Latour, 1987; Hardt & Negri, 2000; Swyngedouw & Baeten, 2001; Brenner & Theodore, 2002; Swyngedouw & Haynen, 2003; Swyngedouw, 2009). Meanwhile, a contrasting body of scholarship on ‘materiality’ and material agency tackles the manner in which the material or ‘natural’ world and ‘things’ shape human activity (Heidegger, 1973; Winner, 1993; Coole & Frost, 2010; Olsen, 2010; Hodder, 2012). Yet further, networked approaches to socio-material relations, and in particular research in the fields of Actor Network Theory (ANT) and assemblage have set out to examine the co-production and contingency of both social and material elements (see for example, *inter alia*, Callon, 1986; Bijker & Law, 1994; Bingham, 1996; Bennett, 2005; Law, 2008). Scholars working with this body of literature seek to demonstrate the extent to which social and material forces come to be entangled in complex and often unpredictable ways.

This thesis is situated under the umbrella of a framework provided by the latter body of literature, that which is concerned with addressing the extent to which the social and material worlds are coproduced. Through a toolkit of concepts originating from Science and Technology Studies (STS), Actor Network Theory (ANT) and assemblage, I conceptualise the Polish nuclear industry as a sociotechnical network which is constantly in the process of being assembled. That is to say that the industry is composed of social (people, policies, social and political forces), material (infrastructure, technologies and physical *things*), and conceptual elements (for example notions of landscape identity, understandings of truth or knowledge, hopes and fears) and that these elements come together and pull apart, forming a networked whole.

I have chosen to use the term sociotechnical *network* to discuss the relationships between social, material and conceptual elements, yet others discuss the relationship between society and technology in terms of sociotechnical *webs* (Hughes, 1986; Monteiro & Hanset, 1996; Scacchi, 2007) or *systems* (Hughes, 1993; Geels, 2005; Geels & Kemp, 2007.) Though the three terms can to a large extent be used interchangeably, the use of the term *network* throughout both the literature review and the following chapters is deliberate, as it refers explicitly to the networked relations discussed in the literatures of Actor Network Theory and assemblage which underpin this thesis.

2.1.1 The Social Construction of Technology

‘Technologies always embody compromise. Politics, economics, theories of the strength of materials, notions about what is beautiful or worthwhile, professional preferences, prejudices and skills, design tools, available raw materials, theories about the behaviour of the natural environment – all of these are thrown into the melting pot whenever an artefact is designed or built’ (Bijker & Law, 1997, p.3).

This thesis is particularly concerned with the social construction of knowledge and technology and the use of Social Constructivism within a broader, relational framework of Actor Network Theory and assemblage. It addresses the social origins of scientific knowledge, scientific or technological ‘solutions’ to energy challenges, and the role of scientific knowledge within an entangled network of social, material and conceptual relations.

Social Constructivism views sociotechnical networks such as that of the Polish nuclear industry as socially constructed phenomena, shaped, formed and structured by social actors and forces, needs and goals (Bijker, 1987; Latour, 1987; Bijker & Law, 1997; Wise, 2005). In addition, the perspective seeks to challenge the elevated status of scientific knowledge over

and above alternative sources of knowledge, for example those held by communities and non-specialists.

‘The treatment of scientific knowledge as a social construction implies that there is nothing epistemologically special about the nature of scientific knowledge: it is merely one in a whole series of knowledge cultures’ (Pinch & Bijker, 1984, p.401).

Within Science and Technology studies, constructivism developed as a critical response to what was regarded to be a positivist view of science and technology (Keat, 1971; Kuhn, 1996; Sismondo, 2010). Early branches of positivist scholarship, rooted in astronomy (Keat, 1971) utilise a philosophy of science which asserts that scientific truth is only observable through quantitative approaches to data collection and the use of established theoretical frameworks, scientific or mathematical models. Positivism shares with realism a view that knowledge and ‘truth’ exist objectively, independent of the subjectivities of the researcher (Fuller & Collier, 2003).

However, such a view is problematic in that it fails to highlight the social processes through which scientific theories and the practices or methods through which they are observed are developed (Keat, 1971; Latour, 1987; Kuhn, 1996, Fuller & Collier, 2003).

‘Scientists and engineers are always members of communities, trained into the practices of those communities and necessarily working within them’ (Sismondo, 2010, p11).

A traditional, positivist view of science neglects consideration of the broader social landscape within which scientific knowledge and technological solutions to social challenges such as energy security are produced.

By contrast, in the early days of STS, researchers began to study science and technology through a constructivist lens, in order to understand how traditional scientific practices, institutional structures and processes shape both the production of scientific knowledge and resultant technological innovations. This line of enquiry was led by Trevor Pinch and Wiebe Bijker with their seminal article which drew connections between the Sociology of Science and the Sociology of Technology, introducing a framework for the study of the Social Construction of Technology (SCOT) (Pinch & Bijker, 1984); by Thomas Hughes with his work on sociotechnical systems and the electrification of Western society in the late 19th to early 20th centuries (Hughes, 1986, 1993); and by Bruno Latour and John Law with their theory of ‘Actor Networks’ (Latour, 1987, 1992; Law, 2000, 2008) (see section 2.3 for a discussion of ANT).

Social Constructivists working with these new frameworks set out to critique the positivist view of scientific knowledge, and to demonstrate the socially situated nature of both scientific knowledge and resultant technological innovations.

For example, Carlson & Gorman (1990, see also Carlson, 1997) have written on the subject of Thomas Edison’s invention of the kinetoscope at the end of the 19th century. A precursor to modern day motion pictures and video, the kinetoscope was conceived of and developed as a single-user device. Edison’s pre-existing notions of how the product might best be marketed led him to develop a peephole design for a single user rather than an alternative model proposed by a colleague which would have utilised a projector for larger audiences. Carlson and Gorman posit that Edison’s invention was the product of the manipulation of ‘both a device-like conception (mental model) and a set of physical artefacts (mechanical representations)’ (Carlson & Gorman, 1990, p.417). Rather than framing technological innovation as ‘discovery’ (of a means through which to view moving images) or solutions to

pre-existing problems or challenges (for example the need to convey moving images to an audience of one or many), they call for a view of technological innovation which recognises the socially situated nature of the inventor or researcher and their role in the production of knowledge.

The SCOT framework has been used in many different contexts, from the study of the invention of bicycles, Bakelite – an early plastic with many uses due to its physical properties and ability to withstand heat - and fluorescent lighting (Bijker, 1997), to electricity grids (Hughes, 1993), and nuclear missiles (MacKenzie, 1999). However, despite the benefits of a framework which contests the status of scientific knowledge and technological solutions as the discovery and application of absolute, objective truth, the SCOT approach has been subject to criticism itself for being perceived to offer limited scope for an examination of the extent to which technological systems and the material world ‘constructed’ through social processes and interactions can go on to shape, enable or limit different members and groups within society (Russell, 1986; Clayton, 2002; Sismondo, 2010). In particular, concerns have been raised for the ability of SCOT and social constructivist approaches to science and technology to acknowledge power structures and imbalances within society, and the manner in which such political processes are played out through applications of scientific knowledge and the presence of technological artefacts (Russell, 1986).

The focus on technology as socially constructed has been argued by Langdon Winner in his influential critique of constructivist approaches to the study of science and technology to draw attention away from how technological systems and their associated industries and infrastructure come to impact society, instead focusing on (de)constructing the institutions of science and technology. Winner (1993) addresses this limitation of pure constructivism by

calling for an examination of what he refers to as the politics of socially constructed technologies and infrastructure.

Winner has sought to challenge the gap provided by pure constructivism through an examination of the politics of technological development, and the 'artefacts' (infrastructure, material things) which arise from it:

‘It [social constructivism] suggests that technical *things* do not matter at all. Once one has done the detective work necessary to reveal the social origins – power holders behind a particular instance of technological change – one will have explained everything of importance’ (Winner, 1999, p29).

He calls for a more symmetrical approach which, whilst acknowledging the social processes which shape infrastructure and the built environment, particularly from within the institutions of science and technology, also examines how the resultant technological artefacts (re)shape society by means of design.

In an article responding to concerns for the validity of a constructivist approach to the study of science and technology, Bijker (1993) cautions against the use of technologically deterministic language to describe the impact of technology or 'nature' on society, and calls for further, politically motivated work to be conducted under a social constructivist framework. In particular, he highlights the need for further research on matters relating to the distribution of power and social agency, equity and the potential of society and technology to shape and reshape one another.

Whilst the first part of this chapter has addressed the advent of STS and debates surrounding the use of positivism and social constructivism as ways of viewing science, scientific knowledge and technological inventions or artefacts, the discussion now turns to the role of

scientific knowledge in the decision making processes surrounding the use of controversial technologies.

2.1.2 The Social Construction of Knowledge: Public engagement and participatory decision making

Social constructivism provides a useful starting point for an examination of the relationship between society and technology. The perspective allows the ‘black box’ of complex technologies or industries to be opened up for analysis (Pinch & Bijker, 1984). In particular, social constructivist approaches encourage an examination of the inherently social processes through which scientific knowledge and resultant technological solutions to social challenges are produced (Burningham & Cooper, 1999; Law & Singleton, 2000).

As such, the perspective offered by social constructivism is helpful in a discussion of nuclear development, as nuclear power has come to be framed in political debates on energy futures as a technological ‘solution’ to the joint challenges of energy security and the need for sustainable development (Bickerstaff et al, 2008).

Within the social sciences, social constructivist approaches to technology and knowledge have been used to study siting controversies surrounding energy infrastructure and the operation of controversial industries and businesses. In particular, research has examined processes of public engagement during planning and development, and perceptions of lay or ‘non-scientific’ knowledge held by scientists and technical specialists. Social constructivism has been beneficial to this line of enquiry as it illustrates how positivist/realist conceptions of scientific knowledge and technological innovation as absolute, quantifiable and objective have limited the access of laypeople outside of the institutions of science and technology to the decision making processes surrounding the use of controversial technologies. In contrast

to scientific knowledge, lay knowledge is viewed from within the institutions of science and technology as incomplete or subjective (Wynne, 1991; Irwin, 2006).

Research which examines the partial and socially constructed nature of all knowledge cultures, lay and scientific alike, has examined technocratic perceptions and ‘deficit models’ of lay knowledge held by scientists, engineers, and technical specialists (Burningham et al, 2007). Such models are argued to conceptualise lay knowledge as inferior, irrelevant, irrational, incomplete or unfounded in comparison to scientific knowledge (Irwin, 2001). As a result of technocratic views, SSK theorists argue that lay knowledge is often perceived to be of lower value, and afforded insufficient attention or space during dialogue (Wynne, 1991, 1996).

It has been suggested that technocratic models of lay knowledge within the institutions of science and technology have had a significant and often detrimental impact on democratic decision making surrounding both the use of controversial technologies and narratives on environmental risk (Petts & Brooks, 2006; Burningham et al, 2007; Barnett et al, 2012). However, it is important to note that different models of lay knowledge exist, and that a neat binary of scientific versus lay knowledge is often too simplistic a narrative.

Burningham et al (2007) describe a series of interviews conducted with chemical industry specialists to discuss perceptions of public knowledge and industry engagement with communities regarding product development. The interviews illustrated a spectrum of views regarding public knowledge. The specialist research participants differentiated between lay knowledge or views held by ‘consumers’, ‘neighbours’, and the ‘public’. They described how different groups and communities required different forms of engagement. For example when engaging with ‘consumers’ the chemical industry representatives sought information on

consumption patterns and opinions on products or developments. By comparison, dialogue with ‘neighbours’ was structured so as to ameliorate any concerns individuals may have relating to a product or development, or to reduce the perception of negative development impacts. Though engagement with ‘consumers’ and ‘neighbours’ revolved around a key aim of reducing public opposition to developments, it was with general ‘public’ views and concerns that the industry specialists indicated truly reductionist models of lay perspectives. In these instances, the companies often approached dialogue in terms of offering reassurance rather than genuine engagement. Crucially, they conceptualised the views held by the public less as ‘knowledge’, but rather as concerns, complaints and obstacles to product development. The researchers concluded that:

‘Only NGOs or other powerful stakeholders are viewed as likely to raise social or environmental challenges to companies. The contribution of these stakeholders comes closest to being viewed as “lay environmental knowledge” that deserves to be taken seriously. Yet, industry relations with NGOs are at best ambivalent. NGOs are described as “troublemakers” pushing environmental scare stories into the media to fuel public concern...’ (Burningham et al, 2007, p.39).

The interviews and opinions described by Burningham et al (2007) demonstrate the presence of a ‘deficit model’ of lay knowledge and public understanding of science and technology (Wynne, 1991). Under such a model, the public (whether ‘consumers’, ‘neighbours’, or the general public) are conceptualised as opposing development or holding concerns with regards to development due to a lack of information. The key aim of public engagement, therefore, is to supply sufficient information so as to address concerns relating to proposed developments or scenarios, and to allow development to continue unhindered by public opposition (Wynne, 1991; Maranta et al, 2003; Hagendijk & Irwin, 2006; Bickerstaff et al, 2010).

Burningham et al's (2007) line of enquiry has been further expanded by Barnett et al (2012) with regards to dialogue surrounding the use of renewable energy technologies. Building on a framework developed by Rowe & Frewer (2005) they explore different models of engagement surrounding the siting of renewables projects, and in particular how engagement is at different times undertaken as 'communication' (a one way process of conveying information from the 'sponsor' to the public), 'consultation' (a two way discussion, but where the views expressed by the public are non-binding and do not necessarily influence the final development process, this form of public engagement does not constitute dialogue), and 'participation' (a transformative process of dialogue between the 'sponsor' and public representatives) (Rowe & Frewer, 2005 p.255-256). The research found that the method of engagement was linked to perceptions of the extent of public knowledge, public interest in engagement, and the extent to which developers felt they needed to offset opposition or concerns relating to the proposed developments. Once again, the presence of a 'deficit model' of lay knowledge and public understanding of science influenced the nature and extent of public engagement.

Critically, the renewables developers interviewed for the study highlighted the need to undertake different forms of public engagement at different stages of the development process. During the early stages of development, for example, interviewees claimed that there was little benefit to sharing development information as the process of development remained in flux.

Barnett et al (2012) suggest that a reductionist, 'NIMBY' (Not In My Back Yard) model of public opposition lies at the heart of hostile or negative perceptions of public engagement held by scientists, technical specialists and project 'sponsors' (Rowe & Frewer, 2005). The NIMBY perspective has been studied in depth with regards to energy developments, and

refuted as an incomplete conceptualisation of public opposition and concerns (Kraft & Clary, 1991; Welsh, 1993; Burningham, 2000; Upreti, 2004; Upreti & van der Horst, 2004; Wolsink, 2007; Cass & Walker, 2009). Research has demonstrated that true ‘NIMBYism’ motivates a very small number of opponents, and that more pressing concerns inform concern for development including the impact on tourism, worries surrounding landscape identity, perceptions of the inequitable distribution of risk and environmental concerns (Walker, 1995; Wester-Herber, 2004; Devine-Wright, 2005, 2009; Jenkins-Smith, 2011).

Moreover, with regards to the siting of controversial energy developments it is argued that developers often come to expect hostility in the face of development, and ‘construct’ a pre-emptive image of the public when preparing for and engaging in public engagement events or activities (Maranta et al, 2003; Walker et al, 2010; Barnett et al, 2012). This ‘imagined’ public may be used to influence both the trajectory of development and the design of public engagement materials and events. Discussing research which examined how ‘the public’ is conceptualised within a variety of different renewable energy sectors, Walker et al (2010) conclude:

‘...there is evidence of a shared imagination or anticipation of ‘the public’ at work... This was not always a simplistic anticipation of NIMBYs anywhere and everywhere, but a clear expectation of the possibility of hostility to project implementation’ (Walker et al, 2010 p.943).

In addition to discussions surrounding the implementation of renewables technologies and siting controversies with chemical industries, there has been a significant strand of research addressing public perception of and engagement with nuclear industries (Kraft & Clary, 1991; Wynne, 1996; Chilvers, 2007; Bickerstaff et al, 2008; Chilvers & Burgess, 2008; Venables et

al, 2009). Wynne (1996) discusses the impact of economic restrictions on sheep farmers in Cumbria following the miscommunication of information on radioactive fallout from the Chernobyl accident in Ukraine in 1986, and a more local source of radiation from the nearby Sellafield complex.

Wynne questions how public and institutional trust in scientific knowledge and the elevated social esteem in which it is held can lead to the displacement or rejection of specialist lay knowledge. In his seminal piece on risk perception and dialogue surrounding the management of environmental hazards he demonstrates how a ‘deficit model’ of public understanding of science and lay knowledge when combined with *a priori* assumptions about the value and objectivity of scientific knowledge can actually prevent society from finding effective solutions to environmental risks.

A ‘deficit model’ of public understanding of science and scientific scepticism of the value of specialist lay knowledge proves particularly troublesome in discussions relating to a technology, such as nuclear, around which there remains a high degree of uncertainty (Venables et al, 2009). As Wynne highlights, failure to consider specialist lay knowledge in the decision making process can result in the use of incomplete or incorrect models for environmental management, and negatively impact upon the livelihoods of communities living and working in the vicinity of environmental risks.

In addition, as the accidents at Chernobyl in 1986 and Fukushima in 2011 demonstrate, each nuclear accident provides a steep learning curve for society and, as with many other forms of environmental risk, the social cost is often borne by those who did not actively choose to take on the risk (Cutter, 1995; Ringquist, 1997; McLeod et al, 2000; Kraft, 2000; Bolin et al, 2000; Morello-Frosch et al, 2001). In order to provide effective solutions to energy challenges, and

achieve a more balanced and equitable dialogue on risk, it is becoming increasingly important to take into consideration different types of knowledge, as well as to challenge the status of scientific knowledge as objective ‘truth’.

Seeking to challenge the ‘deficit model’ of public understanding, and to tackle the frustrations felt by both policy makers and local communities when discussing energy development paths, Chilvers (2007) examines the manner in which scientists, technical specialists and politicians engage with local communities on the subject of radioactive waste disposal. His research highlights the positions of power which are held by those within the institutions of science and technology as a result of the ways in which discourse on environmental management typically takes place. He calls for a more deliberative and inclusive approach to dialogue on points of conflict such as the disposal of radioactive waste, which incorporates scientific knowledge, practical evidence based experience from the operation of nuclear industries, together with specialist lay knowledge, public opinions and concerns (Chilvers, 2007; Chilvers & Burgess, 2008).

A discussion of the manner in which publics are ‘imagined’, and the nature and extent of public engagement with the development of controversial technologies is of particular relevance to an examination of nuclear development in Pomerania, and questions relating to the experience of communities when engaging with the nuclear consortium partners. In particular, the existing literature on dialogue and public engagement surrounding renewables and nuclear in the UK is of value for understanding how different ‘publics’ come to be engaged with or indeed are actively disengaged from the decision making processes which surround nuclear development in Pomerania.

2.1.3 The ‘Construction of Knowledge’ in a broader framework

Research on public engagement, the social construction of knowledge and the development and siting of controversial technologies seeks to pull apart existing technocratic narratives on knowledge and the ‘deficit model’ of public understanding of science, so as to create spaces for dialogue which are more inclusive to local communities.

Such an approach is useful in a discussion of nuclear development in Pomerania, and in particular in the process of unpacking the manner in which scientific, technical and ‘public’ narratives are built up surrounding nuclear development in the region. However, despite the benefits offered by the literatures on public engagement and the construction of scientific knowledge in challenging ‘imagined publics’, the framework is insufficient as a single lens through which to examine the process of nuclear development in Pomerania.

Chapter 1 introduced the history of Poland’s experience with nuclear development during the 1970s and 1980s. The construction and development of Żarnowiec NPP and related facilities led to significant upheaval in the region, and despite project abandonment in September 1990, the legacy of this intense period of time lives on. As Chapters 4 & 5 demonstrate, the legacy of Żarnowiec NPP continues to be embedded in the socioeconomic fabric of Pomerania as a region, in attitudes to development, perceptions of landscape identity and existing land use practices, and in the physical, material remains of the original development site.

Academic and policy focused attention to the manner in which knowledge and both scientific and technological solutions are produced is essential to understanding how privileged social actors, governance structures and an often overtly technocratic view of science and technology can alter development paths. As such, the literatures provide a useful framework through which it is possible to begin to tackle my third research objective: to examine the role

of knowledge communication between ‘scientific’ and ‘lay’ communities in the process of nuclear development. However, a sole focus on public engagement, dialogue and access to the decision making processes surrounding regional nuclear development in Pomerania cannot elucidate the extent to which conceptual and material development legacies influence social narratives surrounding contemporary nuclear development in the region, through entanglement with the built environment or by means of exerting a form of affective agency.

2.2 Layers of Entanglement

The previous section addressed the means through which social actors, processes and perceptions of different knowledge cultures shape development trajectories surrounding the use of controversial technologies. In particular, the discussion focused on the manner in which all knowledge is socially constructed, and the role afforded to both ‘scientific’ and ‘lay’ knowledge within decision making processes.

In the following section, the discussion takes a more reflexive approach in order to examine how historical socio-material relations and in particular layers of social agency can become enmeshed with or embedded in the material world, for example through infrastructure and the built environment. The aim of this discussion is to demonstrate the often complex entanglement of society with technology and infrastructure, and the means through which social, material and conceptual elements combine to produce development trajectories.

The theme of ‘entanglement’ between society and technology has been developed empirically in the fields of urban and regional studies (Graham & Marvin, 2001; Graham, 2001; Brenner & Theodore, 2002; Swyngedouw & Heynen, 2003; Bulkeley, 2005; Brenner et al, 2011). Graham and Marvin (2001) have developed a framework for a ‘Splintered Urbanism’ view of cities and urban spaces in order to examine the networked infrastructure of the transportation,

telecommunications, energy and water systems which flow through cities. Through in depth empirical case studies they demonstrate how decades of urban planning and privatisation policies have come to be embedded within the infrastructure and technologies which make up the built environment and lived experience of cities (Graham & Marvin, 2001; Graham, 2001).

Graham and Marvin describe how distribution grids are woven through the fabric of cities, bypassing certain social groups and areas whilst bringing electricity, heat, sanitation and physical access by means of transport infrastructure and information to others. Their thesis on socio-technical entanglement seeks to demonstrate how city-wide development of distribution networks is uneven, favouring affluent areas, groups and individuals whilst simultaneously hindering access or proving detrimental to the wellbeing of the residents of the areas which come to be bypassed. They argue that infrastructure effectively ‘warps’ space by connecting remote areas of cities or countries with one another, or putting up barriers between existing geographical neighbours.

As such, Graham and Marvin’s ‘Splintered Urbanism’ offers a direct response to Winner’s (1993) challenge to politicise the SCOT approach to technology studies. Their approach is explicitly political in nature, seeking to reconfigure urban distributive injustices associated with the development of technology and networked infrastructure, yet they recognise that agency is not always in the hands of present day social actors or processes. Instead, they argue that agency is bound up in a complex entanglement with the built environment and infrastructural arrangements and that this entanglement plays out past layers of social activity and injustice both in the present and into the future.

The ‘Splintered Urbanism’ thesis demonstrates how social agency in the shape of political and economic decisions and activities has come to be entangled with infrastructure and the built environment. As an approach, it has been used by Rutherford (2008) to analyse the ‘unbundling’ of previously publicly owned services in Stockholm, Zérah (2008) to explore issues of sanitation provision in Mumbai, and MacKillop & Boudreau (2008) to navigate the challenges associated with accessing networked infrastructure for power and water in Los Angeles.

‘Splintered Urbanism’ demonstrates how neoliberal policies of privatisation, played out through access to infrastructural networks, have come to splinter cities over time, resulting in the reconfiguration of urban space. The approach highlights how social and conceptual elements in the shape of policies, historical socio-political arrangements and ideas which surround landscape identity and how a space should be used can come to be embedded within material artefacts in the shape of the built environment and infrastructural arrangements.

Moving away from the theme of cities and urban spaces, entanglement between social and material elements and the role of historical social and political activity has also been discussed by Bouzarovski (2010) in relation to gas pipeline politics in Eastern and Central Europe (ECE) and the former Soviet Union. In particular, he describes the situation surrounding the regional gas crisis which took place in the winter of 2009 following Ukraine’s dispute with Russia regarding payment for natural gas, highlighting the manner in which historical social and economic activities are ‘entangled’ with the networked infrastructure for gas transit through the region:

‘The gas crisis highlighted the infrastructural dependence of ECE countries on political developments, economic relations, hydrocarbon resources and energy transit

pathways located in the former Soviet Union: a clear legacy of communist central planning, which is still present in the region despite 20 years of post-socialist transformation' (Bouzarovski, 2010 p.168).

Writing on the subject of the United Kingdom's entanglement with THORP, Walker (2000) describes what he sees to be a path dependence and entanglement with large infrastructural projects and networks. During the 1970s and 1980s, the UK government pursued a programme of nuclear fuel reprocessing at the Sellafield nuclear complex in Cumbria, seeking to develop a Thermal Oxide Reprocessing Plant (THORP). The facility was constructed in order to reprocess foreign nuclear waste materials with the expectation that forthcoming nuclear reactor designs would create demand for large quantities of plutonium (separated from depleted uranium and radioactive wastes during reprocessing). However, due to an international move towards the use of Light Water Reactors (LWRs) instead of Fast Breeder Reactors (FBRs), the storage of spent fuels in waste ponds 'on site' became a viable option for waste management. As a result of changing practices and the unrealised vision of widespread FBR uptake, demand for THORP's services was reduced. In order to protect the investments which had already been made at THORP, long term contracts were established for the reprocessing of Japanese and German waste materials (Walker, 1999; 2000).

Using the case study provided by the UK's experience with THORP, Walker (2000) calls for a greater attention to the processes which surround the pursuit of a niche technology or technological practice. In particular, he is concerned with studying how governments and institutions can come to be entangled with and 'locked in' to certain development paths or technologies despite changing socio-political or economic circumstances. He argues:

‘[The processes surrounding selection or rejection] can be ignored least of all where complex products and infrastructures are being constructed over long periods, and where states are heavily involved for whichever reasons’ (2000, p834).

‘Not only does ‘lock-in exist, it is an essential but dangerous facet of complex infrastructural innovation’ (2000, p834).

Using the example of the UK government’s pursuit of and later problematic commitment to nuclear fuel reprocessing at THORP in Cumbria, Walker (2000) highlights four types of commitment which can lead to entrapment or entanglement between society and large technological systems. He highlights the ‘capital and infrastructural’ commitments, ‘contractual’ commitments, ‘industrial’ commitments and ‘political’ commitments which are involved in system development, illustrating how the deeper the commitment, the more entangled society becomes with a technology.

Walker’s work on entanglement further highlights the social and political forces which underscore the processes of selection or rejection of a technology type, and in particular the disposal of radioactive waste and the management of nuclear industries (see also Bickerstaff et al, 2008; Chilvers, 2008; Chilvers & Burgess, 2008). However, he also opens up a discussion of how infrastructure itself and investment in infrastructure can lead to a state of ‘lock in’ or ‘entrapment’ with a technology.

These themes are essential to a discussion of nuclear development in Pomerania, and to understandings of how the historical experience of nuclear development at Żarnowiec continues to exert a force over contemporary attitudes towards the technology in the region, and particularly in the hyper-local area surrounding Lake Żarnowiec.

The theme of entanglement between social and material elements has not been limited to work within the discipline of human geography, but has also been examined by those working in the discipline of the sociology of information systems (see for example Orlikowski, (1992, 2005, Star, 1999; Rose et al, 2005, Jordan, 2012). In particular, research in this sphere has focused on the unpredictable nature of socio-material entanglement.

In developing a framework for examining infrastructure ethnographically, Star (1999) seeks to define the characteristics of infrastructure and the relationship between infrastructure and social processes:

‘Infrastructure is sunk into and inside of other structures, social arrangements and technologies... [it] has reach beyond a single event or one-site practice’ (Star, 1999 p.381).

To Star, technology and specifically information technology, is not developed in a void to meet a single social or technical challenge. Rather, each element is co-produced through an entanglement between society and existing technology or conceptual understandings of one or both.

Building on a case study example of software collaboration between a team of biologists and computer scientists, Star argues that computer systems and infrastructure both shape and are shaped by additional forces, both material and social in nature, and that through time the relationship between social and material elements can become deeply entangled. She gives the example of how a computer system is shaped by the ‘programs or subcomponents of the software’ (Star, 1999 p.381) – the scripts and programming languages which provided the puzzle pieces for systems development (Star & Ruhleder, 1996; Star, 1999). Whilst social products in and of themselves, these elements or subcomponents can be regarded as bundled

wholes, modes of practice and operation which cannot easily be taken apart or reformed. They are shaped by social activity (that of the computer scientists) and knowledge cultures (of science and technology), yet as bundled wholes they exert a different form of (material) agency by means of enabling or limiting further social activity. (I discuss the concept and limits of material agency in further detail in section 2.3). Whereas with energy infrastructure, layers of social agency come to be embedded within the transmission infrastructure, power stations and the shape of the physical landscape and built environment, with computer systems layers of social agency reside within and live on to transform future socio-technical relations in both software and hardware design.

Jordan (2012) describes this apparent sense of entanglement between the social and material worlds as a form of ‘sedimented sociality’.

‘The sedimented sociality of a technology – that is, the things a user can or cannot do with a technology because of all the prior social actions which produced a technology’s particular nature’ (Jordan, 2012 p.15).

Jordan argues, again in the context of computer systems, that technological networks are always embedded with sociality. He asserts that whilst the ‘sedimented sociality’ of computer systems doesn’t make them fully autonomous, the nature of material agency still requires attention, specifically how technology can reshape or impact on social or political goals.

Both social scientific approaches to entanglement and research on the future trajectories of information systems indicate the interconnectedness of social activity and networked infrastructure. Each network can be seen to carry not just water, electricity or information, but also the social values, political decisions, associations and arrangements, as well as the knowledge cultures with and through which it was planned, developed and constructed. These

social values, ‘sunk into and inside of’ networked infrastructure (Star, 1999 p381) and extending both back in time historically as well as forward into the future, are difficult to separate from the technologies, infrastructure and material artefacts with which they are entangled. A clear separation of the social from the material fails to appreciate the inherent messiness and entanglement present within sociotechnical systems (Law, 2008).

Graham and Marvin (2001), Swyngedouw & Heynen (2003) and Brenner et al (2011) examine the scalar implications of such socio-material entanglements, and as such address how social and political values and processes come to be embedded within infrastructural arrangements and the built environment of cities. Due to the nature of their respective research foci: distributive inequalities from networked infrastructure (Graham & Marvin, 2001); the impact of a financial crash during a ‘building boom’ and the resultant spread of contaminated water, disease and poverty surrounding former building sites (Swyngedouw & Heynen, 2003); the removal under neoliberalism of policies and funding for the provision of services by municipal or local authorities (Brenner & Theodore, 2002; Rutherford, 2008; Zerah, 2008); an *a priori* focus on the impact of social and political arrangements is beneficial and matches the aims and objectives of their research. However, the aim of this thesis is not just to demonstrate the presence of inequality resulting from social or political arrangements and access to decision making processes (as in section 2.1), but also to elucidate the additional forces which shape individual and group narratives and the resultant dialogue or outcomes.

2.3 ANT & Assemblage: A networked approach

Section 2.2 introduced a discussion of the theme of ‘entanglement’, and the manner in which social, conceptual and material elements combine to form complex webs of actions and reactions. Within human geography, research on the lived experience of cities has shown how

social values and the material world come to be entangled. In particular, Graham and Marvin's theory of a 'Splintered Urbanism' has called attention to how the policies of neoliberalism and privatisation are sunk inside of and played out through infrastructure (Graham & Marvin, 2001; Rutherford, 2008). This theme of entanglement between social and material elements has also been taken up by social scientists studying computer systems and networks (Orlikowski, 1992; Star, 1999; Jordan, 2012).

The theme of entanglement is not limited to studies of sociotechnical or socio-material relations, but has also been the focus of research within the discipline of political science where researchers have drawn attention to feedback dynamics and path dependency, and in particular how a series of political decisions and activities can make switching from one pathway to another a very complex process which is often difficult to achieve (Arthur, 1994; Walker, 2000; Pierson, 2004).

All of these approaches hold in common a recognition that the ability of humans to act, or to exert agency over their surroundings and in relation to technology and infrastructure, is both enabled and limited by interactions and entanglements which build up through time between the social and material worlds. However, much of the research concerned with entanglement within human geography has approached empirical research with scalar analysis and *a priori* assumptions about the importance of social and political activities.

The act of developing a nuclear industry is a lengthy process, which often straddles decades in which there are shifts in political structures and arrangements. This is no more apparent than in Pomerania, where scientific and lay narratives on contemporary nuclear development have been influenced by the communist political and economic challenges of the 1970s, through Solidarity and the transformation period of the 1990s to the present day, centre-right

government of Donald Tusk (Davies, 2005; Kemp-Welch, 2008). Though development plans were abandoned in 1990, since 2005 there has been a renewed focus within Poland on the introduction of nuclear to the combined fuel mix (see Chapter 1). Poland has been subject to numerous social and political shifts over the course of the past forty years (Davies, 2005; Welch, 2006, 2008), from the Stalin years through Martial Law, Solidarity and the introduction of neo-liberal economic models during the 1990s (Lipton et al, 1990; Meyers et al, 1994). The re-emergence of nuclear debates in Pomerania, on the site of a former development site at Żarnowiec can therefore be seen to indicate a degree of continuity and entanglement with more than just social and political elements.

For a study of the complex processes involved in developing a nuclear industry in Pomerania, a framework which recognises the means through which contemporary decision making processes are embedded with historical contextual relations is essential. Moreover, a cohesive framework must also address the means through which society and technology come to shape one another iteratively through what can be extensive development time frames (see Chapter 1).

As has been discussed in section 2.1, a theoretical framework such as that offered by the SCOT model on science and technology can offer only a partial understanding of the processes which shape scientific knowledge and technological developments (Russell, 1986; Winner, 1993; Clayton, 2002; Sismondo, 2010). Instead, there is a need for a more relational or iterative understanding of the relationships and processes which shape technological innovation, one which alongside an appreciation and analysis of the social contexts, structures and processes of public engagement which surround a development also recognises the co-production of systems, webs or networks, and the manner in which social, conceptual and material elements are interconnected.

Originating from Bruno Latour's Actor Network Theory (ANT) with its focus on the associations between elements in a system or network (see for example Latour, 1987, 2005; Murdoch, 1997; Law, 2008), and by Deleuze and Guatarri's work on assemblage (Deleuze & Guatarri, 1986; Bennett, 2005), relational approaches to the interactions between society and technology are concerned with examining the iterative and entangled coproduction of society and technology as networks. Such an approach does not dismiss the role of social agency and activity or socio-political structures (as discussed in sections 2.1 and 2.2), but rather situates social activity and political arrangements or processes within a complex network of entanglements.

2.3.1 ANT & Assemblage: Key concepts

Both ANT and assemblage place emphasis on process, studying the interactions or 'associations' taking place within and between the social and material worlds. As such, the approaches are useful for studying a range of research topics including but not limited to energy (Hughes, 1993; Bennett, 2005, 2009; Harrison & Popke, 2011; Day & Walker, 2013), cities and urban planning (Jacobs, 2006; Jacobs et al, 2007; McFarlane, 2011a; McCann, 2011), institutions and scientific practice (Latour, 1987), floods (Walker et al, 2011), and environmental management practices or challenges (Li, 2007; Bickerstaff & Agyeman, 2009).

A key player in the development of ANT, Law seeks to define the components and interactions which take place between actors in a network. He defines an Actor Network as such:

'the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines,

animals, “nature”, ideas, organizations, inequalities, scale and sizes, and geographical arrangements’ (Law, 2008, p141).

As a lens through which to examine sociotechnical relations and the forces which shape and produce them, ANT acknowledges the social relationships, political arrangements and power struggles which are present in sociotechnical networks such as a nuclear industry (as highlighted in section 2.1), yet also delves into the seemingly limitless pool of elements and associations which lie outside of the confines of a more traditional view of the social world.

As a framework, ANT developed alongside the SCOT approach to sociotechnical relations (section 2.1), and has been used to study the complex interactions between the social and physical or ‘natural’ worlds across a broad range of topics. From the study of the production of scientific knowledge (Latour, 1987), to the history of electricity networks (Hughes, 1993), to EDF’s work on developing an electric car (Callon, 1987), ANT has been used by scholars in their efforts to break down what has traditionally been regarded as a dualistic approach to the relationship between society and technology, or the social and physical worlds (Murdoch, 1997), with one ‘side’ necessarily determining another.

ANT has given rise to new ways of thinking about the relationships between the social and material worlds, and in particular to challenge scalar and hierarchical views of social interactions with the material world (Law, 2008). Rather than making assumptions about the primacy of social agency and structures in all processes from the outset of research, through ANT the focus shifts to a more inclusive view of the multiple factors which shape processes and influence developments.

ANT can be seen to comprise a number of key principles. Perhaps one of the most well-known of these is that of human and non-human ‘agents’, ‘actors’ or ‘actants’⁴ (Latour, 1987; 1992), the ideas, machines, organisations etc. which Law (2008) speaks of, or as Bennett writes:

‘... an actant is a source of action that can be either human or nonhuman; it is that which has efficacy, can *do* things, has sufficient coherence to make a difference, produce effects, alter the course of events’ (Bennett, 2009, p.viii).

ANT and assemblage perceive the social and physical worlds to be constantly evolving at the nexus of numerous interactions taking place between human and nonhuman actants. In addition, to conceive of the social and physical worlds in such relational terms is to acknowledge that neither society nor nature exist on their own. Rather, they exist only in *relation* to one another and to the interactions which take place between humans and nonhumans (Law, 2008).

There is a great deal of overlap between the approaches of ANT and assemblage, yet the key difference which is critical to this thesis is that whilst ANT is concerned with identifying the agency present at the point of interaction or association between actants, assemblage thinking is also concerned with studying the *milieu*, that is to say the cumulative agency of all the small interactions between actants (Deleuze & Guattari, 1986; Murdoch, 1997; Bennett, 2005; McFarlane, 2011a; Legg, 2011).

The concept of ‘assemblage’ was first advanced by Deleuze and Guattari, and their work on ‘agencement’ which, when translated to English can be understood as the process of ‘laying

⁴ The term ‘actant’ is often preferred as a less anthropocentric alternative to the terms ‘agent’ or ‘actor’ due to the contested concept and nature of material agency (Rose et al, 2005, p.3). Assemblage also makes use of the term ‘element’ (Wise, 2005; Bennett, 2005, 2009).

out', 'arranging' or 'organising'. In particular, Deleuze and Guattari aimed to develop a more inclusive framework for social analysis in order to tackle through the formation of 'left assemblages' what they perceived to be the injustice and inequalities associated with contemporary capitalism (Deleuze & Guattari, 1986; McFarlane, 2011a).

To conceive of sociotechnical networks as *assemblages*, is to recognise an assembled whole which is more than just the sum of its parts. The agency of an assemblage by its very nature is both different to and greater than the agency of either the individual actants, or the multiple bonds between them (Deleuze & Guattari, 1986; Bennett, 2005). As a framework for examining the process of nuclear development in Poland, assemblage allows for the material and conceptual legacies to have emerged from the experience of constructing a facility at Żarnowiec in the 1980s to be explored in tandem with the social arrangements and processes which have been seen to shape the trajectories of controversial energy systems (Walker, 1999; Burningham, 2000; Upreti, 2004; Upreti & van der Horst, 2004; Chilvers, 2007; Wolsink, 2007). As such, an assemblage framework can be used to produce a deeper understanding of the complex entanglements which have the effect of both enabling and limiting social agency. Such an understanding is critical for drawing attention to how unequal power relations are both produced and maintained.

In order to make use of an assemblage framework to study the process of nuclear development in Pomerania, it is necessary to establish both *what* the assemblage consists of, and *how* a series of often disparate elements can be seen to come together.

Wise (2005) explores the concept and usefulness of assemblage as an approach by first seeking to define what an *assemblage is not*:

‘An assemblage is not a set of predetermined parts (such as the pieces of a plastic model aeroplane) that are then put together in order or into an already-conceived structure (the model aeroplane). Nor is an assemblage a random collection of things, since there is a sense that an assemblage is a whole of some sort that expresses some identity and claims a territory (Wise, 2005, p91).

Wise’s definition appears at first contradictory. Neither pre-structured nor random, Wise perceives an assemblage to occupy a middle ground between the two polarities. Critically, Wise seeks to emphasise that there is no grand narrative driving an assemblage. Rather, the process of assemblage brings elements together that have some relation to one another.

Wise also acknowledges the presence of ‘non-corporeal’ elements within an assemblage.

‘Assemblages are also systems of signs, semiotic systems. That is, assemblage elements include discourses, words, “meanings” and non-corporeal relations that link signifiers with effects’ (Wise, 2005, p94).

The inclusion of non-corporeal elements and relations is interesting for an examination of Poland’s experience with nuclear, in particular the recognition of the role of landscape identity and perceptions of how a space should be used. Such elements represent themes which are frequently raised in debates surrounding industrial and energy related developments, with a particular focus on the use of renewables (Burningham, 2000; Wester-Herber, 2004; Cass & Walker, 2009; Devine-Wright & Howes, 2010).

In relation to research into social and environmental opposition surrounding controversial industrial developments, Wester-Herber (2004) calls for a deeper understanding of how place attachment and ideas surrounding land use and landscape identity shape hostile attitudes towards development. She draws attention to the manner in which place attachment and

notions of space play a key role in the shaping of personal identities. Such a perspective is helpful when seeking to understand decisions surrounding nuclear development in Pomerania where Kashubian heritage and identity are closely tied to the physical landscape (see Chapters 1 & 4). Whilst Wise (2005) refers to ‘non-corporeal’ relations, this thesis will refer to elements such as discourse, landscape identity and knowledge cultures as ‘conceptual elements’ for the remainder of this thesis, for consistency in discussions surrounding the material and social elements which also constitute the Polish experience of nuclear development in Pomerania.

Bennett (2005), in discussions surrounding her research on electricity networks and materiality addresses the structure of an assemblage:

‘An assemblage is... a collectivity whose origins are historical and circumstantial... a living, throbbing grouping [where] power is not equally distributed. [It is] not governed by a central power: no one member has sufficient competence to fully determine the consequences of the activities of the assemblage’ (Bennett, 2005 p.445).

Bennett identifies three key concepts which define assemblage thinking. First, (as described in section 2.3.1), the inclusion of *material* and *conceptual* actants or elements, second, the *removal of scalar limits* to social and political activity and third, a recognition that social, material and conceptual actants or elements can *act across different time frames*. In simple terms, the contemporary actions, policies and processes may not necessarily prove to be the most important factors for explaining contemporary processes.

2.3.2 Assemblage & Scale

Working with Bennett's understanding of assemblage it is clear that the ordering of the social and political worlds is greatly distinct from that prescribed by political economy based scalar models of socio-material or socio-spatial relations which have long been a focus of geographical research. Scale, or the 'nested hierarchy of bounded spaces of differing size, such as the local, regional, national and global' (Delaney & Leitner, 1997 p.93) has been a popular model within human geography for conceptualising and critiquing environmental governance and the processes which shape space (see *inter alia* Swyngedouw & Baeten, 2001; Brenner & Theodore, 2002; Swyngedouw & Heynen, 2003; Neumann, 2009; Lawhon & Murphy, 2011).

However, in recent years attention has been drawn to the limits of traditionally scalar notions of space including neglect of aspects such as the means through which scale is socially constructed and defined, and the manner in which scale is fluid rather than fixed (see *inter alia* Delaney & Leitner, 1997; Brenner, 2001; Marston & Smith, 2001; Bulkeley, 2005; McCarthy, 2005 for a discussion of some of the debates which surround the limits of scalar models).

Whilst debates surrounding scalar notions of process have evolved to examine how scale is both socially constructed and subject to reconfiguration efforts, scalar frameworks continue to place an emphasis on the primacy of social agency in the shaping of space and socio-material processes. However, as discussed in section 2.2, the study of science, technology and sociotechnical relations requires a more reflexive approach in order to understand the manner in which technology and technological solutions are shaped and constructed by society, but also how they then go on to (re)shape and (re)construct society and social values.

An assemblage frame takes the agency or ability to act and wield power away from a hierarchically organised structure of social actants, institutions and socially constructed governance structures and instead extends agency to multiple human and nonhuman elements (ANT's *actants*) (Bennett, 2005, 2009; McFarlane & Anderson, 2011).

In terms of the social actants or elements involved in a particular arrangement or process, assemblage thinking does not presuppose a hierarchy of socioeconomic or political structures. Assemblage thinking recognises how international pressures, concerns and policies relating to both nuclear as a technology and energy in general may prove to exert as much agency over the assemblage as domestic political arrangements. Moreover, the agency of local communities, opposition groups and government is not assumed to be limited by nature due to a predefined set scalar understanding of social and political structures.

Assemblage thinking, whilst not new, has in the past several years received renewed attention within human geography. A considerable amount of attention has been granted to the theoretical components of the framework (see for example the collection of articles and debates in the June 2011 'Assemblage and Geography' themed issue of *Area*), and a number of notable examples exist of the use of the approach empirically (see Chapter 3). However, ontological assemblage has not been without criticism. Whilst the majority of criticism is aimed at the nature and extent of material agency (discussed in section 2.3.3), concern has also been expressed with regards to the 'flat ontology' and the political implications of the approach. The debate is best illustrated in an exchange between Brenner et al and Farias.

Brenner et al (2011) make the distinction between what they perceive to be an ontological form of assemblage and a reduced, methodological approach to conducting fieldwork. With regards to ontological assemblage, Brenner et al (2011) recognise the merits of an approach

which allows for ‘careful attention to the multiple materialities of socionatural relations’ and analysis of the ‘reactive power’ and ‘agency’ of material actants (2011 p.233) but find the lack of theoretical reference to scalar structuration problematic. They criticise what they see as a lack of regard or attention to the explanatory ‘structuration contexts within which social actants are situated and operate... [and the] multiscale frameworks of state power’ (p.233).

To Brenner et al *ibid*, the relational approach offered by ANT and ontological assemblage is problematic in that it draws attention to the multiple elements and relationships which constitute the lived experience of urban spaces, but fails to differentiate between them in terms of agential capacity or relevance. Rather than developing an ontological assemblage, Brenner et al call for the integration of a networked approach to socio-material relations, and an empirical or methodological approach to assemblage within a more closely defined theoretical tradition such as that offered by critical political economy.

Though Brenner et al see ontological assemblage as removing ‘the force field of struggle among diverse socio-political agents’ (2011 p.236) from centre stage and thus lacking an explanatory framework for critical analysis, Farias (2011) counters the challenges they raise to ontological assemblage. He asserts that the use of political economy as a structural tool is also problematic in that it may be used to make assumptions about the objective ‘truth’ of structure, power and corruption. To Farias, the underlying aim of political economy is based on the premise that simply highlighting the presence of such structures will help challenge and pull down ‘the strength of the powerful’ (Farias, 2011 p.366).

Farias further critiques a purely scalar approach to understanding socio-material relations, cities and the ‘urban condition’ as offered by the framework of critical political economy by highlighting the challenges associated with quantifying and bounding both temporally and

spatially the actors who are deemed to be involved. Farias suggests that ‘urban ‘facts’, objects and processes are always highly uncertain, controversial and conflictive’ (2011, p.366). As such, he calls for an approach to understanding socio-material relations and networks which explores the various components of a network rather than simply taking for granted a given structure or explanatory framework.

In contrast to Brenner et al’s attempts to pigeonhole Farias’ stance as purely ontological and in contrast and conflict to critical urbanism and political economy schools of thought, Farias asserts that ‘[assemblage] inquiry is not at odds with critique, but only with a version of critique that is committed to theory rather than to the empirical’ (2011, p.367).

Farias argues that an empirical application of assemblage thinking does not exclude the opportunity for critical framing or coexistence with political economy or structural theory. Rather, assemblage calls for the careful consideration of the multiple elements and processes involved.

‘We often confront radically uncertain situations in which we don’t know what we are looking for until we find it’ (Farias, 2011 p.367).

Ontologically, this thesis is situated within Farias’s (2011) notion of assemblage as a framework which does not make *a priori* assumptions about the most important elements in a process or assemblage. As I will discuss further in Chapter 3 ontological assemblage, in contrast to purely methodological assemblage, allows the researcher to begin fieldwork with an open mind to discover the processes, relationships and interactions which matter with regards to the specific case study rather than those which are predefined theoretically.

Yet such an approach, as Farias (2011) notes, does not neglect analysis of how social processes and arrangements can result in an uneven distribution of power. This thesis

recognises that agential capacity is not necessarily distributed evenly between individuals, bodies or institutions within an assemblage. Building on the literature discussed in section 2.1 (with regards to the social construction of knowledge and public engagement processes) I seek to demonstrate the pathways and relations through which unequal power relations are perpetuated. Critically, the ontological assemblage framework used in this thesis recognises that power is neither centrally held and distributed, nor can it be accessed uniformly by each of the elements within the assemblage (Bennett, 2005).

2.3.3 Assemblage & Material Agency

One of the key concepts with both ANT and assemblage is recognition of the agency of non-humans (Bennett, 2004, 2005, 2009; Li, 2007; Harrison & Popke, 2011; McFarlane, 2011b; Walker et al, 2011; Day & Walker, 2013). The nature of agency granted to non-human elements or actants within a network or assemblage has been the subject of much debate within the social sciences. How do non-humans, as either material or conceptual elements, exert agency within human/non-human networks or assemblages? And is the agency afforded to non-human elements the same as social agency?

The concept of material agency or the agency of non-humans is not unique to ANT or assemblage. Material agency as a concept has been discussed by scholars who use varying degrees of material agency or materiality for the study of sociotechnical relations (Heidegger, 1973; Winner, 1993; Coole & Frost, 2010; Olsen, 2010; Hodder, 2012). Hodder (2012) suggests that one way in which material ‘things’ can be seen to exert agency over humans is by triggering thoughts which can lead to action (2012, p.18). Hodder argues that human consciousness is inseparable from the material world in which humans are situated. For a discussion of nuclear development in Pomerania, Hodder’s notion of material agency is

particularly intriguing. For example, how do the presence of the infrastructural ruins of Żarnowiec NPP and the altered physical and socioeconomic landscapes surrounding the development site influence social perceptions of the technology, of development pathways for energy security, as well as wider social processes surrounding contemporary nuclear development in the region?

Hodder's stance on material agency shares similarities with that of ANT (Latour, 1987, 1992; Law, 2000, 2008) though he is keen to move away from a view of material 'things' in terms of what they can do for humans, towards an approach which studies the agency of material elements in and of themselves (Hodder, 2012 p.2). As such, Hodder's interpretation and approach to the agency of non-humans resembles theoretical work by Bennett (2005, 2009) on electricity networks, waste materials and stem cell research Roe (2006) on the 'materiality' of animal bodies in agro-food networks and Greenhough (2012) on the material agency of infectious diseases. Jane Bennett pushes the boundaries of the concept of material agency, asking:

‘...how would political responses to public problems change were we to take seriously the vitality of (nonhuman) bodies? By “vitality” I mean the capacity of things – edibles, commodities, storms, metals – not only to impede or block the will and design of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own’ (Bennett, 2009 p.viii).

Work on material agency and 'materiality' covers a broad range of topics, though as Coole & Frost (2010) note, the concept has in recent years been overlooked in favour of more political approaches, 'radical constructivism' and a 'cultural turn that privileges language, discourse, culture, and values' (Coole & Frost, 2010 p.3). In addition to the challenges to what is seen as

a ‘flat’ or ‘apolitical’ ontological positioning of ANT and assemblage frameworks (Brenner et al, 2011; Farias, 2011), some authors have struggled with the notion of giving power or agency to nonhumans. One of the key concerns relates to a perception that through the recognition of the agency of nonhumans, human and social relations, as well as social responsibility are diminished (see Murdoch, 1997; Coole, 2005; Anderson & Wylie, 2009 for a more thorough discussion of the debates which surround materiality).

McFarlane (2011b) responds to challenges to the concept of material agency within the assemblage framework by claiming that ‘it is not that assemblage necessarily decentres the human, but that it necessarily draws attention to the human-nonhuman multiplicity of relations’ (2011b, p.651). Hodder (2012) further explores the notion of material agency by making a distinction between social agency and the agency of non-humans. To Hodder, material agency is ‘not the primary agency of conscious human intentionality, but a secondary agency given to things by humans’ (2012 p.32). Hodder places an emphasis on how recognising the agency of non-humans is not to dismiss human consciousness, but rather to situate it within the material world, subject to external influences.

‘Materials and things are seen as always relational. Contextually embedded within specific networks and social contexts... [they are] actively engaged in the social process... [and] going through social biographies’ (Hodder, 2012, p.33).

As such, material agency can be seen as a spectrum from the ‘vibrant’ and ‘lively’ materialities (Bennett, 2004, 2005, 2009; Coole & Frost, 2010), to a more subdued, situated and relational understanding of the concept (Hodder, 2012; Jordan, 2012). It is this understanding: material agency as relational, situated within the context of socio-technical and socio-material affiliations, that I use the concept of material agency in this thesis.

2.3.4 Assemblage & Time

Bennett (2005) helps emphasise the essence of time to an assemblage framework, which is an understanding which has also been used in empirical work by McFarlane (2011b) in his research on ‘slum’ housing and mobility in Mumbai, and Li (2007) in relation to an assemblage of forest management. The timeframe within which an assemblage operates is not bounded or predefined. Assemblage thinking recognises that elements acting in the past may be as influential to the contemporary experience as elements acting today, tomorrow, or at some point in the future.

This time-based ‘flattening out’ of elements and agency is useful as it allows elements as diverse as the experience of nuclear development at Żarnowiec in the 1980s and resultant base of infrastructure and knowledge; fear of energy scarcity or environmental degradation in 2020; and the structure of the contemporary Polish political system and the EU to be given of equal analytical attention, at least as an initial starting point.

2.3.5 Flux & Milieu

As highlighted at the start of this section, one of the key differences between ANT and assemblage as relational frameworks for the study of sociotechnical phenomena is the additional emphasis provided by assemblage to the agency of the whole, or the *milieu* of an assemblage.

Day and Walker (2013), whilst examining the assemblage framework for a study of energy vulnerability discuss the shape and nature of an assemblage. In particular they describe the way in which when elements come to be assembled they act not just as individual elements, but as part of a greater whole:

‘A whole assemblage should be more than the sum of its parts: it is not just a collection of stuff, but a functioning collective, at least for a time (2013, p.5).

An understanding of an assemblage being greater than the sum of its parts is critical as it highlights the unpredictable nature of an assembled whole. Recognition of the *milieu* of an assemblage also draws attention to the numerous possibilities for an assemblage to exert a (sometimes unpredictable) force of its own, independent of the agency or allegiances of its constituent parts. An assemblage is marked as unique by the *contingent* and *relational* interactions of the elements of which it is comprised.

Wise (2005) further affirms this by drawing attention to the importance of studying the *milieu* of an assemblage

'... an assemblage is a collection of heterogeneous elements, but what is especially important is the relation between the elements. These elements could be diverse *things* brought together in particular relations... the elements that make up an assemblage also include the *qualities* present... and the affects and effectivity of the assemblage: that is, not just what it *is*, but what it *can do*' (Wise, 2005 p.92, original emphasis preserved).

The relationship between disparate elements within an assemblage is seen to create a body, an assembled whole, which can act, influence and shape outcomes in ways that the individual components could not.

Such a framework for analysis is useful for a discussion of nuclear development in Pomerania, as it asks questions of how social agents when engaged through assemblages with nonhuman elements, with the infrastructure, historical legacies and conceptual artefacts of

many decades of nuclear development both in Poland and abroad can co-construct, or co-produce sociotechnical configurations and ‘solutions’ to social challenges.

The concept of assemblage is not intended as a lens through which to analyse the static arrangement or organisation of elements. Rather, it is intended for use to examine dynamic processes of becoming.

‘It is important that *agencement* is not a static term; it is not the arrangement or organization but the process of arranging, organizing, fitting together. The term as it is used in Deleuze and Guattari’s work is commonly translated as assemblage: that which is being assembled’ (Wise, 2005 p.91)

McFarlane & Anderson (2011) describe the ‘constant tension of formation and form that assemblage perhaps uniquely brings to different areas of human geography... a sense of the uncertainty, nonlinearity and contingency of change in political, urban, cultural and historical geographies’ (2011, p.162).

In a discussion of ‘big things’ which she defines as such not just for their large physical size but for the number of bodies and actors they bring together, Jacobs (2006) builds upon the assemblage literature in relation to the development and relative success and failure of high-rise buildings in both the UK and Singapore. Jacobs *ibid* calls for the social and material to be regarded as in a state of ‘coproduction’, so that buildings can be regarded as ‘building events’ in flux rather than static entities. To Jacobs, ‘a building is always being ‘made’ or ‘unmade’, always doing the work of holding together or pulling apart’ (2006, p.11). An assemblage is not fixed, but iterative and in flux.

Just as the success of a building is dependent on the temporal alignment and interactions between a number of social and material agents, the same is true of energy networks. To

Jacobs, ‘for a building to take form and sustain itself as a big thing, it must surrender to technologies, to engineers, contractors, manufacturers, to politics, to others’ (2006, p.13). Energy networks are similar in that their success is dependent on a number of conflicting and contradictory bodies and forces which come together and fall apart in an unpredictable and unstable manner. Ideology, geographical considerations and the nature of the contemporary and historical built environment are also closely tied up with decision making and the success or failure of ‘big things’, of buildings, of infrastructure, and of dense and complex energy networks.

2.4 Assembling Żarnowiec

In this thesis I conceptualise the Polish nuclear industry as a sociotechnical network, and over the course of this chapter, I have presented a discussion of a range of approaches for the study of socio-technical relations. The chapter has presented an argument in favour of the use of an umbrella framework based on assemblage, but encompassing ideas surrounding the social construction of knowledge, the politics of public engagement in decision making processes (section 2.1) and the ‘entanglement’ of the social and material worlds (section 2.2).

I have chosen to combine these bodies of literature as alone I found them insufficient for understanding how it is that a trajectory towards nuclear development is being sustained within Pomerania Province. Though the relational approaches of assemblage and ANT appear promising, as Brenner (2011) critiques, they do not differentiate between the social and material elements in terms of agential capacity.

Assemblage is best understood through practical case based research. In Chapters 4 – 6 I explore the assemblage of the Polish nuclear industry, returning to a discussion of the benefits and challenges of assemblage thinking in the conclusion.

3.0 Methods

This chapter introduces the methodological approach used for data collection. As discussed in Chapter 2 the frameworks provided by Actor Network Theory and assemblage are as much methodological approaches to empirical research as they are theoretical toolkits. In addition to providing a unique way of *seeing* the world and relationships between the social and material worlds, they also present opportunities for *doing* empirical work which differ from traditional social scientific approaches. Farias (2011) describes the dual qualities of ANT and assemblage as both theory and method:

‘[ANT] offers a theory about how to conduct inquiries and how to elaborate concepts... (Farias, 2011, p.367)’.

This chapter describes the iterative, mixed qualitative approach to empirical work which has been used for data collection, the experience of conducting research and a discussion of some of the limitations and barriers encountered during the fieldwork stage of research.

3.1 Research Design

Chapter 2 presented a critique of positivist and realist perspectives of knowledge and scientific practice (Keat, 1971; Latour, 1987; Kuhn, 1996), illustrating how knowledge and social understandings of the world are always situated within wider contexts, and limited by existing knowledge and both theoretical and methodological approaches to research. Though Keat, Latour and Kuhn describe ‘physical’ or ‘natural’ scientific knowledge, the same limitations also apply to the production of social scientific knowledge. As such, it is important to note the position of the researcher within the research, and the role of research design in shaping research outcomes (Carlson & Gorman, 1990; McDowell, 1992; Rose, 1997; Welsh, 2002; Law, 2004). Rose (1997) discusses ‘reflexivity’; the awareness of the researcher of their

own position within the research and role in shaping knowledge outcomes through research design. For example, decisions relating to the selection of methodological tools, the choice of questions posed during interviews, the selection of theoretical frameworks used to shape the broader research project, and the analysis drawn from research participants' responses can all dramatically alter knowledge outcomes. Rose's position on reflexivity in research stems from feminist geographers' critiques of both natural and social scientific practices which seek to highlight the 'neutrality' or purity of scientific research (McDowell, 1992). This is a theme which has also been recognised more broadly within Science and Technology Studies (see Chapter 2). As such, reflexivity can be seen '...as a strategy for situating knowledges: that is, as a means of avoiding the false neutrality and universality of so much academic knowledge (Rose, 1997 p.306).

There are many different methodological approaches to research. Within the social sciences and particularly within geography, a discipline with strong divisions between 'physical' and 'social' research activities, there has long been a dualism between quantitative and qualitative methodologies. Within human geography, this dualism has often seen qualitative methodologies painted as incomplete or unscientific by advocates of a quantitative approach to research, and quantitative methodologies criticised for being too closely tied to empiricism and positivism by feminist and poststructuralist geographers working with qualitative methodologies (see *inter alia* Dixon & Jones, 1998; Sheppard, 2001; Knigge & Cope, 2006). However, at times it is necessary to move away from a dualistic critique of qualitative versus quantitative methodologies. As Sheppard (2001) notes, the use of quantitative methodologies need not always be seen as an indication of positivism or empiricism, and qualitative approaches to geographic research can provide a 'legitimate alternative' to quantitative methodologies which is both reflexive and refined. However, beyond debates into the place of

quantitative and qualitative methodologies within social scientific research lies a more practical question: which methodological tools best suit the research project in question? This is one of the key themes raised by Law (2004) with regards to the practice of conducting research under the umbrella of Actor Network Theory.

Due to the nature of this research, as a study of the *process* of nuclear development in Pomerania Province, Poland, it has been necessary to delve into a messy and often unpredictable tangle of elements, relationships and processes. As Law notes:

‘If the world is complex and messy, then at least some of the time we’re going to have to give up on simplicities... if we want to teach ourselves to think about the messes of reality at all then we’re going to have to teach ourselves to think, to practice, to relate, and to know in new ways’ (Law, 2004 p.2).

In light of the ‘mess’ of both *thinking* and *doing* assemblage research, during different stages of fieldwork I made use of a broad range of qualitative methodological approaches including semi-structured interviews, attendance of events and community meetings, participant observation and, during the latter stages of research, a more visual methodology (see section 3.3). Through the use of qualitative research methods and particularly through semi-structured interviews, it has been possible to discover a vast array of experiences, perceptions and concerns which influence narratives on nuclear development. These are themes which a more prescriptive, quantitative approach to fieldwork would have struggled to uncover. With regards to previous research on contested developments and the use of controversial technologies (see Chapter 2), qualitative methods and particularly semi structured interviews have proved helpful in examining the motivations which lie behind social and environmental

opposition to energy developments (Burningham, 2000; Upreti & van der Horst, 2004; Wolsink, 2007) and in pulling apart the unhelpful ‘NIMBY’ model of public opposition.

Rather than imposing a rigid methodological frame, I have utilised a flexible and open approach to understanding the elements and processes which shape attitudes towards nuclear power in Pomerania Province both at the hyper-local level surrounding Lake Żarnowiec (Chapters 4 and 5) and more broadly within the Tricity region (Chapter 6), as well as the decision making processes which surround Poland’s return to nuclear development. The use of semi structured interviews enabled research participants to highlight the elements and processes which they felt were most pertinent to shaping attitudes towards nuclear power, and the decision making processes which surround nuclear development within the region of Pomerania. As a result of an open and iterative research design and the use of qualitative methods, certain research avenues opened up which may otherwise have remained hidden (Clifford & Valentine, 2003; Law, 2004). Furthermore from a political stance the use of an open methodological framework enabled research participants to raise issues which, as Chapter 6 shows, they struggle to voice through the conventional spaces of engagement which surround nuclear development in Pomerania.

3.1.1 Reflexivity

However, despite my open and iterative approach to fieldwork, as with all knowledge I cannot profess to have produced a ‘complete’ or ‘impartial’ overview of nuclear development within Pomerania. The events, descriptions and analysis presented in the following chapters are situated within the confines of the period of time during which fieldwork took place, as well as within the boundaries of the themes research participants felt comfortable or willing to discuss.

Nuclear development is a lengthy process and one which during early discussions is in a state of flux (see Chapter 2), with different actors, elements and institutional bodies pulling in different directions. This thesis conceptualises nuclear development as a process of assemblage, and recognises that energy or infrastructural assemblages by their very nature stabilise with time, often coinciding with the construction of infrastructure which can be seen to freeze certain assemblages in place for a fixed period of time (the predicted operational lifespan of the facility, for example).

However at the time of writing, though the ‘Żarnowiec’ site remains the most favoured location, a final decision has yet to be made regarding the location of a nuclear power plant within Pomerania. The fieldwork for this research coincided with a period of time during which the flux of the process of nuclear assemblage in Pomerania was most apparent, and the events and descriptions presented in the following chapters should be seen in this context. The dialogue and observations presented in the following empirical chapters represent a snapshot in time of the process of nuclear assemblage in Pomerania. Had fieldwork taken place earlier (in 2009 for example, just after nuclear discussions had been brought back to the table after a twenty year lull), or later (for example should construction work on the first facility commence at a future date), the image of assemblage might differ significantly to that which is presented in this thesis.

Though it is important to note that the image of nuclear assemblage in Pomerania presented in this thesis is bounded by time, such an understanding does not undermine the research. The aim of this thesis, as described in Chapter 1, is to examine how it is that a trajectory towards nuclear development is being sustained within Pomerania, and the role of social, material and conceptual elements in shaping the development trajectory. Though the specific configuration

of elements and legacies may be altered at different times, it is the entanglement of elements and sense of *milieu* (see Chapter 2) of the assembled whole which is of interest to this thesis.

In addition to the image of assemblage produced within the time constraints in which fieldwork took place, it also became apparent that within the timeframe, certain actors were more accessible than others. In particular, I encountered difficulties when trying to communicate with a number of institutions and elites (see also Chapter 6). This stood in contrast to my experience with the communities and individuals who comprised the local opposition movements. As I discuss further in Chapter 6, without true platforms for dialogue and debate, many of these individuals embraced the opportunity to have their voices and concerns heard.

With regards to reflexivity and my role as researcher within the research, it is important to consider how my presentation and position within the research may have influenced the themes and discussions which took place during semi structured interviews and meetings (Rose, 1997). As a twenty-four year old student at the time of the main period of research in 2011, I was much closer in demographic terms to the activists and opposition movement members than to the engineers, scientists and government representatives with whom I spoke. Furthermore as a young, female researcher with a predominantly social science background asking questions of male engineers who had experienced, first hand, the construction of Żarnowiec NPP during the 1970s and 1980s, I often encountered a sense of reluctance to discuss the development process in any depth. During one particularly memorable exchange, a pre-scheduled interview was cut short with an exchange between my prospective interviewee and my colleague who accompanied me to assist with translation and interpretation:

“Tell the lady she has chosen the wrong area to study. Why study the social processes or social aspects of nuclear development? It is a technical subject. She should read the national power strategy, after that, she can come here and talk about this topic”
(Interview: Representative of the Technical University of Gdańsk, Gdańsk, July 2011; see also Chapter 6).

3.1.2 Methodological Assemblage

As discussed in Chapter 2, ANT and assemblage provide the theoretical and methodological backbone for this study of nuclear development in Pomerania. However, the approaches are not prescriptive methodologically, and the practice of *doing* ANT and assemblage research remains open and flexible according to the specific case in question. Law, reviewing work which has been conducted under the umbrella of ANT unpacks a number of themes which can be seen to flow through different accounts of Actor Networks or assemblages:

‘... actor network theory is not a theory... [it is] descriptive rather than foundational in explanatory terms... it tells stories about “how” relations assemble or don’t... it is a sensibility to the messy practices of relationality and materiality of the world (Law, 2008, p.141-142).

Critically, Law emphasises the ‘mess’ of both the approach and the relations which are being studied, calling for a descriptive approach to empirical work which allows for the messy, complex entanglements to rise to the surface (Law, 2004) Such tracing of connections is apparent in work by Bijker et al (1987), Latour (1987) and Hughes (1993), on the history and evolution of technological systems and scientific practices and paradigms. The descriptive narratives they produce seek to demonstrate the presence of complex, hidden webs of entanglement in technological systems and how such ‘relationality’ produces agency.

Though the concept of assemblage is not new, its use within the discipline of human geography has not been widely adopted methodologically. Attention to assemblage as an approach has tended towards the theoretical (see Chapter 2 for an overview of the discussions which surround assemblage research in human geography). As such, though the approach has received considerable theoretical attention and has been the subject of a themed issue of *Area* in 2011, discussions of the practicalities or practices of *doing* assemblage research remain fairly light on the ground.

Researchers working with an assemblage framework have tended to produce descriptive narratives of networks and assemblages. These approaches illustrate the '*bricolage*' nature of assemblage as both theoretical and methodological toolkit. They aim to piece together relations and connections and a detailed understanding of phenomena which does not presuppose structure or emphasis.

For example, Bennett (2005) conceptualises the August 2003 blackout across North America as the product of an assemblage. She begins her enquiry with a discussion of the agency of electricity, tracing a sequence of events and interactions which took place between social and material actants in the grid which culminated in the complete shutdown of the grid. Through her descriptive approach to the blackout event, Bennett uncovers a number of discussion points. She highlights the failure of the utilities 'who, by legal and illegal means, had been milking the grid without maintaining its infrastructure' (2005, p.22), as well as the challenges presented by consumer demand, and the physical limits of transmission infrastructure to operate under high temperatures before safety mechanisms cause automatic shutdown. Through an open and highly descriptive approach to empirical work, Bennett's discussion of the North American energy grid is able to delve into topics which a more prescriptive approach might not allow for.

In a similar vein, Li (2007) explores community forest management in Indonesia in terms of assemblage, descriptively tracing the history of forest management practices and the multiple interconnections between what she refers to as ‘things’, ‘agents’ and ‘objectives’. Li’s conceptualisation of forest management as an assemblage engages with a diverse set of elements including but not limited to the villagers, scientists and activists who shape forest management policies, their knowledge and the discourses they engage in, together with the trees, forest products, documents, and overarching concepts and objectives such as sustainability and conservation which influence and limit the trajectory of the assemblage in complex ways.

Whilst Bennett and Li approach assemblage openly and descriptively, placing great emphasis on a discussion and illustration of the agency of things and concepts, others have retained more traditional social scientific approaches to conducting assemblage research. Using focus groups and semi structured interviews as techniques from which to launch deeper modes of enquiry, Harrison & Popke (2011) examined the experience of energy poverty in North Carolina using an assemblage framework. To begin with, they engaged in a series of interviews with residents who qualified for a ‘Weatherization Assistance Program’ which provided subsidies and practical assistance for overcoming energy poverty. The interviews enabled the researchers to trace deeper ‘biographies’ of energy poverty, uncovering a range of elements which contributed to the assemblage of energy poverty, including ‘physical health, financial exigencies, social networks, the materiality of the home, and the infrastructure of energy provision’ (2011, p.954).

3.2 The research process

This thesis uses theories of assemblage and actor networks as an overarching conceptual lens and toolkit through which to view the processes surrounding nuclear development in Pomerania. This approach recognises the potential influence of many different elements acting across different time scales and in different places. As such, the practice of doing assemblage research, and tracing the connections and relationships between elements can be a messy and iterative process. Moreover, certain elements, processes and relationships remain hidden from view to begin with, and it is only through fieldwork that they may begin to emerge.

3.2.1 Exploratory research

In the months leading up to the start of fieldwork, I followed the dialogue and discussions surrounding Polish nuclear development plans in national and regional print media publications which were made available online (see table 3.1). I scanned these newspapers for key words and phrases to identify articles on energy developments and both domestic and international discussions surrounding the use of nuclear power.

Publication	Description
Gazeta Wyborcza	Daily newspaper – centre left (national)
Rzeczpospolita	Daily newspaper – centre right (national)
Nasz Dziennik	Daily newspaper – Catholic (national)

Wprost	Weekly news magazine – centre (national)
Polityka	Weekly news magazine – centre left (national)
Trojmiasto	Daily newspaper for the Tricity region (regional)
Dziennik Bałtycki	Daily newspaper for Pomerania (regional)

Table 3.1 List of publications identified during the preliminary research phase in order to follow discussions surrounding nuclear development plans in Poland, and also within Pomerania Province.

The purpose of these activities was to establish key individuals and institutions involved in the decision making processes surrounding nuclear development with the intention to make contact with them and potentially arrange to meet for a semi-structured interview or a more informal meeting.

From this exploratory research, it was possible to create a list of the institutions and actors involved with the decision making processes surrounding nuclear development in Pomerania. The list (see table 3.2) comprised of local, regional and national government bodies, planning agencies in Pomerania, Polish energy giant Polska Grupa Energetyka (PGE), local businesses, and both dialogue platforms and lobby groups. Furthermore, during the course of fieldwork, research participants made recommendations for additional groups and individuals to make contact with.

Institution or organisation	Description	Contact Interviewee	Interview date	Language
Ministerstwo Gospodarki	Ministry of the Economy (Warsaw) – nuclear energy division	n/a	Interview declined	n/a
Urząd Marszałkowski Województwa Pomorskiego	Pomeranian Province Martial Office (Gdańsk)	Energy Minister for regional government	February 2012	Polish (with interpretation)
Gmina Gniewino	Local municipality to the west of Lake Żarnowiec	Commune Administrator	July 2011	English (with technicalities confirmed in Polish and conveyed via interpreter)
Gmina Krokowa	Local municipality to the east of Lake Żarnowiec	Mayor of Krokowa	February 2012	Polish (with interpretation)

Polska Grupa Energetyka (PGE)	Polish Energy Group (Warsaw) State owned energy company and main stakeholder in Poland's nuclear industry	n/a	Interview declined	n/a
Pomorska Specjalna Strefa Ekonomiczna (PSSE)	Pomeranian Special Economic Zone (Sopot)	Teresa Kamińska, Director of PSSE	Interviews cancelled by research participant	n/a
Stocznia Gdańska	Gdańsk Shipyards (Gdańsk)	n/a	Interview declined	n/a
Politechnika Gdańska	Gdańsk University of Technology (Gdańsk)	Senior Representative (name and position changed due to the nature of our communications)	July 2011	Polish (with interpretation)

Wydział Infrastruktury - Pomorski Urząd Wojewódzki w Gdańsku	Department of Infrastructure - Pomeranian Office (Gdańsk) – Representative from the Gdańsk office	Representative for Energy	February 2012	Polish (with interpretation)
Forum Dialogu I Współpracy Województwa Pomorskiego “Energia i Samorządność”	Pomeranian Forum for Dialogue and Cooperation “Energy and Self Governance” (Gdańsk)	Dr Piotr Stankiewicz (responsible for establishing the forum and conducting research on behalf of PSSE)	July 2011	English
Stowarzyszenie na Rzecz Elektrowni Jądrowej w Województwie Pomorskim	Association for the Development of a Nuclear Power Plant in Pomerania Province (Gdańsk)	Waldemar Dunajewski (responsible for establishing the association)	July 2011	Polish (with interpretation)

Table 3.2 List of stakeholders, organisation and institutions involved in the decision making process surrounding the introduction of nuclear power within Pomerania Province. The table indicates the name of the organisation or institution, a description including location or reach, the name or position of the individuals contacted for interview, and where applicable, the interview date.

Event / Interview	Participants	Date
Meeting of ‘Pomorska Inicjatywa Antynuklearna’	PIA activists (~10 members present)	February 2011
Interview	Professor Iwona Sagan, University of Gdańsk	March 2011
Interview	Local activist (name changed in text to preserve anonymity)	March 2011
Chernobyl anniversary demonstration	Public event and demonstration by PIA activists, Central Gdańsk	April 2011
Meeting of ‘Pomorska Inicjatywa Antynuklearna’	PIA activists (~20 members present)	April 2011
Interview	Economist involved in talks surrounding project abandonment of Żarnowiec NPP in 1989 (name changed in text to preserve anonymity)	May 2011
Site visit to Lake Żarnowiec and the villages of Żarnowiec, Nadole, and Czymanowo	For this site visit I joined a field trip for undergraduate students arranged by a colleague at the University of Gdańsk.	June 2011
PSSE research communication event	Representatives from PSSE, PGE, Gmina Gniewino, Gmina Krokowa, and the Pomeranian Martial Office plus ~300 local residents and activists	October 2011

Meeting of 'Forum for Energy and Self Government'	~ 50 members of the dialogue forum	October 2011
Communication event by PGE to the resident of the village of Choczewo	~ 300 local residents and activists from the Tricity	February 2012
Site visits to Lake Żarnowiec and the villages of Żarnowiec, Nadole, Czymanowo and Choczewo	-	July 2012 & August 2013

Table 3.3 A list of the more informal interviews, events and demonstrations I attended during the course of research. In addition to the events and interviews detailed in tables 3.2 & 3.3, the research has been informed by further informal and often spontaneous meetings and exchanges (see section 3.2.3).

Each of the identified parties (see table 3.2) was approached for a semi-structured interview to discuss themes relating to the process of nuclear development, the roles they play in decision making processes surrounding nuclear, their experience of accessing information on development plans and their attitudes to dialogue surrounding energy choices, futures, and opposition. During the early stages of research, key themes for discussion also included the nature and extent of collaboration and communication between the separate institutions and individuals, for example with relationships between local and regional government, and the attitudes of individuals within Pomerania's emerging pro-nuclear lobby to dialogue platforms and civic debate.

With the opposition groups and movements in the Tricity, a more informal and relaxed approach to interviews and meetings was appropriate. After making contact with these groups by email and through connections with fellow doctoral research students at the University of Gdańsk, I began to follow along with their planning and discussions via their blogs, social media pages and a 'rise up' hosted email list. I came to be most closely involved with PIA,

and attended meetings, demonstrations and planning sessions with the group members, as well as with members of Greenpeace Poland and Europe where they coincided.

During my time in Gdańsk I was fortunate to receive support from the Institute of Geography at the University of Gdańsk. As well as study space and a base from which to conduct research, this connection was helpful in terms of gaining practical assistance with access to the institutions I had originally identified as potential research participants (see table 3.2), scheduling meetings, and with interpretation during interviews (further discussion of translation and interpretation of written materials is covered later in this chapter).

Arranging meetings with the individuals and institutions listed in table 3.2 presented a number of challenges due to scheduling difficulties. Having the assistance of a local team of researchers who were familiar with the institutions in question and who could help with logistical challenges such as navigating gatekeepers was of great help and made the process of conducting fieldwork both more efficient, and in certain instances possible where otherwise it would not have been.

However, despite the assistance of the Institute of Geography, of the original list a number of institutions still either refused to discuss development plans, or agreed to an interview but kept postponing, rescheduling and then finally cancelling meetings. A discussion of the implications of these data gaps is presented later in this chapter. Though these are gaps in the methodology and the story of nuclear assemblage in Pomerania, the absence of discussion and withholding of information came to be a key theme within the research, and will be discussed further in the context of Chapter 6.

3.2.2 Time frame, research practicalities & ethics

The fieldwork period for this research fell between February 2011 and February 2012, and it was during these months that the majority of interviews, informal meetings and participant observation with the opposition groups took place. During this period of time, I made eight research trips to the Tricity, on a monthly basis between February and July 2011, and then twice more in October 2011 and February 2012. My decision to arrange fieldwork in such a manner and to make frequent trips to the Tricity rather than conduct all of the research in one bulk period was a key element of the research design. By extending the research period out over a longer time frame it was possible to examine the dynamic nature of dialogue surrounding nuclear development in the region. In particular, this came to be helpful following the accident at Fukushima in March 2011 when both international dialogue on nuclear power and debates taking place within Pomerania were evolving from month to month. Each research trip was carefully planned and coordinated in advance so that the time could be put to best use. Certain interviews were arranged several months in advance so as to secure a time slot with the participant and also for translation practicalities, though as has been discussed above, difficulties were still encountered with a few businesses and institutions.

Between trips it was possible to translate, transcribe and review each interview, meeting or event and to begin preliminary analysis of the material. This was helpful as it allowed the design of interviews and meetings to evolve and for the themes presented in the following empirical chapters to be further developed. There were certain limitations to this approach, however, particularly relating to spontaneity. With the opposition movement Pomorska Inicjatywa AntyNuklearna, events would often be arranged with very short notice. For

instance, in April 2011 the group arranged for a demonstration to take place in Central Gdańsk to mark the 25th anniversary of the accident at Chernobyl. Whilst it was possible to make arrangements to attend the demonstration and an extended group meeting which took place the next day, there were other events which were missed due to the short notice. However, through community discussions on the 'rise up' list, it was possible to follow along at a distance with plans for demonstrations, and discussions following each event.

Prior to commencing fieldwork, I completed and passed a full ethical review in line with the University of Birmingham's process for the self-evaluation of postgraduate and staff led research projects. Due to the nature of some of the discussions which took place between myself and research participants who stand in opposition to nuclear development plans in the region, in addition to the informal and often spontaneous nature of the research, it was not always possible to confirm research participants preferences on matters of anonymity. As such with the exception of the research participants detailed in table 3.2, the names of activists and individuals quoted in this research have been changed, and key characteristics and identifiable information have been purposefully omitted (Wiles et al, 2008).

3.2.3 Interview structure

The formal interviews and more informal meetings described in this thesis were conducted in a mixture of languages. In certain instances, conversations took place in English, with research participants making occasional breaks into Polish for key words or phrases relevant to the subject of discussion. At other times, the meetings were conducted in Polish, or in a combination of the two languages (see table 3.2). Whilst my Polish language skills allow me to translate written materials and get by in everyday life in Poland, I required assistance for the interpretation of spoken conversations and interviews. In order to gain the most accurate

interpretation of events, for the formal interviews which took place entirely in Polish, or in a combination of Polish and English, I worked with a bilingual doctoral researcher and colleague from the University of Gdańsk (see also section 3.2.5).

Prior to each of the interviews listed in table 3.2, I prepared a list of themes for discussion, and read through any relevant Polish and English material or policy documents which I had been sent by the participant. For each of the formal interviews, a certain format and interview structure was adopted. To begin with, the participant would be briefed on the nature of the thesis, and introduced to the key themes which were to be discussed with them during our meeting. They would then be invited to discuss the history of their personal or institutional involvement with nuclear development plans in Pomerania, their attitudes to development and to the proposals which were being made public surrounding the location of the first facility, as well as to dialogue and civic debate on nuclear development.

Where the interviews took place entirely in Polish, my colleague would interpret in blocks following discussion in Polish of a question or theme. Each meeting was recorded with a Dictaphone for accurate transcription, together with paper notes. Following each interview, I consolidated these notes and listened back through the recordings to pick out the key themes and prepare for the next meeting. The duration of each interview varied greatly from 45 minutes, to three hours.

These interviews, despite their formality, were very fluid and open so as to enable the participant to elaborate on the themes which they felt were of the greatest relevance. The pre-prepared themes and questions were used as a guide for conversation and as prompts when particular lines of enquiry fell blank. However, oftentimes the participant would raise new themes, and our discussion would take on a new direction. In addition, the method of

translation, with interpretation from Polish to English during the course of the meeting allowed for language related challenges to be overcome as it was possible to remain engaged with the discussions which were taking place, as well as to reshape questions as the meeting progressed.

The practices described above refer to the formal interviews which were conducted with local and regional authorities' representatives and representatives from organisations and associations (see table 3.2). However, discussions and encounters with participants which took place during this research were diverse in both formality and approach. The locations ranged from government offices and science and technology parks, to small student rooms at the University of Gdańsk, to cafes, cars, corridors, community halls in remote villages and demonstrations on the streets of Gdańsk. As such, and in addition to constantly shifting requirements relating to language and interpretation, the research approach for each meeting remained flexible to account for different situations. In addition to the formal interviews detailed in table 3.2, I attended in person a number of demonstrations and informal events, dialogue meetings and public consultations, and conducted further, informal research which it was harder to document, and which was not always prearranged. These instances are noted throughout the empirical chapters as personal communications, and they often proved to be some of the most valuable contributions to the research. It was through informal communications and discussions which some of the key themes behind this research began to emerge. In particular, these communications were helpful for building a picture of the identities people and institutions attach to the former construction site of the land surrounding Żarnowiec NPP and to Kashubia and Pomerania more broadly. These are themes which will be brought to centre stage in Chapters 5 and 6.

3.2.4 Participant Observation

In addition to the formal interviews and informal meetings discussed in the previous sections, I also made use of participant observation in order to better understand the processes of dialogue and decision making surrounding proposals for future nuclear development in the region of Pomerania. As such, during public meetings and street demonstrations I engaged in a somewhat *passive* form of participant observation. As a result of wishing to observe both the proponents and opponents of nuclear development discussions, I remained largely external to the groups during these encounters – observing from a distance rather than becoming an active member of discussions (May, 2011).

I opted to include participant observation as part of my mixed qualitative methodology in order to observe body language and atmosphere as well as the spaces of engagement – in a physical sense – in which discussions were taking place. This technique allowed me to observe the tactics used by both proponents and opponents of nuclear development to voice their perspectives and concerns. For example, through passive participant observation it was possible to examine the role of visual presentations and materials used in dialogue and debate surrounding nuclear development, as well as how individuals and groups engaged in or became/remained disengaged from dialogue with one another. In addition, participant observation proved helpful in the presence of practical barriers to gaining access to key members of the pro-nuclear lobby (as detailed in section 3.2.1). Whilst it was not always possible to conduct a formal interview in order to understand attitudes towards science-public dialogue, participant observation enabled me to explore these themes in situ as the contrasting groups came face to face.

Amongst others, Dewalt & Dewalt (2001), Flowerdew & Martin (2005) and May (2011) highlight some of the challenges associated with conducting social research through

participant observation. For example, when participant observation forms a large part of the research methodology, the challenges associated with gaining access to and trust within communities can significantly alter the trajectory of the research, opening up certain pathways whilst closing others entirely. In addition, the act of *doing* participant observation research can sometimes alter narratives and shape outcomes in unexpected ways as research participants moderate their actions and narratives in response to the presence of the researcher and the nature of the research. However, to a large extent these challenges can be minimised through less engaged forms of participant observation such as the passive form I employed during public meetings and demonstrations. Rather than directly engaging with the two distinct communities during these meetings and events and potentially altering or shaping group discussions and activities, I sought to understand how they perceive of one another and react to each other's narratives, activities and visual materials through observing their interactions in person.

Dewalt & Dewalt (2001, p.20) explore the different forms of participant observation, and refer to the researcher making use of the passive form of the methodology as a 'spectator' or 'bystander'. This lies in contrast to more engaged forms of participant observation whereby the researcher participates in discussions and to different extents becomes an active part of the community in which he or she is conducting research (Dewalt & Dewalt, 2001; Flowerdew & Martin, 2005; May, 2011).

3.2.5 Reflections

As has just been described, the fieldwork for this research began by following discussions taking place in the Polish media surrounding national plans for the (re)introduction of nuclear power in Pomerania. This approach was undertaken as it was one of the most instant channels

through which to begin to engage with debates, and to elucidate the actors and institutions involved in the development of a nuclear industry in Poland.

The tracing of connections and dialogue common to ANT and assemblage has been argued to favour the narratives of already privileged social actors and institutions (Winner, 1993). The case study of nuclear development in Pomerania is indicative of such a scenario, and the manner in which nuclear power is discussed in the Polish media favours a pro-nuclear narrative over discussions surrounding the limitations and challenges of the technology (see Chapter 6 for further discussion of the Polish media's links with PGE).

However, I chose to use the approach documented in section 3.2.1 as a starting point from which to launch a deeper enquiry into the processes surrounding nuclear development in Pomerania. The initial list of 'relevant social' actors and institutions evolved with time as participants made suggestions of further contacts, and as events unfolded following the accident at Fukushima. To this extent, the research was not solely dependent on representations of nuclear within the Polish media, or on the voices and perspectives of those who had access to such public platforms.

It was also possible to trace the counter narratives on nuclear development in Pomerania which are present in Gdańsk, through following along with the local opposition movement, their meetings, communications and informal publication methods via the internet. Though the pro nuclear development narrative remains the stronger driving force within Pomerania, an alternative conceptualisation of nuclear is still visible (see Chapter 6). However, the opposition movement in Gdańsk remains relatively small. This is partly due to the perception of a lack of avenues or platforms for opponents or concerned local residents to question or challenge development plans. At the time of writing, the membership of PIA remains limited,

and many individuals were unwilling to speak out against nuclear due to what the activists I met with described as apathy with the decision making processes which surround nuclear development in Poland. As such, the individuals and institutions in favour of development provided greater empirical material for analysis. This should be kept in mind throughout the empirical chapters.

The research design allowed discussions to take a natural turn, and for themes to emerge which with a more structured approach may have remained hidden. In particular, themes relating to the strength of attachment to the land surrounding the original development site on Lake Żarnowiec, the presence and role of existing energy infrastructure, and the development legacies from the 1980s really began to emerge through both formal (see table 3.2) and more relaxed encounters with research participants (see table 3.3).

3.2.6 Language & Interpretation

Language considerations and the navigation of communication challenges came to be a central part of research design. As Temple (1997 p.607) notes, 'if language constructs as well as describes a society, the figure of the interpreter/translator must come out from behind the shadows'. Discussing cross cultural research in British-Polish communities, Temple draws attention to the manner in which translation and interpretation can alter meanings, and the need for communication between the researcher and interpreter regarding the key concepts of the research (Temple, 1997; Temple & Young, 2004). Though the challenges and limitations of conducting research in a language other than the researcher's mother tongue cannot be completely overcome, I attempted to address the challenges associated with the fluidities between language and meaning by working with a fellow doctoral researcher from the Institute of Geography at the University of Gdańsk. As a long term Tricity resident himself,

familiar with local institutions and practices and with a personal interest in energy related developments within the region of Pomerania, my colleague was well equipped to accurately present the themes I wished to discuss with research participants and to interpret the formal interviews detailed in table 3.2.

3.3 A visual turn

As the fieldwork period progressed, key themes began to emerge through interviews, meetings, the dialogue platform events and demonstrations (see tables 3.2 & 3.3). These themes challenged my original perspective on the processes surrounding nuclear development, and particularly my *a priori* theoretical assumption that development was purely the product of social and political activities (see section 2.1 of the previous chapter). Increasingly, the roles of infrastructure and development legacies were themes which participants from a multitude of different backgrounds began to comment on.

By the June of 2011, it had become apparent that a theoretical framework with an emphasis on social agency and social processes alone could not offer a sufficient explanation of the processes shaping nuclear development in contemporary Pomerania. In particular, it became clear to me that it was necessary to demonstrate the extent to which the socioeconomic and physical landscapes surrounding the original development site have been critically altered through the experience of nuclear development in the 1980s (see also Chapter 2). The imagery surrounding contemporary nuclear development in Pomerania is bound up with these legacies and, as Chapters 4 and 5 will show, with references to the built environment and existing energy infrastructure which surrounds the ruins of Żarnowiec NPP.

In addition, through my attendance of a number of dialogue platform meetings, demonstrations and events, I came to observe the imagery and language used to persuasive

effect by both those in favour of nuclear development and those in opposition. The perceived identities of the land surrounding Żarnowiec as both present and future ‘energy zone’ to PGE, PSSE and local and regional government, and a space in which an apocalyptic ‘Żarnobyl⁵’ would unfold should development persist came to frame narratives on both ‘sides’ of development.

As such, at this stage of the fieldwork, I began to incorporate a more visual approach into my workflow in order to better demonstrate the processes which were taking place and shaping dialogue on nuclear development in Pomerania, and the contrasting visual interpretations of the primary space around which Pomerania’s discussions of nuclear development revolve.

3.3.1 A visual approach

Throughout my time conducting interviews, meeting with the opposition group PIA, and attending conferences, demonstrations and public consultation meetings, I came to gather a large body of visual materials. These included items such as posters, flyers, special edition anarchist publications and campaign material from PIA together with informational brochures, leaflets and visual presentations from PGE and regional government. I was struck by the contrasting imagery being used to demonstrate different ways of conceptualising both nuclear as a technology, and the prospect of nuclear development within Pomerania. Together with the aural and written material provided through interviews, participant observation and informal meetings, these visual materials offered an opportunity to add an extra dimension to the research, and a means through which to demonstrate how the *idea* of nuclear development in Pomerania is deeply entangled with the legacies of historical development and interpretations of both ‘lay’ and scientific knowledge.

⁵ A play on words from the Polish spelling of ‘Chernobyl’ – ‘Czarnobyl’ and Lake Żarnowiec.

The decision to begin to incorporate this material into the existing methodology was informed by work undertaken by Rose (1996; 2000; 2003) on the use of visual materials in geography, both as method and a form of analysis. Rose notes how geographic knowledge has historically been, and continues today to be shaped or produced through visual materials (1996), yet she acknowledges some of the challenges associated with using visual materials in the production of knowledge and geographic research.

Rose argues that visual interpretations of the world such as those provided by photographs, maps, and publicity materials are ‘never neutral. They have their foci, their blinkers and their blindnesses’ (2003, p.213). She also describes how not only the production, but also the use and analysis of visual materials can ‘produce hierarchies and differences... for example, around what can and cannot be seen, around what remains invisible and what is turned into shadow by particular strategies of display, and around who can and cannot interpret the visible and how’ (2003, p.213-214). Rose’s challenge to human geographers using visual materials as an object of study is to recognise the situated, socially produced nature of these visual artefacts. Rose calls for visual materials to always be seen within the wider social and cultural contexts in which they were produced.

Noting the social origins and situated nature of visual materials, Rose offers some suggestions of how best to interpret them, and provides a list of questions which human geographers might use to gain a deeper understanding of visual materials. For example, Rose asks of a visual document or artefact questions such as ‘when was it made?’, ‘where’ and ‘by who?’, ‘what use is made of colour?’, ‘who was the intended audience of the image?’ and ‘how is it circulated?’ (Rose, 1996 p.285).

The social origins of visual materials have also been discussed in depth by historical geographer Schwartz (1996). Schwartz describes how photographs in the 19th century ‘reflected and constituted perceptions of space, time, place and identity’ (1996, p.17-18). Discussing travel photography at the time, she describes the ‘visual agenda(s)’ of the photographer(s) when documenting a phenomenon or space, and how the decision on whether to take a photograph and *how*, came to be entangled with ‘cultural determinations of what was memorable or worthy of recording’ (1996, p.29).

Rose and Schwartz offer a critique of the manner in which visual materials are produced, and demonstrate how and why the researcher should harbour an awareness of the contexts which surround visual materials during the research process. Their work is particularly helpful for analysing narratives and discourse comprising one or more visual components. To this extent, their discussions of the social origins and production of visual materials were helpful as a starting point from which to begin to address the body of visual materials gathered during the course of the more traditional, aural narratives collected and observed during the initial stages of fieldwork.

The empirical material presented in the following chapters makes use of these materials, further describing and illustrating the extent to which nuclear development is entangled with understandings and awareness of infrastructure, material ‘things’, emotions such as the fear and promise of nuclear development, and notions of landscape identity. Visual methodologies do not replace the narratives and opinions expressed through interviews, meetings and social encounters, but rather support them, illustrating themes which are often difficult to convey through words alone.

Rose and Schwartz challenge the researcher to be aware of the social origins and production context of visual materials. Their critique is particularly pertinent to the use of *existing* visual materials produced by the research subject, or participant, either during the course of a research project or as an historical artefact. For example, Schwartz (1996) with her work on the cultural origins of 19th century photographs, and Rose (1996) on the use of historical photographs within social scientific research. However, a social scientific approach to research which seeks to *produce* visual materials as either part of or in place of traditional methods is often regarded as either lacking objectivity, or being overly reductionist in approach. This is particularly apparent with the use of visual materials to document space.

3.3.2 The use of visual materials

During the main research period, February 2011 – February 2012, I made a number of site visits to the villages surrounding Lake Żarnowiec for interviews with both Gmina Gniewino and Gmina Krokowa, for community meetings, and to make a site visit to the ruins of Żarnowiec NPP, and the energy developments which are in operation in the area including a large Hydro facility and wind farm (discussed in further depth in Chapters 4 & 5). Further to these visits, I made two additional visits to the area in July 2012 and August 2013 with the express purpose of documenting through photographs the extent to which the hyper-local area surrounding Lake Żarnowiec has been altered by energy related developments, and how the identity of the area continues to be shaped by these changes.

The hyper-local area surrounding the original development site of Żarnowiec NPP is marked by the industrial and energy related developments which took place on the land throughout the mid to late 1980s and beyond. The area provides a dramatic contrast to the landscapes encountered on the approach through farmland and thick pine forests from the Tricity.

Aural narratives and the written word are the most common and widely accepted methods for documenting the experience of space and landscape change within the social sciences (Clifford & Valentine, 2003), yet often they fall short as a means through which to describe space. For this, photographic and video methodologies provide a helpful alternative medium. These techniques are broadly accepted within the field of ethnography (Ruby, 1975; Pink, 2007) yet as Garrett (2011) notes they are viewed more cautiously within the discipline of human geography.

For example Macpherson (2005) argues that visual interpretations of landscapes by their very nature exclude alternative experiences of space. She calls for a 'multi-sensory' approach to understand how spaces are perceived and experienced. The 'multi-sensory' experience of space has been addressed by Delaney et al (2008) with regards to the experience of urban environments, incorporating traditional aural narratives with visual and sensory experiences.

Concerns for the 'partial' nature of visual materials support those which have already been discussed on the situated nature of and the photographer's role in the production of visual materials and artefacts. Critically, Rose notes how visual interpretations are subjective. Discussing the use of slides to display photographic material she acknowledges that 'there are, of course, huge differences between the photographed referent and its image' (2003, p.215). To see and to document is to offer a bounded, subjective and inherently situated view which can often speak more of the one who documents than that which is documented.

However, despite the apparent limitations of photographic and video methodologies and interpretations of space, there remains a place for their use within a broad methodological toolkit, and particularly within a theoretical framework of assemblage which seeks to trace narratives, connections, and the 'mess' of process (Law, 2008).

Garrett (2011) argues that visual research methods, and he places emphasis on the use of videography though I argue that the same criteria can be applied to photography, 'are an important component of contemporary fieldwork' (2011, p.21). He breaks down the use of video as a research methodology into five categories: 'writing about films (analysis); production for an audience; footage as record; reflexive filmmaking; and participatory video (2011, p.22). It is the third of these, 'footage as record', which I found particularly helpful as a descriptive and explanatory tool for the entanglement of historical legacies, material artefacts and identities which surround the original development site of Żarnowiec NPP.

To supplement the aural and written narratives which I had collected during the course of the interviews (see tables 3.2 & 3.3) and together with the visual materials provided during these meetings, I documented the Żarnowiec site through photographs. Lake Żarnowiec is encircled by a road. It was the area immediately surrounding this road which I focused on during site visits. I set out to document the existing energy infrastructure (both in use and abandoned) together with the signs which line this road, and to contrast the images with images taken on the entry road through the village of Tyłowo (see figure 4.1 in the following chapter for an annotated site map).

Despite careful research design, it is not possible for photographic material to be entirely devoid of subjectivity. However, as highlighted both in Chapter 2 and at the start of this chapter, the same limitations can be seen to apply to quantitative methods and more traditional qualitative approaches to social scientific research, for example the use of semi-structured interviews or participant observation (McDowell, 1992; Rose, 1997). During the process of conducting fieldwork, the researcher is constantly making decisions about what to measure, and how, which lines of enquiry to pursue, and then during analysis and research presentation, which narratives to display.

As discussed in the prelude to this chapter, these apparent limitations are in line with a constructivist perspective on scientific knowledge, as opposed to a positivist stance with its emphasis on quantifiable objectivity. It is the responsibility of the researcher to be aware of the situated nature of research methods, and the narratives and knowledge which are produced through both natural and social scientific enquiry.

3.4 Data Analysis: Qiqqa

This thesis makes use of a broad range of qualitative research methods. From formal interviews, informal meetings and participant observation to the analysis of visual materials and text based documents, the research process generated a large body of diverse materials. In order to make sense of the themes and narratives which began to emerge as the research period progressed, I utilised the reference and data management system ‘Qiqqa’ (pronounced ‘quicker’). Qiqqa allows users to create an unlimited number of libraries in which documents and materials can be uploaded and organised by theme (Qiqqa, 2014).

In addition to using Qiqqa to organise my bibliography, I created a library for the sole purpose of arranging my empirical materials. For interviews and meetings I uploaded transcripts in Polish and English as well as photographs, visual materials and notes from the events I attended. Following this, I created custom taxonomies by assigning ‘tags’ to each item within the library. These tags provided descriptions of the materials. For example, I created tags to describe whether the document or item referred to a community meeting or a formal interview, an official policy document or field notes. In addition, I created tags based on the content of the materials and the themes raised by research participants during the interview, meeting or event.

For example, during meetings in which participants raised topics of discussion such as the role of the Catholic Church, print media or international debates surrounding nuclear development, I created appropriate tags to identify items within the library as referring to these themes. The approach I took is not unique to 'Qiqqa', but is also familiar to researchers using alternative Computer Assisted Qualitative Data Analysis Software (CAQDAS) such as the 'NVivo' package (Welsh, 2002).

The process of assigning tags and creating custom taxonomies through Qiqqa allowed me to become familiar with my research materials and to identify the major themes underpinning the research. This was an essential part of data analysis and a process which I conducted whilst still actively engaged in the research during 2011 and 2012. Transcribing interviews and organising materials within Qiqqa whilst arranging further interviews and research trips to Poland enabled me to identify any significant gaps in my research, as well as to explore new avenues which I hadn't previously identified prior to undertaking the research.

In addition, through the use of Optical Character Recognition (OCR) technology, Qiqqa transforms text based documents into fully searchable records. The text based content of an OCR scanned document, together with its title and associated tags are all fully searchable within Qiqqa. A simple search within Qiqqa generates a results page with excerpts highlighting every instance of the term being present, and the percentage relevance of each search result.

Of course, as with any form of CAQDAS (Welsh, 2002) it is important to note the role of the researcher within the process of data analysis. Qiqqa is only as powerful as the information uploaded by the researcher and requires an initial investment of time in order to learn how to make use of the data analysis tools. I found that the more I used Qiqqa and refined my tags,

the more helpful the software became throughout my research. Furthermore, the process of creating a custom taxonomy with theme based tags remains a subjective undertaking, and cannot be seen as a means through which to quantify qualitative research.

3.5 Conclusions

This chapter has presented the data collection methods I used for the empirical components of this thesis. It details the use of a diverse range of mixed qualitative research methods, and their application within a broader theoretical framework of assemblage. It also discusses the challenges of conducting research in a foreign language, translation and interpretation practicalities and the role of research design and both aural and visual methods in shaping research outcomes.

Through this chapter I have described the ‘iterative’ and ‘messy’ nature of assemblage work and the challenges associated with ‘doing’ assemblage in addition to the discussions on ‘thinking’ assemblage which were presented in Chapter 2. As such, this chapter has presented a basis for the empirical material which the following three chapters present.

4.0 Pathway Creation in Pomerania

The previous chapters have introduced the study area together with the theoretical and methodological frameworks through which I examine the processes which surround Poland's experience of nuclear development in Pomerania. The aim of this thesis is to examine how it is that a trajectory towards nuclear development is being sustained within the region of Pomerania. As such, this thesis examines the role of social, material and conceptual elements in shaping narratives on nuclear development. Whilst the first two empirical Chapters, 4 and 5, focus on the elements and processes which influence narratives at the hyper-local level of Lake Żarnowiec, Chapter 6 will turn to regional discourse surrounding nuclear development in Pomerania.

The aim of this chapter is to explore how historic layers of social agency and the promise of nuclear power came to be entangled with the physical landscape surrounding Lake Żarnowiec. As Chapters 5 and 6 demonstrate, such a discussion is central to understanding the processes and entanglements which characterise Poland's contemporary experience of assembling a nuclear industry in Pomerania.

In this chapter I explore how the hyper-local area surrounding Lake Żarnowiec has been critically altered through sunk investments in site specific knowledge, the resettlement of the traditional Kashubian farming and fishing villages of Kartoszyno, Czymanowo and Nadole, and the construction of two large energy facilities; Żarnowiec NPP and a hydroelectric support plant, Żarnowiec Hydroelectric. The chapter examines the historical processes and conflicts which surrounded the construction of Poland's first nuclear power station and demonstrates visually how the land on the southern tip of Lake Żarnowiec has been transformed into an energy 'zone'.

4.1 Pathway Creation and Changing Identities

As a result of the socioeconomic and political pressures of the People's Republic of Poland's entanglement with the Soviet Union (see Chapter 1), in August 1971 the Polish government issued a statement of intention for the construction of the country's first nuclear power plants (NCBJ, 2012). This statement came to mark the beginning of a phase of preparatory work for a series of nuclear plants, the first of which was to be located adjacent to Lake Żarnowiec in Pomerania, northern Poland.

It was intended that Żarnowiec would be just one of many nuclear complexes to be constructed over a period spanning three decades. In addition, the nuclear facility was to operate in tandem with a hydroelectric pumped storage power plant for load balancing (Site visit: Żarnowiec Hydroelectric, Czymanowo, June 2011, July 2012; Szkudlarek et al, 2011; NCBJ, 2012). Once the decision to pursue nuclear development at Żarnowiec had been taken, work commenced on assessing the land and preparing the community for nuclear development.

4.1.1 Investment in site specific knowledge

Central to site preparations, the Polish atomic energy agency undertook a year of intensive research to assess the suitability of the terrain and local economy for the proposed developments. (NCBJ, 2009; Interview: Teodor, Gdynia, May 2011). The environmental impact assessments and exploratory groundwork which take place prior to the construction of nuclear power stations and waste repositories can be argued to be non-binding and speculative in nature, yet local councils are often reluctant to grant a licence for these types of studies as it is seen as a precursor to further development due to research costs and the site specific nature of study findings. The 'irreversibility' of nuclear development together with a general mistrust

in the nuclear industry (Kemp, 1990; Bickerstaff et al, 2008) are recognised as key factors in complicating the process of site selection and can lead to the localised blocking of applications for studies and further development, most clearly evidenced through case studies of nuclear waste storage solutions. For example Macfarlane (2003) discusses attempts to find a site for preparatory groundwork on an underground waste repository in the USA during the 1980s, and the eventual block by the United States Congress on research into the disposal of High Level Radioactive Waste to non-site-specific research. Such experiences are echoed in the British context at Sellafield (Cumbria County Council, 2013; Westmoorland Gazette, 2013) where applications for preparatory groundwork on an underground repository for nuclear waste have repeatedly been refused. Meanwhile, at Hinkley Point in Somerset where permission for significant geological surveying prior to the construction of a new power plant has been granted (World Nuclear News, 2011) there has been public outcry and opposition to the work. In both of these cases, opponents have cited concerns for environmental research and ground preparation as it is perceived to be the first step on a path which may prove to be cumbersome to retreat from.

However, at Żarnowiec preparatory research was able to proceed unhindered due to the social and political context within which the facility was being developed (see Chapter 1). Under communism there were far fewer spaces for dialogue between national government and the regional authorities on development paths, and the decision to conduct site specific research and later construct a nuclear power plant was made centrally.

Today, the socioeconomic and political context of contemporary Poland is far removed from that of the 1970s. As the vocal populations of Choczewo-Lubiatowo (see Chapter 6) and Mielno (Głosu Koszalińskiego, 2012) have already indicated, it is unlikely that preparatory research could be conducted on these sites without the presence of significant public

opposition and expensive delays⁶ (see section 4.3 for further discussion of the planning regulations which surround applications and environmental impact assessments).

However, at the time, the research confirmed the suitability of the ‘Żarnowiec’ site for nuclear development – results indicated that the lake is of sufficient capacity for cooling purposes⁷, the surrounding area was (and remains) one of low population density and there were no indications of concern for seismic stability (Szkudlarek, 2010; Interview: Teodor, Gdynia, May 2011). The positive indications which arose from the research period can be seen to have raised the profile of Żarnowiec over other sites (Choczewo-Lubiatowo and Gąski in Gmina Mielno, see Chapter 1) which to this day remain bound with uncertainties.

In 1990, despite the abandonment of construction work on Żarnowiec NPP, the IAEA acknowledged the validity of the original environmental impact assessment conducted during the 1970s (Szkudlarek et al, 2010). At the time of writing, though additional studies are scheduled to take place before a decision is made regarding the future of the ‘Żarnowiec’ site, the legacy of preparatory studies and the existing body of site specific knowledge can be seen as a first step towards the concept of nuclear development becoming entangled with the land surrounding Lake Żarnowiec.

4.1.2 Opposition at Kartoszyno

In December 1972, the successful indications of the year of environmental research beside Lake Żarnowiec were announced, triggering a series of actions for further development on

⁶ In February 2012, Gmina Mielno held a referendum on the announcement by PGE that the village had been shortlisted as a potential development site for nuclear power. Over 94% of residents voted against the prospect of nuclear development in Mielno. Whilst the referendum is not legally binding, the results of this referendum have been acknowledged by regional planning authorities.

⁷ Preliminary models based on existing scientific knowledge of the ‘Żarnowiec’ site suggest that the capacity of Lake Żarnowiec is of sufficient capacity to cool one reactor (EPR or AP1000) using a closed cooling system (Szkudlarek et al, 2011, p.420).

site. The first of these was the reservation of the land for exclusive use by the state for the purpose of nuclear development, together with the resettlement of the longstanding farming community of Kartoszyño who occupied the land on which Źarnowiec NPP was to be constructed (NCBJ, 2009). At the time of a national census in 1970 the population of Kartoszyño stood at 101 residents across 16, multigenerational farming families (Sagan, 1991; Meeting: Iwona Sagan, Gdańsk, March 2011) and as development became imminent, the residents of Kartoszyño were offered a choice of relocation to alternative farms elsewhere in Pomerania or compensation to give up farming and move to the Tricity. However, in contrast to the villagers of Nadole and Czymanowo (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011), the existing farming community of the village of Kartoszyño stood in unison against development plans and refused to abandon their farms⁸.

Such resistance was a novel occurrence given the political and economic climate of 1970s Poland (see Chapter 1). Whilst displays of discontent were becoming increasingly common throughout the cities and urban areas of Poland as evidenced by the events of 1956, 1968 and the food crisis of 1970 (Ost, 1991; Davies, 2005; Kemp-Welch, 2008), the resistance to the state from the residents of a small village such as Kartoszyño stood out. It was one of the first times that such a small community had challenged a development of the scale of Źarnowiec NPP.

The residents of Kartoszyño held fast for a decade of resistance during which time repeated calls were made by the communist government for the families to vacate their farms and relocate to the Tricity. The residents continued to refuse the offer of compensation. However,

⁸ In his 1977 Polish language documentary ‘Ojcowizna’ (*Heritage*), Ireneusz Engler, Polish film and documentary maker meets with the residents of the former village of Kartoszyño to discuss their opposition activities and eventual relocation to the purpose built village of Odargowo-Kolonia.

on April 25th 1979 it was announced that construction work would soon commence on the land on which the village of Kartoszyño stood, and that the location of Poland's first nuclear power plant remained unchanged (NCBJ, 2009; Interview: Energy Minister for the Pomeranian Province Marshal Office, Gdańsk, February 2012). Over the course of the next three years, the community ultimately yielded to pressures from central government and moved away from the farmland of Kartoszyño. It had become clear that development would take place and the relocation demands would become increasingly aggressive as preparatory work neared completion (Sagan, 1991; Interview: Iwona Sagan, Gdańsk, March 2011).

The resistance from the residents of Kartoszyño marked a fork in the road for both the final trajectory of the original Żarnowiec NPP, and the future identity of the landscape surrounding Lake Żarnowiec. Construction work on Żarnowiec NPP commenced shortly after the families had moved away from Kartoszyño, yet a decade of resistance from the villagers had caused unforeseen challenges for the communist government and for the Żarnowiec NPP development. The events at Kartoszyño caused delays which pushed the period of nuclear development into a new era for Polish society; one where, as Chapter 1 explored, the political landscape was beginning to change (Weigel, 2003; Davies, 2005; Kemp-Welch, 2008), and social and environmental movements were gaining significant traction.

From 1982, construction work on Żarnowiec NPP progressed slowly, plagued by the inefficiencies and repeated setbacks common to large infrastructural projects under communism (Josephson, 2000; Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011). Further to the preparatory studies and preliminary groundwork of 1971, the land was slowly transformed by investment in infrastructure. Together with the reactor buildings, further support facilities were constructed including a railway connection linking the village of Kartoszyño beside Lake Żarnowiec to Wejherowo and the Tricity

region, a radio meteorological mast, a lakeside hotel at Nadole, 1700 apartments in Wejherowo, Gniewino and Krokowa, lakeside industrial units and a vast electricity distribution network (NCBJ, 2009).

Then, on 26th April 1986, an experiment in reactor 4 of Chernobyl NPP, Ukraine went catastrophically wrong, spreading radiation, rumours and fear throughout Central and Eastern Europe and further afield (Wynne, 1996). After Chernobyl, the climate surrounding nuclear power became increasingly hostile. In Poland, the opposition groups ‘Freedom and Peace Movement’ (*Ruch Wolność i Pokój*) and the Movement for an Alternative Society (*Ruch Społeczeństwa Alternatywnego*) led a movement, centred around what was by then the socially and politically pivotal city of Gdańsk, to oppose the continued construction of Żarnowiec NPP. However, it is important to note that RSA and RWiP were not created with the sole intention of opposing nuclear development, but rather to tackle wider social and environmental issues and a growing sense of discontentment with the communist government of Poland and Poland’s economic entanglement with the Soviet Union. Speaking of her personal recollection of the protests surrounding the continued construction of Żarnowiec NPP after the Chernobyl accident, Hana explained:

“The Freedom and Peace Movement began because of opposition to the oath of military allegiance⁹... our agenda was human rights, and later ecology. The majority [of opposition to the construction to Żarnowiec NPP] was ecological, but of course there were some people who would say that they were [opposing construction]

⁹ Until 1988, Polish youths joining the armed forces were required to make an oath of military allegiance. The oath included a statement of support for the Soviet Union. Members of RWiP opposed this oath, and demanded that the oath be amended and an alternative form of national service introduced for conscientious objectors. After many arrests and a period of hunger strike, RWiP was successful on both counts. The success with the oath of military allegiance bolstered the campaign group, and spurred them on to further social and environmental protest (Interview: Hana, Gdańsk, March 2011; Group meeting: PIA, February 2011; See also Skiba et al, 2011).

because it was Soviet [technology], and for political reasons” (Interview: Hana, Gdańsk, March 2011).

Members of both movements kept up a constant presence both in the streets of Gdańsk and later, the ports of Gdynia to blockade the arrival and installation of the reactors (Janusz Waluszko, Gdańsk, February 2011; Interview: Hana, Gdańsk, March 2011). From March 1989, as construction neared completion and it became evident that the ships containing the reactors would soon be reaching the docks of Gdynia, the Freedom and Peace Movement called for weekly demonstrations to take place. Hana recalls:

“... From March we met every Friday at about 4pm. We met in Central Gdańsk at the Golden Gate (Złota Brama) for an anti-nuclear manifestation. On one occasion, Zomo [riot police] appeared to control the crowd...”

At 5am on 16th November 1989, following the release of information that the reactors would soon be docked at Gdynia for road transport up to Żarnowiec, a group of opponents rallied themselves and arranged a blockade of the port at Gdynia. They stationed themselves at the terminal buildings and pledged to remain in place until a decision could be reached or a full referendum on the future of nuclear power in Poland announced. Three days later, with no sign of let up, a round of hunger strikes commenced, gaining momentum as additional protestors joined in (Interview, Hana, Gdańsk, March 2011).

Despite a twenty-four hour presence at the docks, the authorities employed physical repression tactics to transport the reactors through the Port of Gdynia and up to the site at Lake Żarnowiec. After nearly two decades of planning, development and construction, and even in the face of mounting debts and socioeconomic challenges, the unrelenting determination of the communist authorities to persevere was apparent. It was not until what

seemed like the eleventh hour that on December 24th 1989, the decision was finally taken to temporarily halt construction work on Żarnowiec NPP for the duration of one year (Waluszko, 2011b).

An accelerated motion was put through the legal framework on 17th January, signalling the end of 40 days of hunger strikes and port blockades. In May 1990 a referendum on the future of Żarnowiec NPP and Poland's nuclear energy future took place, but turnout remained below the binding threshold at just 44%. Nonetheless the vast majority – 86.1% of those who did vote - opposed continued development (NCBJ, 2009; Waluszko, 2011b). In the region of Gdańsk, more than 90% of voters voiced an opinion in opposition to continued nuclear development.

Throughout the final wave of protests and blockades of the Port of Gdynia, a series of government discussions were undertaken (Kołodziejski & Kozłowski, 1989). These debates were triggered both by opposition; student movements and academic debates, and by the nuclear accident in Chernobyl. In March 1989, a final meeting was announced to discuss continued development plans and the future of Żarnowiec NPP. Teodor, an economist present at the meeting recalled:

“This was a government led meeting... Experts were asked to go to the site at Żarnowiec and see what could be done. One of the experts was an engineer who took part in the construction of a plant in Ukraine. When they came to the area where parts of the reactor building had been fabricated the engineer pointed out all the mistakes which had been made with the basement of the building. After the meeting and field trip another meeting was arranged and the final decision that the plant wouldn't be

constructed was taken. The argument was that Poland simply couldn't afford to build a safe nuclear power plant [at that time]” (Interview: Teodor, Gdynia, May 2011).

By 1990, with the farming communities of Kartoszyńno resettled and the land on which their farms had stood just ten years before transformed beyond recognition, the decision to abandon nuclear development plans was met with mixed emotions. Whilst many had expressed concern for the safety of the plant which had been constructed, the development had carved out a space for industry. This space and the landscapes surrounding Lake Żarnowiec were now devoid of economic activity and faced an uncertain future.

4.2 The altered landscapes of Lake Żarnowiec

In section 4.1 I described a series of turning points throughout the 1970s and 1980s during which the landscape surrounding Lake Żarnowiec was transformed from an agricultural area steeped in Kashubian history to an energy zone, bound up with both material and conceptual remnants from a period of communist era nuclear development. Preparatory studies and investment in site specific knowledge has seen the ‘Żarnowiec’ site favourably set apart from the alternative locations of Choczewo-Lubiatowo and Gąski (see figure 1.1) which have yet to be explored for their viability. The ‘soft’ or non-infrastructurel preparatory work for Żarnowiec retains relevance and influences contemporary attitudes to the proposed sites for nuclear development within the region of Pomerania. This is evidenced through discussions with engineers and planners (see Chapters 5 and 6), but also through provisional frameworks for environmental impact assessment (Szkudlarek et al, 2011).

Meanwhile, the resistance and delayed relocation of the residents of Kartoszyńno pushed the development of Żarnowiec NPP into a new political era for Poland, ultimately resulting in project abandonment in September 1990 at a stage so advanced that the vast majority of the

material investment was complete, leaving just the reactors to be installed. Walker (2000) in his work on the UK government's commitment to THORP (see Chapter 2) highlights the pivotal role of infrastructural investment in creating a sense of 'entanglement' or 'entrapment' with a technology or development path. Walker's analysis of the UK's entanglement with an obsolete pursuit of nuclear fuels reprocessing echoes aspects of Gmina Gniewino's experience of entanglement with energy infrastructure following Poland's abandonment of nuclear in September 1990. Following the collapse of communism and in the immediate aftermath of project abandonment on Lake Żarnowiec, the community of Gmina Gniewino found it increasingly difficult to extricate itself from what had come to be a complex relationship with large scale energy infrastructure; a situation which was exacerbated through the presence of a fully functional hydroelectric pumped storage facility, the construction of which had been premised on cooperation alongside a nuclear power plant. In the following section I explore the history of the development of Żarnowiec Hydroelectric, the impact the development had on the local community and the challenges Gmina Gniewino faced when central government investment in energy infrastructure was unexpectedly removed in 1990.

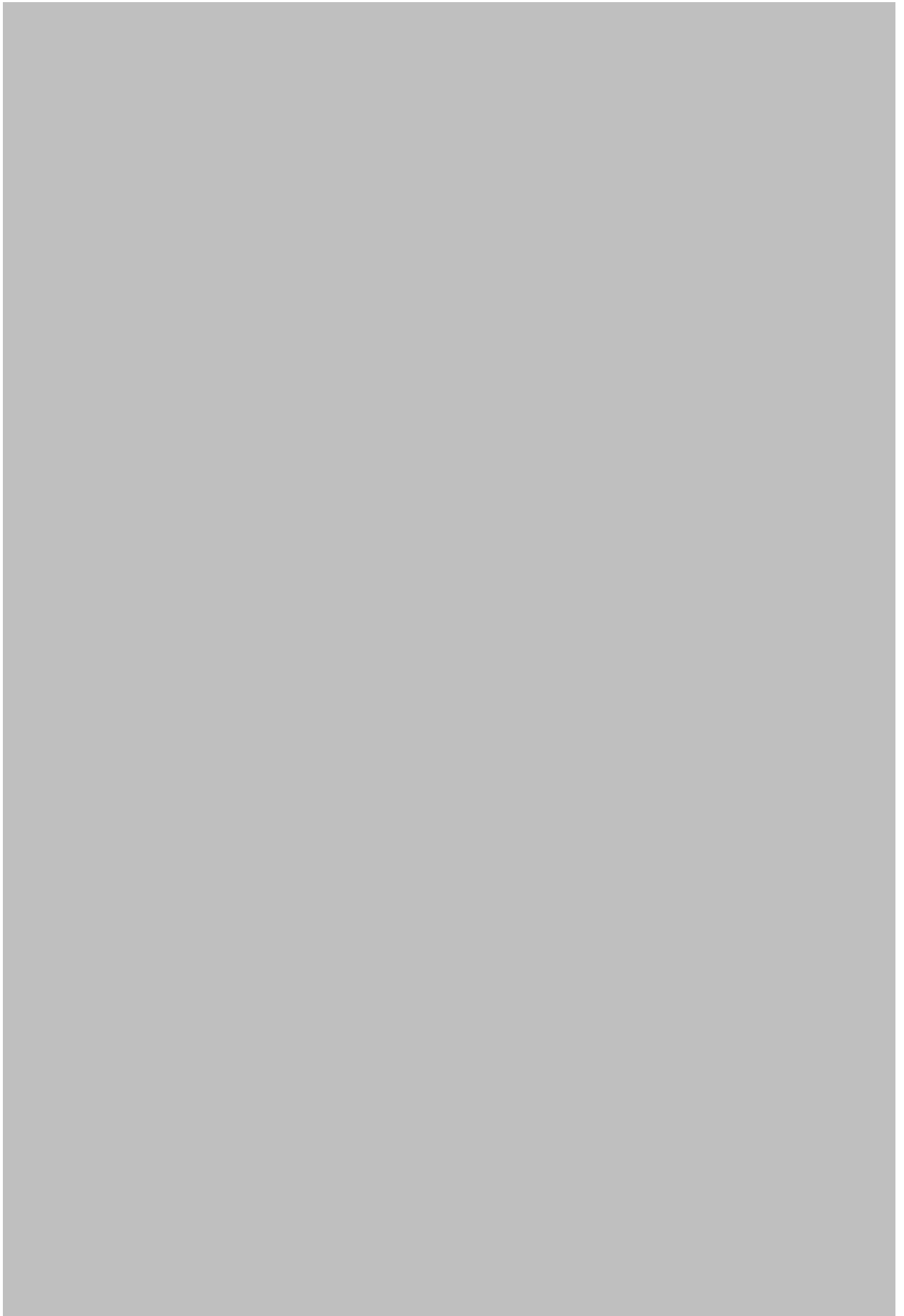


Figure 4.1 *A map of Lake Żarnowiec. This map offers a visual aid to indicate the locations of a series of photographs taken around the perimeter of Lake Żarnowiec. (Map by Google; Annotations by author)*

4.2.1 The construction of Żarnowiec Hydroelectric

From the outset of the People's Republic of Poland's pursuit of energy security in the 1970s, the construction of a nuclear power plant at Żarnowiec was never intended as an isolated project. As has been discussed in Chapter 1, one of the central driving forces behind the decision to develop the first nuclear facility in Pomerania rather than elsewhere in Poland was concern for the lack of native generational capacity in the north of the country to support the population of the Tricity agglomeration and its associated industrial activities (see figures 1.9 & 1.10). The perception of a threat to supply security and an associated impact upon the economic output of the region with its shipping and petrochemical industries bred a vision for a regional energy hub which could be relied upon for greater regional stability (Interview: Energy Minister for the Pomeranian Province Marshal Office, Gdańsk, February 2012).

Whilst the preparatory studies described in section 4.1.1 were being conducted, construction work had already commenced on an adjacent plot of land for what remains to this day Poland's largest hydroelectric storage facility. Żarnowiec Hydroelectric Power Plant has an installed capacity of 716MW and was constructed as a support facility to Żarnowiec NPP. Taking water from Lake Żarnowiec up to a purpose built storage reservoir on a natural plain above the lake during off-peak hours, energy is released back into the system when demand increases. The natural layout of the landscape with hills rising sharply from the waterside through densely packed woodland and opening out on to flat and open countryside to the North West provided perfect conditions for such a facility.

The land around Lake Żarnowiec falls into the jurisdiction of two ‘gmina’ (municipalities). These are Gmina Krokowa and Gmina Gniewino. Whilst the land on which the former Żarnowiec NPP sits falls within the jurisdiction of Gmina Krokowa, the villages of Czymanowo and Nadole, together with the infrastructure for Żarnowiec Hydroelectric are administered by Gmina Gniewino (see figure 1.2). In the summer of 2011 during an interview at the offices of Gmina Gniewino to discuss the role of energy infrastructure for the local community and plans for future investments in the region, the Commune Administrator for Gmina emphasised the continued importance of Żarnowiec Hydroelectric to the local economy. To Gmina Gniewino, the construction of the hydroelectric storage plant was the first of many transformative ‘steps’ for the region.

Discussing the facility, he said:

“The most important power plant here is the hydro power plant. It is part of PGE, it is not independent. This is the biggest investment here in Gniewino to ever be constructed. [Today] it is one of the largest [hydro plants in the country], but at the time it was the largest [overall]. There was a village in this area, where the artificial reservoir is, and it was relocated. This investment made great changes here.”

“This was the first big step of industrialisation for this community and the result of this was the inflow of people from outside of the region... People who were involved in the process of construction of the power plant in general, and the local workers. This was a very big change.” (Interview: Commune Administrator for Gmina Gniewino, July 2011)

Construction work on both Żarnowiec NPP and Żarnowiec Hydroelectric required a large workforce to migrate from the Tricity. The construction period even before delays set in was

set to span more than a decade (NCBJ, 2009). Nuclear development on the site of the former village of Kartoszyño was just the beginning of an extensive nuclear programme which would see Poland construct a series of nuclear power plants across the country (see figure 1.10). The migration of workers and change in demographics in response to the promise of long-term employment in the construction efforts further altered the socioeconomic landscape surrounding Lake Żarnowiec.

“The second step of industrialisation was the process of constructing the nuclear plant in the 1980s. The second step made the changes even deeper, so even more people came here who were involved in constructing this power plant. They had quite strong connections with the Tricity. Lots of people commuted to the area and people who worked [on the site of the two power plants] had quite a lot of privileges. During that period lots of new detached houses were constructed because people who worked there, they were able to get some materials just to build their own houses.”

“Because of these processes the cultural landscape changed very much especially around the power plant, in the villages of Nadole and Czymanowo. There is now a kind of skansen there [an open air museum]. This was made just to preserve the remains of the old village because the changes were so big, and so fast...” (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011).

In this interview with the local authorities at Gniewino, it became apparent that the infrastructural changes and construction of the two power plants are regarded to have been instrumental in altering the character of the villages surrounding Lake Żarnowiec. Not only had the existing residents of three villages (Kartoszyño, Nadole and Czymanowo) been forced to relocate, but construction work on both sites required that a sizeable workforce transfer to

the area from the Tricity. The social reconfiguration, with the farming and fishing communities moving away and construction workers migrating to the area for work was further facilitated by loopholes in the legal frameworks of the time which allowed materials to be siphoned off site for personal use.

The open air museum at Nadole - keenly recommended by my research participant as a place to visit - demonstrates just how vast these changes were. Figures 4.2 – 4.5 show examples of the traditional farm buildings of the village of Nadole prior to the construction of Żarnowiec Hydroelectric and Żarnowiec NPP. The buildings are characteristic of the three villages which were demolished as a result of the energy developments which took place throughout the 1980s, and highlight the contrast between the landscape as it stands today and the traditional Kashubian practices which dominated the area until the 1970s.



Figure 4.2 (marked ‘G’ in figure 4.1) *Skansen Nadole – open air museum depicting the traditional farming methods of the region. (Photograph by author, June 2011)*

Skansen Nadole was established in 1982 in order to preserve the cultural heritage of the land surrounding Lake Żarnowiec. Following the resettlement of the residents of Kartoszyno (see section 4.1.2), concerns were raised both in Gdańsk and Gniewino that the construction of Żarnowiec NPP would remove all trace of the former character of the land, together with the Kashubian farming practices which had previously defined the area. The buildings of the exhibit are original, and have been renovated in keeping with the traditional Kashubian style of the area. At the time of writing Skansen Nadole is operated in tandem with other exhibits throughout the counties (*powiaty*) of Puck and Wejherowo (Site visits to Lake Żarnowiec and the village of Nadole, June 2011, July 2012, August 2013; Visit and tour of Skansen Nadole, June 2011).

The open air museum at Nadole stands in stark contrast to the villages of Nadole, Czymanowo and Kartoszyno as they are today. As the photographs in figures 4.6 – 4.24 demonstrate, the villages are now dominated by industrial infrastructure, both operational (Żarnowiec Hydroelectric and a number of smaller, independent construction and chemical industries), and in an advanced stage of decay (Żarnowiec NPP on the site of the former village of Kartoszyno).



Figure 4.3 (marked 'G' in figure 4.1) *Skansen Nadole*. Photograph by A. Czyżewska, July 2009; Made available under the Creative Commons (CC BY-NC-SA 2.0) (*Skansen Nadole*, 2009)



Figure 4.4 (marked 'G' in figure 4.1) *Skansen Nadole*. Photograph by *A. Czyżewska*, July 2009; Made available under the Creative Commons (CC BY-NC-SA 2.0) (*Skansen Nadole*, 2009)



Figure 4.5 (marked ‘G’ in figure 4.1) *Skansen Nadole*. Photograph by A. Czyżewska, July 2009; Made available under the Creative Commons (CC BY-NC-SA 2.0) (*Skansen Nadole*, 2009)

A visit to Lake Żarnowiec and the villages which surround it highlights the extent to which the area has been given over to large scale energy infrastructure. However, what marks these landscape changes apart from industrial development elsewhere in Poland under communism is the rapid pace at which the area was developed, and the almost polar shift from centuries old Polish farming methods and the Kashubian heritage of the area to a programme of Soviet inspired nuclear development and large scale renewables deployment. These changes forced the villages to make a significant leap from one economic paradigm to another, the success of which was entirely dependent on the production, storage and transmission of electricity.

In addition to the challenges presented to cultural heritage which arose as a result of the relocation of residents from the villages of Kartoszyno (marked 'C' in figure 4.1), Nadole (marked 'G') and Czymanowo (marked 'H'), the construction of Żarnowiec Hydroelectric and Żarnowiec NPP created additional problems, in the shape of a lack of investment in other supporting facilities, and a state of inactivity by the residents of Gmina Gniewino:

“The whole of Lake Żarnowiec was planned to be fenced off, and all the people would have to move from there, and of course the temperature of the water was to change [due to cooling], which would impact the ecosystem¹⁰... the planned changes were very, very big. The local community was told that once construction work had begun on the power plant[s], there would be further investment in infrastructure here... new roads, schools, houses, and so people did nothing. People were just waiting for the changes, doing nothing during this period [from the 1970s through to project abandonment in 1990], because you know, they were, they had no power because all decisions were made in Warsaw...”

“... So the people here were completely inactive, the atmosphere in the plants was one of, you know, “we do nothing, everything will be given to us”... people were just waiting for the changes and the Gniewino community was one of the communities which was [hit hardest by project abandonment on Żarnowiec NPP]... the changes here were very big in comparison to other regions, because of these huge investments. People were depending on that economic and political system in the 1980s”
(Interview: Gmina Gniewino, Gniewino, July 2011).

¹⁰ The original Żarnowiec NPP facility was designed to use VVER-440 “water-water” reactors, a Soviet design which releases cooling water into the environment for evaporative cooling (Jepherson, 2005). Due to the size of Lake Żarnowiec relative to a larger body of water, for example a direct coastal location, the use of the VVER-440 would have caused water temperatures to increase over time by a few degrees, effecting the ecosystem of the lake (Presentation: Pomeranian Province Marshal Office, Gdańsk, February 2012).

My interview with the Commune Administrator for Gmina Gniewino highlighted the void which had been carved into both the physical and socioeconomic landscapes surrounding Lake Żarnowiec during the 1980s. Traditional farming practices and activities had ceased, the demographics of the area had undergone a shift away from agriculture towards an influx of migrant workers from the Tricity region, and all the time the local community was becoming more and more dependent on the upcoming investment in energy infrastructure. It was a great shock to Gmina Gniewino when Żarnowiec NPP was abandoned, as the physical landscape surrounding Lake Żarnowiec had come to be deeply entangled within a trajectory towards the development of large scale energy infrastructure.

The operation of Żarnowiec Hydroelectric as a pumped storage facility has persisted despite project abandonment of Żarnowiec NPP. Without surplus electricity to store from a nuclear plant which cannot be taken off grid to coincide with demand fluctuations, Żarnowiec Hydroelectric operates in tandem with the national energy network (*narodowa sieć elektryczna*), and to this day serves as both backup facility and an educational hub in promotion of the area surrounding Lake Żarnowiec as an energy zone (see Chapter 6).

4.2.2 A photographic tour of Lake Żarnowiec

Throughout fieldwork, research participants made reference to the physical landscape surrounding Lake Żarnowiec, describing how much it had changed and how the area contrasts with nearby villages, including the 2nd proposed development site of Choczewo-Lubiatowo. It is hard to convey in words alone the scale of the area, or the extent to which the hyper-local area surrounding the former development site on the southern tip of Lake Żarnowiec has been given over to energy infrastructure.

In order to convey this aspect of the research through the confines of the written format, I returned to Lake Żarnowiec in the summer of 2013 to document the area through video and photographs (see Chapter 3 for a discussion of the use of visual methodologies throughout this thesis). The following images were taken as a mixture of photographs and video stills. In order to situate the photographs within the context of Lake Żarnowiec, I have annotated a map (figure 4.1) and placed reference markers with each photograph. The photo-documentary begins at point A, travelling counter-clockwise around Lake Żarnowiec through the village of Tyłowo (A), past the former village of Kartoszyń (B, see also section 4.1), to the remains of the original Żarnowiec NPP construction site (C & D). Following this, the discussion and photographs follow the lake through the countryside to the north of the lake (E & F), south again to the village of Nadole (G), past the Żarnowiec Hydroelectric facility at Czymanowo (H, I & J), and out to the west via the town of Gniewino towards the wind farms at Lisewo (K).

For reference and scale, the map also depicts the location of the Choczewo-Lubiatowo site (L, see also figure 1.1), which I discuss in further detail in Chapter 6. The distance from Tyłowo (A) to the village of Żarnowiec (E) measures 11km. The aim of this photo-documentary is to demonstrate visually the extent to which the land surrounding the original Żarnowiec NPP development site has been given over to industry and large scale energy infrastructure. The physical and socioeconomic changes which took place during the 1980s around Lake Żarnowiec have had a significant impact on how the area is perceived, as well as how both ‘scientific’ and ‘lay’ narratives surrounding the selection of a development site are shaped within the wider region of Pomerania (see Chapter 6).

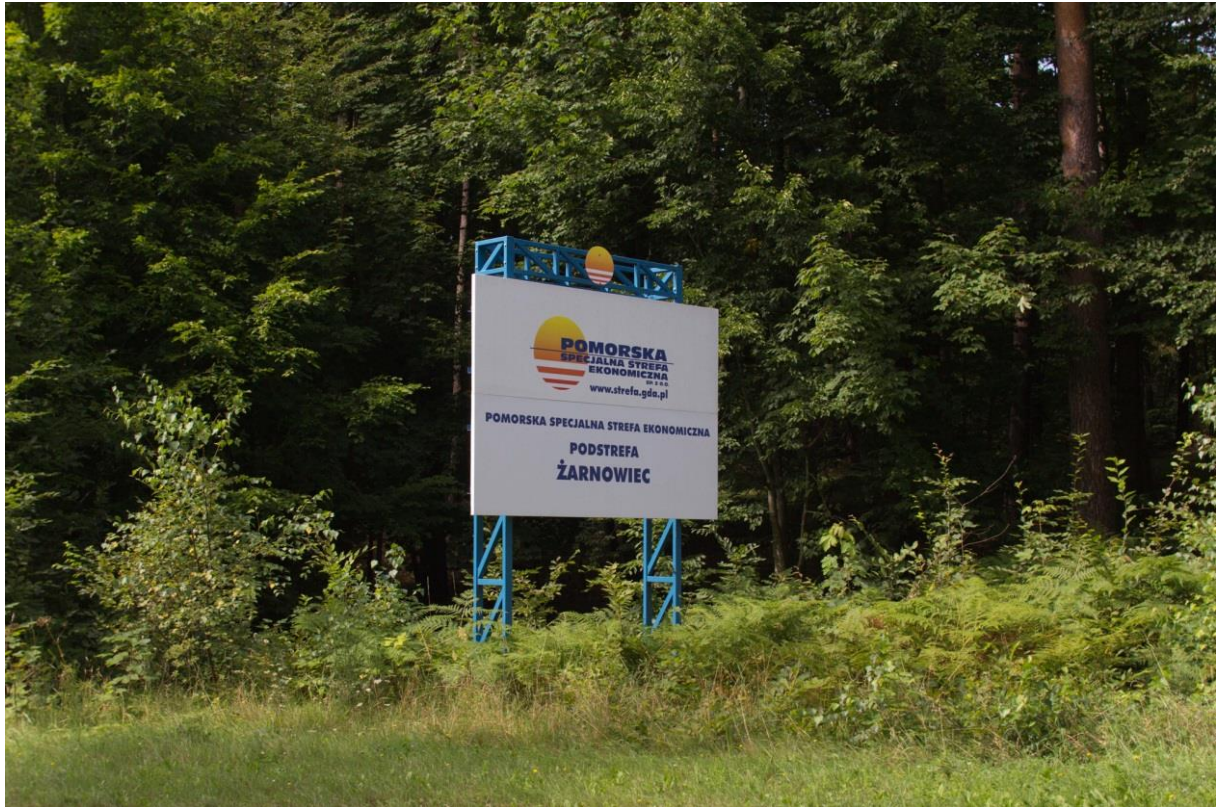


Figure 4.6 (marked 'A' in figure 4.1) *This photograph was taken just before turning off the main road from Wejherowo on to the road which surrounds the lake. The sign indicates the start of the Pomeranian Special Economic Zone 'Subzone Żarnowiec' (see section 4.3 for a discussion of PSSE).*



Figure 4.7 (marked 'A' in figure 4.1)

Driving through the small village of Tyłowo towards the site of the former village of Kartoszyño. To the left as the road descends to the lake it is possible to see the vast network of transmission infrastructure (see also figures 4.20 & 4.21) which connects the energy infrastructure of Lake Żarnowiec to the main electricity network.



Figure 4.8 (marked ‘B’ in figure 4.1) Signposts for industrial businesses on the site of the former village of Kartoszyño (advertising building materials and services) (left); A sign for the Pomeranian Special Economic Zone ‘Subzone Żarnowiec’ (right) (see also figure 4.4).



Figure 4.6 (marked 'B' in figure 4.1) *Opposite the signs shown in figure 4.5 is the entry way to a series of support buildings constructed for Żarnowiec NPP. The gate remains padlocked though the buildings are derelict and over the years have been ransacked for materials.*



Figure 4.7 (marked ‘C’ in figure 4.1) Over the road from the previous two photographs, the photographs show the reactor buildings and infrastructural remnants from construction work during the 1980s. The sign on the (padlocked) gate reads: “Construction Site, Entry Forbidden”.



Figure 4.8 (marked 'C' in figure 4.1) *A different angle of the abandoned reactor buildings from the 1980s construction of Żarnowiec NPP.*



Figure 4.9 (marked ‘C’ in figure 4.1) A closer view of the artwork (just seen in figure 4.8) on one of the access points. The cartoon is by the ‘social street art’ group ‘3fala¹¹’. The image depicts engineers or construction workers holding construction materials. The slogan ‘Zbudujemy drugą Japonię’ translates as ‘we will build another Japan’ in reference to the March 2011 nuclear accident at Fukushima. Meanwhile, the circular background blends the Japanese symbol of the rising sun with the international symbol for radioactivity. Images by 3fala pop up from time to time in different areas of the Tricity. This particular image could be seen on the ruins of Żarnowiec NPP during visits conducted to the ‘Żarnowiec’ site in both July 2012 and August 2013.

¹¹ The aim of ‘3fala’ is to convey through street art and open invitation workshops, the social, political and environmental messages which members feel are not being addressed elsewhere. In Polish, ‘3fala’ translates as ‘3rd wave’, in reference to the work conducted by the previous waves of social movements which have taken place in Poland (3fala, 2014). Though present, social opposition to nuclear development plans in Pomerania is far lower than that experienced during the peak of activity in the 1980s (see Chapter 1).



Figure 4.10 (marked 'C' in figure 4.1) *The overgrown field in front of the reactor buildings. The land on which the ruins of Żarnowiec NPP sit formed, until 1982, farmland for the farming community of Kartoszyño.*



Figure 4.11 (marked ‘D’ in figure 4.1) *A gas power plant adjacent to the ruins of Żarnowiec NPP. The facility was constructed in the 1990s but the investment fell through due to a lack of transport infrastructure and the termination of all long term contracts within the Special Economic Zone (PSSE) following EU accession (see Chapter 5).*



Figure 4.12 (marked 'D' in figure 4.1) *As above (figure 4.11).*



Figure 4.13 (marked ‘D’ in figure 4.1) *Industrial units, managed by Pomorska Specjalna Strefa Ekonomiczna*



Figure 4.14 (marked ‘F’ in figure 4.1) *Continuing around the lake on the north side, away from the ruins of Żarnowiec NPP. The buildings return to those of a typical Polish village. Between point D and point G on the map shown in figure 4.2, the landscape shows little sign of industrial activity or reference to energy infrastructure. The northern tip of the lake is instead marked only by the monastic village of Żarnowiec (E) and agricultural land (F).*



Figure 4.15 (marked 'G' in figure 4.1) *Standing on the pier at Nadole, looking north-west.*



Figure 4.16 (marked ‘G’ in figure 4.1) *Standing on the pier at Nadole, looking east across Lake Żarnowiec to the industrial buildings at Kartoszyno (D)*



Figure 4.17 (marked ‘G’ in figure 4.1) *Standing on the the pier at Nadole, looking east to Kartoszyño. This photograph together with figure 4.16 show the forested hills which limit development on the site to the east of Lake Żarnowiec. To the west behind Czymanowo, further hills and forested land leads up to the artificial reservoir of Żarnowiec Hydroelectric.*



Figure 4.18 (marked ‘H’ in figure 4.1) *Pipes leading up the hillside to the artificial reservoir of Żarnowiec Hydroelectric.*



Figure 4.19 (marked 'H' in figure 4.1) *Żarnowiec Hydroelectric, backing on to Lake Żarnowiec.*



Figure 4.20 (marked ‘H’ in figure 4.1) *Vast networked infrastructure for the transmission of electricity away from Lake Żarnowiec.*



Figure 4.21 (marked ‘H’ in figure 4.1) *As above. Figures 4.20 and 4.21 show the networked infrastructure for the transmission of electricity away from the Żarnowiec site. At the time of writing, the infrastructure serves the Żarnowiec Hydroelectric facility as well as wind farms at nearby Lisewo (K).*



Figure 4.22 (marked 'I' in figure 4.1)

The artificial reservoir for the pumped-storage Żarnowiec Hydroelectric.



Figure 4.23 (marked 'T' in figure 4.1) *The 'Kashubian Eye'; A viewing tower over Lake Żarnowiec, operated in tandem with Żarnowiec Hydroelectric (see Chapter 5 for a discussion of how the 'Kashubian Eye' and Żarnowiec Hydroelectric have come to be used as symbols in Gmina Gniewino).*



Figure 4.24 (marked ‘I’ in figure 4.1) *The ‘Kashubian Eye’ as seen from the bank of the artificial reservoir (figure 4.22).*

The aim of the series of photographs of Lake Żarnowiec shown above is to demonstrate visually the extent to which the landscape surrounding Lake Żarnowiec has been transformed by the experience of industrial development and the arrival of both nuclear and hydro power plants during the 1980s.

Following twenty years of neglect, the infrastructural remnants (or ‘material artefacts’ - see Chapter 2) of Żarnowiec NPP are beyond repair, yet their presence continues to set the landscape apart as a “place for the atom” (Interview: Energy Minister for the Pomeranian Province Marshal Office, Gdańsk, February 2012), acting as an affective reminder of the original development plans.

The financial investments made in infrastructure during the 1980s' construction of Żarnowiec NPP have largely gone to waste, but the investments which have been made in site specific knowledge and in preparing the socioeconomic landscape for development continue to shine through the layers of decay. Whilst Choczewo-Lubiatowo and Gąski (see figure 1.1) have yet to be explored in the context of the viability of developing a nuclear industry on the land (in terms of site specific environmental impact assessments and the nature and extent of opposition to development plans), the material artefacts of Żarnowiec NPP and the existing entanglement between the socioeconomic and physical landscapes surrounding Lake Żarnowiec act as a reminder that the 'Żarnowiec' site is bound with fewer uncertainties. As section 4.1.2 discussed, the widespread social opposition to nuclear development at Kartoszyń in the 1980s was a product of the social climate and frustrations of late communism in Poland, heightened by an international furore following the April 1986 nuclear accident at Chernobyl. Early indications from opinion polls indicate that even following the nuclear accident at Fukushima in March 2011, public opinions surrounding Poland's nuclear development proposals remain largely unpolarised (PSSE, 2011).

In Chapter 5, this thesis explores how the 'altered landscape' of Lake Żarnowiec continues to shape both 'scientific' and 'lay' attitudes to nuclear development in the region of Pomerania. Through meetings, interviews and in personal communications with a vast range of social actors including the local and regional authorities (see Chapter 3), I constantly came up against a narrative that the land on which Żarnowiec NPP had been constructed was 'altered', 'tainted', or somehow less desirable when compared to locations just a few kilometres away from the 'Żarnowiec' site. Research participants made reference to the infrastructural remnants of Żarnowiec NPP and their sense that the landscape had been irrevocably given over to industrial and energy related activities. Throughout the duration of my fieldwork for

this research, research participants urged me to make visits to Lake Żarnowiec in order to see in person the extent to which the landscape had been altered by energy developments in the area, and to understand their motivations to push towards further development on the existing site rather than exploration of the Choczewo-Lubiatowo or Gąski options further west along the coast. It was these conversations which motivated the inclusion of a more visual methodology in order to explain the source of different notions of landscape identity and attitudes towards energy developments around the lake.

In addition to the affective agency of the conceptual and material artefacts of Żarnowiec NPP, the infrastructure for Żarnowiec Hydroelectric is still in operation, together with the networked infrastructure for the transmission of electricity away from the lake. As the following chapters explore, the presence of these functional artefacts has led to yet further pressures and desires to see a nuclear industry realised on the land surrounding Lake Żarnowiec. Section 4.4 now turns to address how the presence of zoning policies and infrastructural planning legislations adds to these development pressures.

4.4 Strefa: Zones and zoning

A discussion of the entanglement of the hyper-local area surrounding Lake Żarnowiec with large scale energy infrastructure is incomplete without a discussion of the policies and planning processes which, since the collapse of communism and beginning of economic restructuring activities in the early 1990s, have further entrenched the ‘entangled trajectory’ of the former development site.

Following the collapse of communism and project abandonment at Żarnowiec in September 1990, the new Polish administration, recognising the significance and potential of the landscape changes and investments which had taken place in the region with the construction

of a nuclear complex, facilitated the creation of a Special Economic Zone (Specjalna Strefa Ekonomiczna) at Żarnowiec (PSSE: Public Consultation of Research Results, Gdańsk, October 2011). The zone was established in 1997 for a period of twenty years with an aim to rejuvenate the economy, provide employment and take advantage of the existing infrastructure woven through the landscape as a result of the historical pursuit of nuclear development beside Lake Żarnowiec.

In 2001, the SEE at Żarnowiec was restructured, becoming a subzone of what is today the Pomeranian Special Economic Zone (PSSE). Figure 4.25 is a map, produced by PSSE, to indicate the location of the industrial units available for small and medium sized enterprises. The site covers areas 'B', 'C' and 'D' as shown in figure 4.1.

Following the restructure, PSSE takes in much of the Tricity region. The aim of PSSE is to facilitate investment in the old industrial hubs of Pomerania, with a particular emphasis on science and technology, electronics and energy systems (Gdańsk Science and Technology Park, 2010; PSSE: Public Consultation of Research Results, Gdańsk, October 2011).

Special Economic Zones, geographically defined areas established to encourage development by offering financial incentives to prospective business owners are not unique to Poland. Rather, they exist throughout the world as a means to facilitate industrial development and economic activity in areas which would otherwise struggle to prosper, for example in the Philippines (Makabenta, 2002), China (Litwack & Qian, 1998), and India (Levien, 2012). In Poland, there are currently fourteen special economic zones. The programme began in the 1990s in the immediate aftermath of the collapse of communism to facilitate market development and a smoother transition to a market based economy for regions of the country which were the product of communist economic structures and activities.



Figure 4.25 *A map of the industrial units of the former Żarnowiec NPP site, managed by PSSE 'Subzone Żarnowiec' (PSSE, 2014).*

Under Polish law, Special Economic Zones are defined as:

‘Separate and not inhabited part[s] of the Polish territory, where firms, after obtaining a licence (permission), can settle their business, and after fulfilling the criteria mentioned in the Act, receive full or part income tax exemptions’ (Smętkowski, 2002 p.2).

Smętkowski also notes that the aim of special economic zones is to facilitate economic development in a region through the achievement of one or more of seven targets.

‘The purpose of the establishment of a special economic zone is to accelerate economic development in a part of the country... particularly by the realisation of one

of the following: development of a certain field of economic activity; development of new technological solutions and their use in national economy; development of export; increasing competitiveness of production and services; making use of already existing industrial and economic infrastructure; creating new jobs; making use of natural resources with respect to natural environment' Smętkowski, 2002 p.2).

For PSSE, three of these features apply. PSSE and specifically 'Subzone Żarnowiec' aim to increase the uptake of industrial activities relating to the production of agrochemical and energy businesses (Pomeranian Province Martial Office: Gdańsk, February 2012). In addition, the zone at Żarnowiec was created because of the pre-existence of industrial infrastructure, and its focus on energy is an obvious choice due to the topography of the landscape for wind, small reserves of natural gas and the existing hydro power plant on the lake (Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

PSSE operates by granting public aid to enterprises who seek to create jobs within the zone, under the condition that they plan to invest in excess of EUR 100,000 over a period of 3 or 5 years (PSSE, 2013). The ability of PSSE to arrange longer contracts, however, is limited by planning restrictions regarding the land on which PSSE 'Subzone Żarnowiec' is located.

Since 2005 when the Ministry of the Economy reopened debate surrounding the development of a nuclear industry in Pomerania, planning regulations have been in place to reserve the land on which Żarnowiec NPP sits. In response to questions relating to why PSSE was pushing for a decision to be made relating to the future of nuclear development on the Żarnowiec site, a representative from the Pomeranian branch of the Ministry for Infrastructure explained:

'So the land is blocked, there is no competition [from other developments]... Nobody knows if there will be investment in nuclear power, and there are three possible

locations, and so the investors [PGE] do not want to purchase the land or own the land at this stage, but they want to have free access and be sure that nothing else will be constructed there. As a result of [the special regulations on nuclear development due to its status as an area of national priority], the investor is allowed to go to [any of the three] locations and [take time] to make a decision about which site [to pursue development on]... If the decision is made that there will be nothing built, then the local administration will have the opportunity to make a decision about the [Żarnowiec] plot' (Interview: Department of Infrastructure, Pomeranian Voivodeship Office, Gdańsk, February 2012).

Energy, together with other areas of investment including transport and telecommunications is deemed an area of national importance and priority, and as such is regulated through an altered planning framework which prevents long term development on speculative development sites until a decision regarding the key investment has been made. In addition, the unique planning framework for energy has been designed to speed up the planning and applications process. Though prospective investors still need to go through the normal planning process with regards to permissions, permits and public consultation periods, the time frames for priority investments, including nuclear, are greatly reduced from 65 days for regular developments to 30 days for priority investments. Furthermore, should the process overrun, the regional office for the Department of Infrastructure is subject to a penalty of 500PLN (approximately £100 at the time of writing) per day (Interview: Department of Infrastructure, Pomeranian Voivodeship Office, Gdańsk, February 2012).

As such, until a final decision has been taken on the precise location within Pomerania of a future nuclear power plant, the land on which the former Żarnowiec NPP was built cannot be

released for development (Wydział Infrastruktury, 2011¹²; PSSE: Public Consultation of Research Results, Gdańsk, October 2011; Interview: Department of Infrastructure, Pomeranian Voivodeship Office, Gdańsk, February 2012). Due to the uncertain future of nuclear development in Poland and the continued delays which have caused setbacks at multiple stages of the decision making process, PSSE is limited to issuing construction permits on a short term basis to prospective companies (Interview: Mayor of Gmina Krokowa, Krokowa, February 2012). As such, it is in the interests of PSSE, Gmina Gniewino and Gmina Krokowa to see a decision made on the location of a future nuclear facility as soon as possible, as until then, the site remains in a state of uncertainty, negatively impacting on the possibilities offered for economic development in the local communities.

4.5 Conclusions

This chapter has addressed the origins of ‘entanglement’ between the hyper-local area surrounding Lake Żarnowiec and a trajectory towards nuclear development. In this chapter I have presented a discussion of the physical and material landscape changes which took place in and around the villages of Kartoszyno, Gniewino and Żarnowiec and explored the investments in both infrastructure and site specific knowledge which have been ‘sunk into and inside of’ (Star, 1999 p.381) the physical and socioeconomic landscapes of the hyper-local area surrounding Lake Żarnowiec.

This chapter has, through discussions with the local authorities and planning bodies but also through a series of photographs, explored how communist investment in energy infrastructure beside Lake Żarnowiec has irrevocably transformed the villages surrounding the lake from largely self-sufficient agricultural units steeped in Kashubian history and local practices, to an

¹² Polish language legal regulations and requirements about ‘the Preparation and Implementation of Investment in Nuclear Power Facilities and Associated Investments’, documents received from the Department of Infrastructure, February 2012

industrial energy ‘zone’, subject to the intricacies of national politics and foreign direct investment.

The aim of this chapter has been to demonstrate how preferential development pathways and futures are sculpted by radical landscape change and investment in a very specific and inflexible technology. In line with Walker’s (1999, 2000) analysis of the UK’s ‘entrapment’ with a programme for nuclear fuel reprocessing and the production of plutonium at THORP, discussions with local authorities and planning bodies in the region of Pomerania have indicated how early, inflexible policies and an all-encompassing pursuit of a development path under communism has presented significant challenges to the local municipalities when attempting to restructure and move forward following an abrupt change in policy and end to investment. These are themes which are further explored in the following chapter.

Conceptually, the chapter utilises the assemblage framework which underpins this thesis (see Chapter 2) by examining the period of flux which characterised the first stage of the process of nuclear development in the region. It explores the means through which a range of disparate ‘elements’ came together: the social elements and context within which nuclear was pursued by the central government of the People’s Republic of Poland, as well as the social pressures which ultimately led to project abandonment; the ‘material elements’ of infrastructure, and changes to the physical landscape; and the ‘conceptual’ elements of altered notions of landscape identity, investment in ‘site specific knowledge’, and the perception that, following such intense development, the landscape is now flawed, damaged or altered.

Following the Polish energy white paper of 2005 which once again linked Poland’s energy future to the enthusiastic embrace of nuclear power (Ministerstwo Gospodarki i Pracy, 2005), the perception of an ‘altered landscape’ on and around Lake Żarnowiec has re-emerged, and

as the following empirical chapters will demonstrate, continues to shape narratives on and the trajectory of nuclear development within the wider region of Pomerania. Many of the material and conceptual artefacts and legacies born of this period appear to have survived project abandonment and continue to act in confusing and oftentimes unpredictable ways in the present day.

As such in Chapter 5 this thesis further unpacks the relevance of communist nuclear development legacies to contemporary discussions surrounding Poland's nascent nuclear industry in the municipalities of Gniewino and Krokowa which flank Lake Żarnowiec. The chapter examines how the municipalities have adjusted following project abandonment and the extent to which both Gmina still feel bound to energy infrastructure and securing further investment in the sector. The chapter demonstrates how material and knowledge based artefacts emerging from the period of communist nuclear development and entangled together through the medium of the landscape surrounding Lake Żarnowiec continue to shape narratives on nuclear development at municipality level.

5.0 From Historical Entanglement to Contemporary Narratives

The aim of Chapter 4 was to demonstrate the extent to which the hyper-local area surrounding the southern tip of Lake Żarnowiec has been transformed by investment in large scale energy infrastructure. The chapter examined how over the course of twenty years the physical landscape and villages surrounding the lake were transformed from a series of small, tight knit farming and fishing communities steeped in Kashubian practices and cultural heritage to an industrial energy ‘zone’. The discussion emphasised the investments which had been made in site specific knowledge as well as within the infrastructure of the two power plants, and demonstrated through both aural narratives and a series of photographs how the area has come to be entangled within a trajectory of nuclear development.

Whilst the focus of Chapter 4 was historical, examining pathway creation and the formation of socio-material entanglements, this chapter turns to address the continued relevance of the artefacts and their agency within the process of nuclear assemblage which is taking place within Pomerania. It examines how the municipalities of Gniewino and Krokowa have adapted to the uncertainty which surrounds nuclear development in the area, and the extent to which their adaptive measures have led to a deeper state of entanglement and path dependency. In this chapter I explore how Gmina Krokowa feels limited by the presence of the infrastructure and planning regulations which surround it, and how this sense of limitation and inevitability of nuclear development in the region of Pomerania has led the municipality to push forward in favour of future development on the ‘Żarnowiec’ site at Kartoszyń. The chapter also examines how Gmina Gniewino has tackled the uncertainty which surrounds future nuclear development around Lake Żarnowiec, and the measures which are being taken to create a local educational-tourism industry which complements and benefits from rather than conflicts with investment interests and local entanglements with energy.

The aim of this chapter is therefore to demonstrate the continued relevance of socio-material entanglements with energy infrastructure in Krokowa and Gniewino, the agency of the conceptual and material artefacts and their role in the wider process of assembling a trajectory towards nuclear development in Pomerania.

5.1 The agency of material artefacts

By the time September 1990 came around and construction work on Żarnowiec NPP was officially terminated, it is estimated that approximately \$2billion had been invested in the project (Presentation & interview: Pomeranian Province Marshal Office, Gdańsk, February 2012). In effect, a nuclear ‘zone’ had been created on previously agricultural land, yet with the collapse of communism, the space had become largely redundant. Through an extended period of flux during which time a body of disparate elements came together, the technological paradigm of soviet era nuclear development had given way to socioeconomic landscape changes and embedded assumptions about how the land could and should be used. The rudimentary elements of a nuclear industry had been assembled, yet at this point in time, its future remained uncertain.



Figure 5.1 The railway station at Żarnowiec is long gone, but the substation and transmission network still hums with activity. (Photograph by author, July 2012)

As Chapter 4 has shown, a significant proportion of the investment in both infrastructure and site specific knowledge had been sunk ‘into and inside of’ (Star, 1999, p.381) the landscape surrounding Lake Żarnowiec. To this day, large mounds of pre-formed concrete and steel remain dotted around the site as visual reminders of the aggressive pursuit of nuclear power by the central government of the People’s Republic of Poland. As I have shown through the use of a photographic documentary of Lake Żarnowiec in the previous chapter, a visit to the area demonstrates just how close Poland came to embracing the atom, yet the persistence and agency of these material artefacts is less visually apparent.

Even more rapid than the construction and installation of these infrastructural elements was their demise. In the immediate aftermath of project abandonment, large parts of the raw

materials of Żarnowiec NPP and its supporting buildings were torn up, stolen and sold for scrap metals (Interview: Energy Minister for the Pomeranian Province Marshal Office, Gdańsk, February 2012). To the casual observer of the remnants of Żarnowiec, there is little to see. It is a concrete wasteland. Each spring, the Żarnowiec¹³ flowers, after which the lake and village are named, grow up through cracks in the preformed concrete, highlighting the advanced stage of decay the site has been left to fall into.

The reactor buildings, in 1989 just months away from becoming operational, have long since flooded as the pumps keeping the lake waters out were first turned off and later stolen. The hotel and support facilities built to accommodate site workers have crumbled and, following a brief rebirth as a local UrbEx hotspot¹⁴, been demolished due to safety concerns. The railway station once bursting with workers from the Tricity and bringing raw materials to the site, together with the single gauge railway tracks themselves are barely traceable except for the faint hint of sleepers glinting up between weeds in the quiet country roads which link the local villages to the industrial zone (see figure 5.1).

Yet certain aspects of the infrastructural investment in the area remain. Standing on the land adjacent to what was the railway station the deafening buzz of electricity can be heard overhead. A substation and network of transmission towers and cables flow out across the

¹³ Żarnowiec – in English, the shrub is called the ‘common broom’, a hardy shrub with yellow flowers which often grows in coastal areas and on heathland.

¹⁴ UrbEx (Urban Exploration) is the activity of locating abandoned or decaying buildings and infrastructure, or accessing aspects of the built environment which are perceived to be off limits or undesirable, and documenting them through videography and photography. Activities extend to but are not limited to industrial and military ruins, construction sites, culverts and drains, the top of skyscrapers and abandoned psychiatric facilities. For further details, visit 28dayslater.co.uk, a popular UK based forum for UrbEx.

Żarnowiec and Nadole are popular amongst the Gdańsk based UrbEx community due to loose security and the rich history of the site. There are many examples of videos and photographic documentation of the ruins of Żarnowiec. ‘Ruiny Hotelu Nadole (2009)’, ‘Opozczony Hotel Nadole 2010 (2011)’ and the HDR portfolio ‘Hotel Nadole’ (2008) by flickr user 5y12u3k are just a few examples to detail Hotel Nadole, which has since the spring of 2011 been completely demolished.

lake and south to Wejherowo (see figure 5.1). Though Żarnowiec NPP never came to be fully realised, the twinned facility of Żarnowiec Hydroelectric was completed in 1983 and is still in operation today (Site visit: Żarnowiec Hydroelectric, Czymanowo, June 2011, July 2012). Even more recently it has been joined by wind farms on the hills stretching out from Gniewino to Lisewo.

The transmission networks which serve these facilities link the quiet villages of Żarnowiec, Nadole and Czymanowo and the town of Gniewino (see figure 4.1) to the larger cities further afield and, despite the lack of nuclear power on the site, the local area remains a firm energy ‘zone’. It is to these material artefacts and the continued relevance of the entangled legacies of 1980s nuclear development around Lake Żarnowiec that section 5.1 now turns.

5.1.1 Uncertain futures and the ‘sedimented sociality’ of energy infrastructure

Following the collapse of communism in Poland in 1989 and the abandonment of Żarnowiec NPP in 1990, the exodus of construction workers and their families away from Gniewino in search of work elsewhere left a significant void in the local socio-economic landscape. In addition, the presence and operation of Żarnowiec Hydroelectric itself began to pose more of a problem than an opportunity. As discussions with the Commune Administrator for Gmina Gniewino, presented in section 4.2 illustrate, the process of nuclear development around Lake Żarnowiec during the 1980s had deeply altered the socioeconomic, cultural and material landscapes, shifting the economy from its agricultural past to an industrial future. However, the post-communist transformation period brought new challenges for the gmina. The municipalities had come to depend on energy as a source of income and prosperity, yet it remained uncertain how these dependencies could be sustained in the context of post-communism.

Despite the successful completion of Żarnowiec Hydroelectric, the facility loomed over the hills of Gniewino as a symbol of lost promise and incomplete investment (see section 4.2). The infrastructure of Żarnowiec Hydroelectric came to be symbolic for Gniewino, as a material artefact entangled with the socioeconomic climate in which it had been constructed and physically embedded in the land of the former villages of Czymanowo and Nadole. The infrastructure of Żarnowiec Hydroelectric stood as a stark reminder of the altered landscapes of the villages, together with the ideas, hopes and dreams of a generation of planners, engineers and politicians.

Investment in large scale energy infrastructure is perceived by both Gmina Gniewino and Gmina Krokowa to be a glowing promise which has been withheld. The failure to successfully develop a nuclear industry on the ‘Żarnowiec’ site despite the preparation and transformation of the land in anticipation of Żarnowiec NPP has led the municipalities to separately voice their frustrations with the process. In many ways, both municipalities felt bound to a continuously uncertain future with energy.

During a meeting with the Mayor of Gmina Krokowa in February 2012, he highlighted the various energy investments to have featured in discussions for the region since the 1970s, and how each time the investment has fallen through:

“First it was to be a nuclear power plant, and this influenced the development of the region [through the successful completion of the pumped storage facility]. Then we thought we would have investment in gas¹⁵, but the gas development plans were also abandoned. Now we are told to expect nuclear again. And maybe we wait for shale¹⁶.”

¹⁵ In the late 1990s there were plans to construct a gas power plant on land adjacent to Żarnowiec NPP, but investment was delayed and later cancelled due to the removal of the railway which linked Lake Żarnowiec to Wejherowo and the Tricity (Interview; Mayor of Gmina Krokowa, Krokowa, February 2012).

“The municipality [Gmina Krokowa] has been waiting for a decision to invest for years now... together with the residents we want to know what the final investment decision shall be. We want to know where we stand... delaying a decision is harmful [to Gmina Krokowa and the local economy] as the activities of the Special Economic Zone are limited [until a decision is made]. Part of the area [of PSSE] is allocated for possible nuclear development” (Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

In the opinion of the Mayor of Gmina Krokowa, the uncertainty surrounding the location of Poland’s first nuclear power plant within Pomerania is frustrating, as he believes it is an obvious choice:

“The best location [to site a nuclear power plant in Pomerania] is [the] Żarnowiec [site]. It has been transformed, and it makes no sense to destroy the pristine Lubiatowo. [We are sure that] PGE agrees about this, but we (Gmina Krokowa) must wait for a decision.”

The reason for Gmina Krokowa’s frustrations lies within the planning and decision making structures which surround future nuclear development. Nuclear power holds the status of an area of national importance and priority (see Chapter 4 for a discussion of the planning regulations which surround nuclear development). As such, the decision to construct a nuclear power plant in Poland is taken at the level of national government. In contrast to infrastructural investments and developments of standard status, the decision making processes surrounding areas of national importance overrides the normal roles granted to both

¹⁶ In addition to nuclear development, there are also plans for the exploitation of shale gas reserves in northern Poland, though uncertainties remain about the viability of shale gas exploration in the area (Community Meeting: Energy and Self Governance Platform, Gdańsk, October 2011).

regional and local government units (Interview: Department of Infrastructure, Pomeranian Voivodeship Office, Gdańsk, February 2012). Until the Ministry of the Economy together with energy company PGE has secured investment, arranged a consortium of partners for the construction of a facility and selected one of the three sites for development, neither the municipalities of Krokowa and Gniewino at the local level of government nor the Pomerania Voivodeship at the regional level can engage in the decision making process.

During an interview with Gmina Gniewino, the Commune Administrator with whom I was speaking voiced the municipalities' frustrations with the uncertainty surrounding the siting of a future nuclear facility together with the decision making processes which surround areas of national importance:

“The thing is that the land on which the nuclear power plant would be constructed is not owned by [the municipalities of Gmina Gniewino or Gmina Krokowa]. It is owned by PGE and even if it was owned by us, you know, no one would care about it. If a decision was made [to use the ‘Żarnowiec’ site for future nuclear development], they [PGE and consortium partners] would just take the land from us and of course pay something but there would be no space for discussion and no place for us saying that we agree or don’t agree [with the development plans]. So in fact, we have no power to decide on the investment, we just wait for a decision to be made. And of course we try to encourage it [but] lobbying between the various locations is on the regional level...” (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011).

In order to overcome the uncertainties which accompany the structure of the planning process and push for a decision in favour of siting a nuclear power plant on the ‘Żarnowiec’ site, in

2009 Gmina Krokowa began discussions with the neighbouring municipalities (Gniewino in which Żarnowiec Hydroelectric is situated, and Choczewo, in which the second option nuclear development site of Lubiadowo lies; see the maps in figures 1.1 & 1.2) to create a coalition of support for the ‘Żarnowiec’ site. The Mayor of Gmina Krokowa explained that the aim of cooperation between the municipalities is to share local knowledge with PGE and try to influence the decision on where to site the first nuclear power plant. Under Polish atomic law, there is no financial incentive for competition between the municipalities with regards to a siting decision, as 50% of tax revenues arising from the operation of nuclear facilities would be shared with neighbouring municipalities (Atomic Law Act, 2007; Interview: Mayor of Gmina Krokowa, Krokowa, February 2012). As such, the municipalities remain concerned with ensuring that, should nuclear development plans in Pomerania progress, the development impacts on the communities in the least harmful way. Gmina Krokowa’s reasoning for pushing for the ‘Żarnowiec’ site over the alternative sites of Choczewo-Lubiadowo and Gąski centres on the presence of existing infrastructure at Żarnowiec, and a perception that the landscape has already been altered to accommodate energy infrastructure. Speaking of the alternative development sites, The Mayor explained:

“[If the development is sited at Lubiadowo] then the coastal landscape will be degraded, but not at Żarnowiec... It is already degraded there. [Also], Żarnowiec already has transport infrastructure and [electricity transmission] network. At Lubiadowo, it must be built...” (Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

Gmina Krokowa feel that a delayed decision on using the land on which Żarnowiec NPP sits to construct a new facility has been harmful to the community, as the land has already been altered to accommodate industry and energy infrastructure, but no long term contracts for

alternative businesses can be drawn up until PSSE has been given permission to release the land. Discussions with the Mayor of Gmina Krokowa highlight the extent to which the material artefacts and entangled development legacies continue to influence narratives on future development paths around Lake Żarnowiec. As a result of the layers of ‘sedimented sociality’ (Jordan, 2012 p.15) – past social and political activities - embedded within the physical landscape of Lake Żarnowiec and material artefacts of the original Żarnowiec NPP, Gmina Krokowa feels bound to what remains an uncertain development trajectory. This situation has been further compounded by the shape of the planning structures which surround areas of national importance (see Chapter 4).

Furthermore, the desire of Gmina Krokowa and Gmina Gniewino to push forward in favour of nuclear development at the ‘Żarnowiec’ site results from a perception of the inevitability of nuclear development in Pomerania, and a sense that the municipalities have no control over what is ultimately a decision taken at the national level by the Ministry of the Economy and PGE on whether or not to pursue nuclear development and, if so, where. The local municipalities have therefore taken the decision to form a unified front, presenting the already transformed land of the ‘Żarnowiec’ site as their preferred development site so as to reduce further industrial development which may negatively impact on the character of the region and the interests of the tourism industry. It is through cooperation at a local level that they hope they may be able to shape a decision with regards to the siting of a facility.

The uncertain future of existing infrastructure and the energy ‘zone’ surrounding Lake Żarnowiec is also felt across the water from Krokowa in Gmina Gniewino (see figure 1.2). Following the collapse of communism and construction work on Żarnowiec NPP, by 1990 Żarnowiec Hydroelectric offered little financial benefit to the community. Faced with an existing body of infrastructure but no further investment, and an economy which had to a

large extent been paused through the 1980s in anticipation of forthcoming investments (see section 4.2 in the previous chapter), Gmina Gniewino found themselves to be in a challenging situation, and one which would ultimately push them further down an energy development trajectory:

In a meeting in July 2011, the Commune Administrator for Gmina Gniewino placed great emphasis on the void left following project abandonment and post-communist economic restructuring:

“The collapse [of the system] was a complete disaster for us, because everything was steered from the outside... [National funds] were closed and the investment of the power plant was stopped. There was no work here, no future.”

“After the collapse of the communist system there was a period of stagnation. No money, no investment, and the problem was that Gmina [Gniewino] didn’t earn a lot of money on the hydro power plant, because the power plant paid very small taxes. [Taxes] were counted on the value of the land, but not the value of the infrastructure, so there was very little money.” (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011)

The period of time in the immediate aftermath of project abandonment saw both Gmina Krokowa and Gmina Gniewino struggle financially. As Chapter 4 discussed, investment in general infrastructure and the community during the 1980s had rested entirely in the hands of central government, and was intricately bound up with plans for an energy zone comprising Żarnowiec NPP and Żarnowiec Hydroelectric. Yet in 1990, only the hydroelectric plant was in operation and hopes for the construction of a nuclear power plant had been abandoned. Furthermore, the hydroelectric plant at Czymanowo is a load balancer, designed to work in

tandem with another power plant or a grid system, rather than in isolation. The continued operation and success of Żarnowiec Hydroelectric was therefore dependent on significant restructuring (Site visit: Żarnowiec Hydroelectric, Czymanowo, June 2011, July 2012; Interview: Commune Administrator for Gmina Gniewino, July 2011).

However, the most pressing challenge for Gmina Gniewino was that the manner in which taxes were gathered from state owned investments and infrastructure did not benefit the local community. Other than investments relating to the construction of the two facilities, the communities had received little additional funding and had come to depend on the presence of energy infrastructure for economic survival (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011; Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

Following the collapse of communism, ownership of many of the country's infrastructural assets remained the property of the state. For energy infrastructure, this meant that State Owned Enterprise (SOE) Polska Grupa Energetyka (PGE) would take charge of Żarnowiec Hydroelectric. At first, both Gmina Gniewino and Gmina Krokowa received revenue based on the value of the land beneath the infrastructure, but not the value of the facilities themselves. This became increasingly problematic as the local municipalities struggled to support the communities under the new economic climate of post-communist Poland. In order for Gniewino, the municipality in which the bulk of the operational infrastructure lies to adapt successfully, the municipality required financial recognition and compensation from PGE for the operation of Żarnowiec Hydroelectric.

Together with Gmina Krokowa, Gmina Gniewino lobbied national government for a change in the legal framework which would see taxes counted on the value of existing infrastructure,

rather than the value of the land. The eventual success of this campaign marked a significant victory, changing development trajectories significantly, and leading to further entrenchment of energy infrastructure in the socioeconomic fabric of the local area.

“When the inflow of money started, we [Gmina Gniewino] started our own investments... investments in sports infrastructure and education infrastructure. This was a big change. But another was investment in the energy infrastructure too. When the investments came, there were no protests, no protests [at all]. Some money [from the revenue provided by taxes from the Hydro plant] was spent on ecological sources of energy like wind, biomass and a heating system. Biomass [for this plant] is sourced from plantations of willow and it is grown locally” (Interview: Commune Administrator for Gmina Gniewino, July 2011).

Since the tax system was restructured to consider the value of infrastructure rather than just the value of the land, both Gmina Gniewino and Gmina Krokowa have ploughed revenues from Żarnowiec Hydroelectric back into the community in the form of further infrastructural investments. These investments are focused on tourism, energy and, together with PGE, the provision of education about energy and the environment (see section 5.2).

At the time of my interview in Gniewino in July 2011, preparations were well underway for the Euro 2012 football tournament jointly hosted by Poland and Ukraine. In reference to the investments in sporting infrastructure, the Commune Administrator spoke of a brand new training ground, stadium, spa and hotel complex on the land just outside of the town of Gniewino. The complex ‘Hotel Mistral Sport’ was purpose built as a ‘Team Base Camp’ for the Euro 2012 games. Together with Żarnowiec NPP and Żarnowiec Hydroelectric, it is a significant investment for the region in terms of scale and its transformative capacity. My

interviewee was keen to emphasise the significance and potential presented through the municipality's investment in the four star hotel and training facility. Even before conversation could turn to the subject of energy investments, he was keen to discuss 'Team Base Camp', offering me copies of promotional brochures, badges, stickers, and extending an invitation to watch a short film and presentation on the brand new facility. The training complex was designed to benefit the local tourism industry in northern Kashubia. Though the final details of where each international team would stay during the tournament were undecided at the time of our meeting, Gmina Gniewino were hopeful that the Spanish team would spend time at the grounds, helping to boost the region's image. However, our discussions uncovered a deeper motivational force behind the investment. Both municipalities hope that additional investment in regional tourism will help mitigate any losses following the potential development of a nuclear power plant in the area, and offset any concerns which may be held by the local community through the provision of unrivalled facilities (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011; Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

Furthermore, at the time of our meeting Gmina Gniewino hoped that the investment in the hotel and infrastructure of Hotel Mistral Sport might offer further incentive to PGE to develop on the site of Żarnowiec NPP. Part of the sporting investment has seen the transport infrastructure leading in to Lake Żarnowiec rejuvenated. Progress on road improvements was noticeable given the staggered nature of fieldwork visits to the region between February 2011 and July 2012, and a follow up visit in August 2013. Surrounding the top reservoir of Żarnowiec Hydroelectric out to Lisewo via Gniewino (between 'I' and 'J' in figure 4.1) is a brand new stretch of road, making access for large vehicles much easier than it is on the older roads which surround the lake and nearby villages. In July 2012, road investments stretched

even further and appeared to be taking place along the main road route 218 from Gdańsk to Wejherowo and north to Lake Żarnowiec (Site visits to the area, February 2011 – August 2013). Gmina Gniewino recognises the importance of such investment in transport infrastructure connecting Lake Żarnowiec and the villages which surround it to Wejherowo and the Tricity region. During the 1990s, efforts to operate a gas power plant at Kartoszyń fell through, due to the removal of the railway connection which had linked Lake Żarnowiec to the metropolitan SKM line in the nearby town of Wejherowo. Given the state of the roads in many rural areas due to a chronic lack of investment, the presence of good connections is seen as another indicator of ‘readiness’ for significant investment, and is designed to sway opinions for foreign investors making site visits (Gmina Gniewino, 2013).

5.2 Energy, Infrastructure & Community Identity

Section 5.1 explored the continued relevance to the local communities of Gmina Krokowa and Gmina Gniewino of the entanglements arising from the construction of Żarnowiec NPP during the 1980s, together with the material agency of the infrastructure itself. To a large extent, both Gmina feel bound to or limited by a trajectory towards investment in energy as a result of historical socio-material entanglements and the decision making processes which surround contemporary nuclear development in Poland. During the 1980s, investment in energy infrastructure and the promise of a nuclear industry created a dependency on a single, specialised development path. This dependency has been experienced in different ways by the two municipalities, as the abandoned infrastructure of Żarnowiec NPP lies within the administrative boundaries of Gmina Krokowa whilst the functional Żarnowiec Hydroelectric plant is at Czymanowo in Gmina Gniewino.

However, since project abandonment of Żarnowiec NPP in September 1990, both municipalities have experienced high levels of uncertainty during attempts to restructure their economies. Until a decision is made on the future of the land on which Żarnowiec NPP sits, Gmina Krokowa feel that the community cannot move forward. The presence of large scale energy infrastructure, the layers of ‘sedimented sociality’ (Jordan, 2012 p.15) embedded within it, and the uncertainties which surround the future of the ‘Żarnowiec’ site limit investment in alternative development paths and industries. As time has elapsed, Gmina Krokowa has become increasingly frustrated by the lack of a decision on investment in nuclear, and has entered into discussions with the neighbouring Gmina of Gniewino and Choczewo to push forward on promoting the ‘Żarnowiec’ site to both regional government and PGE as the ‘logical’ place to site a nuclear power plant in the region.

Whilst Gmina Gniewino does not face the uncertainties of Gmina Krokowa with regards to securing investment on reserved land, the municipality has experienced significant challenges during the process of social and economic transformation. However in recent years Żarnowiec Hydroelectric has become the municipality’s main source of income. With few other options for investment, Gmina Gniewino has taken to using the presence of existing energy infrastructure to further support the community, placing revenues from the plant into further energy related investments with the aim of fostering an image of Gniewino as an energy ‘zone’ around which further investments in tourism, education and energy may be situated.

At first limited by the presence of the material artefacts of the investments which had taken place on and around Lake Żarnowiec under communism, Gmina Gniewino has begun to use the presence of existing energy infrastructure to their advantage in order to secure further investments in both tourism and energy interests. Gmina Gniewino hopes that by incorporating the ‘energy theme’ into local tourist attractions that they can overcome some of

the uncertainty which surrounds future nuclear development in the area. As the following discussion shows, this objective has been achieved through marketing activities which seek to demonstrate how tourism and large scale energy infrastructure can mutually benefit each other and peacefully coexist.

This interplay between the municipalities of Gmina Gniewino and Gmina Krokowa illustrates the extent to which social and material elements can be seen to co-shape development trajectories; historic layers of social and political activity are ‘sunk inside of’ (Star, 1999) the material artefacts which both limit and motivate further social and political activities.

5.2.1 Imagery, identity and tourism

The imagery of Żarnowiec Hydroelectric and the ruins of Żarnowiec NPP are never far from the surface of visual representations of the region, and this is most clearly seen through promotional materials used by Gmina Gniewino to secure investment in the municipality. Alongside the regional flag which accompanies official documentation, Gmina Gniewino has taken to using an additional emblem (see figures 5.2 - 5.4).

The emblem depicts the municipality’s key attractions; the ‘Kashubian Eye’ educational-tourism park, the stadium and training ground built as a ‘Team Base Camp’ for the Euro 2012 football tournament and a large setting sun, representing the location of Gmina Gniewino within Kashubia, just a few kilometres from the golden sands of the Baltic coastline. Together with the slogan ‘Gniewino – a good place’ (*Gniewino – Dobre Miejsce*), the emblem is designed to encourage further investment in the municipality.



Figure 5.2 Gniewino's Emblem (Personal communications with a representative from Gmina Gniewino, July 2011)

Gmina Gniewino's choice of emblem is eye-catching and hopeful, visually illuminating and reinforcing the municipal authorities' vision of the area's identity. This is an identity which is co-shaped by development pressures from tourism and energy, a challenging duo given the controversies and hesitations which surround the use of nuclear technologies.

Yet Gmina Gniewino's efforts to self-brand as a prime location for foreign investment pivot around the presence of existing energy infrastructure, and the municipality has begun to incorporate images of the area's existing infrastructural assets into marketing materials. The viewing tower or 'Kashubian Eye' next to the upper reservoir of Żarnowiec Hydroelectric is particularly symbolic as a point of educational tourism, with a strong focus on the history and operation of energy infrastructure on and around Lake Żarnowiec. The emblem appears in full or as an outline on printed letters (see figure 5.3), and on promotional materials targeted to both potential investors and tourists (see figure 5.4; Gmina Gniewino, 2013).

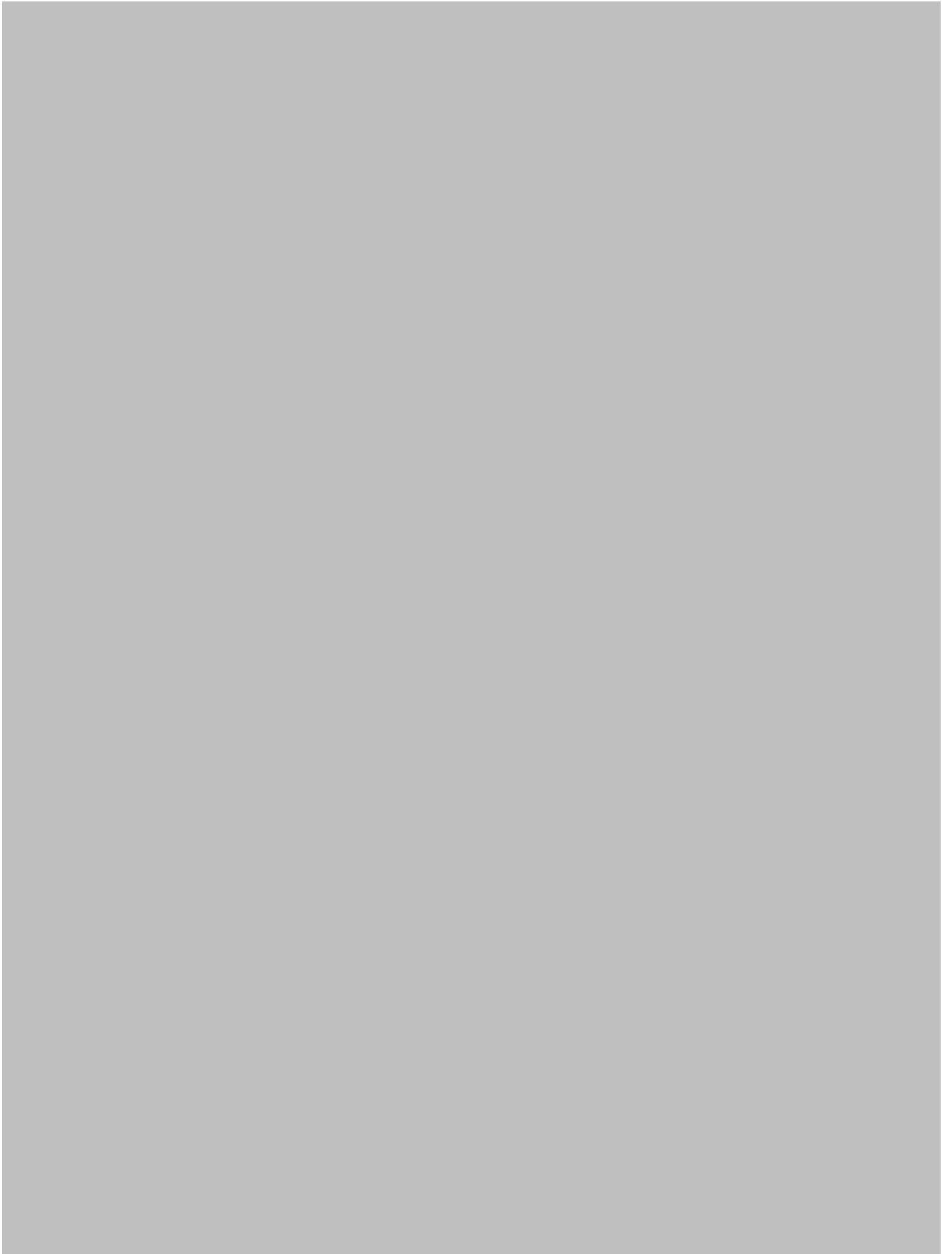


Figure 5.3 Gniewino's emblem (as in figure 5.2) in use on a letter of invitation from the Mayor of Gniewino to conference participants prior to a conference organised by the Gmina in November 2009. The symbol of the 'Kashubian Eye' is also in use as a water mark behind the text of the letter. (Letter and conference materials received via personal correspondence with the Commune Administrator for Gmina Gniewino, July 2011).

Translation of figure 5.3:

"Dear Ladies and Gentlemen!

I have the pleasure of inviting you to participate in a conference on the location of nuclear power plants within various localities within the European Union, the relationship between local governments and the EU, and possibilities for cooperation.

The conference shall take place in Gniewino on the 25th – 26th November, 2009. This time has been confirmed with Hanna Trojanowska, the government minister for nuclear energy, Roman Zaboriowski, Governor for Pomerania, Jan Kozłowski, the Marshal of Pomerania and Director of the Gdańsk Science and Technology Park. The conference will bring together foreign guests – local governments who have nuclear power plants sited within their municipalities, and on the Polish side – The local government municipalities of Lębork, Wejherowo and Puck, as this is the area indicated as a potential location for future nuclear investment. Guests to the conference will represent similar areas to ours in terms of coastal locations, and in other geographical terms.

Nearer the time you will receive additional materials including a detailed programme of the conference. I strongly encourage you to confirm your participation in this event.

With regards,

The Mayor of Gmina Gniewino"



Figure 5.4 Gniewino's emblem on flags in Nadole (marked 'G' in figure 4.1) (Photograph by author, August 2013)

The ‘Kashubian Eye’ (see figures 4.23 & 4.24 in the previous chapter) is the central focus point of an educational tourism park beside the upper reservoir of Żarnowiec Hydroelectric. As Gmina Gniewino’s Commune Administrator explained during our discussions, the park has been designed as somewhere where families can go to learn about energy and see power plants in action. It is from the top of the Kashubian Eye that the status of the area as an energy zone really emerges, due to the views it offers of the physical landscape of Kashubia.



Figure 5.5 The view from the top of the ‘Kashubian Eye’ over the wind farms of Lisewo to the North West. (Photograph by author: July 2012)

The tower enables visitors to take in the sights for many kilometres in every direction. Standing in the same spot and turning full circle it is possible to watch as water stored in the upper reservoir is released back down to power the turbines of the hydro plant, and to take in both the scale of the wind farms at Lisewo (figure 5.5) and the former construction site of Żarnowiec NPP. Further afield, the Baltic coastline can be seen to the north, together with a large expanse of open countryside with lakes and forests to the south.

On the ground floor of the Kashubian Eye there is a museum and educational hub given over to documenting the construction of both Żarnowiec Hydroelectric and Żarnowiec NPP. A

large scale model of the hydro plant illustrates the operation of the facility, and details the history of its construction. The walls of the museum are covered in black and white photographs depicting the construction of both plants, and before and after images demonstrating the scale of the investment and landscape changes which took place during the 1980s (Site visit: Kashubian Eye, Czymanowo, June 2011, July 2012). The ‘Kashubian Eye’ has been a great success for Gmina Gniewino. It is a popular destination for families with young children and for educational school trips as it lies in the heart of a landscape which has a diverse range of energy infrastructure.

In addition, the use of a familiar format in the shape of the viewing tower complements a theme which is common elsewhere in Kashubia. Viewing platforms and towers (*‘Punkt Widokowy’*) such as the one at Gniewino are very popular in Pomerania, dotted throughout the forests and lakes which flank the coast north and west of the Tricity. The use of a familiar tourist attraction allows the educational-tourism focus of the Kashubian Eye Park to be seen as an accessible and enjoyable place to visit, pulling in visitors who might not otherwise visit the attraction.

The tower together with the tourist park in which it sits have been designed to use the imagery and presence of energy infrastructure to the benefit of the local community. To this extent, the energy infrastructure in and around Lake Żarnowiec has been incorporated into the tourist interests of the wider region, a relationship which both municipalities hope to pursue further over the coming years. Since it was unveiled that nuclear development might once again take place at Żarnowiec, Gmina Gniewino has prepared plans for the integration of the existing energy infrastructure of Żarnowiec Hydroelectric and the educational tourism hub of the ‘Kashubian Eye’ park into an attractive package for developers. In an attempt to sway opinion and encourage the national consortium, led by PGE to select the ‘Żarnowiec’ site rather than

at one of the alternative nearby locations, Gmina Gniewino has been working on plans for a larger ‘energy theme park’ which would be based around the Kashubian Eye. Such an attraction would be used to further shape an identity for the area using images of energy as a point of touristic interest:

“For many years we have planned to construct a thematic park based on energy. It would be interactive, modern, to show the history of energy in this area. It would be very interactive. It [the plans] is ready. If there is nuclear investment, then we can show these plans and seek further investment. It would be a form of educational tourism.” (Interview: Commune Administrator for Gmina Gniewino, Gniewino, July 2011)

Gmina Gniewino’s plans for an energy theme park have been informed by discussions which took place during a conference held at Gniewino in November 2009 (see figure 5.3). During the conference, the municipalities spoke with the municipal governments of other European countries where nuclear power plants have been constructed in tourist areas. Of particular interest to Gmina Gniewino were discussions held with representatives from the Municipality of Borsele in Zeeland, the Netherlands. A nuclear power station has been in operation in the town of Borssele since 1973, and in 2009 the municipality began to put together plans to develop a ‘fun park’ around the complex.



Figure 5.6 ‘Funpark Borsele’ plans, shared with Gmina Gniewino during a conference held in Gniewino in November 2009 (see figure 5.3). (Conference materials presented by Borsele¹⁷ Municipality, made available through personal communications with the Commune Administrator for Gmina Gniewino, July 2011).

At the time of writing, the Municipality of Borsele’s plans for ‘Funpark Borsele’ have not been realised, but Gmina Gniewino’s plans for a similar educational theme park around Żarnowiec Hydroelectric, the ‘Kashubian Eye’ complex and the possibility of future nuclear development have been shaped by the ‘Borssele nuclear power plant and theme park’ model.

As the images and narratives above have shown, Gmina Gniewino’s efforts to market the municipality as a ‘good place’ for investment in energy and tourism have made heavy use of imagery, playing on the features of the physical landscape together with the presence of the infrastructural development legacies of the 1980s. For Gniewino, the aim of integrating the

¹⁷ Spellings: The town of Borssele (double ‘s’) lies with the municipality of ‘Borsele’ (single ‘s’).

tourism and energy industries of the area is to shape an identity for the area where the two, sometimes conflicting interests can peacefully coexist and mutually benefit each other. This is seen as a necessary activity due to the municipality's dependence on energy as a source of income and the uncertainties which are felt with regards to wider decision making processes surrounding nuclear.

In addition to integrating the local energy infrastructure into the 'Kashubian Eye' tourist park, Gmina Gniewino and regional planning authorities have also taken to highlighting the presence of energy infrastructure on tourist maps and promotional materials. Images and visual materials play a central role in marketing and development efforts. From early design plans and architectural mock-ups to publicity and advertising materials, images help convey ideas in a manner that words and aural narratives alone cannot match (Branthwaite, 2002). Visual materials in a similar vein to aural narratives cannot be seen as neutral or complete representations of phenomena (see Chapter 3). Rather, they are artefacts embedded with social values, rich with meaning and altered perspective (Rose, 1996; Schwartz, 1996).

Discussing the power of visual imagery in marketing, Branthwaite concludes:

'Imagery...is about experiencing something directly, for oneself, which takes on a personal reality for each viewer' (Branthwaite, 2002 p.170).

Maps are unique visual artefacts in that they seamlessly combine what appear to be objective facts (topography, landmarks, major transport networks etc.) with a subjective view of the landscape (editorial decisions about what is important or noteworthy). The location of roads, towns and landmarks can be supported by satellite imagery, itself a product of scientific

knowledge and often regarded as an objective truth.¹⁸ Yet the inclusion of major roads may be at the expense of depicting small pathways or dirt tracks, routes which may be of greater relevance to local communities. Moreover, the same landmark depicted in satellite imagery can be given different meaning on different maps, depending on political and economic factors, cultural understandings and the values ascribed to ‘lay’ and ‘scientific’ knowledge cultures (Harley, 1988; Duncan, 2006).

The selective mapping of landmarks can be seen as an exercise in both highlighting and at times creating a sense of local identity. What is seen is as important as what is hidden through exclusion. Image selection, the language used to provide additional narrative, and the general sense of a place created through selective mapping activities mean that maps provide very interesting narratives for visual analysis.

Maps have long been recognised within human geography and critical cartography as information rich documents that transcend their primary purpose of guiding the unacquainted from Point A to Point B (Perkins, 2004; Dell Casino & Hanna, 2006; Duncan, 2006; Billings et al, 2008; Leuenberger & Schnell, 2010). As Harley (1988) argues, maps should not be seen as objective but rather be ‘regarded as refracted images contributing to dialogue in a socially constructed world... Maps are never value-free images... Both in the selectivity of their content and in their signs and styles of representation maps are a way of conceiving, articulating, and structuring the human world which is biased towards, promoted by, and exerts influence upon particular sets of social relations’ (Harley, 1988 p.129).

¹⁸ Satellite imagery itself, however, is subject to bias. The creation of a two dimensional image of a spherical body, as seen from one point in space is a challenge to even the best of mathematical models, themselves social products based on existing knowledge and understandings of the earth. Perspective bias and distortion is of lesser concern for satellite imagery covering hyper local areas as the curvature of the earth can be factored as negligible. Yet these challenges illustrate that not even photographic material using the most advanced technology can be seen to be truly objective (see for example Zhou & Li, 2000 for a discussion of the accuracy of satellite imagery).

In this light, maps depicting Kashubia can be seen as subjective artefacts created to present a carefully curated view of the region. In the case of maps for the Kashubian tourist industry, these narratives and choices demonstrate the identity of a place as seen by the design teams, map makers and local authorities, as such speaking of an existing relationship with space, and both national and regional perceptions and interpretations of identity. The decision to include specific landmarks, energy infrastructure and key references to defunct structural arrangements in the built environment in a neat visual package demonstrates the manner in which energy infrastructure has been woven through the landscape surrounding Lake Żarnowiec, together with ideas about how the area's future should unfold. The production of special issue tourist maps is initiated by social bodies with vested interests, and supported financially by local authorities, agencies and businesses. In the case of the area surrounding Lake Żarnowiec, the most powerful bodies involved in dialogue surrounding mapping activities are the local municipalities of Gmina Gniewino and Gmina Krokowa, the Special Economic Zone for Pomerania (PSSE), regional government, and the businesses occupying units adjacent to the former development site for Żarnowiec NPP. It is these bodies who are responsible for the production and financing of tourist maps, and it is their vision of the region which can be seen to dominate the visual imagery.

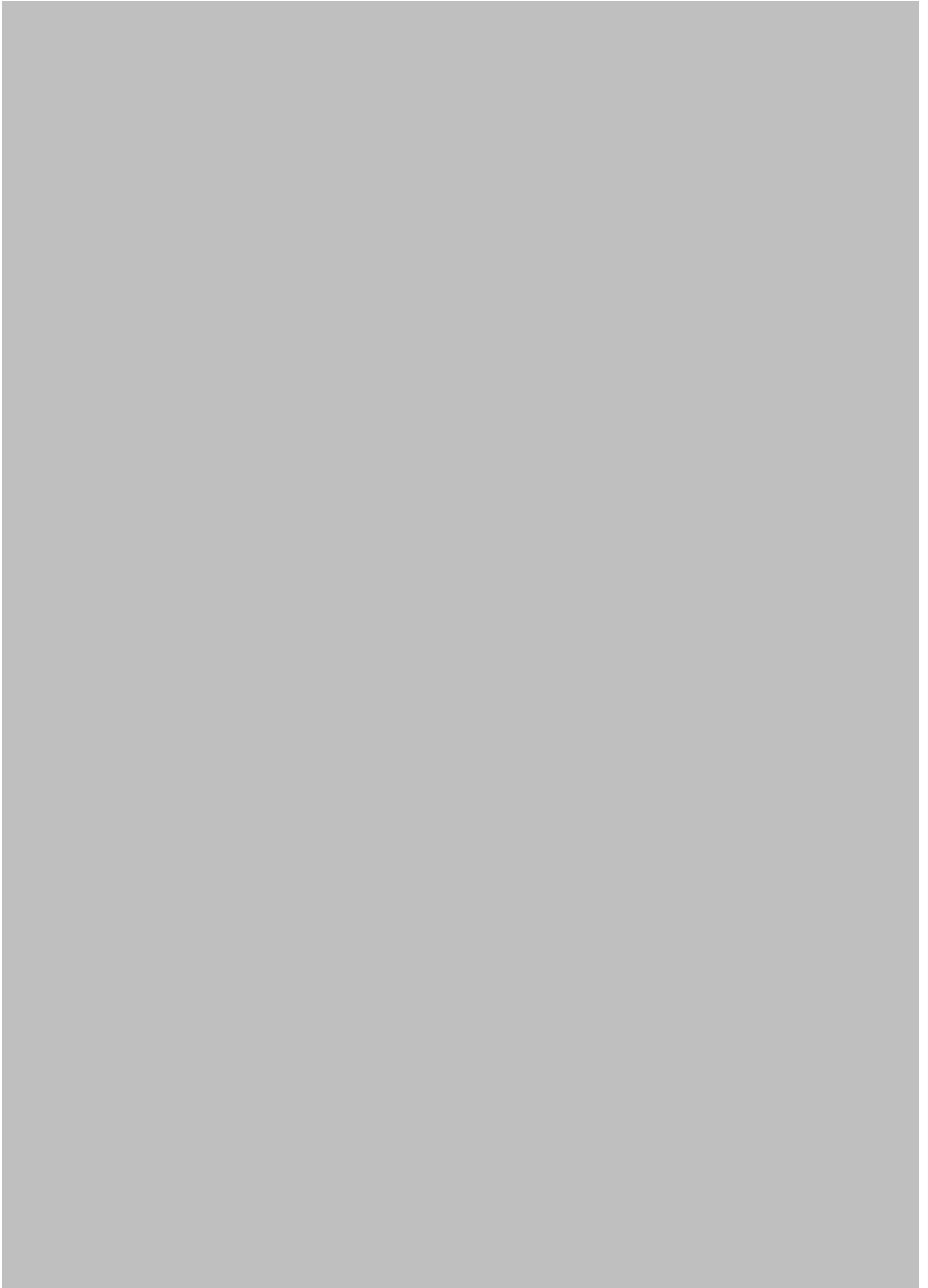


Figure 5.7 Forest Promotion Complex for ‘Oliwsko-Darżłubska’ – Tourist Attractions for Wejherowo District ‘*Leśny Kompleks Promocyjny Lasu Oliwsko-Darżłubskie - Atrakcje Turystyczne Nadleśnictwa Wejherowo*’. This map (a close up of figure 5.8), in the forest between the upper reservoir of Żarnowiec Hydroelectric and Lake Żarnowiec indicates sites of touristic interest in the vicinity of Wejherowo. The map indicates ‘Skansen Nadole’ (see Chapter 4), the wind farms of Lisewo (figure 5.5), the hydroelectric plant at Czymanowo, the Special Economic Zone at Kartoszyno, and the ‘land of the abandoned nuclear power station’ (*‘Teren zlikwidowanej budowy elektrowni atomowej’*)



Figure 5.8 Forest Promotion Complex for the ‘Wejherowo’ region, indicating sites of touristic interest. (Photograph by author, August 2013)

The historical language area of Kashubia is marketed within Pomerania Province as a tourist destination. Given the area’s historical and cultural routes (see Chapter 1) combined with the physical geography of lakes, sand dunes, forests and open countryside, this fact in itself is of little surprise. Yet closer inspection of maps detailing the local attractions yields surprising results. Maps of Lake Żarnowiec focus almost exclusively on the energy infrastructure which has transformed the region. Despite no longer being operational, the train line connecting the

Tricity to the lakes is marked arriving into the village of Kartoszyno (see figures 5.7 & 5.9). The route is not a nature trail or converted cycle route as similar routes so often are in the UK¹⁹. No trains run along this route, it is simply an historic path and connection which has previously been carved out between the Tricity and the original development site of Żarnowiec NPP at Kartoszyno. The railway line to Kartoszyno is an extension from the SKM intercity line (*Szybka Kolej Miejska*) which continues to operate a local service through the Tricity connecting the three cities of Gdańsk, Sopot and Gdynia to Wejherowo and Lębork to the North West. The extension to Kartoszyno originally ran north from Wejherowo, but was dismantled shortly after the construction of Żarnowiec NPP was cancelled. The line is joined by other disused railway routes through Kashubia, including the historic “Gdańsk Wrzeszcz - Stara Piła line” which, until 1945, linked the Tricity to the heartlands of Kashubia (Personal communications with Tricity residents whilst conducting fieldwork, 2011 – 2012). However, in the summer of 2013 Gdańsk City Council authorities began the reconstruction of part of the Wrzeszcz-Stara Piła line, to provide a rail connection between the Tricity and the newly extended Gdańsk Lech Wałęsa Airport. This action has highlighted the potential which the Wejherowo-Kartoszyno extension holds, should investment in nuclear once again be placed beside Lake Żarnowiec.

The inclusion of the rail route from Wejherowo to Kartoszyno in maps of the area can be seen as an attempt to shape and display an image of the area’s identity as an energy zone. The outline acts as a reminder of the region’s not too distant past. Through mapping activities, the railway connection is remembered and kept alive as an additional element of the infrastructural development legacies. Its inclusion in tourist maps together with notations for

¹⁹ For example the ‘Tissington’ and ‘High Peak’ trails in the Peak District, and the ‘Harborne Walkway’ in Birmingham. These trails are now pedestrian walkways and cycle trails along the track beds of disused rail routes.

Skansen Nadole, the renewable energy power plants and the ruins of Żarnowiec NPP at Kartoszyño is an exercise in shaping an identity for the landscape based on the infrastructural investments which have taken place around the lake over the course of the past thirty years.

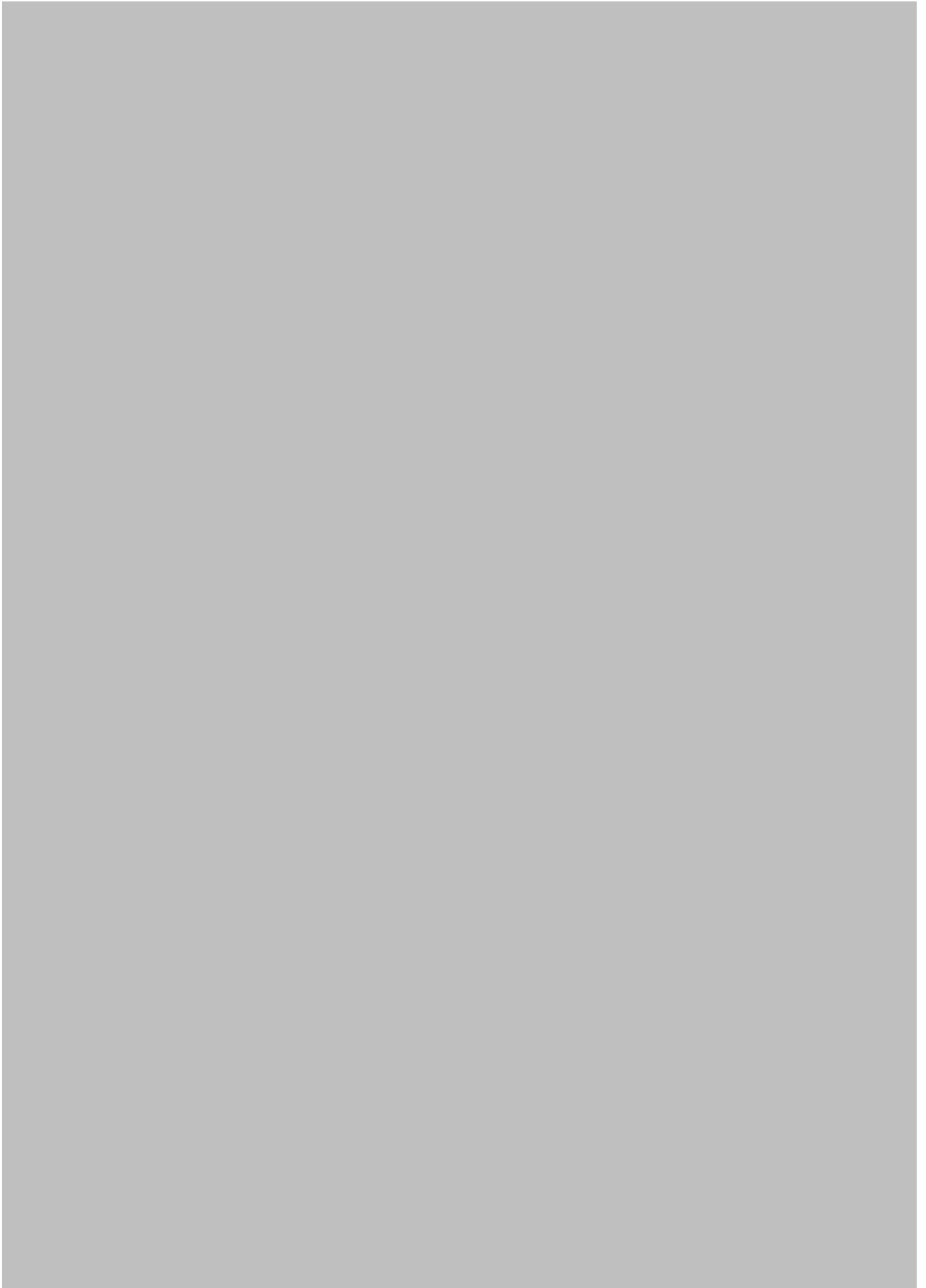


Figure 5.9 ‘Mapa turystyczna Kaszuby’ - Tourist Map Kashubia. This map produced by the Polish publishing company ‘Demart’ is on sale in major bookshops and tourist destinations throughout the region. The map is a modern edition, published in 2012. By the ‘W’ of ‘Żarnowiec’, there are markings for the remains of a railway station and line which was constructed at the same time as Żarnowiec NPP but has not been present on the site for over a decade. (Demart, 2012).

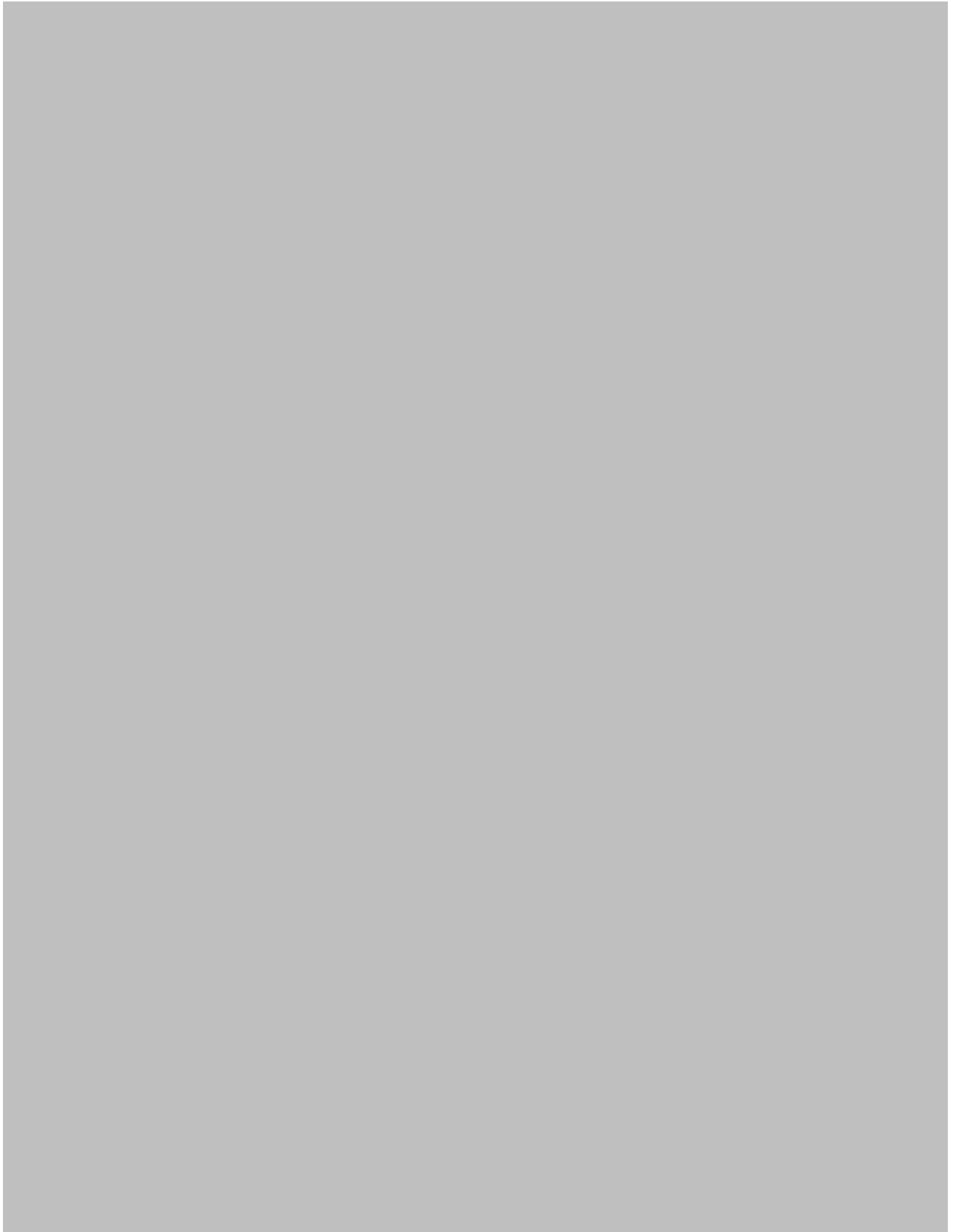


Figure 5.10 ‘Pobrzeże Bałtyku’ – Map of the Baltic Coast. This map, produced by the Polish publishing company ‘Demart’ is on sale in major bookshops and tourist destinations throughout the region (Demart, 2013). As in figures 5.7 & 5.9, the map indicates the location

of the Wejherowo-Kartoszyno rail extension, together with notations for the energy infrastructure which surrounds Lake Żarnowiec.

On these local tourist maps (figures 5.7, 5.9, 5.10), Żarnowiec NPP is depicted alongside both Żarnowiec Hydroelectric and the tower of the 'Kashubian Eye' at Czymanowo which Gmina Gniewino has chosen as an emblem in publicity materials. To investors and tourists alike, the emphasis on these infrastructural investments illustrates perceptions, held by the local municipal authorities, of the value and identity of the land surrounding Lake Żarnowiec. As with the 'Kashubian Eye', the presence of energy infrastructure is used as a point of touristic interest. Once again, the material artefacts of Żarnowiec NPP and the landscape changes which have taken place surrounding Lake Żarnowiec can be seen to co-shape an identity for the area.

5.3 Conclusions

The previous chapter (Chapter 4) examined the processes through which a series of disparate elements first came together around Lake Żarnowiec, transforming the landscape from an agricultural area with a strong Kashubian heritage to an energy 'zone' given over to the operation of large scale energy infrastructure. The chapter explored how the villages of Kartoszyno, Czymanowo and Nadole within the municipalities of Gniewino and Krokowa came to be 'entangled' with energy infrastructure, and how this situation was consolidated following the collapse of communism through new planning regulations which have effectively reserved the land on which Żarnowiec NPP sits indefinitely, until a decision has been made by the Polish Ministry of the Economy and energy company PGE on the future of nuclear power in Poland.

This chapter has further unpacked this sense of entanglement of energy infrastructure with the land and communities surrounding Lake Żarnowiec, demonstrating the continued relevance of these entanglements and the agency of material and conceptual artefacts. In this chapter I have explored how the municipalities of Gniewino and Krokowa have experienced a high level of uncertainty over their future prospects, and the extent to which they feel bound to a trajectory of further energy developments due to the ‘altered landscape’ of Lake Żarnowiec. The layers of ‘sedimented sociality’ (Jordan, 2012 p.15) embedded within the material artefacts and physical landscape have limited the options of the municipalities of Gniewino and Krokowa, and continue to exert a form of material agency within the assemblage by channelling future social and political activities along a trajectory towards nuclear development.

Furthermore, during meetings with the representatives from the municipal authorities, they voiced their frustrations with the planning regulations and decision making processes which surround areas of national importance such as energy infrastructure, and the sense that they have no power to self-govern or participate in closed, national level debates on the siting of a future nuclear power plant within their administrative boundaries.

As a result of these material limitations and socio-political frustrations and uncertainties, the municipalities of Gniewino and Krokowa have taken measures to try and shape an identity for the landscape and demonstrate to representatives from PGE and regional government that the ‘Żarnowiec’ site is a ‘good place to invest’. In section 5.2, the chapter discussed these measures, including how the municipalities are seeking to structure the local tourism industry around the presence of the landscape changes and infrastructure of energy investments. To date, their methods can be seen to include the construction and operation of existing and planned ‘educational tourism’ attractions and the marking of energy infrastructure, both operational and defunct on maps designed for tourists.

The aim of Chapters 4 and 5 has been to demonstrate how a “place for the atom” (Interview: Pomeranian Province Marshal Office, Gdańsk, February 2012) has been carved out in the landscapes surrounding Lake Żarnowiec. This is a process which began in the 1980s, and has been consolidated across three decades through the repeated performance of socio-material relations and entanglements. Chapters 4 and 5 have examined how a trajectory towards and dependence on future nuclear development has been sustained within the municipalities which surround Lake Żarnowiec, but it is to the wider context of the Tricity region that Chapter 6 now turns.

6.0 The Social Shaping of Nuclear Narratives in Pomerania

Chapters 4 and 5 addressed the extent to which the hyper-local area surrounding Lake Żarnowiec has come to be ‘entangled’ with and dependent on investment in large scale energy infrastructure. The chapters examined how the atmosphere of opposition which surrounded the construction site of Żarnowiec NPP during the 1980s has given way to an atmosphere of acceptance, and why the municipal governments of Gmina Krokowa and Gmina Gniewino are actively pursuing future nuclear development on the ‘Żarnowiec’ site. Whilst Chapter 4 focused on pathway formation and the manner in which elements first came together, Chapter 5 examined the continued relevance of the socio-material entanglements for the municipalities of Gniewino and Krokowa, and the agency of the material and conceptual artefacts themselves within the contemporary process of nuclear assemblage.

However, attitudes towards nuclear power and nuclear development have not just been altered at the hyper-local level surrounding the ‘Żarnowiec’ site, but also within the wider region of Pomerania. As research conducted on behalf of Pomorska Specjalna Strefa Ekonomiczna has shown (PSSE, 2011), public opinion on nuclear development in the counties of Puck and Wejherowo is more favourable in Pomerania (71%) than it is nationally (63%).

In this chapter I unpack the social elements, contexts and processes which have shaped contemporary attitudes towards nuclear development in the wider region of Pomerania. The aim of this chapter is to examine the role of public communication and scientific knowledge in the process of nuclear assemblage, and explore how the design of discourse spaces has resulted in the inequitable distribution of agency between the institutions and organisations responsible for the promotion of nuclear development in Pomerania and concerned publics.

6.1 Public dialogue and access to information

“But why are you studying Żarnowiec? This is an old story” (In conversation with Łukasz, a Polish chemical engineer from Kraków, February 2011).

“Poland won’t develop nuclear power. Nuclear was a Communist plan. You should study renewables or the coal industry” (In conversation with Maksym, an energy specialist from Kraków, September 2010).

“There is nothing to study here at Żarnowiec but the old ruins. There are short pieces in the news but nothing will come of it” (In conversation with Paweł, local Tricity resident, February 2011).

Throughout the main period of fieldwork from February 2011 to February 2012, one statement in various forms came to underpin the research: Nuclear development in Poland took place during the 1980s, but it is an old story, and it is not worth pursuing.

To many Pomeranians, ‘Żarnowiec’ is synonymous with Communism and the political climate of the mid to late 1980s. As such, the site of Poland’s first nuclear power plant is perceived to be little more than an industrial wasteland. It is simply ‘old ruins’, and something to be forgotten. Yet in late 2010 and early 2011 when these statements were made, the Polish government was well under way with legal preparatory work for the operation of a nuclear industry. This process began in January 2009, and by May 2009 PGE had been named as the main investor (NCBJ, 2013). Despite the lack of widespread public awareness of the government’s plans to revisit the question of nuclear, by early 2010 the Council of Ministers had identified 28 potential locations for the construction of the country’s first nuclear power plant by 2020, and once again the ‘Żarnowiec’ site sat at the top of the list (Premier, 2010).

However since this period, the flow of information to the public has been limited and without the widespread distribution of information about development plans, public awareness of and discourse on nuclear development continues to lie outside the arena of national debate. Whilst Chapters 4 and 5 explored how a sense of entanglement with and dependence on energy infrastructure has led the municipalities surrounding the original development site beside Lake Żarnowiec to actively pursue future nuclear development, the following chapter turns to address the social processes and relationships which shape attitudes towards and narratives on nuclear development within the Tricity area of Gdańsk-Sopot-Gdynia - the centre of widespread social and environmental opposition during the 1980s.

6.1.1 Public interest in nuclear development

The lack of public awareness of and interest in development debates has been attributed by activists involved with Gdańsk based ‘*Pomorska Inicjatywa Antynuklearna*’ (PIA) and Greenpeace Poland to the delays inherent with nuclear development. Many of the activists at meetings held between February and June 2011 expressed concern for the lack of public dialogue on nuclear development in Poland, especially in light of the widespread social opposition experienced at Żarnowiec throughout the 1980s.

“Polish people are not interested in something which is going to happen in 2022²⁰. There is something else that is on the front page and those are two issues. We all know what they are... They don’t think about nuclear power, and when [Hanna] Trojanowska [the Polish energy minister] talks about nuclear development plans, that’s her thing and people don’t sit up and pay attention... It is difficult [to write about or discuss the challenges of nuclear development] unless people are interested” (Jakub, activist: Gdańsk, April 2011).

²⁰ The revised date of project completion as of 2011; the completion of the first nuclear power plant has since been pushed back to 2024 (IAEA, 2013)

The two key media issues Jakub made reference to were the first anniversary of the Smolensk plane crash in which the incumbent President Lech Kaczyński²¹ had died, and discussions surrounding the beatification of Pope John Paul II²². These news stories were considered to be of greater importance and interest to Poland and Polish people than the revival of debate on nuclear development, an issue which many felt had been discussed to exhaustion throughout the 1980s.

“Society is not very interested in [talking about nuclear power] because they are more in the debate about Smolensk and the black and white very spectacular events. There is not even as much discussion about rents [discussed in section 6.1.2] as there is about Katyń. And if they aren’t interested in social issues, they have even less interest in the environment” (Janek, activist: Gdańsk, February 2011)

“It is the same style of thinking as in the 1970s, the people who were 15 or 16 years old at that time, they said ‘now it is ok because we don’t have air strikes, we don’t have concentration camps’ and this is kind of the style of thinking [that we are experiencing now]... ‘it is not so bad’... and so if things are not so bad then ‘we should not be worried’ so much about, you know, ecology or the social something because we are not shooting people on the streets.” (Paweł, activist: Gdańsk February 2011)

²¹ On Saturday 10th April 2010, 96 Polish politicians and military officials en route from Warsaw, Poland to Smolensk, Russia were killed as their plane crashed whilst attempting to land in thick fog. The crash was high profile as the passengers had been due to attend a ceremony to mark the 70th anniversary of the Katyń massacre in which at least 22,000 Polish nationals were executed under orders from Stalin and Soviet officials.

²² The first stage of Pope John Paul’s beatification took place on 1st May 2011. He remains a popular figure within Poland due to his links with the Solidarity (*Solidarność*) movement which ignited social change and brought an end to Communism (see Chapter 1).

At these meetings during the spring of 2011, the activists explored the broader theme of social and environmental activism in Poland, in the context of Poland's contemporary history (see Chapter 1). They described how, in contrast to large parts of the twentieth century, everyday life in contemporary Poland is now 'comfortable enough' to not stimulate widespread social or environmental opposition of the scale which was seen under Communism. Instead, the nature of social and environmental opposition movements has been reconfigured and tends towards hyper-local activism by small communities:

"I mean, there is [social and environmental activism], it is intensive [where it is present] but not connected all around Poland, so it is really decentralised even if [the individual protests] are in the same cities, the [activists] sometimes do not collaborate in very serious ways, but do something that they want to do on their street or [in] their neighbourhood and so on and so on and so that's maybe why it is not so easy to see that we [could] have this big movement against nuclear energy, because in Poland usually movements are just movements which are really local. That is what I think... As I watch some news on TV especially when it is not so cold then in Poland I think that there is 3 or 4 protests every week but these are protests in some villages, some small cities, some districts in the big cities. [But] we don't have this big real strong ecological movement" (Paweł, activist: Gdańsk, February 2011).

The activists explained that it is often only matters of Polish cultural identity which spark social interest, hence the widespread interest in both Katyń and Pope John Paul II. In recognition of the lack of interest in nuclear debates and environmental opposition initiatives they joked that in order to raise the profile of the risks of nuclear development to the environment and society, the Catholic Church would need to state a position for or against the technology.

“Because the discourse in Poland is between, it is between as Marcin [another activist present at the meeting] said about being Catholic or not being Catholic. So the debate [on nuclear development and ecological protection] is in this position... Is nuclear supported by the church?... [The debate about nuclear power is] not in a position of being ecological or against ecological...” (Mikael, activist: Gdańsk, February 2011)

“And probably the crucial moment would be if the bishops [laughter amongst those gathered] were in the debate. It would be probably [more laughter]...” (Marcin, activist: Gdańsk, February 2011).

“But they would not speak out. It would be too controversial. (Jarek, activist: Gdańsk, February 2011).

6.1.2 Fatigue with development and construction work

In addition to the bias towards coverage of news stories such as the Katyń trial, the Smolensk plane crash and discussions surrounding the papal beatification during 2011, it also became apparent that there was a growing sense of fatigue with discourse surrounding development of any sort in Poland. Since EU accession in 2004, Poland has seen significant investment in infrastructure and the built environment. In Pomerania, development funds secured through the EU have contributed to a renewed interest and incentive to build new roads, schools, universities and further public facilities (Interview: Commune Administrator of Gmina Gniewino, July 2011; Interview: Mayor of Gmina Krokowa, February 2012; Personal communications with doctoral researchers and Tricity residents during fieldwork, Gdańsk, 2011). Many of my research participants felt that nuclear is just another development alongside the realisation of the many other projects under discussion and construction in the region. Furthermore, they felt that it is not possible to truly engage in dialogue on these issues

due to widely held assumptions about the value of development and modernisation (Meetings with PIA, February & April 2011). As Jarek explained:

“And also, you know, that the idea of modernisation of Poland is still very useful because someone says that we need to modernise our industry and modernise and build a lot. Build. It is development...this is the way that public discourse on [nuclear development] can be seen because ‘we have to modernise’... and the problem is that strong opposition can only be built on the basis of the Catholic Church ideas and national identity so this is also the problem that people active in some [of the small, localised] ecological movements they are in fact outside of [wider, regional and national] debates because...” (Mikael, activist: Gdańsk, February 2011).

“‘Green freaks’ they are called” (Ona, activist: Gdańsk, February 2011)

“And ‘ecoterrorists’”(Paweł, activist: Gdańsk, February 2011).

Throughout the research period, research participants often repeated the phrase “*Budować!, Budować!, Budować!*” (Build! Build! Build!) in reference to the changes and developments taking place across the Tricity area (Informal conversations with activists in PIA and Greenpeace, doctoral researchers at the University of Gdańsk, and with local residents in Sopot, February – October 2011) . From the shipyards of Central Gdańsk, travelling north-west along road 468 which connects the three cities, the transformation of the region and constant hum of activity is evident. In the countryside stretching out on the back roads from Gdańsk through the suburbs of Osowa to Wejherowo and the lakes, brand new residential areas and facilities for businesses are appearing where once there were just fields. With each passing month throughout the period of fieldwork, and on repeat visits to the region in July 2012 and August 2013, new mixed use developments, a new airport terminal, new roads and

railway flyovers continued to spring up at a rapid pace, such that the changes to the region over just two years were striking. The Tricity remains in a perpetual state of flux, with the cranes of new construction sites becoming an almost permanent fixture to the skyline alongside the cranes of the Gdańsk shipyards (Fieldwork observations and informal conversations, February 2011 – August 2013).

Rather than expend energy and resources mounting opposition to a development which is perceived to be far off in the future, the attention of the small group of local social and environmental activists has been placed on projects with more immediate impact in the heart of the Tricity (Attendance of PIA and Greenpeace Poland meetings, 2011; In conversation with Bogdan, activist: February 2011). One particular heated issue which has garnered local attention concerns rental costs, access to accommodation and investment in the tourism industry.

In May 2011, construction work began on a large Solidarity museum beside the Gdańsk shipyards in Central Gdańsk. The 'European Solidarity Centre' (*Europejski Centrum Solidarności*) is due to open in the summer of 2014. Together with a large exhibition documenting the history and origins of the Solidarity movement in Gdańsk, it will provide a space for the commemoration of freedom movements throughout Europe. The museum is being developed so as to preserve the memory and message of Solidarity for future generations (ECS, 2014). However, the decision to invest in the museum has been met with criticism within the Tricity as many residents feel that it is both an unnecessary investment – the city already has a museum of the shipyards (*Muzeum Stoczni Gdańskiej*), less than 500m from the site of the new building – and harmful to the community, as the decision to progress with the development coincided with increased tax rates and rental costs across the city (Attendance: 'March of the Empty Pots' Demonstration, Gdańsk, May 2011).

Since the collapse of Communism in 1989, demand for accommodation across the city of Gdańsk has increased. This has been attributed to changing lifestyles and an increase in the number of 'non-traditional' households (Sagan & Grabkowska, 2012). At the same time, there has been movement towards the regeneration of pre-war late 19th century to early 20th century tenement buildings within the inner city. These buildings had largely fallen into disrepair by the end of 1989 due to Communist ideology and urban planning programmes which financed the construction of large, high rise housing estates and withdrew financial support from the older housing stock. However, Communist urban planning largely destroyed pre-existing class divisions within the inner city districts. The regeneration of previously run down areas of the inner city and the tenement houses is seen as beneficial and desirable by Gdańsk City Council, yet the gentrification of these areas has driven up rental costs across all housing stock to such an extent that many young people and families struggle to meet their increasing rents each month, whilst others have been unable to afford independent living spaces or to move to accommodation which better suits their individual needs (Bouzarovski, 2009a; Sagan & Grabkowska, 2012).

As such, the decision to focus investment on the tourist industry and the memory of Solidarity, rather than keeping the concept of Solidarity alive by addressing the housing issues and sense of social exclusion which plague the inner city is a particularly jarring issue attended to by local social activists and groups such as 'Nothing About Us Without Us' (*Nic O Nas Bez Nas*) (Nothing About Us Without Us). On Saturday 14th May 2011, the group organised a march through Central Gdańsk to express their frustrations with the construction of the new shipyard museum and solidarity centre (see figure 6.1 below). The protest march had been arranged to coincide with a visit to the city by President Bronisław Komorowski to lay the foundation stone of the European Solidarity Centre. The foundation stone ceremony

took place in a public space beside the existing museum entrance and the Monument of the Fallen Shipyard Workers, though the protestors were barred access to the site by riot police (Attendance: 'March of the Empty Pots' Demonstration, Gdańsk, May 2011).

The demonstration was well attended with far greater numbers turning out for the march than had attended any of the anti-nuclear demonstrations in the Tricity (Attendance of the 'March of the Empty Pots' Demonstration, Gdańsk, May 2011; Attendance of anti-nuclear demonstrations and demonstration reports received from activist mailing lists, February 2011 – July 2012). However, as Janek noted during a group meeting in February 2011, the number of individuals demonstrating on the issue of rent increases and social welfare represents just a tiny fraction of those affected by housing costs. Whilst such events make social and environmental opposition appear to be thriving in the Tricity, the events remain limited to very small, localised protests rather than the large, unified movements characteristic of the 1980s (Janek, activist: Gdańk, February 2011).



Figure 6.1 ‘Protest of the Empty Pots’ demonstration against the construction of the new Solidarity Museum. (Photograph by author, Saturday 14th May 2011)

Translation of banners in figure 6.1: Harmful Development! / Stop Rent Increases!!

Section 6.1 has demonstrated the critical role within the process of nuclear assemblage of the socio-political context in which nuclear development takes place. As Chapter 4 explored, resistance to development plans from widespread social and environmental activism can actively block elements from coming together and nuclear development from taking place. However, contemporary Polish society is much altered from the days of the original Żarnowiec protests. Social and environmental opposition to the construction of Żarnowiec NPP during the mid to late 1980s was a product of the socio-political and socio-economic

climate of communist Poland. In the mid to late 1980s, opposition emerged after nearly forty years of Communist rule and in the aftermath of a period of Martial Law²³ which had severely limited social and political freedoms (Davies, 2005; Kemp-Welch, 2008). However, since the collapse of Polish Communism and transformation of Poland's socio-political and socio-economic landscapes during the 1990s, the pressures which had provided a backdrop to widespread opposition have been dismantled. In the wake of the dramatic socio-economic and political transformations which have taken place throughout Poland, opposition has been reconfigured into smaller, disconnected protest movements focusing on very specific, localised issues. As the following discussion illustrates, the contemporary opposition movement has, to date, struggled to organise a united front or to drastically alter the trajectory of the assemblage towards nuclear development.

Though public interest in nuclear development in Pomerania has been limited due to the reasons outlined in the previous section, public opinion and opposition towards nuclear technologies are still regarded as important and influential factors in the process of nuclear development in Poland. Across all three tiers of government (see Chapter 1 for a brief outline of the structure of the Polish political system), those involved in the decision making processes surrounding nuclear development recognise the potential of social and environmental opposition to negatively impact development. In the immediate aftermath of the nuclear accident at Fukushima, Japan in March 2011, Prime Minister Donald Tusk conceded that public attitudes to nuclear development remain central to the success or failure

²³ Following a period of mounting social and political unrest in the wake of Pope John Paul II's visit to Poland in 1979 and the creation of a 'Solidarity' trade union at the Gdańsk shipyards in August 1980, the communist government of the People's Republic of Poland attempted to regain control by instating Martial Law. Martial Law had a significant impact on the everyday life of Polish citizens; the newfound 'Solidarity' movement was deemed illegal and its leaders exiled; social activism and religious expression resulted in imprisonment; and many people lost their lives. Martial Law was in place from December 1981 to July 1983 (see Davies, 2005; Kemp-Welch, 2008).

of nuclear development initiatives, adding that “without social acceptance, this type of investment makes little sense” (Wyborcza, 2011).

With regards to development in Pomerania, the spectre of Solidarity, youth movements and opposition to the construction of Żarnowiec NPP during the 1980s is never far from the surface (Wyborcza, 2011a; Interview: Commune Administrator of Gmina Gniewino, Gniewino, July 2011; Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdańsk, February 2012).

Individually as well as collaboratively through ‘dialogue platforms’ and promotional groups, those actively promoting the construction of a nuclear facility in Pomerania have sought to manipulate discussions surrounding nuclear power in order to limit negative associations with or attitudes towards the technology and any associated social or environmental opposition.

During the course of fieldwork it became clear that there are two broad categories within which tactics for the suppression of opposition lie. The first of these is an apparent reluctance to open up discussions on the construction of a nuclear power plant in the region of Pomerania to include concerned publics and lay perspectives, or to release detailed information on development plans and the relationships between key businesses and institutions involved in the decision making processes which surround nuclear development. It is to these issues that section 6.2 turns, examining the challenges associated with accessing information surrounding the plans to develop a nuclear industry within Pomerania.

The second approach by the institutions responsible for nuclear development to limit negative discourse surrounding the technology is by means of the design and manipulation of discourse spaces. During meetings and interviews, these spaces were referred to by research participants and event organisers as ‘dialogue platforms’, though as sections 6.3 and 6.4 illustrate, the

nature of discourse taking place through these platforms may be better understood as ‘communication’ (the relaying of information from developer to lay public) or at best ‘consultation’ (engaged discussions between developer and lay public, but with no guarantee of implementation of lay perspectives or knowledge) rather than true engagement or ‘dialogue’ (Rowe & Frewer, 2005; Barnett et al, 2012; see Chapter 2 for a more detailed discussion of knowledge communication).

As such, in sections 6.3 and 6.4 I unpack the manner in which discussions are facilitated in private and public ‘dialogue platforms’, as well as through the media. These final two sections examine the social construction of ‘rational’ and ‘irrational’ narratives on nuclear development in Pomerania, and the means through which scientific and technical perspectives on nuclear power are granted greater agency over the process of nuclear assemblage than social or ‘lay’ perspectives.

I argue that the difficulties associated with accessing information together with the structure of discourse spaces in Pomerania Province drastically limit the ability of the small group of activists involved with PIA to organise themselves into a more united opposition movement. In contrast to the members of carefully constructed and managed interest groups and associations in favour of nuclear development in the region, social and environmental activists in the Tricity, together with their narratives, are effectively excluded from the decision making process.

6.2 Access to information

In addition to concerns for low public awareness and interest in nuclear power, the lack of information on Poland’s nuclear development plans is regarded by PIA as a limiting factor for the development of contemporary opposition to nuclear development in the region.

During meetings conducted between February and May 2011, the activists involved with PIA and Greenpeace Poland stated motivations including ecological concerns relating to the impact on fish and wildlife, the transport of radioactive waste through the Tricity, and perceptions of risk relating to the operation of a nuclear power plant so close to a densely populated region of the country (Meetings with PIA & Greenpeace Poland members, Gdańsk, February - May 2011).

These concerns are neither new nor unique to Pomerania, having formed the basis of the opposition to the construction of Żarnowiec NPP in the 1980s (Interview: Marta, Gdańsk, March 2011) as well as underpinning concerns relating to nuclear development internationally. Yet as a result of the limited availability of information on Poland's nuclear development plans, the opposition movement feel that their ability to raise the profile and scope of opposition to match that of the Żarnowiec protests of the 1980s has been blocked.

During meetings with both PIA and Greenpeace members in early 2011 and through demonstrations on the streets of Gdańsk, activists expressed their concern for the lack of public interest in holding a debate on the subject of nuclear development in Poland. They highlighted the deficit of information provided by the investors as a key factor in limiting public debate on the topic of nuclear power as well as the growth of an opposition movement:

“So the campaign [to develop a nuclear industry in Poland] really started around 2005. But the social campaign never really started. Unlike in the 80s there is no real campaign, there are just isolated cases of opposition. We are just provided with very general and not enough information... (Jozef, activist: Gdańsk, February 2011)

“The situation is like pre protests, pre everything. On the one hand there is no repression, but on the other there is no involvement... The decision makers don't give

much information, so there is not much of a position [for us to protest or call for a debate] because there is, you know, against what?” (Ona, PIA activist, Gdańsk, February 2011)

The activists’ experience of trying to engage with the decision making process surrounding nuclear development in Pomerania is not unique or a result of their affiliations with local anarchist networks. During my extended period of fieldwork, I became increasingly frustrated with how difficult it was to illicit information or arrange meetings with the institutions and organisations associated with Pomerania’s nuclear development plans, and discussions with fellow researchers from the Tricity region indicated that I was not alone in these challenges.

In Chapter 3 I detail the original research design and a list of the businesses, institutions and individuals who were identified prior to undertaking fieldwork. However, despite numerous attempts to make contact, it was not possible to meet directly with representatives from the energy company PGE or the Pomeranian zoning authority PSSE. Both organisations responded to requests for interviews by insisting that it was too early to pass comment on the details of plans for nuclear development in Pomerania (Monthly communications with PGE and PSSE via an interpreter, April 2011 – February 2012), despite the on-going activities reported in the media surrounding relationship building between local institutions and businesses (discussed in 6.2.2).

In addition to PSSE and PGE, unsuccessful attempts at contact were made with the Ministry of the Economy between May 2011 and February 2012. Instead of being offered direct correspondence, representatives from PSSE, PGE and the Ministry of the Economy gave suggestions for written materials including both the national and regional energy strategy documents (Communications with the Ministry of the Economy, July 2011). The reluctance

of PSSE and PGE to meet to discuss public engagement in the decision making processes surrounding Pomerania's nuclear development trajectory is indicative of broader attitudes to different knowledge cultures.

As a result of PGE, PSSE and the Ministry of the Economy's reluctance to engage with the research, the only correspondence which was possible with these institutions was through attendance of public meetings held in October 2011 at the Gdańsk Park for Science and Technology (PGE and PSSE), and in February 2012 at Choczewo primary school (PGE). Rather than engaging in multiple instances of dialogue with various individuals and groups, PGE and PSSE appeared keen to carefully orchestrate discussions within a small number of discourse spaces. However, it is important to note that my challenges accessing information during fieldwork in the Tricity were not unique to being an external researcher.

During interviews with the Mayor of Gmina Krokowa and the Commune Administrator of Gmina Gniewino in July 2011 and February 2012 respectively, and the Energy Minister of the Office for Regional Government in February 2012, it became clear that the flow of information from PGE and the Ministry of the Economy at the national level is limited. In Krokowa in February 2012, the Mayor of Gmina Krokowa explained that the municipality receives information about development plans at the same time as the general public, and relies upon websites and public communication channels as their main source of information. The Mayor explained how, in January 2012 when the most recent shortlist of proposed development sites was announced, he was invited to meet with PGE the day before the announcement was made public. However, he did not receive any additional information about the shortlisted locations, or details surrounding how the sites had been selected for inclusion. He explained that the municipal government for Krokowa has had to take a passive stance on the receipt of information, and to wait for a "decision from the top" (in reference to

information from PGE and the Ministry of the Economy) to be made in order to know what is going to happen to the land surrounding the ‘Żarnowiec’ site (Interview: Mayor of Gmina Krokowa, Krokowa, February 2012).

Similarly, the Energy Minister of the Office for Regional Government explained how regional government has not been invited to discuss nuclear development plans with PGE. For significant announcements such as those relating to the potential location of the first plant, information is received a day in advance of the public announcement, but the information is only “very general”. He attributes the lack of information received from PGE to the early stages of the development process, though he expressed hope that once a decision about the final location of the plant is made that regional government will be in receipt of more detailed information from the consortium partners (Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdańsk, February 2012).

The reluctance of both PGE and the Ministry of the Economy to discuss their respective roles in the pursuit of nuclear development in Pomerania is a useful illustration of the carefully controlled nature of the communication of information regarding development plans. These institutions, the relationships they have formed, the exchange of information between them and the decision making processes they engage in remain largely inaccessible to the general public as well as to organised groups and local and regional government. These experiences support the views of the opposition movement in Gdańsk that dialogue on the subject of nuclear development is a tightly controlled and opaque process.

In the spring of 2011 statements of cooperation were signed between PGE, Hitachi GE and a number of local institutions including the Gdańsk Shipyards and the Technical University of Gdańsk (Dziennik Bałtycki, 2011; Trojmiasto, 2011). Following these announcements, I

contacted the Gdańsk Shipyards and the Technical University of Gdańsk in order to discuss the arrangements detailed in the local press, though as with PGE and PSSE it proved difficult to arrange meetings. A representative for the shipyards would not comment any further on the arrangements with PGE and Hitachi, stating that it was too early in the decision making process to offer any further information (Personal communications with Stocznia Gdańska, April 2011), and at the Technical University of Gdańsk, the head of the department responsible for relations with PGE and the signing of the statement of intention agreed to meet, but despite the public announcement of the statement of cooperation between the university, the shipyards, PGE and Hitachi, he declined to offer any further information on the consortium or confirm the university's relationship with the consortium:

“It is a misunderstanding to think of any relations between the Technical University of Gdańsk and any investors and big players that would like to construct the power plant here” (Interview: Representative of the Gdańsk Technical University, Gdańsk, July 2012).

Other than brief statements indicating that dialogue and preparations for a nuclear power plant were indeed taking place on a closed level, those involved in the decision making process and in forming business relationships for potential future investment demonstrated considerable reluctance to provide information on development plans, and particularly information relating to public engagement strategies.

During fieldwork, the reluctance of key players to discuss the development plans and in some instances to deny any relationship with PGE or representatives from national government was frustrating, yet these experiences support the claims of the activists involved with PIA and discussions with representatives from local and regional authorities that the decision making

process remains largely opaque and inaccessible. Without widespread interest in development plans (as highlighted in section 6.1) or access to information concerning PGE and the Ministry of the Economy's intentions to construct a nuclear power plant in Pomerania, the process of nuclear assemblage within Pomerania has, to date, been able to continue along a largely uncontested trajectory. The disparate elements of a nuclear industry - national energy challenges and fuel diversification demands (see Chapter 1); the dependencies and socio-material entanglements of the municipalities in which the most favoured development site is located (see Chapters 4 and 5); and the legal and policy related frameworks and contracts which underpin the nascent Polish nuclear industry – have been able to come together without the resistance which plagued and eventually led to the abandonment of construction work on Żarnowiec NPP during the 1980s.

6.3 Dialogue Platforms and Public Participation

Throughout fieldwork for this research, many participants described how they felt that a lack of information restricted their ability to build a powerful counter argument to nuclear development, or to garner further attention from the public (see section 6.2). Furthermore, research participants also identified a lack of a platform for truly open dialogue as a key component of their frustrations with the decision making process and their ability to assemble their concerns into a cohesive argument which could be heard in the public sphere (Attendance of demonstrations against nuclear development in Pomerania, Gdańsk, March & April 2011; Attendance of meetings with PIA between February and June 2011).

Whilst these groups have struggled to increase their membership and the opposition movement within the region of Pomerania and specifically within the Tricity remains relatively small, those employed by the institutions hoping to realise the investment in nuclear

recognise the potential of an opposition movement to swell and to cause problems for future investment. The activities and membership of the contemporary opposition movement in Gdańsk are minor when compared to the scale of social and environmental opposition experienced during the construction of Żarnowiec NPP during the 1980s, yet isolated pockets of opposition have arisen following the release by PGE of a shortlist of possible locations for development, most notable at the development site of Choczewo-Lubiatowo (Attendance of public consultation and demonstration: Choczewo, February 2012; See figure 1.1 for a map indicating site locations).

As a result of these small but vocal incidents of social and environmental opposition throughout the region of Pomerania, the zoning authority PSSE (see Chapter 4) has financed a body of research into regional attitudes to nuclear development, and begun to address demands for a platform through which stakeholders and interested parties can meet to discuss regional energy development plans.

6.3.1 The Dialogue Platform for Energy and Self Governance

In early 2011, Pomorska Specjalna Strefa Ekonomiczna (PSSE) commissioned a research project into public opinions of nuclear development within the counties (*powiaty*) of Puck and Wejherowo. These two counties were selected as the ‘Żarnowiec’ site within Gmina Krokowa resides within Puck County, whilst the Choczewo-Lubiatowo site within Gmina Gniewino falls under the administrative boundaries of Wejherowo County (see figure 1.2).

The research project was designed to gain a better understanding of the factors which influence public attitudes towards proposals to construct a nuclear power plant in Pomerania, as the studies which had been conducted on behalf of the Polish Atomic Energy Agency (*Państwowa Agencja Atomistyka*) over the twenty years period following project

abandonment in September 1990 had focused on nationwide opinions of speculative development, rather than the opinions of those who live and work close to the proposed development sites (Atomistyka, 2007).

The research was conducted on behalf of PSSE by a team from the University of Toruń, led by Dr Piotr Stankiewicz:

“I was hired by the Special Economic Zone to conduct research on nuclear energy issues on social communication, participation, dialogue and such issues. [During the research, we felt that] there is a need to create something like a platform for public dialogue because there was the feeling that the people who have some interests, groups, but they don’t have the space to articulate their interests to come into dialogue with other stake holders.

So the idea was to offer them a space where they can communicate with others, articulate their interests and exchange their views and cooperate to maybe not to come to a consensus but to at least to clarify their position and we proposed that to the Special Economic Zone and also to the local government and they agreed to create something” (Interview: Piotr Stankiewicz, researcher, Gdańsk, July 2011).

It is important to note that the decision by PSSE to finance research into public attitudes and concerns relating to nuclear development in Pomerania predated the Japanese tsunami and nuclear accident which took place on 11th March 2011. However, following the accident, the need for a communication platform and more detailed understanding of public opinions within Pomerania became even more apparent. In April 2011, the regional government in Gdańsk, informed by the on-going research being conducted on behalf of PSSE and in light of mounting international interest and debate in the wake of the Fukushima nuclear accident and

clean up crisis agreed to the creation of an open platform for debate on matters relating to regional energy developments. The platform was named 'Energy and Self Governance'.

Discussing the structure of the new platform, Piotr explained:

“The [platform] consists of for the moment about sixty members... they are all people who represent regional stakeholders, the University of Gdańsk, the Technical University and also regional and local authorities, companies, investors, but also the opposition... We try to organise meetings on various factors of energy so it is important that it is not concentrated on nuclear... It is about energy in general and the regional questions because there are many controversies which should be somehow, maybe not solved, but managed... and that's what we try to do is to offer space for management of controversies, local conflicts...”

Though the question of nuclear development is central within energy debates in Pomerania, as the technology and discussions surrounding it stretch back decades historically, the platform was designed to facilitate discussions on all types of energy development taking place within Pomerania. In addition to nuclear development, the region has also seen sizeable investments in the renewables sector, with a large emphasis on both on and offshore wind, as well as speculative interest in the exploitation of regional shale gas opportunities (UMWP, 2011; Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdańsk, February 2012).

However, the process of establishing a platform for debate proved challenging. Piotr explained how certain groups of individuals and institutions approached the platform as a means to promote development perspectives relating to their personal philosophy or business ventures, rather than seeking to engage in truly open dialogue:

“[The dialogue platform] was not created just by the Special Economic Zone or myself, but also by the actors who are involved... representatives of local and regional government, of the universities, and other parties. We spent more than half a year preparing the forum...

I think one of the biggest problems was and still is to convince such people that [the aim of the platform] is not [to] convince people that nuclear energy or another type of energy is the best... [but to] try to start the dialogue from the assumption that there are various interests and interest groups, and it is not possible to say that [there is one truth] of which [opponents] must be convinced. This is one of the biggest obstacles in creating the forum I think.”

These challenges were encountered most often with members of the regional pro-nuclear lobby:

“They [platform participants interested in the successful development of a nuclear industry in Pomerania] think or they hope that within the forum they will have better opportunities to convince other people [of their position]... that there will be an opportunity to make a campaign for nuclear energy” (Interview: Piotr Stankiewicz, researcher, Gdańsk, July 2011).

Despite the presence of the ‘Energy and Self Governance’ initiative, attempts at dialogue on nuclear have been challenging. To coincide with the publication of the research on public opinion on nuclear development in the counties of Puck and Wejherowo which had led to the creation of the dialogue platform, in October 2011 a presentation event was arranged to take place at Gdańsk’s new Science and Technology Park. The aim of the event was to make the findings of the research public whilst facilitating discussion under the umbrella of the newly

established 'Energy and Self Governance' dialogue platform. However, the manner in which the event had been designed proved limiting. The main panel of presenters comprised representatives from PSSE as well as from regional government, both Gmina Krokowa and Gmina Gniewino and the energy company and key stakeholder PGE. Opposition groups and wider interests were not represented on the main panel. As such, representatives from Greenpeace Poland and PIA were limited to taking a seat in the main audience (Attendance of meeting at the Science and Technology Park, Gdańsk, October 2011). The event was well attended despite the event having been arranged to take place at midday on a Wednesday in an industrial park away from the city centre, and the first half of the event was given over to the presentation of the research findings followed by short statements by the panellists. Though the intention of the meeting was to facilitate dialogue on the findings, the structure of the event with panellists sat at the front of the room, physically set apart from the audience by a few meters and a long panel table, created an atmosphere which limited dialogue and the balance of power in the room fell to the panellists. Following the presentation of results by Piotr Stankiewicz, the panellists were invited to comment on the findings of the research and the perspectives of their respective institutions for the development of a nuclear power station in Pomerania.

The head of PSSE, Teresa Kamińska, in her comments following the presentation of the research findings stated that PSSE was interested in social opinions on nuclear development as well as the potential benefits associated with investment in the technology. She insisted that the discussions should extend to all types of energy development, and not be limited to nuclear. She expressed the need for and support of technological innovation for the region, and stated an interest in exploring the role that nuclear could play for the region (Teresa Kamińska, PSSE, Gdańsk Science and Technology Park, October 2011). The panellist from

PGE, Witold Drozdź commented by stating that the primary concern for the energy company was establishing the best development path for the region. He highlighted the value and importance of social opinions on nuclear development for PGE, stating that the energy company remained open to discussions on many different perspectives and options for Poland's energy future (Witold Drozdź, PGE, Gdańsk Science and Technology Park, October 2011).

Neither of the representatives from PSSE and PGE volunteered further information on development plans in their post presentation speeches, rather opting to keep their commentary neutral and focused on the findings of the sociological research. This approach was also mirrored by regional government representative Ryszard Swilski, who stated that regional government remained committed to the diversification of energy resources (Ryszard Swilski, Województwo Pomorskie, Gdańsk Science and Technology Park, October 2011). Such commentary or lack thereof, frustrated representatives from PIA and Greenpeace Poland as well as individuals from the local community who had attended the meeting hoping that it would provide an opportunity to receive more detailed information surrounding the investment (Attendance: Presentation of PSSE's research findings & Dialogue Platform meeting. Gdańsk, October 2011).

The representatives from PSSE, PGE and regional government kept their commentary closed to the controversial aspects of nuclear development, leaving the more cautious commentary on the findings to representatives from the local tiers of government in Gmina Gniewino (Commune Administrator) and Gmina Krokowa (Mayor Henryk Doering). Whilst both highlighted the importance of regional investment opportunities and expressed recognition of the need for diversification of energy resources, they also highlighted their concerns for regional tourism, stating that they hoped to discuss the investment in further detail, with a

particular emphasis on the proposed location and distance of a future facility from local communities (Representatives for Gmina Gniewino & Gmina Krokowa, Gdańsk Science and Technology Park, October 2011).

A short question and answer session took place following the comments made by the panellists, and the first to ask questions of PGE and PSSE were representatives from PIA and Greenpeace Poland. However, questions relating to ecological concerns, proposals for the location of the facility and the impact of nuclear development on the tourist industry were frequently left unanswered as the panellists appeared neither willing nor able to offer a detailed response. Rather, the question and answer session ended abruptly as the panellists conversed amongst themselves or left the room to answer phone calls (Attendance: Presentation of PSSE's research findings & Dialogue Platform meeting. Gdańsk, October 2011).

The discussion and commentary of the panellists during the presentation event at Gdańsk Science and Technology Park tended towards the cautious and reserved. There was very little scope for a discussion of the challenges associated with nuclear development. These topics were left untouched behind the panellists table, yet many of the participants in the audience had come to discuss their concerns and hoped to receive more detailed information of the investment (Attendance: Presentation of PSSE's research findings & Dialogue Platform meeting. Gdańsk, October 2011). The presentation event was a frustrating experience for those concerned about plans to develop a nuclear industry in Pomerania. Rather than facilitating full and open dialogue to include a discussion of the challenges and risks of nuclear development, the event appeared to have been carefully constructed to preserve a positive atmosphere surrounding development proposals.

6.3.2 The Association for the Development of a Nuclear Power Plant in Pomerania

Also present amongst the audience at the Science and Technology Park on the afternoon of the presentation event were representatives from businesses and local institutions who have expressed an interest in cooperating during the development process alongside the official consortium partners. Many of these individuals have a personal interest and investment in seeing the introduction of a nuclear industry within Pomerania due to specialist training they received at the time of the original development of Żarnowiec NPP during the 1980s (Interview: Waldemar Dunajewski, Gdańsk, July 2011; Interview: Representative of the Technical University, July 2011; Interview: Energy Minister of the Pomeranian Province Martial Office, Gdańsk, February 2012). One such individual is the head of a second platform for dialogue on nuclear development in Gdańsk, the ‘Association for the Development of a Nuclear Power Plant in Pomerania Province’ (*Stowarzyszenie na Rzecz Elektrowni Jądrowej w Województwie Pomorskim*).

The head of SEJP, Waldemar Dunajewski, is an electrician by trade with a postgraduate specialisation in the economics and management of nuclear power, and it was his knowledge of nuclear technologies and experiences during the 1980s which led him to establish the association in early 2011. However, unlike the ‘Energy and Self Governance’ platform, the focus of Waldemar Dunajewski’s SEJP is placed solely on nuclear development with an aim to bring together individuals and organisations who wish to lobby for the successful development of a nuclear industry for personal or professional reasons (Interview: Waldemar Dunajewski, Gdańsk, July 2011).

Also in contrast to the ‘Energy and Self Governance’ Platform, the association has not been designed to enable those who stand in opposition to nuclear development to express their

opinions, but rather to encourage those who wish to see nuclear developed in the region to group together to support the bid for nuclear investment and to influence decisions relating to the location of the first nuclear power plant within Pomerania. Waldemar Dunajewski explained:

“There are two main aims [for the association]. The first is just to create a good atmosphere [for nuclear power] in the region, and the second aim is to prepare local companies and to prepare [a dialogue platform] to let them be part of, to let them take part in the construction and process of developing a nuclear power plant [in Pomerania].

“Our idea is first of all to gather together the people who have a positive attitude to the investment, and we hope that there will be many young people. There are already some students who support very much the idea of the power plant here... We plan to train the members and teach them about the advantages of nuclear power on the regional level and on a national level.”

“The second aim of ours, to make the good atmosphere, is to go to the [municipalities] where the power plant would be located and just to teach them [the local residents as well as the municipal authorities] about the advantages of nuclear power... and [finally] we aim to provide reactions for articles in the media which are against nuclear power, so you know, media activities (Interview: Waldemar Dunakewski, Gdańsk, July 2011).”

The activities of the SEJP are in line with a ‘deficit model’ of public knowledge and public understandings of science, technology and risk (Wynne, 1991). Comprising a membership of engineers, business owners, science and engineering graduates and technical specialists, the

SEJP aims to overcome any negativity surrounding nuclear development through education, and ‘communicating’ scientific and technical perspectives of the benefits of nuclear development to potential opponents. In the true sense of the word ‘dialogue’, it is not a ‘dialogue’ platform (Rowe & Fruher, 2005), but rather a pressure group for the promotion of a single, united perspective on nuclear development.

The two platforms, ‘Energy and Self Governance’ and ‘SEJP’ differ in their approach to communications. The former, at least in principle addresses concerns and opinions from a wide range of perspectives, whilst the latter focuses solely on promotional activities surrounding the development of a nuclear industry within Pomerania. However, the two platforms also differ in their legal status.

Whilst the SEJP has been granted official recognition by Gdańsk City Council under the 1989 Law of Associations, the Dialogue Platform for Energy and Self Governance, established on behalf of PSSE and outlined in section 6.1 has not received the same recognition. As a result, ‘Energy and Self Governance’ is regarded as an informal arrangement, and there are no requirements for regional or national government to take into consideration the discussions which take place through the platform (Interview: Waldemar Dunajewski, Gdańsk, July 2011; Interview: Piotr Stankiewicz, Gdańsk, July 2011).

Piotr Stankiewicz described the limitations which result from the ‘Energy and Self Government’s’ lack of legal status as an association:

“We can’t be sure that the results of the dialogue will be implemented, that is why we talk about dialogue and not negotiation... we simply cannot guarantee that the regional authorities will take the results of the dialogue [into account when engaging in discussions with PGE and the Ministry of the Economy]. We can promise that the

results of the dialogue will be transmitted to the regional authorities, but we cannot be sure that [the discussions we have] will have an impact.” (Interview: Piotr Stankiewicz, Gdańsk, July 2011.)

Though the agency of local and regional government is limited due to the manner in which decisions regarding ‘areas of national importance’ are managed (see Chapters 4 & 5), the legal recognition of the SEJP as an association by Gdańsk City Council is a significant advantage to the platform. ‘Association’ recognition grants a group the right to publicly voice opinions on a specific matter of public interest (Rady Państwa, 1989).

6.3.3 PGE and the ‘Battle of Choczewo’

The fieldwork for this research took place during the first stages of discussions surrounding nuclear development in Pomerania. As such, public meetings relating to the siting of the first nuclear power plant were only just starting to take place towards the end of 2011 and beginning of 2012. In February 2012, to coincide with the release of an updated shortlist of possible locations for the first plant by energy company and main investor PGE, a public consultation meeting was arranged between PGE and the community of Choczewo.

Choczewo is a small village north west of Lake Żarnowiec (see figure 1.1). The Choczewo-Lubiatowo²⁴ site is the second most favoured site for development, preceded by the ‘Żarnowiec’ site and followed by the Gąski site which lies further west along the Baltic Coast. Choczewo was a surprise announcement for development at the end of 2011, as the site had previously not featured on any of PGE’s shortlists.

²⁴ The ‘Choczewo-Lubiatowo’ site is mostly located on the coast at Lubiatowo, but stretches in land close to the village of Choczewo. Both Choczewo and Lubiatowo are within the administrative boundaries of Gmina Choczewo.

Many of those assembled in the audience for the public consultation had taken the decision to attend as they believed, as with the consultation event at the Gdańsk Science and Technology Park in October 2011, that it would be an opportunity to ask questions of PGE relating to the investment and choice of Choczewo as a possible development site (Attendance: Public Consultation at Choczewo, February 2012). However, the two events shared many similarities in terms of their format. The meeting took place in the local Choczewo primary school and representatives from PGE sat at the front, flanked by video cameras and the media as they began the session with a presentation they had prepared which focused largely on the benefits of nuclear power to the community. The presentation painted a picture of investment by PGE in a new power station which would create jobs and provide a boost for the local economy. The presentation focused on how ‘green’ and ‘environmentally friendly’ nuclear technologies are (see also section 6.4.3), placing emphasis on the safe selection of modern reactors over the Soviet era reactors which had previously been at the centre of the controversy and opposition to the construction of Żarnowiec NPP during the 1980s (Attendance: Public Consultation at Choczewo, February 2012).

As figures 6.2, 6.3 & 6.4 illustrate, the meeting at Choczewo was attended by a large crowd of activists and concerned local residents. The event had been advertised throughout the Tricity as the ‘Battle of Choczewo’ (*Bitwa O Choczewo*; See figure 6.5), and approximately 300 people had made their way through one of the heaviest snow storms of the year to be in the audience. The activists were very well organised, wearing matching yellow jackets emblazoned with ‘no to the atom in Lubiatowo’, holding up anti-nuclear artwork and banners, and constantly posing questions to the representatives from PGE. However, the presentation itself did not touch on any of the controversial aspects of nuclear development, and failed to address the topic which many of the local residents hoped would be top of the agenda that

night - that of the potential negative impact of nuclear development on tourism and the local landscape (see figures 6.2, 6.3 & 6.4). Furthermore, following the presentations by PGE the question and answer session fell flat as community members raised their concerns for the proposed development and PGE circumnavigated the key issues.



Figure 6.2 The public consultation event arranged by PGE to take place at Choczewo primary school. (Photograph by author, February 2012)

Translation of banners in figure 6.2: Atom Stop! Tourist Region; Do not lie, that there will be jobs in the power plant! Atom be gone!; Choczewo homes without nuclear power!!!



Figure 6.3 PGE's presentation at the public consultation event at Choczewo primary school.
(Photograph by author: February 2012)



Figure 6.4 Members of PIA holding up banners and posters at the public consultation event held in Choczewo primary school, February 2012. (Photograph by author: February 2012)



Figure 6.5 ‘Battle of Choczewo’ – Poster distributed throughout the Tricity in advance of the PGE communication event at Choczewo primary school. (Image source: Distributed via mailing list by members of PIA).

Translation:**BATTLE OF CHOCZEWO**

cut the forests, dig the dunes, pave over the beach; fear of storms; a nuclear waste disposal site; being deceived over jobs for community residents; a negative impact for tourism; Is this to be our future? Come and join us to fight for the defence of our beautiful land! 9th February, 5pm, Choczewo School.

6.4 The imagery of an ‘imagined public’

The first half of this chapter focused on public attitudes to nuclear development within Pomerania at a regional level, and specifically within the Tricity area of Gdańsk-Sopot-Gdynia. The aim of these discussions was to examine the process of nuclear assemblage within the wider region of Pomerania, and to identify why attitudes towards the prospect of constructing a nuclear power plant in Pomerania have changed so dramatically since project abandonment on Żarnowiec NPP in September 1990. In section 6.1 I explored how the socio-political climate in which nuclear development takes place influences attitudes towards debates surrounding the technology. Meanwhile, section 6.2 examined the difficulties associated with accessing information on contemporary nuclear development plans within the region. These two sections identified the reasons which lie behind the absence of widespread social and environmental interest in or opposition towards nuclear development plans within the region of Pomerania. The discussion found that without widespread information on development plans or a climate of public distrust in the institutions responsible for development, it has been possible for nuclear assemblage to continue largely unchallenged.

However, despite the absence of widespread social and environmental opposition to nuclear development plans within Pomerania, there have been isolated incidents of local activism, most notably in the villages surrounding the second and third development sites on PGE’s

shortlist (see figure 1.1 for a map of the locations of the three sites). As such, and with the memory of the protests which took place throughout the construction of Żarnowiec NPP never far from the surface of debates, those keen to see investment in nuclear within Pomerania have begun efforts to facilitate discourse between interested parties. Yet as section 6.3 has shown, these attempts have been problematic and indicative of the uneven distribution of agency between the institutions and organisations in favour of nuclear development and those who stand in opposition to the plans. Whilst there are spaces for communication they have, to date, been one way. There remains very little opportunity for the residents, concerned publics and activist group members to participate or co-shape the process of nuclear assemblage.

6.4.1 Nuclear power is for engineers!

The following section demonstrates how scientists, technicians, engineers and decision makers within Pomerania engage in discourse with the community and specifically with the concerns of local social and environmental opposition groups. The section examines how the design of public communication events shapes dialogue and the trajectory of nuclear assemblage through the manipulation, both direct and indirect, of credibility in the arguments for and against nuclear development.

During fieldwork it became apparent that to those involved with the Pomeranian pro-nuclear lobby, social opposition and resistance to development are viewed as the products of a lack of understanding or a dependence on sensationalist information about the technology as depicted by the media. This ‘deficit model’ of public understanding of science (Wynne, 1991; Burningham et al, 2007) is clear through the proceedings of ‘dialogue platforms’ and public consultation events. These events, as illustrated in section 6.3, are not designed to enable truly

open dialogue, but rather to influence or persuade the local communities and development opponents of the merits of nuclear as a technology.

The 'Energy and Self Governance' platform, created by Dr Piotr Stankiewicz aims to encourage participation and to facilitate discourse between a variety of social actors and institutions, seeking a more deliberative and inclusive approach to discourse on nuclear development. However, as the event held in October 2011 and Piotr's own experiences with further platform events demonstrates, truly open discussions have not been possible (Interview: Piotr Stankiewicz, Gdańsk, July 2011). During meetings, the already privileged social actors and institutions of PGE, PSSE and local businesses associated with and involved in the development process dominate discussions, leaving little space for alternative narratives and perspectives on development plans, an experience which has also been noted by Chilvers (2008) with regards to participatory decision making surrounding nuclear waste management in the UK.

Such a biased scenario is further compounded by the legal framework which surrounds the two key dialogue platforms. Whilst Waldemar Dunajewski's 'Association for the Development of a Nuclear Power Plant in Pomerania Province' (SEJP) has been recognised as an association by Gdańsk City Council and enjoys access to regional government discussions, the 'Energy and Self Government' platform is not legally recognised. The outcomes of discourse from the 'Energy and Self Government' platform are instead regarded as non-binding recommendations.

Both the presentation of PSSE's research findings at Gdańsk's Science and Technology Park in October 2011 and PGE's public consultation event at Choczewo primary school in February 2012 are best viewed as public 'communication' events – the one way relaying of

information from ‘sponsor’ to ‘public’ - rather than spaces for ‘dialogue’ - two way communication, working towards a mutually agreed solution - or ‘consultation’ - two way communication, but with no guarantee that the discussions will inform development outcomes (Rowe & Frewer, 2005; Barnett et al, 2012). Furthermore, during the Choczewo event, PGE arrived at the meeting prepared to tackle opposition through the presentation of ‘rational’ information on the safety profile of modern nuclear reactors and the benefits of nuclear development for the communities around Lake Żarnowiec and Lake Choczewo. These activities demonstrated the presence of an ‘imagined public’ who would oppose development plans purely on the basis of a lack of understanding. Rather than engaging with the community and understanding their specific motivations and concerns, PGE applied a pre-emptive approach to public communications. The representatives of PGE approached the public communication event prepared for hostility, and readied themselves to tackle hostility with a ‘rational’ scientific approach to public communication. Whilst the event at Choczewo was advertised by the opposition movement as a ‘battle’ against PGE by the people of Choczewo and as such can be seen to confirm the ‘imagined public’ model held by PGE, I argue that it is the lack of a suitable space for truly open dialogue and debate which drove the community members of Choczewo and Lubiatowo to take such radical and evocative action.

During interviews, key representatives of institutions expressed their opinion that nuclear development is a subject for technical specialists, and that those concerned with social outcomes should not become involved in dialogue unless they are willing to discuss the subject in purely technical or scientific terms. This view is based on a presumption, critiqued within the field of Science and Technology Studies (Pinch & Bijker, 1984; Latour, 1987; Wise, 2005) that scientific knowledge is objective truth rather than the product of iterative social processes, conducted by social actors prone to their own mistakes and biases.

“[You have] chosen the wrong area to study. Why study the social processes or social aspects of nuclear development? It is a technical subject. If [you read] the national power strategy, after that, [you] can come here and talk about this topic” (Interview: Representative of the Technical University of Gdańsk, Gdańsk, July 2011).

Such was my experience when meeting with a senior representative of the Technical University of Gdańsk in July 2011. The meeting had been arranged in order to discuss the signing of an agreement of cooperation for nuclear development in Pomerania between the Technical University and a number of local institutions (as described in section 6.2). Following this exchange, and counter to the briefing surrounding the research, he proceeded to advance through a number of presentations regarding the criteria for the selection of a location, mathematical models of risk and the impact of development, proposals for the nuclear power plant, and his recommendations regarding the location (Interview: Representative of the Technical University of Gdańsk, July 2011).

A similar tactic was also undertaken by the Energy Minister for Regional Government when asked for the city’s perspective on energy development and nuclear in particular. Despite having communicated with the representative prior to the meeting about the nature of the research, it became clear as soon as the meeting began that the agenda would remain fixed upon the scientific and technical rationale for nuclear development. As such, rather than being invited to open a discussion on social engagement with the decision making process he launched into a number of presentations, designed to show the benefits of nuclear development. These presentations detailed the 2005 and 2009 programmes of energy to 2025 (Ministerstwo Gospodarki i Pracy, 2005; Ministerstwo Gospodarki, 2009; UMWP, 2011; Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdynia, February 2012).

The Energy Minister for Regional Government was keen to discuss the regional government's interactions with the opposition movement and how they were involved and represented during the decision making process and through community engagement events:

“Thanks to these initiatives [of the Energy and Self Government platform] we have been able to hear the attitudes of everyone who has an opinion – entrepreneurs, local authorities and local communities” (Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdańsk, February 2012).

However, he was dismissive of many of the concerns which had been raised by community members and the local social and environmental opposition movement. On the subject of local opposition and both social and environmental perceptions of risk, he was keen to point out that the opposition movement “simply do not grasp the basic concepts” of nuclear as a technology:

“First you need to be an engineer and then you can talk with us” (Interview: Energy Minister of the Pomeranian Province Marshal Office, Gdańsk, February 2012).

6.4.2 From Fukushima to the Baltic Coast

In the immediate aftermath of the tsunami which struck the coast of Japan and the ensuing nuclear accident at Fukushima in March 2011, the focus of discourse on nuclear development in Poland remained firmly fixed on the positive aspects of investment and on limiting any association between the operation and governance of the Japanese nuclear industry and the nascent Polish industry. The rapid response by the Polish government to the events unfolding at Fukushima struck fear amongst the opposition movement in Gdańsk:

“I think that there is not enough opposition to nuclear power now. I hope that it comes after Japan. I can see how much organisation there is around damage control, organised by those who are for nuclear power. They are very much afraid that Fukushima will cause opposition. You can see that Tusk has already spoken that [the list of proposed sites are] not on the, not located on the area of seismic activity. It is horrifying because it shows how serious they are about building a plant” (Interview: Hana, University of Gdańsk, March 2011).

My interview with Hana took place less than a week after the tsunami which caused catastrophic meltdown of reactors at the Fukushima facility in Japan. The reaction of the Polish administration to the accident lay in stark contrast to the reactions elsewhere in Europe for example in Italy where a public referendum was held on whether the country should pursue nuclear development (Times, 2011) and in Germany (Der Spiegel, 2011) where Chancellor Merkel ordered the closure of aging nuclear facilities. Whilst these nations responded by temporarily closing plants dating from the same era as the Fukushima plants and ordering a review of operational practices, Poland’s Prime Minister Donald Tusk issued a response indicating Poland’s continued desire to pursue nuclear.

“Nie możemy popadać w histerię - przyczyną zagrożeń radiologicznych w Japonii nie jest awaria elektrowni, tylko potężne trzęsienie ziemi i tsunami”

Translation:

“We cannot fall into hysterics - The cause of the accident and hazards in Japan is not a failure of [nuclear] power [as a technology], but a powerful earthquake and tsunami”

(Tusk, 23rd March 2011, Gazeta Wyborcza)

“We need to make a decision based on rational analysis and not emotions”

(Grad, 5th April 2011, The Guardian)

The reaction of the Polish administration to the accident at Fukushima failed to address rising public concerns for the safety of the environment and society in the face of the changing social climate on nuclear technologies. Instead, the approach and comments further demonstrated a desire to present nuclear development as the most ‘rational’ or obvious choice for Polish society. Poland’s pursuit of nuclear was presented in terms of the social and economic benefits development would bring (Gazeta Wyborcza, 2011), whilst the rise in concern for the risks associated with the nuclear industry were dismissed as an ‘hysterical’ reaction to an unfortunate accident and outdated reactor designs. Once again, the Polish administration appeared to be working with an ‘imagined public’ in opposition to nuclear development as a result of information garnered from the rolling news coverage of the Fukushima accident. In contrast to neighbouring states in Europe, the reaction of the Polish administration failed to engage with the international debates which continue to surround nuclear power in the aftermath of the Fukushima accident, or the concerns of Polish citizens for the long term safety of a nuclear industry. Rather than triggering the release of further

information or true participatory engagement and dialogue on development pathways, the incident appeared to demonstrate just how inaccessible and opaque the decision making process for nuclear remains.

6.4.3 A battle of imagery

As a result of the limited nature of public engagement surrounding nuclear development in Poland, and specifically with regards to the decisions surrounding investment in Pomerania, the small number of social groups and individuals who stand in opposition to nuclear investment and development in Pomerania feel that they have limited options for expressing their fears and concerns. In addition to the limitations of public platforms for discussion and debate discussed in section 6.3, there are also limitations at play with regards to access to traditional forms of print media.

During a meeting held with members of PIA in April 2011, a key participant who reiterated his need for anonymity detailed his experience of meeting with a journalist for one of Poland's major national economics and politics publications, '*Wprost*'. The journalist wished to write an article detailing the plans to develop a Polish nuclear industry, yet was cautious due to an advertising deal the magazine held with the major energy company, PGE. The journalist wrote the piece, leaning more in favour of a positive view of the technology and it was approved by his editor, yet PGE were unhappy with the final editorial and skipped their advertising deal with the magazine for three months.

Advertising forms a significant proportion of income for a publication. With readership transferring to digital media and often leaning towards the free distribution of information, without advertising deals publications would struggle to stay in business. In effect, the voice of the media is controlled by large corporations such as PGE, and as such cannot freely

present an unbiased perspective on development. Without such a perspective, it is hard for the opposition movement to gain traction or to present their views of the technology to a wider audience. The agency of the opposition is therefore significantly limited:

“The journalist summarised ‘I can write what PGE wants me to write but that doesn’t make sense so I don’t touch the subject of nuclear power in Poland. And all my colleagues do the same’” (Jakub, Gdańsk, April 2011).

Without access to dialogue platforms, and without true representation in the media, the opposition have adopted alternative methods of communication, using graphic illustrations, underground publication methods and personal blogs to present an image of nuclear power which runs sharply counter to that of the pro nuclear lobby. However, these images and methods of communication are problematic in and of themselves. In particular, the imagery surrounding the opposition movement is often seen juxtaposed against the very carefully constructed narratives and imagery of the pro nuclear lobby. Radioactive warning signs, gas masks and coveralls, re-enactments of nuclear meltdown scenarios, and posters printed in bright reds and yellows (see figures 6.6, 6.7 & 6.8), are displayed against a more widespread backdrop of polished publicity material by PGE and the Polish Atomic Energy Agency, and authorised scientific research by very well-funded institutions and individuals whose profession rather than personal interest it is to see nuclear arrive in Pomerania.



Figure 6.6 At a demonstration to mark the 25th anniversary of the accident at Chernobyl, Central Gdańsk, 26th April 2011 – (Photograph by author)

Translation of figure 6.6:

Banner: *Światło w domu, bez atomu : Light in our homes without the atom*

Handheld: *Attention, contaminated land!!!*

April 26th 2011 marked the 25th anniversary of the accident at Chernobyl, and nuclear debates were high on the international agenda as a result of the tsunami and resulting nuclear meltdown in Fukushima, Japan. To mark these two events and bring awareness to the potential of nuclear development in Poland, several events took place in Poland's major cities. In Gdańsk, members of PIA organised a demonstration to take place just outside the Gdańsk

Central Station. This ‘happening’ was a theatrical stunt designed to garner attention from both the public and the media, and to spark wider dialogue and debate. Dressed head to toe in white coveralls and full face gas masks, a group of activists gathered together to act out an evacuation drama following a mock nuclear accident at Żarnowiec. With megaphones and a sound system playing the sound of an emergency warning system complete with sirens, the event was designed for shock factor. A sizeable crowd gathered to watch the event unfold, as two speakers began reading aloud a script detailing instructions for evacuation whilst further activists began circling the crowd with trays of paper cups containing liquid iodine. Just meters away on a sunny April afternoon, tourists sat in cafes, commuters passed by to access the bus stops, tramways and rail connections of Gdańsk Central Station and newspapers and magazines sat on the stands of news kiosks with front covers detailing both the clean-up operation in Japan as well as international reactions to the accident (Attendance: Anniversary demonstration, Gdańsk, April 2011).

Though the anniversary event was documented in a short piece on the local evening news that night and featured in the local Tricity newspaper (*Nasze Miasto*, 2011), the event in Gdańsk together with further debates in Łódź and in Warsaw were minor when compared to the events which were organised in Japan, France and Germany in the weeks before and after the Chernobyl anniversary.

With the Chernobyl anniversary protests and street demonstrations of early spring 2011, the opposition movement turned to imagery and theatrics to try and stimulate debate on Poland’s plans to develop a nuclear industry. Yet the outcome of the events was the branding by the media of those who participated in the events as overly emotional and detached from reality (*Gazeta Wyborcza*, 2011).



Figure 6.7 The flyer produced by PIA to advertise the Chernobyl anniversary demonstration (see also figure 6.6). (Image: PIA. Distributed by mailing list and pasted to billboards throughout the Tricity.)

Translation of figure 6.7:

26th April at 5pm by the cinema, Central Gdańsk

Protest against the construction of nuclear plants in Poland

25th anniversary of the catastrophe of nuclear energy in Chernobyl

Pomeranian Antinuclear Initiative



Figure 6.8 A flyer produced by PIA for a street demonstration in reaction to the Fukushima accident of March 2011. (Image: PIA. Distributed by mailing list and pasted to billboards throughout the Tricity.)

Translation of figure 6.8:

Sunday 20th March at 12pm, under the Golden Gate, Gdańsk

Protest against the construction of nuclear plants in Poland

FAREWELL NUCLEAR POWER PLANTS!!!

You think that nuclear power is bad energy?

Come! Take part in a symbolic act of purification

Translation of figure 6.9

Saturday 28th April

NO to the ATOM

At midday:

Demonstration against the construction of nuclear power plants in Poland, meeting at the Neptune fountain. WE INVITE YOU TO PARTICIPATE!!!

At 2.30pm:

Open meeting with the liquidators from the Chernobyl catastrophe

Professor Angelina Nyagu and Wladlenem Lepskyi at Gdańsk Shipyards

The campaign is organised under the framework of the European Week “For the future without Chernobyl and Fukushima”



Figure 6.9 A flyer produced by PIA for a street demonstration to be held in April 2012
Image: PIA. Distributed by mailing list and pasted to billboards throughout the Tricity.

The flyers in figures 6.7, 6.8 and 6.9 illustrate the nature of the imagery and language used by the opposition movement. In striking reds and yellows, the international colours of risk, danger, evacuation and with images of gas masks and burning, radioactive scarecrows, the

attempts of the opposition movement to engage in dialogue departs dramatically from the carefully orchestrated dialogue platforms , meetings and narrative described in sections 6.2 and 6.3.

Figure 6.8 is particularly dramatic as it depicts a burning '*Marzanna*'. The figure Marzanna and the traditions which accompany her mark the passing of winter and the arrival of spring and hope. Each spring, Polish school children create an effigy of Marzanna as British children would build a Guy Fawkes in the autumn. The effigy is then paraded through the villages, down to the rivers, and set alight. This symbolic tradition has developed to ward off the darkness and emptiness of the long winter months. The image of a radioactive and burning Marzanna by the opposition movement is particularly haunting choice as it turns Marzanna from a symbol of hope and prosperity to one of alarm and fear.



Figure 6.10 Anarchist magazine; Distributed by 'Bractwo Trojska' in Poznan.

Translation of figure 6.10:

Publication title: Monthly wild life

Headline: The atom will not succeed



Figure 6.11 Anarchist magazine, distributed by ‘Bractwo Trojska’ in Poznan.

Translation of figure 6.11:

Publication title: Another World, quarterly anarchist #2 (35) 2011

Headline: Without the atom in our homes

Fukushima – a media tsunami

Campaign against Żarnowiec NPP – memories

Figures 6.10 and 6.11 above are the front covers of two editions of anarchist publications made available in 2011. Once again, they take on an extreme view of nuclear development, choosing to use the most haunting and attention grabbing images to display their special publications on the subject of nuclear development. On the first, a man runs through an urban landscape wearing a bright yellow overall and gas mask, whilst in the second a father is pushing a young child in a pram whilst wearing a gas mask. Again, the choice of colours, bold text and phrasing is designed to grab attention and sway dialogue in a direction which it is not possible for it to go during the aforementioned dialogue platforms and meetings (Rose, 1996).

However, these publications are designed for a small, niche audience. Published through independent publishers 'Bractwo Trojska', they are online orders only, or distributed through small activist circles. Whilst the dominant narrative - that of the pro nuclear lobby funded by PGE appears on the front covers of magazines available in national book retailer, Empik, the alternative, alarming narrative is limited in both scope and scale to anarchist circles.

The images presented by the opposition movement during their demonstrations, and through their blogs and underground publications lie in stark contrast to the imagery used by the pro nuclear lobby. Where the opposition movement use the language and imagery of horror and fear (see, in particular, the images in figures 6.4 & 6.5), the pro nuclear lobby carefully construct their publicity material to present an alternative, more 'rational' approach to the technology. Using calming greens and blues, images of safety and security, and narratives on the benefits of nuclear development and the safety of the technology, the void between the two stand points is further expanded.

The following images are from printed articles and publicity materials made available by PGE during the community meeting at Choczewo in February 2012, as discussed in the previous section, 6.3. These articles accompanied the presentations given that evening by PGE (see figures 6.2 & 6.3).



Figure 6.12 A special edition newspaper, produced by PGE and distributed to the residents and activists present at the Choczewo communication event in February 2012.

Translation of figure 6.12:

Title: News, consciously about the atom

Headline: What is the research on the location and environmental planning?

How can we begin to construct a house, without knowledge of the area in which we wish to put it? How do we know that you cannot build a house on sand? Or a factory on shaky ground? These questions can only be explained by studies conducted by specialists.

The information newspaper above (figure 6.12) and below (figure 6.13) was provided by PGE to the residents of Choczewo in February 2012, and it has been designed to reduce opposition through the presentation of ‘objective’ scientific knowledge. The newspaper together with the presentation focused on the perceived benefits for the community should a nuclear facility be constructed on the site. However, the newspaper does not directly address the concerns that community members had raised prior to or during the meeting regarding waste, the environment and a negative impact on tourism and the local beauty of the area (Attendance of the meeting at Choczewo, February 2012).

The language used in the newspaper is dismissive, comparing the decision to build a nuclear power station to examples of building a house on sand or a factory in an area of seismic instability. The message from this publication is that siting decisions are for specialists, not for the community, and that there is no discussion to be had in the social sphere with regards to where to place the facility. Through this publication, PGE set out to overcome social opposition from the community in Choczewo through reassurance that siting issues were in the hands of competent professionals.

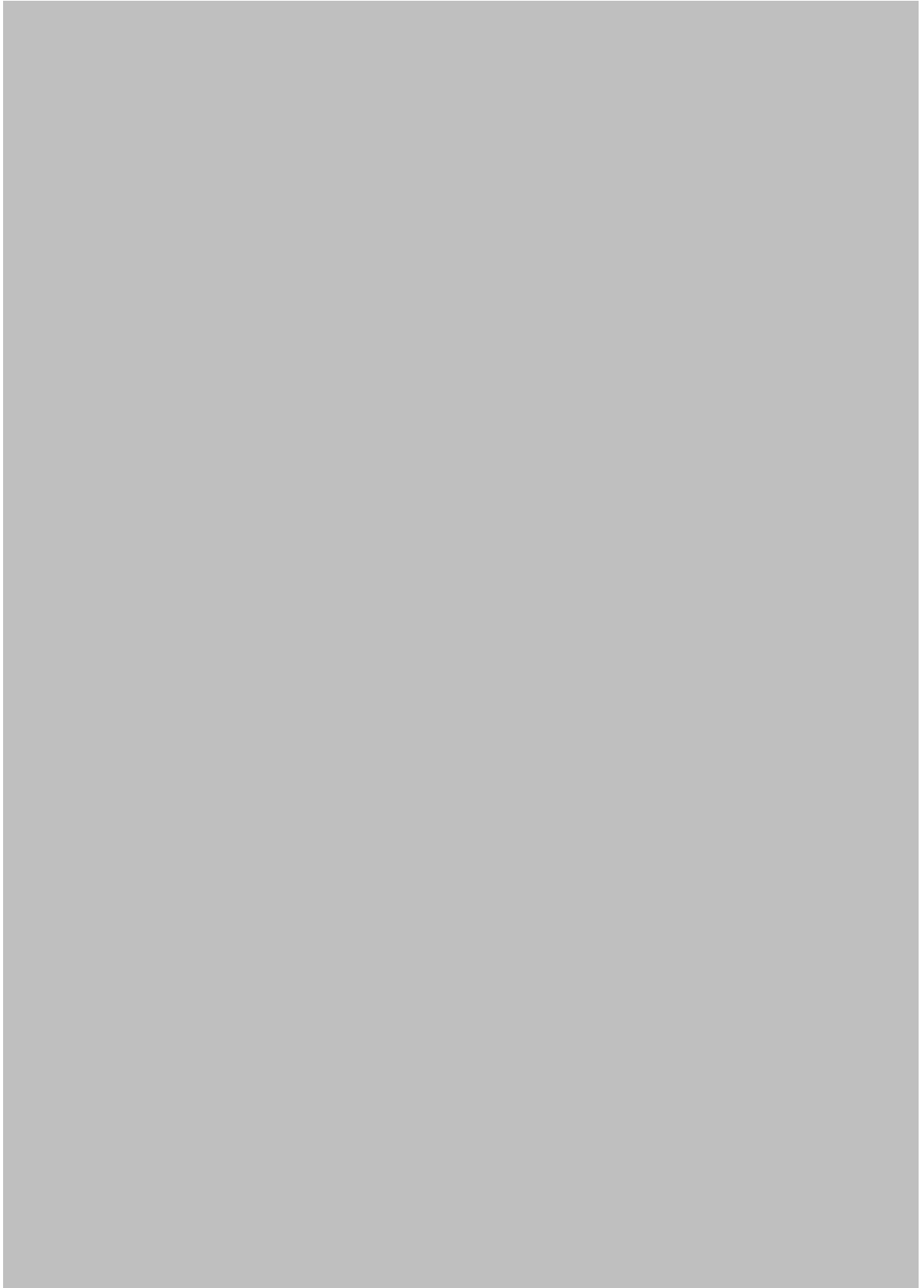


Figure 6.13 (As shown in 6.12)

Translation of figure 6.13:

Left: Frequently asked questions and answers

Main: Benefits for the community and region

Clockwise from top left: Financial benefits for the community and region, the development of local services and infrastructure, employment, tourism, real estate

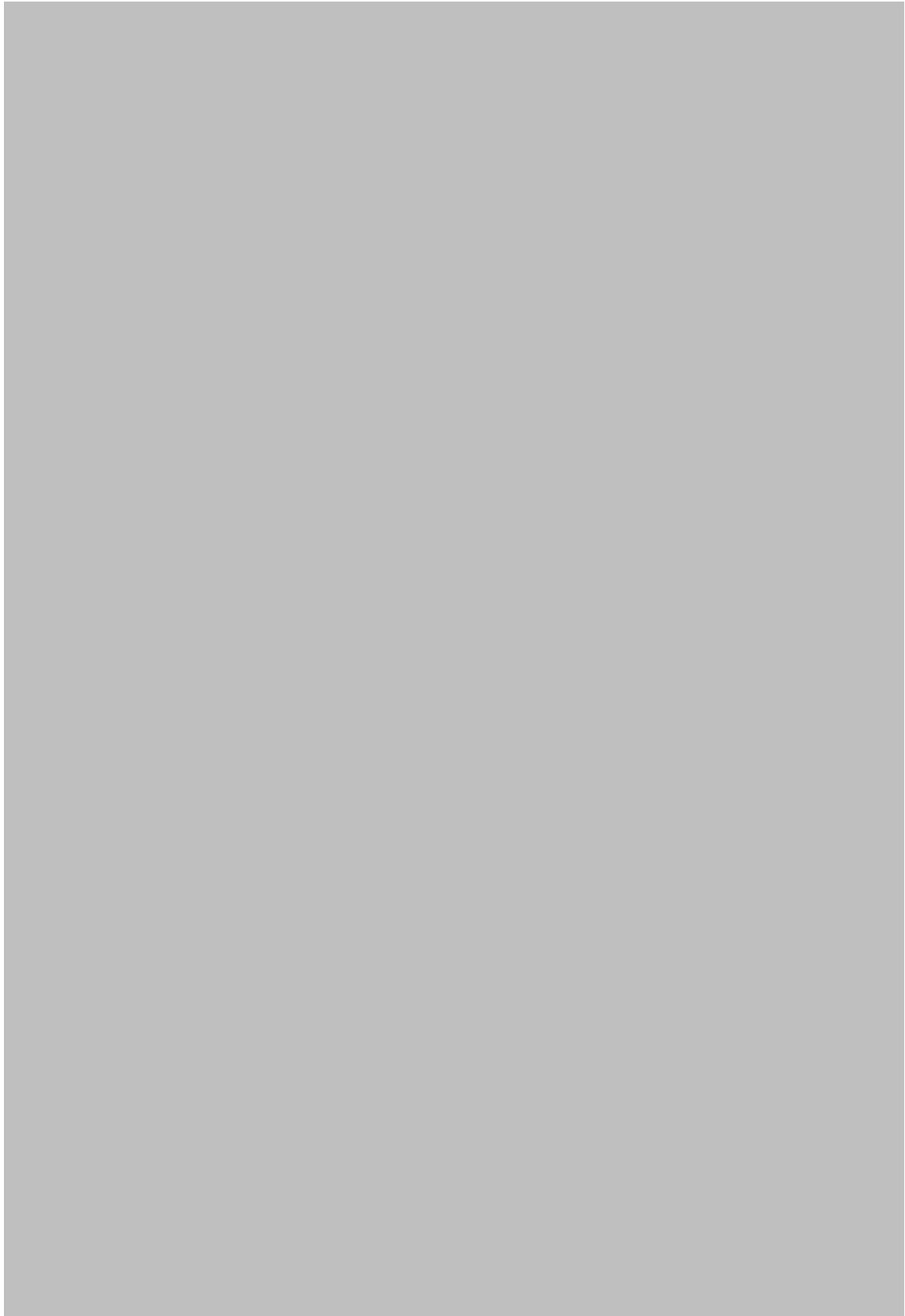


Figure 6.14 Further publicity materials produced by PGE and distributed at the Choczewo communication event in February 2012.

Translation of figure 6.13:

What will nuclear power plants give us?

Lower carbon emissions

Energy security and independence for Poland

Figures 6.13 and 6.14 further demonstrate the presence of a ‘deficit model’ of public understanding held by PGE (see Chapter 2). The glossy, cloud shaped brochures distributed by PGE to those gathered at Choczewo school in February 2012 unfolds to show imagery of ‘bright ideas’ and blue skies together with a list of the benefits for the community (figure 6.14). However as the opposition movement’s own visual materials indicate (figure 6.5), the activists already hold an awareness of the ‘possibilities’ of nuclear development. It is not a lack of understanding which drives their opposition, but rather genuine concerns for the future of the communities of Choczewo and Lubiatowo, and the natural environment of the Baltic coastline. Whilst PGE can be seen to have approached the Choczewo communication meeting with a model of an ‘imagined public’ (Maranta et al, 2003; Walker et al, 2010; Barnett et al, 2012), so too had the community members and activists of PIA come ready with an ‘imagined energy company’. Despite the accuracy of both of these imagined responses, the result of the evening was a sense of frustration by the opposition movement with the spaces available for discourse surrounding nuclear development in Pomerania.

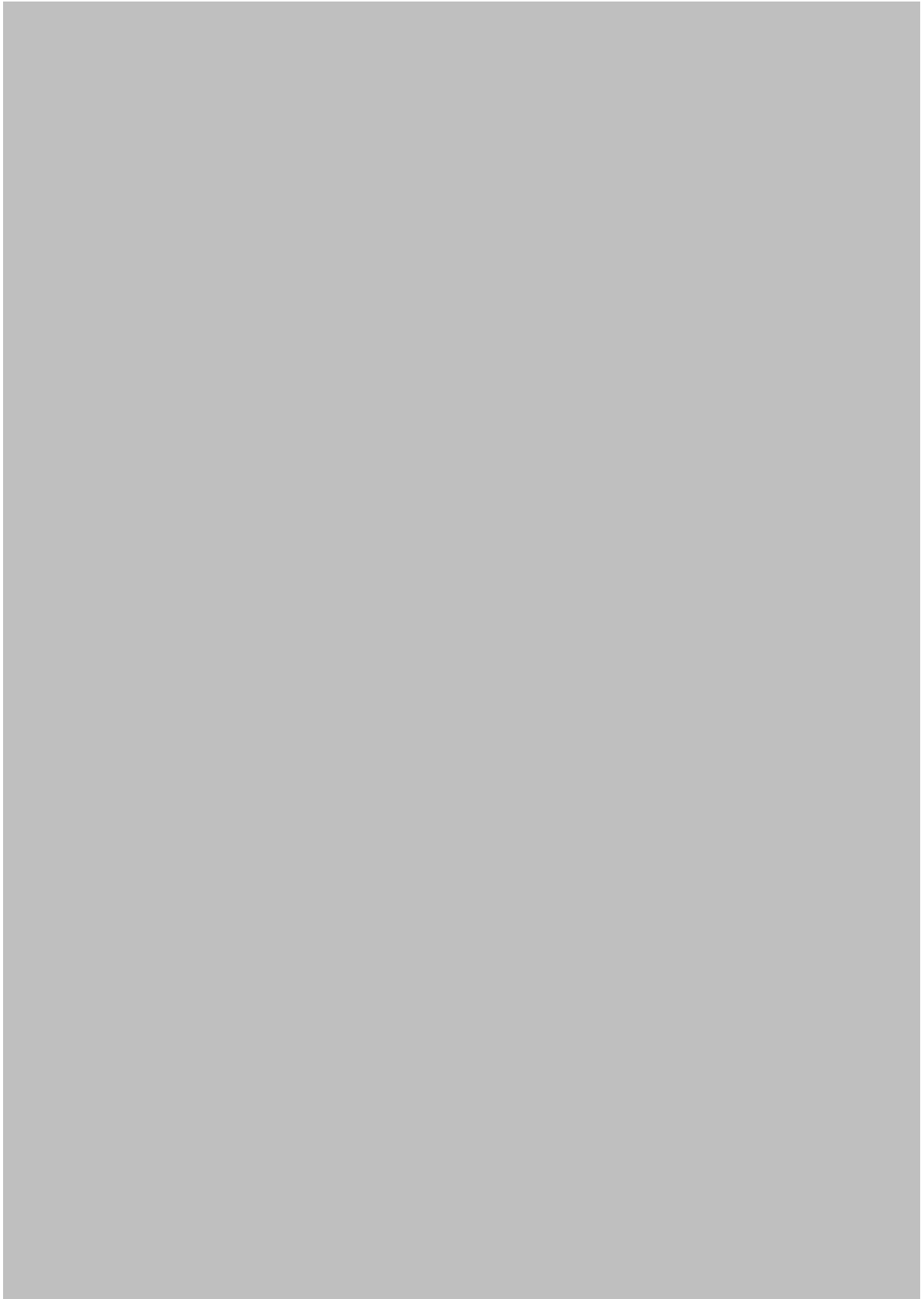


Figure 6.15 (As shown in 6.13); publicity materials made available by PGE, February 2012.

Translation of figure 6.15:

A nuclear power plant is much more than just additional generational capacity

Nuclear energy effects economic and social development:

The [construction] of the first nuclear power plant is the beginning of a whole chain of positive circumstances:

- a) a stable and reliable source of power for a long (60 years) period of life
- b) no CO₂ emissions or other pollutants characteristic of conventional sources of electricity
- c) the diversification of fuels to meet EU standards
- d) cheaper source of electricity than conventional sources (such as coal and gas) but also renewables
- e) the creation of numerous jobs during the investment process as well as during the time of exploitation
- f) the possibility of economic recovery for industry in the region – through the production of a number of energy components by Polish enterprises
- g) the development of Polish scientific research and in the future, higher education

6.5 Conclusions

Whilst Chapters 4 and 5 set out to examine the socio-material entanglements and development legacies which continue to shape dialogue surrounding nuclear development in the villages surrounding the preferred development site beside Lake Żarnowiec, Chapter 6 has turned to the social elements, contexts and discourse which shape the trajectory of nuclear development in the wider region of Pomerania.

Section 6.1 explored how public awareness of and attitudes towards nuclear development in Pomerania have been altered since 1990 by a lack of public interest or awareness of development issues. In particular, research participants discussed how they felt there is a lack of interest in ecological issues in Poland due to the relative comfort of the lived experience of contemporary Poland relative to that of the 1970s and 1980s.

Sections 6.2 and 6.3 examined how individuals and institutions associated with Pomerania's pro nuclear lobby seek to maintain low levels of social and environmental opposition to development plans through the selective release of information relating to the investment. As the opposition movement has identified, without information, it is difficult to construct an alternative oppositional narrative to PGE and the Ministry of the Economy's development plans.

In the final section of Chapter 6, the discussion turned to methods through which the pro nuclear lobby in Pomerania maintains a positive image of nuclear development by means of constructing an image of the technology and investment which is wholesome and beneficial to the communities in and around which the first nuclear power stations are hoped to be constructed. The imagery and narrative of the pro nuclear lobby stands in stark contrast in both nature and scale to that of the opposition movement. In addition, those involved in fostering a positive image of nuclear in Pomerania seek to reduce opposition to development by means of dismissing alternative narratives as misinformed, ignorant or irrational.

Chapter 6 has highlighted both the role of the social climate in which nuclear development takes place, and the privileged position of 'scientific' knowledge and specialist actors within discussions surrounding the introduction of a nuclear industry within Pomerania. Through 'dialogue platforms', which can more accurately be understood as 'communication' platforms (Rowe & Frewer, 2005; Barnett et al, 2012), the institutions responsible for preparing the region of Pomerania for nuclear development appear to operate under a 'deficit model' of public understanding of the issues which surround nuclear development (Wynne, 1991; Irwin, 2001; Burningham et al, 2007), constructing an 'imagined public' with which to communicate (Maranta et al, 2003; Walker et al, 2010; Barnett et al, 2012).

Energy company Polska Grupa Energetyka (PGE), and the Pomeranian zoning organisation 'Pomorska Specjalna Strefa Ekonomiczna' (PSSE) have come to expect hostility from the public, and have designed spaces for discourse accordingly.

As the discussions in sections 6.3 and 6.4 have shown, PGE and PSSE, together with the Association for the Development of a Nuclear Power Plant in Pomerania Province (SEJP) have come to conceptualise opposition to nuclear power as the product of a lack of detailed scientific knowledge. As such these groups have, to date, approached discourse with the general public from an educational perspective, rather than from a mind-set open to true engagement.

Furthermore, increasingly removed from or unable to express themselves through spaces of engagement within the process of nuclear assemblage within Pomerania, the activists and concerned community members have taken to the use of evocative, horror themed imagery in order to be heard.

7.0 Conclusion

The aim of this thesis has been to examine how it is that a trajectory towards nuclear development is being sustained within Pomerania Province, northern Poland. In order to achieve this aim, I have conceptualised the Polish nuclear industry as a sociotechnical network in the process of being assembled (see Chapter 2), and examined the role of historical development legacies and science-lay dialogue in shaping attitudes towards and the decision making processes which surround the construction of a nuclear power plant.

The research has been motivated by Poland's historical experience with nuclear development within the region of Pomerania throughout the 1970s and 1980s which resulted in the (incomplete) construction and later abandonment of a nuclear power plant beside Lake Żarnowiec. Since project abandonment in September 1990, the site has fallen into an advanced stage of disrepair. However, since 2005 with the announcement of Poland's Energy Policy to 2020 (Gospodarki i Pracy, 2005), and 2011 with the announcement of a shortlist of development locations, the site together with the ruins of the old power station have once again come to take centre stage within contemporary nuclear development debates.

As the material presented in empirical Chapters 4 – 6 has shown, debates surrounding the pursuit of nuclear development in Pomerania Province can be seen to play out in two distinct sites: First, within the communities and landscapes surrounding Lake Żarnowiec where the construction and later abandonment of Żarnowiec NPP and the continued operation of Żarnowiec Hydroelectric has led to a sense of socio-material entanglement and path dependence; and second, within the dialogue spaces of the wider region of Pomerania, centred around the Tricity.

In this chapter, I reflect on the use of an assemblage framework for examining the elements and processes which shape narratives surrounding the pursuit of nuclear development in Pomerania, Poland, draw conclusions to the aim and objectives set out in Chapter 1, and consider avenues for further research.

7.1 Reflections on ‘thinking’ assemblage

In Chapter 2, I presented an argument in favour of the use of an umbrella framework based on assemblage, but encompassing ideas surrounding the social construction of knowledge, the politics of public engagement in decision making processes (section 2.1) and the ‘entanglement’ of the social and material worlds (section 2.2). In particular, this study is motivated by research which has been undertaken by Walker (1999; 2000) on the long-term entanglement of the UK government with a Thermal Oxide Reprocessing initiative in Cumbria (THORP), by Graham & Marvin (2001), Star (1999) and Jordan (2012) on the manner in which layers of social agency and political activity (‘sedimented sociality’ - Jordan, 2012 p.15) come to be embedded within or ‘sunk inside of’ (Star, 1999 p.381) infrastructural arrangements; and by Burningham et al (2007) and Walker et al (2010) with their work on processes of public engagement and the presence of ‘imagined publics’ within dialogue spaces (see also Chapter 2).

Assemblage thinking allows the focus to be placed on the process of becoming, and the dynamic relationships which emerge and play out between different elements of a grouping within a given timeframe. Assemblage shares with scholarship on Actor Network Theory a relational understanding of the links between people, things and concepts as individuals or groupings. Such relational, networked thinking encourages an examination or understanding of the world which does not presuppose a hierarchical structure with humans or social forces

at its centre. By removing the *a priori* assumption that humans and social forces lie at the heart of or indeed govern all interactions with the material world, assemblage thinking opens up a conceptual space within which it is possible to examine the co-production of socio-material phenomena, and the roles, activities and agency of a broader range of elements.

Assemblage thinking brings to the table the possibility that the world and any event or process taking place within it may be shaped both by humans and non-humans alike. These elements may be acting across different time scales: either from the past - as Chapter 5 has shown, the decision to construct a nuclear power station beside Lake Żarnowiec in the 1980s has created a development legacy which shapes contemporary development narratives despite the nearly twenty five years which have passed since the construction site was abandoned; or from the future - a fear of energy insecurity in the future has provided impetus for the energy policies released in 2005 and 2009 which reawakened the drive towards nuclear development.

For an examination of the processes which shape and sustain large technological systems and investment in energy infrastructure such as that of a nuclear industry, assemblage is a particularly useful approach. Assemblage enables an analysis of the relationships and power struggles played out within and between social actors and their policies - for example the engineers, scientists, politicians, as well as the activists, communities and 'lay specialists' involved in the debates which surround the return to nuclear development within the region of Pomerania.

These are themes which have been addressed by scholars researching the motivations behind public opposition to controversial developments (section 2.1). However, relational approaches also recognise that these social actors and processes are influenced, and sometimes limited by the presence of external and material forces. For example, Chapters 4 and 5 have shown how

the ability of the municipalities of Gniewino and Krokowa to shape future development trajectories is influenced by previous layers of social and political activity which has come to be ‘sunk into and inside of’ (Star, 1999 p.381) the infrastructure and physical landscape surrounding Lake Żarnowiec. As noted by Orlikowski (1992), Star (1999), Graham & Marvin (2001) and Jordan (2012), once embedded within infrastructural arrangements, layers of historic social and political activities can often ‘reshape’ society in unexpected ways. Within relational approaches to sociotechnical networks, this phenomenon can be seen as a form of ‘material agency’ (see Chapter 2).

As the material presented in the empirical chapters has shown, an assemblage framework which recognises historical entanglement and the agency of socioeconomic landscapes, social histories and legacies, as well as different notions or perceptions of both space and land use is critical to a discussion of energy development in Pomerania. However, these are concepts which are given little analytical attention by more traditional, dualistic views of sociotechnical relations. The critical lens offered by the literatures on the Social Construction of Technology and the Social Construction of Knowledge are beneficial as they recognise the impact of the structure of scientific debate upon the ability of marginalised groups to raise their concerns surrounding the use of controversial technologies, yet as a stand-alone framework the approaches are not sufficient for a study of the process of nuclear development in Pomerania. SCOT and SSK approaches emphasise the partial and situated nature of all knowledge cultures (see Chapter 2), yet they struggle to unpack the many (non-human) elements and processes which shape the attitudes and motivations which lie behind institutional support for or community opposition to specific development paths.

For this study of nuclear development in Pomerania, a framework provided by SCOT and SSK alone would have been sufficient for understanding the processes which take place at a

regional level and how true public engagement is limited through the construction of dialogue spaces. These are the themes which have been discussed in Chapter 6. However, the approaches would have fallen short when exploring how it is that attitudes towards nuclear power have changed at the hyper-local level of Lake Żarnowiec (as discussed in Chapters 4 & 5).

To this extent, the use of a hybrid theoretical framework with its focus not just on social and political activity, but also on material agency and the role of the built environment and infrastructural legacies, has been extremely helpful. By examining the agency of non-human actants and the contemporary agency of the infrastructural legacies which surround Lake Żarnowiec, this thesis has drawn attention to the *limits* of contemporary social agency, as well as the extent to which the social and political worlds are shaped by layers of social and political activity which have played out in the past.

With the exception of a select few key studies (see for example Bennett, 2005; Li, 2007; see also Chapter 3) the role of non-humans in studies of process and becoming has been largely absent. As such, this thesis has contributed to the literature by offering a unique insight into the manner in which decisions surrounding proposals for a large scale energy development can be shaped and produced.

In contrast to perspectives which place agency solely in the hands and minds of social actors, assemblage thinking does not take such an assortment of elements and presuppose that social forces and political structures hold full autonomy over them. Rather, it explores the manner in which they interact with one another, hold together and pull apart, shaping outcomes collectively in a manner which is messy, unpredictable, and constantly in flux. Crucially, however, though the assemblage framework which underpins this thesis enables each of these

elements to be given due consideration, the approach does not necessarily diminish or eradicate social structures or agency over the assemblage (as critiqued by Brenner, 2001). Rather, it sees social forces and political arrangements as pushing and pulling within an assembled whole, subject to unseen and sometimes unexpected forces or elements.

7.2 (Re)assembling Żarnowiec

In this section I return to answer the main aim and research question which lies behind this study of nuclear development in Poland: How is it that a trajectory towards nuclear development is being sustained within Pomerania Province?

The research found that a trajectory towards nuclear development is being sustained in the region of Pomerania by two key mechanisms. The first of these is a sense of hyper-local ‘entanglement’ beside the preferred development site of Lake Żarnowiec. Nuclear development requires - at the very least - an absence of widespread social and environmental opposition. This must take place on many different levels, but perhaps most importantly in the immediate vicinity of where the facility is to be located. As discussions with the municipal authorities of Gniewino and Krokowa have shown (Chapters 4 & 5), the presence of an ‘altered landscape’ and the management practices which surround it has led to a state of dependence which has become further entrenched as the years have gone by. Until a decision is made on the future of the land on which the former Żarnowiec NPP was constructed, the land can only be used for short term investments. Furthermore, the transformation of the area surrounding Lake Żarnowiec during the 1970s and 1980s has shaped a new identity for the municipalities as an energy ‘zone’. As Chapter 5 has illustrated, this is an identity which is being used to secure further investments in the shape of educational-tourism initiatives. These two chapters have shown that the presence of a legacy of nuclear development can lead to

vast changes in the socio-economic, cultural and physical landscapes surrounding a development site, altering attitudes towards and options for future development.

Whilst Chapters 4 and 5 have focused on the hyper-local area of Lake Żarnowiec in which the preferred development site is situated, Chapter 6 turned to wider regional processes and the nature of public participation within discussions surrounding future nuclear development in Pomerania. The chapter explored the role of socio-political context in motivating opposition towards nuclear development plans, but also the mechanisms through which opposition has been suppressed.

The second mechanism through which a trajectory towards nuclear development is being sustained within the region of Pomerania is through the uneven design of dialogue spaces. During discussions with local activist and opposition members, as well as through attendance of meetings, demonstrations and communication events (see Chapter 6), it became clear that the spaces for dialogue surrounding nuclear development in Pomerania are highly uneven. This has resulted in the narratives and knowledge cultures of the pro nuclear lobby within Pomerania taking centre stage, whilst those of the opposition movement and concerned communities have become marginalised.

This thesis has studied the elements and processes which are shaping a trajectory towards nuclear development in Pomerania, Poland with a particular focus on the roles played by development legacies and the design of spaces for science-lay communication and dialogue. I argue that it is the combined whole of these two mechanisms which sustains a trajectory towards nuclear development.

As highlighted in the introduction, this thesis contributes to the literature both theoretically – by combining literatures which have historically stood in contrast and conflict with one

another - and empirically, through an in depth case study which places theory in practice and develops the small body of assemblage based approaches to the study of socio-technical relations.

The research uses an ‘assemblage’ approach to combine the existing literature on the Social Construction of Knowledge and Technology with a relational approach to understanding socio-technical systems which also examines the nature of material agency (see Chapter 2). Previously, the decision making processes surrounding the development of controversial industries have been studied from a perspective which makes *a priori* assumptions about the elevated role of social and political forces in the decision making processes surrounding energy developments and controversial industries. However, this thesis has identified that such assumptions can be misleading, resulting in an incomplete image of the factors which influence decision making. In particular, Chapters 4 and 5 have demonstrated how contemporary social and political activity is shaped by and to a large extent steered by previous layers of social and political action which have come to be embedded within the physical landscape surrounding the proposed development site.

7.3 Reflections on ‘doing’ assemblage

In Chapters 2 and 3, I highlighted the benefits of an open and flexible approach to research which seeks to unpack the elements and forces which shape development processes. In particular, I found assemblage helpful as it allowed for an examination of the processes which are taking place at the hyper-local level of Lake Żarnowiec, at the same time as an exploration of narratives and socio-political arrangements which shape dialogue within the wider region of Pomerania.

In particular, the ‘tracing of connections’ (Law, 2004) common to both Actor Network Theory and assemblage has been helpful for casting a light on elements and activities which would otherwise remain in the shadows. For example the use of an assemblage framework uncovered the activities of the municipalities of Gniewino and Krokowa in ‘reshaping’ an identity in the aftermath of project abandonment. In Chapter 5, I described how, in the face of great uncertainty surrounding the location of future investment in nuclear and the existing body of infrastructure, the municipal authorities have begun to integrate both touristic and energy related interests and development pressures. This can be seen as an example of material agency – where the ‘sedimented sociality’ (Jordan, 2012 p.15) of previous social and political activities, ‘sunk into and inside of’ (Star, 1999 p.381) the infrastructure and physical landscape surrounding Lake Żarnowiec has both limited and motivated further social and political activities.

However, at times the use of assemblage has been challenging. Fieldwork uncovered so many elements and processes, acting across different periods of time and in different ways that at times, it has been difficult to know how to ‘structure’ or make sense of the ‘mess’ (Law, 2004) of socio-material-conceptual relations.

Whilst ‘doing’ assemblage research, it is necessary to reflect on the contingency of socio-material relations and the ‘flux’ of an assemblage. Whilst socio-material assemblages such as that of a nuclear industry stabilise over time through the construction of facilities, at the time of writing the future of nuclear development in Pomerania remains uncertain. Geopolitical pressures such as the regional gas disputes between Russia and Ukraine (see Chapter 1) create a sense of urgency for Poland in seeking energy independence, and the communities of Gniewino and Krokowa remain in limbo until a decision has been taken on whether to construct a future facility on the historic development site. These are examples of factors

which strengthen the ‘coming together’ of elements and the push towards nuclear development in Pomerania. Yet at the same time, should political sentiment towards nuclear power change due to a change of government, technological developments or the economic viability of alternative fuel sources, or through social action rise once again in response to external social pressures within Poland then the stability of the current assemblage of elements within Pomerania may be contested and weakened.

7.4 Future research

Though I have focused on a specific regional example of nuclear development with a unique set of elements, relationships and development pressures, the research has wider implications for understanding the role of development legacies and spaces of discourse in shaping attitudes towards and the decision making processes which surround the use of controversial technologies. This thesis draws attention to the role of infrastructural legacies, the built environment and changes to social and cultural landscapes in leading to a state of ‘entanglement’ with a nuclear development trajectory. However, further afield from nuclear development, these are factors which also influence the decision making processes which surround urban (re)development in communities with a history of mining, heavy industry or military activity. The study of process and consideration of the agency of social, political, material and conceptual elements is useful for the study of many different phenomena.

I conclude this thesis with a consideration of avenues for further research. This study has highlighted the role of dialogue and development legacies within the process of nuclear development. Whilst previous research has explored dialogue (see Chapter 2), this study has contributed to the literature by exploring the role of development legacies and altered landscapes in shaping attitudes towards nuclear development. However, it remains unclear the

extent to which the results of this study represent a pattern or have occurred as a result of a unique set of development pressures and historical ties within the context of Poland's complex history. As such, further research is needed to explore how socio-material development legacies continue to shape the decision making processes which surround the use of nuclear power and controversial technologies elsewhere in the region of Central and Eastern Europe as well as further afield.

In addition, from a methodological position, I found the use of visual analysis and visual methodologies particularly helpful for illustrating concepts which are sometimes very hard to put into words. In particular, visual methods helped with describing how conceptual elements such as landscape identity, and the hopes and fears which surround the use of nuclear power can shape narratives on future nuclear development. Furthermore, this research has shown how visual materials and alternative spaces for dialogue and communication provide valuable tools to marginalised communities and groups within society. Without a true platform or space for engagement, these methods have proven to be critical for the activists and concerned residents within the Province of Pomerania. Further research, working with a visual methodology from the start, could provide an even richer narrative of the processes which surround attitudes towards the process of nuclear development.

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