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# OPENCAST COAL MINING IN WALES

Development of the industry in terms of  
social and environmental impacts



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# **Opencast coal mining in Wales: Development of the industry in terms of social and environmental impacts**

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## **Abstract**

This research reviews the development of the opencast coal mining in Wales. It briefly looks through the historical development of the industry and the prerequisites for its current role in the economic development of the country. The privatization of the sector after 1994 with the Coal Industry Act 1994 has led to major changes in the decision-making process and caused great problems with the restoration and aftercare process of many opencast sites. The main focus of this research is on the social and environmental impacts of this industrial sector, as well as on the policy framework creating favourable political, economic and social environment for the development of the coal industry. The case study of “Ffos-y-fran Land Reclamation Scheme” in Merthyr Tydfil gives a good example of the increasing public awareness in Wales as well as the growing demand for a bigger role of society in the decision-making process in the country. Even though coal industry has played a significant role in the economical development of the UK, today the British Government is standing on stronger economical and political ground with greater social awareness looking at many new opportunities for development of cleaner and safer energy.

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## INTRODUCTION

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The coal and steel industry have contributed greatly to the British economic development. These industries and the trade related to them were crucial for the rise of the Industrial Revolution, achieving self-sufficiency during wartime, the post-war recovery as well as the energy security in Wales and the UK in general (Rees & Evans, 1954). Many cities and communities across the UK would not be the same and the United Kingdom would not be the same today if it was not for the coal. Today, however, the UK Government is standing on stronger economical and political ground with greater social awareness looking at many new opportunities for development of cleaner and safer energy. Yet, the Welsh Government and the Westminster Government continue to live in the past by creating policies and reports explicitly indicating the dependency of the National Economy and National Energy Security on fossil fuels, thus creating favourable political, economic and social environment for the development of the coal industry.

This research has been assigned to Nadya Dedikova, a postgraduate student in Cardiff University (Wales) and Radboud University (The Netherlands), by Friends of the Earth Cymru, a non-profit environmental organization based in Cardiff, Wales, as part of a three months internship. The main aim of this research is to review the historical development of the coal industry in the UK, particularly aimed at Wales, and to address the social and environmental impacts which are inevitably connected to it. Similarly the research will focus on the impacts on the local authorities, local communities and the environment due to this industry after the decline of the Industrial Revolution. Special attention will be given to the implementation of policies and strategies in the UK and Wales that contribute to the future development of this sector. A case study of the “Ffos-y-fran Land Reclamation Scheme” in Merthyr Tydfil will be presented shortly demonstrating the impact of an operating opencast site on the local residents. This research will end up with a conclusion and recommendation based on the findings.

For the purposes of this research a mixed methods approach of both quantitative and qualitative methods will be used. These methods will be supported by desktop studies, data collection, semi-structured interviews and a case study as focusing on one specific case will allow a better understanding and exploration of the current situation, leading to a more detailed analysis. The reason for this decision is simply practicality and variety so information from different sources can be obtained and analyzed for better results. In terms of ethical consideration appropriate measures have been taken to secure the integrity and reliability of the research. For the purposes of the study a full consent was asked by any participant in the interviews providing them with full explanation why this research has been undertaken and what are the aims of it. The research questions that will guide this study are formulated in the following way:

- *“Why does the opencast coal industry continue to evolve and play a significant role in economic development in Wales?”*
- *“What is the policy framework that supports this industry today?”*
- *“What are the environmental impacts of the opencast coal industry?”*
- *“What are the social impacts of the opencast coal industry?”*

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## LIMITATIONS

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This research looks briefly at the past development of the coal industry with greater emphasis on the current policy implications that drive this sector to progress and influence peoples' lives and their environment as well as the economic development and energy supply in the country. A coherent and integrated approach is an important aspect of every study which wishes to reflect on the past and compare it with the present so that recommendations for the future can be made. Similarly, every aspect of the problem, in terms of various stakeholders such as institutions, society and the market, as well as various factors such as other related issues and prerequisites, should be acknowledged and considered. This means that when the issue of coal is discussed many other issues should also be related – coal usage, alternative energy production, environmental condition, political and socio-economic situation, etc.

Unfortunately the time and resource limitations of this paper do not allow it to cover all the aforementioned topics and restrict this study of giving a more integrated vision. Thus further research and analysis on this topic is required. However, effort has been made to ensure that as many points of view as possible are presented and taken in consideration.

## HISTORICAL BACKGROUND

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The mining industry, in particular opencast and deep mining of coal, has played a very important role in the industrial development of Wales and the UK as a whole. Without the coal and steel trade and industry many cities and areas around the world would not be the same today. One prominent example of this is Cardiff. Before the XVIII and XIX century Cardiff was a small town which began its rapid growth after the construction of the Docks that linked the town with the Taff Vale Railway (Jenkins, 1854). This connection brought huge amounts of coal from the South Valleys and made Cardiff the main coal export port in the world (Jenkins, 1854). Existing statistics on coal mining date back from the early XIX century listed in the Reports of Inspectors of Mines (National Coal Museum, n.d.). However, coal extraction and usage is known to exist long before that period. According to the historical coal data of the Department of Energy and Climate change (2014) the production of coal in the United Kingdom by using opencast method of extraction has started after 1942 with 118 sites being opened in the period 1943-1952 and around 10 million tonnes of coal extracted (see table 1). Since then the number of new sites has gradually decreased but the amount of coal produced increased, most of which was used for production of energy (Great Britain Department of Energy and Climate change, 2014).

The coal itself is a mineral that is positioned in the depths or surface of the earth in coal seams (Beynon et al., 2000). The first method of coal extraction was the underground mining, represented by numerous collieries and ancillaries needed for the purpose. However this type of mining was not enough to satisfy the needs for coal production during the wartime (1939-45) in the UK (Peart & Rutherford, 1986). Opencast coal mining (OCM) is considered to be officially introduced in the UK in 1942 as an emergency measure during WWII (Peart & Rutherford, 1986) and shortly after that put into practice in South Wales in 1943. However, the first “official” opencast coalfields were opened in the autumn of 1941 (Beynon et al., 2000). The areas of South Wales and Monmouthshire had significant reserves of coal and allowed the country to derive large amounts of the mineral turning the place into a region with great potential for future development (Rees & Evans, 1954, p.14). In addition to the rich reserves of coal laying underneath the surface or in shallow depth, the opencast extraction process of this mineral is simpler, faster, cheaper and more profitable compared to underground mining (Walsh et al., 1991) and allows the companies to extract better quality minerals that could be used for varies combustion processes (Countryside Commission, 1993). Some authors also consider that OCM does not cause significant damage to the environment and that in some cases it may even be beneficial as the process includes restoration and recultivation leaving derelict areas in better than their original condition (Rees & Evans, 1954). Although this can be the case for some areas there are many other mining sites “*absorbing better quality agricultural land, or affecting areas of higher landscape value*” (Commission on Energy and the Environment, 1981, p.86). The Council for the Protection of Rural England has declared opencast coal mining to be “*one of the most environmentally destructive processes being carried out in the UK*”, as well as “*among the most ugly examples of the ravages of industrial exploitation*” (Beynon et al., 2000, p.68).

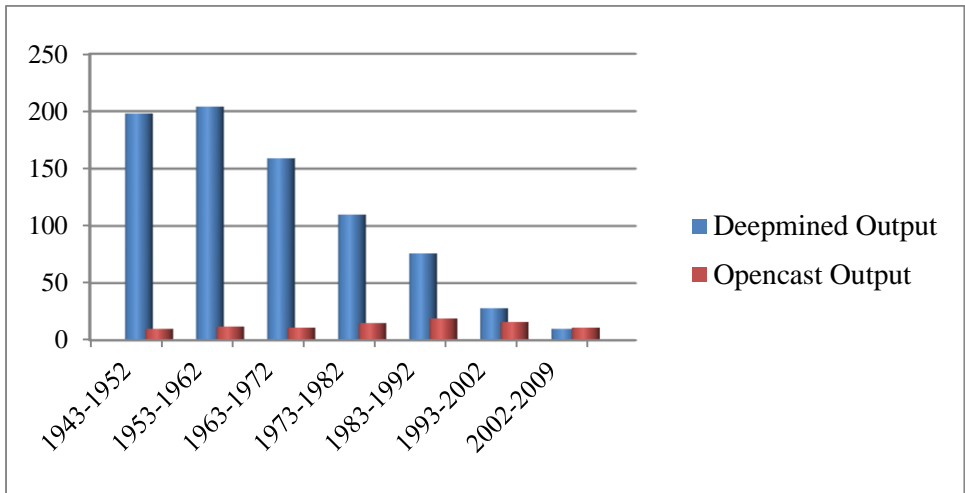


Table 1. Coal Production, 1943 to 2009  
 Source: Department of Energy and Climate change (2014)



## METHOD OF EXTRACTION

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The opencast coal mining technique is used in areas where the coal reserves are scattered in shallow and thin seams and cannot be extracted by deep mining methods (Beynon et al., 2000). The opencast process starts with exploration activities to identify where there are deposits of coal and what is the depth of the seams. Once planning permission is granted and an EIA has been conducted (if there is a need for it in the first place) the contracting company can enclose the perimeter of the working site and apply temporary rights of occupation and suspension of public right of way by the authorization of the relevant authority (Beynon et al., 2000). When the contractor has secured the area some other preliminary works are needed, such as setting a proper drainage system (Commission on Energy and the Environment, 1981). The extraction itself starts with stripping and storing the top- and subsoil layers and placing it on the side of the site, creating big artificial mounds (Horne & Frost, 1991). After the top layer is removed the opencast operations usually involve “*physical movement of large quantities of rock to gain access to the coal*” (Beynon et al., 2000, p.97) and this stage is carried out by the use of certain quantities of explosives which end up in a blasting reaction. These blasts create “*ground vibration and surges in the air pressure*” (Beynon et al., 2000, p.97). Once the coal is extracted from the ground it is loaded to trucks and lorries and taken to coal preparation plants where the mineral is washed from any attached “polluters” like soil or rocks to increase its market value and decrease the transportation costs (Commission on Energy and the Environment, 1981). Even though the process of OCM is easier and cheaper than the deep mining one, the method of work is still complex and it requires a lot of planning and assessment before, during and after the working activities (Commission on Energy and the Environment, 1981).

This description of the coal extraction process by the method of opencast mining is just a brief summary to give readers a basic idea of the process. The technological approach may vary significantly based on the size and type of the site and according to the technological innovations in the sector (Horne & Frost, 1991).

## ENVIRONMENTAL IMPACT

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Ever since 1942-43 when opencast coal mining was introduced and began to operate in the UK it started creating discourse amongst the academic society related to its environmental impacts (Peart & Rutherford, 1986). The main reason for which was related to both the short and long-term negative impacts that this sector could have on the surrounding environment and societies. The Flowers Commission on Energy and the Environment was appointed in 1978 by the Secretaries of State for Energy, the Environment, Scotland and Wales to create a report called “Coal and the Environment” with the terms of reference “*to advise on the interaction between energy policy and the environment*” (Commission on Energy and the Environment, 1981, p.1). The need for this report evolves from the intention of the seven Heads of Government at the Venice Summit in 1980 to double the amount of coal extraction and usage. It is a groundbreaking document which fully comprehends the process of coal mining in terms of policy implementation, environmental implications and social impacts.

There are numerous ways in which the opencast coal mining sector can cause damage to the environment and the people living around the area of operation. Peart & Rutherford (1986) describe these negative impacts as they relate peoples’ anxiety to the nuisance of the working process such as noise, dust and blasting vibration that directly affect peoples’ health and everyday lives as well as increased or diverted traffic and access limitation that could cause deterioration of the road surface and indirect inconvenience for the society. Even though this situation was described almost 20 years ago, a period in which techniques are supposed to have undergone major improvements, local communities witness the same negative effect of the exploration process today (Austin & Austin, 2014). The Flowers report describes the environmental damage that opencast sites can cause in a number of facets such as disfigurement of the landscape, permanent loss of agricultural land and degradation of the British landscape (Commission on Energy and the Environment, 1981). In many cases the environmental damage is related to the restoration and aftercare processes because after the operation has ended the contractor is required to restore the area to the original or improved condition (Beynon et al., 2000, p.107). Even if this requirement is performed well there are multiple sequent effects that follow the operational and restoration stages and causes a negative environmental impact (Beynon et al., 2000). Many of these impacts are related to ripping earth layers apart and disturbing the microbiology of the soil, which leads to decrease of micro-organisms and reducing the soil’s fertility, which in its turn leads to reduced number of flora and fauna that the site could sustain after the restoration is complete (Beynon et al., 2000). Peart & Rutherford (1986) argue that the restoration activities are poorly performed by the contracting company and poorly monitored and controlled by the governmental bodies. The authors point out that there is substantial evidence that many sites after restoration are characterized by “*diminution of landscape quality, the loss of soil fertility and the loss of agricultural quality*” (p.21) as well as decrease in biodiversity and crop yields, quality of ecosystem services, etc. (Commission on Energy and the Environment, 1981). Moreover quality of the restoration processes is jeopardized not only by financial but time limits as well. When the contractors do not wait for the right moment to carry on with restoration activities faults can occur quite frequently. One example, given by Peart & Rutherford (1986) and repeated in the advisory booklet of the Countryside Commission (1993), is when the top soil is placed under wet conditions leading to

bad connection of the layers which results in poor drainage, oxidation of the soil and low crop yields.

Under these circumstances the Ministry of Agriculture, Fisheries & Food together with the National Coal Board and the academia researched the possible solutions for strengthening the rules concerning the restoration of past mineral extraction sites, which resulted in the adoption of a five years mandatory aftercare period (Countryside Commission, 1993). This new rule was imposed to all mineral sites by the Mineral Act 1981 (Countryside Commission, 1993). Regardless of the new and stricter rules, the existence of negative environmental damage is still inevitable. According to Beynon et al. (2000) the bad drainage or the soil's ability to properly store and transmit water is a still existing side effect of the restoration process, which is directly linked to flood risks and oxidizing of the soils. The ability of the soil in a natural site to absorb rain-water is 90-99 %. *“On an opencast site, particularly during the five-year period when it can't be under-drained, about 90 per cent of the water runs off”* (Beynon et al., 2000, p.111).

Even if an opencast operation has some benefits in terms of environmental improvement, for instance swamp areas turned into more productive land, this is still not incentivizing enough to overcome the resistance of local communities where past opencast workings have taken place (Countryside Commission, 1993; Beynon et al., 2000). Noise and dust pollution are most evident concerns of people living near opencast working sites. In order to preserve the top soil for later restoration the layers should be removed in dry weather conditions, which inevitably creates dust emissions that are spread miles around the operation site by the contribution of winds (Beynon et al., 2000). Dust influences ecosystem as well as human health in various ways. It is consisted of small particulate materials which if inhaled by humans can lead to serious respiratory problems, such as difficulties with breathing, lung damage, cancer and premature death (Environmental Protection Agency, 1995; Field et al., 2009). A specific example that Beynon et al. (2000) gives is the 1983 Glynneath case in South Wales where the West Glamorgan Health Authority stated, after an investigation, that there was a relation between the opencast sites and the increased cases of asthma in that area. The BCC tried to prove that statement wrong by conducting a separate investigation amongst its workers but still the final report from the Weeland Road Public Inquiry supported the connection of increased respiratory deceases with the opening of new opencast sites with clarification that Glynneath has quite high mortality and unemployment rate which contribute to the high rates. It was clear that more strict protective measures should be taken.

Noise pollution is inseparable part of the process as well, as it is linked to the heavy machinery involved in the opencast method – noisy vehicles and the process of excavation itself (Beynon et al., 2000, Commission on Energy and the Environment, 1981). The intensity and duration of the noise depend on the scale of the operational site but still this type of pollution is considered to be a great issue for the local population (Beynon et al., 2000). Blasting is another topic of community concern in regards to the noise from unexpected explosions and the fear of property and health damage (Beynon et al., 2000).

Coal extraction is inevitably related to coal combustion for producing energy. It has been proven that the smoke, created by the process of burning coal, contains toxic pollutants such as CO<sub>2</sub> emissions, arsenic, sulphur, etc. that harm both the environment and human health (Beynon et al., 2000). Evidence shows that respiratory diseases as well as lung cancer are more common in cities and areas where coal combustion is taking place as certain particles such as

arsenic, radioactive elements and polycyclic aromatic hydrocarbons are related to these diseases and are contained in the smoke causing air pollution (Commission on Energy and the Environment, 1981). During the disastrous London fog in winter of 1952 many people in Greater London experienced respiratory problems and 4,000 people died due to atmospheric pollution of smoke and sulphur dioxide cause by coal combustion and unusual meteorological conditions. From that point on it was scientifically proven that smoke coming from burned coal contains toxic pollutants that affect directly human health (Commission on Energy and the Environment, 1981).

Trucost's<sup>1</sup> (2013) study classifies the top 100 externalities of the business and transforms the environmental impacts of these businesses into monetary terms in order to estimate "*the financial risk from unpriced natural capital inputs to production model*" (p.7). This study reveals that many of the researched businesses, including coal power generations, do not accumulate enough profit to be able to cover the environmental costs of their activities, which means that these cost would have to be covered by customers and taxpayers. The polluter pays principal is one that has been present in the UK policy guidance for centuries now. However in this case it could be seen as a "consumer pays" principal (Commission on Energy and the Environment, 1981). One of the leading positions in the Trucost (2013) survey is given to the coal sector, mainly to the coal power generation, where "*coal combustion [for power generation] drove 43% of global GHG emissions*" (p.39) and is responsible for "*42% of global costs for air pollution*" (p.11). Greenhouse gas (GHG) emissions are known to be extremely harmful to the environment when released in the atmosphere as they are related to many of the climate change effects such as increase in global temperatures, flooding, acidification of oceans, loss of biodiversity, etc. as well as related to many heart and respiratory diseases which cause significant effect on the human health (Trucost, 2013). According to the global data 57% of all CO<sub>2</sub> emissions are released during combustion process of fossil fuels (IPCC, 2007). Some opencast coal reserves are proven to contain high levels of sulphur, over 2 and even 3%, which is one of the main elements to cause acid rains, and is a problem for the coal-fired power plants as under the Environmental Protection Act 1990 these stations are required to use coal with less sulphur contents (Beynon et al., 2000).

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<sup>1</sup> Trucost is a corporate environmental research group that has undertaken this study on behalf of the TEEB (The Economics of Ecosystems and Biodiversity) for Business Coalition.

Rank	Impact	Sector	Region	Natural capital cost, US\$ bn	Revenue, US\$ bn
1	GHG	Coal power generation	Eastern Asia	361.0	443.1
2	Land use	Cattle ranching and farming	South America	312.1	16.6
3	GHG	Iron and steel mills	Eastern Asia	216.1	604.7
4	Water	Wheat farming	Southern Asia	214.4	31.8
5	GHG	Coal power generation	Northern America	201.0	246.7
6	GHG	Cement manufacturing	Eastern Asia	139.9	174.0
39	GHG	Coal power generation	Western Europe	32.8	40.2
90	GHG	Coal power generation	Northern Europe	15.0	18.4

Table.2. Ranking of the 100 Region-sectors by EKPIs with the greatest impact across all EKPIs when measured in monetary terms

Source: Trucost, 2013

Northern Europe, the Region-sector where the UK is positioned, is ranked in 90<sup>th</sup> place (Table 2) between the world's top 100 Region-sectors<sup>2</sup> by EKPIs<sup>3</sup> in terms of its environmental impact. The main reason for this is due to its geographical features: land and population and the fact that Trucost's study (2013) analyses different types of sectors which cause environmental degradation in various ways. Nevertheless this does not diminish the role of the Northern European Region as one of the big pollutants in the developing world and Table 3 demonstrates the serious damage this region is causing in terms of air pollution.

Rank	Sector	Region	Air pollutant cost, US\$ bn	Revenue, US\$ bn	Impact ratio
1	Coal power generation	Northern America	113.4	246.7	0.5
2	Coal power generation	Eastern Asia	88.3	443.1	0.2
3	Coal power generation	Western Europe	16.1	40.2	0.4
4	Petroleum power generation	Eastern Asia	10.7	15.1	0.7
5	Coal power generation	Australia and New Zealand	7.5	25.7	0.3
6	Corn farming	Northern America	7.3	50.1	0.1
7	Coal power generation	Eastern Europe	6.6	57.7	0.1
8	Cement manufacturing	Eastern Asia	6.6	175.7	0.0
9	Coal power generation	Northern Europe	6.5	18.4	0.4

Table 3. The global 20 region-sectors: Air pollution

Source: Trucost, 2013

<sup>2</sup> Region-sectors - an industry sector broken down by region. Regions have been defined according to the United Nations continental sub-regional definitions. See: <http://unstats.un.org/unsd/methods/m49/m49regin.htm>

<sup>3</sup> EKPIs - Environmental Key Performance indicator; environmental impact categories developed by Trucost for appraisal of businesses, sectors and regions.

## DECISION-MAKING PROCESS IN THE UNITED KINGDOM

Since 1930's the reserves of coal within the UK are in possession of the state (Beynon et al., 2000). After opencast coal mining started in 1942-43 first it was the responsibility of the Ministry of Works to be in charge of all operations in the country until 1945 when the Ministry of Fuel and Power was assigned for the job (Commission on Energy and the Environment, 1981). By 1984 the entire decision-making process regarding opencast coal mining was a responsibility of the Minister of Fuel and Power (Opencast Coal Act 1958). A statutory corporation, the National Coal Board, was created in 1947 to manage the coal mining industry in the UK and support the Minister in his work. However no action concerning coal could be taken by the Board itself unless it was first authorized by the Minister (Opencast Coal Act 1958). This disturbed the planning processes and caused some problems to the local authorities (Walsh et al., 1991) and therefore in 1983 the "Coal and Environment" white paper made the first step in transferring "all planning decisions on opencast coal mining proposals from the Department of Energy to local mineral planning authorities" (Walsh et al., 1991, p.2). In the Mineral Planning Policy Wales (2000) "the term "Mineral Planning Authority" is that given to any of the authorities with responsibility for planning control over mineral working and relates to each county or county borough council and each national park authority" (p.1). Figure 1 depicture the decision-making process in the UK after the Circulars for England and Wales (DOE Circular 3/84, WO 13/84) came into force (Walsh et al., 1991). The graph applies to the planning structure in Scotland as well under the Town and Planning Act (Scotland) 1972 (Walsh et al., 1991).

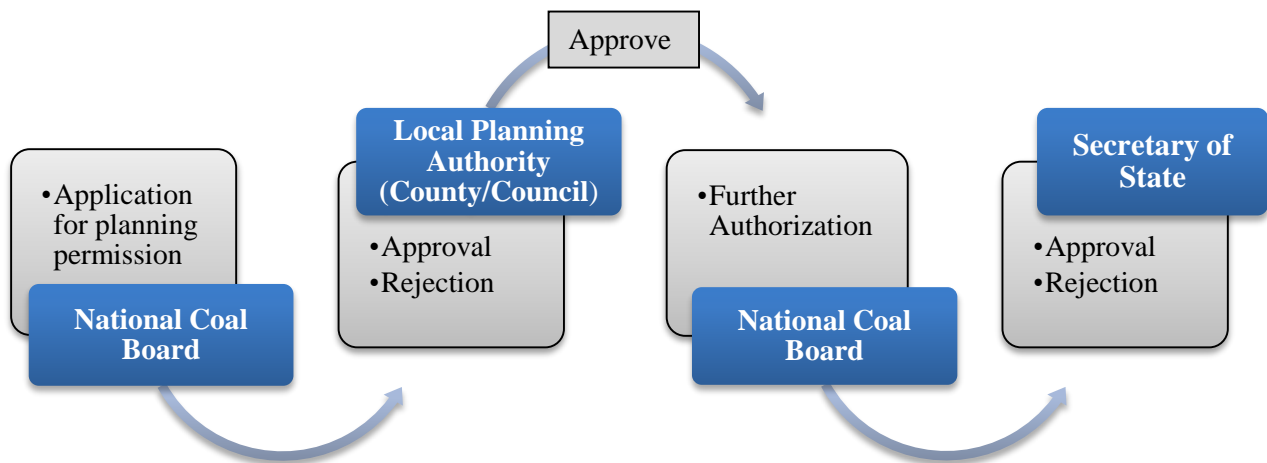


Fig.1. Decision-making process concerning opencast coal mining in the UK after 1984  
 Source: Walsh et al., 1991

The Housing and Planning Act 1986 confirms the cancellation of the role of the Secretary of State, as a single authority in terms of issuance planning permissions for opencast coal mines and reinforces the role of the Local Authorities such as County and Community Councils in England, Wales and Scotland (Housing and Planning Act 1986). Yet this document did not entirely exclude the role of the Secretary of State as the National Coal Board had to ask for further authorization on issues such as temporary rights of occupation and suspension of



public right of way, which orders had to be authorized by the Secretary of State (see fig. 1) (Circular DE 28/87 and WO 54/87, 1987). In 1987 the National Coal Board was renamed to British Coal Corporation and by the Coal Industry Act 1994 all its assets were taken by the private sector which not long after led to its dissolving in 2004 (Department of Energy and Climate Change, 2013). After the privatization of the company its coal liabilities were taken over by the Department of Trade and Industry and later in 2008 by the Department of Energy and Climate Change (DECC) (Department of Energy and Climate Change, 2013). The Coal Authority is a non-departmental public body created in 1994 under the direction of DECC for the purpose of licensing and administering coal mining and providing service for public safety hazards (The Coal Authority, n.d.).

The planning and decision-making process concerning authorization and planning permissions of new opencast coal mining sites has become more complex and detailed as new legislation has come into force and some European standards have been applied. According to the Mineral Planning Guidance 2 (1988) before presenting the application the developer should consult with the relevant MPA in the so called pre-application consultations. After this stage the developer submits the application and depending on the size of the developing project and the potential impacts it would cause it is decided by the MPA if an Environmental Impact Assessment (EIA) should be conducted or not. In accordance with Council Directive 97/11/EC if the size of a project exceeds 25 hectares the project falls into Annex I of the Directive and therefore it is a subject to an EIA and if the project does not exceed 25 hectares it falls into Annex II of the Directive and then it is up to the MPA to decide whether or not there is a need for an EIA. If there is a need for an EIA the developer should present an environmental statement to the MPA. In accordance with Mineral Technical Note 2 (MTAN 2) the developer is also obliged to prepare a Health Impact Assessment. According to the Mineral Planning Guidance 2 (1988) after the application is submitted the developer must notify in writing all land owners and all interested parties. MPA are required to determine an application eight weeks after it has been submitted. The MPA then consults with any other interested parties and institutional bodies. After that planning permission can be granted or refused. If local community groups, NGO's or other form of society dispute the MPA decision to grant planning permission to certain opencast sites they can call in on a public investigation to a more authorized body (Ministers, Secretary of State, etc.). If this body decides that there is no need for investigation the planning procedure continues with granting permission, if however there is a need for further investigation the Planning Inspectorate carries out a public inquiry and creates a report in which it states its findings. Then, with the recommendation of the Planning Inspectorate, the Authorized body makes a final decision whether or not to grant planning permission to the proposed development.

Figure 2 demonstrates the decision-making process in the UK but it should be noted that given the focus of this paper and the limited time resources this graph may not be entirely accurate and should not be used in any other research as it does not contain all the detailed steps of the decision-making process.

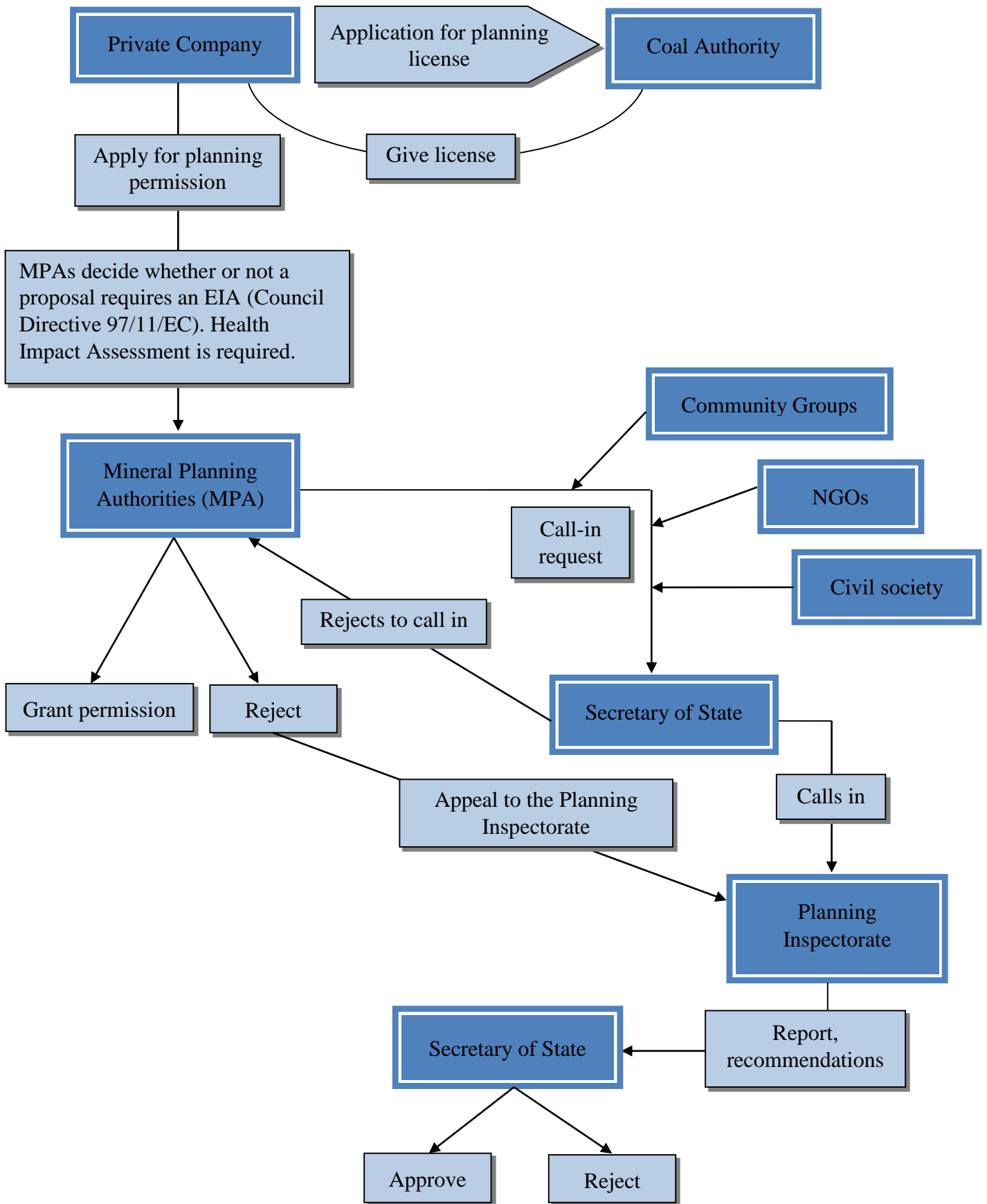


Fig. 2. Decision-making process concerning opencast coal mining in the UK  
 Source: Author's own



## POLICY FRAMEWORK OF THE OPENCAST MINING INDUSTRY IN WALES

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*“It is likely that coal will be a strategic source of energy for the foreseeable future”* (Minerals Technical Advice note 2, article 13.)

*“The National Assembly for Wales has a legal duty to pursue sustainable development in all it does”* (Minerals Technical Advice note 2, article 5.)

*“Between 2005 and 2006, permitted opencast reserves in Wales increased from 3.9Mt to 17Mt”* (Minerals Technical Advice note 2, article 17.)

*“The statistics demonstrate that there is an on-going need for economic regeneration in the coalfields and that in the meantime coalfield communities remain under acute stress”* (Foden, Fothergill & Gore, 2014, p.36)

*“The UK’s reserve base of almost 4.6 billion tonnes would last over 70 years at 2012 demand levels”* (UK Coal Forum, 2013, p.7).

*“Coal fired plant continues to play a crucial role in the UK generation portfolio, providing 41% of electricity generated across Great Britain in 2012”* (UK Coal Forum, 2013, p.2)

*“Respondents overwhelmingly agree (88%) that we (in Britain) need to radically change how we produce and use energy by 2050”* (Demski, Spence & Pidgeon, 2013, p.29)

“The loss of agricultural land, reduction in the beauty of the landscape and problems such as noise, dust, heavy lorry traffic and disturbance to the public, led to a steady rise in opposition to [opencast coal mining] during the 1970s” (Horne & Frost, 1991, p.30). As mentioned in previous sections of this paper the Flowers Commission on Energy and the Environment was appointed in 1978 by the Secretaries of State for Energy, the Environment, Scotland and Wales to create a report called “Coal and the Environment” with the terms of reference “to advise on the interaction between energy policy and the environment” (Commission on Energy and the Environment, 1981, p.1). It is a groundbreaking document which fully comprehends the process of coal mining in terms of policy implementation, environmental and social impacts. The way in which this document was composed reveals a complex yet undisputable and inextricable link between coal production, energy security and environmental and social concerns. However to make a clear and objective distinguish between these concerns without giving priority and weight to some of them is extremely hard, perhaps even impossible. This can be witnessed in every policy document as a prominent example is the Mineral Planning Policy Wales (2000) where it is written that “wherever possible any mineral workings should avoid any adverse environmental or amenity impact” (article 5.), yet “if this cannot be achieved, it should provide local or community benefits which clearly outweigh the disbenefits of likely impacts to justify the grant of planning permission” (article 62.).

This report concludes with clear recommendations addressed to the UK Government that “the combined effect of opencast operations can, for those badly affected, add up to a very severe diminution in the quality of life [and recommend that] the volume of opencast mining should be allowed to decline [...and] there should be no increase in the present target of 15 million tonnes per year” (Commission on Energy and the Environment, 1981, p.212). The response of the Government to the Flowers report is unambiguous and negative as production of opencast coal increased considerably in the period 1979-1991 reaching a peak of 21 million tonnes.

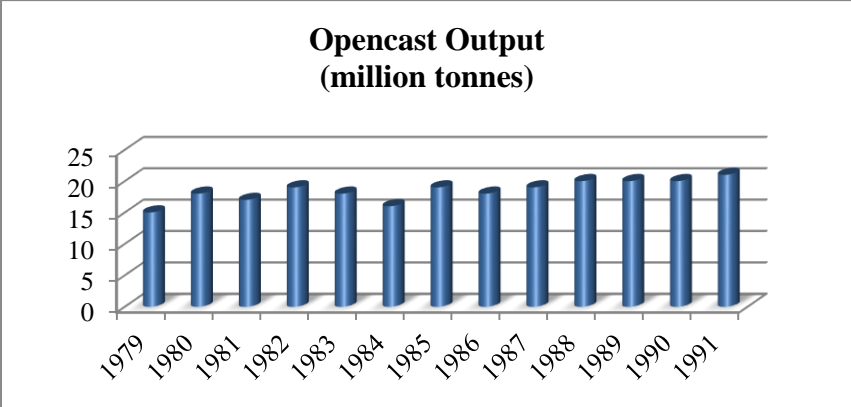
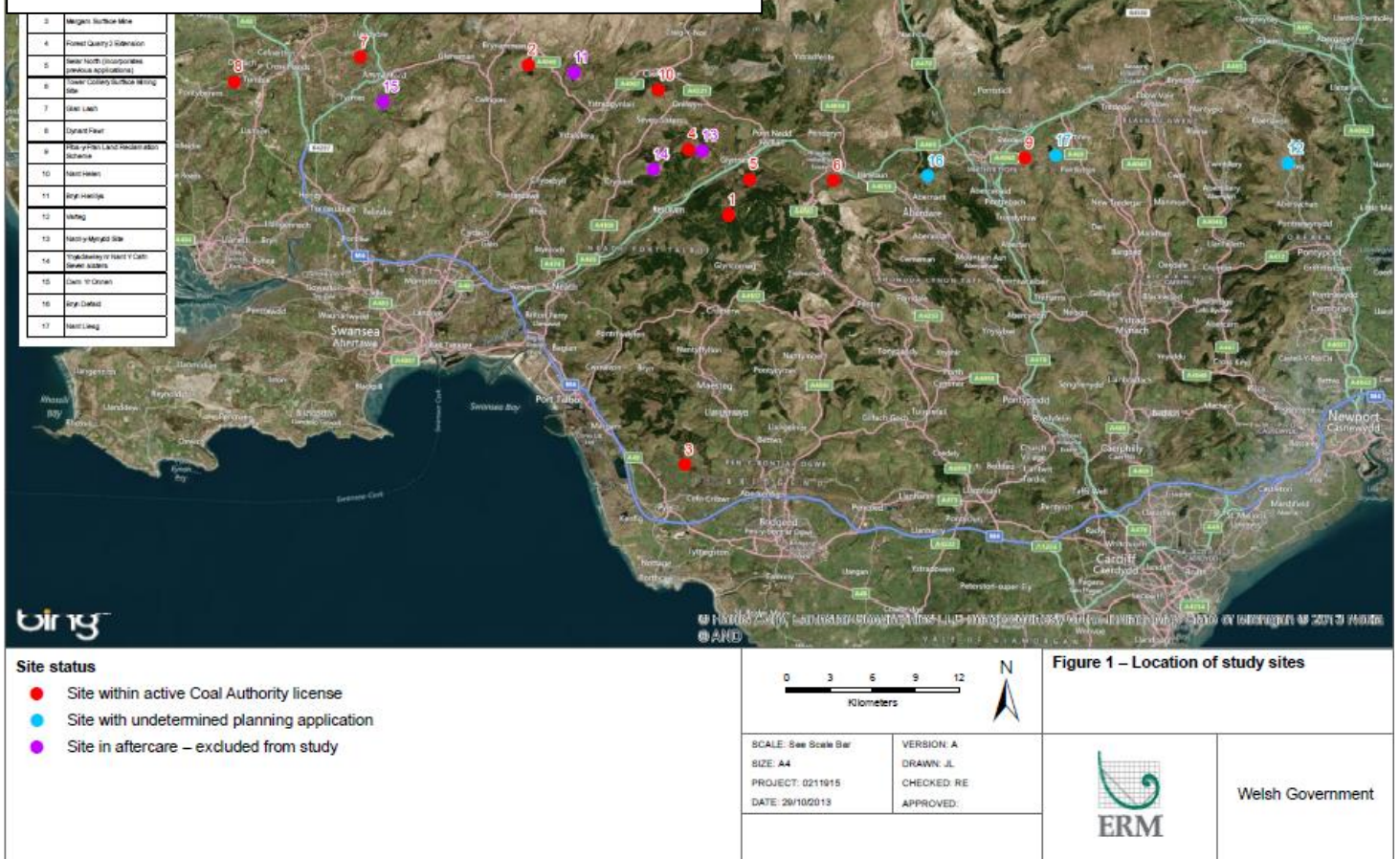


Table 4. Opencast coal output in the period 1979-91  
 Source: Department of Energy and Climate change (2014)

The Flowers report presented very comprehensive and quite surprising for its time findings. Yet the UK Government did not follow its recommendations and continued extracting even more coal. This is may be one of the reasons that in the XXI century, a century of innovations and technological progress the UK is still quite dependent on fossil fuels to sustain its economic growth. In the present time the South Wales region itself has ten active opencast coal sites in operation, four former sites are being considered for potential reopening and three sites are waiting for approve/refuse of planning permission from the relevant MPA (Ellison & Griffiths, 2014). This equates to 48% of all opencast coal mines in the UK (Clubb, 2014).

Fig. 3. Map of opencast coal mining sites in South Wales  
 Source: Ellison & Griffiths (2014)



Under the Dyfed Act, 1987 and the Glamorgan Acts, 1987 and Article 53 of the Planning Policy Wales any private company that has been granted planning permission for a new opencast coal mining site is requested to ensure a previously determined financial bond which is intended to cover the costs of the restoration processes once operations have been stopped (Ellison & Griffiths, 2014). This bond, however, could be controversial for many reasons including unpredictable costs, regulatory or market failure, or any other unpredictable circumstances. The most evident case is the one in Scotland where due to market failure two of the largest opencast coal operators were forced to go into administration leaving the Scottish Government with preliminary estimated shortfall of £50 to £100 million (Foe Scotland & RSPB

Scotland, 2013). This situation arose in connection to the regulatory failure of the local authorities to ensure sufficient financial guarantee that will cover the costs of the restoration processes (Foe Scotland & RSPB Scotland, 2013). In an anonymous interview conducted by Nadya Dedikova (2014) with a representative of one of the Local Authorities in Wales, which has an opencast site in operation, it was made clear that this MPA has managed to secured a sufficient, in their calculation, financial bond to cover the cost of the restoration activities and that any unpredictable circumstances can be preliminary determined by the progressive restoration strategy put into practice. However in a paper ordered by the Welsh Government “*Research into the failure to Restore Opencast Coal Sites in South Wales*” many of the opencast sites in Wales are described at sites with potential risk where the secured financial bond will not be sufficient to cover the restoration activities and alternatively restoration strategies should be considered (Ellison, & Griffiths, 2014). In the Anonymous Interview (2014) the representative of the Local Authority stated that in the case when mining operations are still in progress any additional costs could be reassessed and the contractor could secure more financial means. However if any additional cost occur when the site is in the restoration stage and minerals are no longer extracted there is no other legal force that could oblige the contractor to cover the additional costs. This situation is controversial to the planning system which aim is “*to secure, without compromise, restoration and aftercare to provide for appropriate and beneficial after-use*” (Welsh Government, 2000, article 7.)

The situation in Scotland resulted in the establishment of the Scottish Mines Restoration Trust in April 2013, an independent non-profit organization, which “*role is to offer advice, expertise and where appropriate funding to facilitate the plans for restoration of derelict sites*” (Scottish Mine Restoration Fund, 2013). In Ellison & Griffiths (2014) recommendation is given that a similar Restoration Fund should be created in Wales as the authors of the report realize how some insufficient financial bonds could “*contribute to a situation where full compliance with planning conditions and successful restoration may not be achieved*” (p.10). This Trust would be considered appropriate step to tackle with any potential problems caused by opencast coal mines as it is a non-governmental organization and it would be a better representative of the voice of the local communities. However taking in consideration the principal “The polluter pays”, principal well established in the UK and the EU law systems, it should not be, under any circumstances, legally justify for the society to have to pay the restoration or any other costs related to opencast coal mining. This should not be allowed to happen neither in the form of tax that consumers have to pay, nor in the form of charity campaigns, simply because in this way the “polluter” would be free of any legal and financial prosecution at the expense of local communities. Therefore creating a Restoration Trust in Wales could be a good preventive measure but by no means a solution to such potential and unfavourable circumstances.

The role of the Welsh Government, however, does not end with only the responsibility to deal with unfortunate scenarios where restoration activities have failed and cost have to be covered and alternative strategies should be implemented. The Government has the power to influence the future development of the industry, but it does not do that independently as it follows the political guidance of the UK. In the Welsh Government (2000) it is stated that every MPA should take in account the mineral reserves in their area and should “*ensure that an appropriate contribution is made in its unitary development plan to meeting local, regional and UK needs for minerals [...as] policies which seek to meet only local needs or which rule out all*



*forms of mineral working within an area will only rarely be acceptable*” (articles 11.; 12.). In an Anonymous Interview (2014) the representative of the Local Authority has confirmed that a Development plan created by them which excludes mineral development project will not be granted consent and therefore will not be executed. These conditions reveal how centralized the decision-making process in the UK Government is and how limited the role of the Local Authorities is.

On the other side of the coal industry is the combustion process and the energy production. As the UK Coal Forum (2013) shapes a UK Coal Strategy it gives utmost importance to the coal power plants as they provided “*41% of electricity generated across Great Britain in 2012*” (p.2) and taking in account the 4.6 billion tonnes of coal reserves the country has it could “*last over 70 years at 2012 demand levels*” (p.7). Yet with a growing population the UK is expecting a much higher energy demand in future which should not be as heavily reliant on fossil fuels such as coal and natural gas, as it is at present simply because of the uncertainties in the market, the negative environmental and social impacts, and the commitment of the country to reduce its carbon emissions (Hammond & Pearson, 2013).

The Welsh Government, together with the UK Government, is committed to the Climate Change Act 2008 to reduce its carbon emissions with 80% lower than the 1990 baseline till 2050, and 34-37% reduction by 2020 was proposed according to the second and third CCC carbon budget (Hammond, Howard & Jones, 2013). For the Welsh Government this means reduction of 3% per annum from 2011 (Mason & Milbourne, 2013) which sums up to 9% total reduction to date. Unfortunately the reporting paper of the Welsh Government (2013) “*Welsh Government Policy Statement: Preparing for a changing climate*” is in its first stage where targets and means are only described but not implemented and therefore not available for accountability. However this document contains more recommendations and guidelines rather than mandatory measures and actions for actual reduction of carbon emissions leading to the possibility of this document to become nothing more than a wish list.

One strategy to reduce carbon emissions that the UK is counting on is the Carbon Capture and Storage (CCS) techniques that can capture and store the carbon emissions coming from power stations in order to continue using fossil fuels like coal and gas (Great Britain, 2014). Few CCS project proposals have been introduced in the UK but have not been put into practice. Major restrictions for this kind of projects are the very high costs associated with implementation and the unclear conditions concerning the places where carbon would be stored (Monbiot, 2007). According to Clubb (2014) there is no place in Wales, in terms of geological aspects, that would permit the storage of liquid carbon dioxide, and if it has to be transported to another place outside Wales this will make the process even more expensive. According to the UK Coal Forum (2013) in “*2012 the UK had 28GW of coal fired capacity*” (p.12) and in accordance with the Large Combustion Plant Directive (LCPD) and the Industrial Emissions Directive that the UK has ratified and in relation to the country’s own National Emissions Reduction Plan (NERP) plants of more than 50MWth have to meet great Emission Limit Values or will be force to close down. This means that before 2016 “*8GW of coal plant will have to, or will have already closed*” (UK Coal Forum, 2013, p.12). Even if some coal power stations manage to implement this technology on time and succeed to reduce to certain extend the CO<sub>2</sub> emissions there are many other countries where CCS project have already been implemented and where “*serious local opposition has been recorded*” (Demski, Spence & Pidgeon, 2013,

p.18). Furthermore the Strategy for Coal in the UK does not include in any way in its vision for sustainable energy production what are the negative impacts of the coal extraction process and how these impacts could be prevented which proves that this strategy could not be an integrated solution.

In the strategic document of the UK Coal Forum (2013) it is argued also that coal is “*vitally important to the economies of the regions in which it is extracted*” (p.8). The research of the Sheffield Hallam University the “*Economic and social conditions in the former mining communities of England, Scotland and Wales*” (2014) can be seen as a major contra argument to this statement. As former coalfields are integral parts of the history and present of the UK, its economic development and peoples’ lives the Sheffield Hallam University has undertaken this research to demonstrate the overall situation in the former coalfield areas of Great Britain (Foden, Fothergill & Gore, 2014). This research describes the negative impacts that occurred after the fall of “King Coal” in eloquent figures and statistical data. Everything from job loss and low qualification levels to health status and percentage of incapacity benefit claimant rates is shown and described. Many of the graphs rank South Wales as one of the most problematic and deprived areas in Great Britain pointing out that in the “*coalfields as a whole, there are just 50 jobs for every 100 residents of working age. In South Wales there are just 41 for every 100*”. Generally in the coalfield areas people are characterized with poor general health (bad or very bad health – 9.8% and limitation on day-to-day activity – 14.9% for the South Wales region, highest in GB) and high percent of the population (approx. 15-20% for Wales) who are with Level 1 or no qualification skills and are usually employed in the lower-grade or manual working positions which rarely gives them income higher than the national minimum wage. In most coalfields “*the share of pensioners living in poverty [...] is around double the average in South East England [and] 43 per cent of all neighbourhoods in the coalfields fall into the worst 30 per cent in Britain, according to Indices of Deprivation*”(p.6)

<b>Out-of-work benefit claimant rate (%)</b>		
1.	<b>South Wales</b>	<b>17.1</b>
2.	Durham	15.8
3.	Fife	15.7

Table 5. Out-of-work benefit claimant rate in the UK  
*Source: Foden, Fothergill & Gore, 2014*

<b>Incapacity benefit claimant rate (%)</b>		
1.	<b>South Wales</b>	<b>11.2</b>
2.	West Cumbria	9.7
3.	Durham	9.1

Table 6. Incapacity benefit claimant rate in the UK  
*Source: Foden, Fothergill & Gore, 2014*

The Coalfields Regeneration Trust was created in 1999 as a charity organization in order to support the local population and subsidize projects that will have positive and long-lasting effect on the coalfields communities in the UK (The Coalfields Regeneration Trust, n.d.). The Community Enterprise Network Wales is part of the Coalfields Regeneration Trust and is the organization responsible for implementing projects and assisting local communities in the Wales Valleys with the financial support of the European Regional Development Fund (The Community Enterprise Network, 2014).

The UK Energy Research Center conducted a nationally represented British survey in August 2012 by the name “*Transforming the UK Energy System: Public Values, Attitudes and Acceptability*” (Demski, Spence & Pidgeon, 2013). On one hand the survey determined that the perception of the general public in the UK concerning fossil fuels is unfavourable because they

are insecure, non-renewable and cause negative impacts on the environment and society, and believe that the UK should decrease its fossil fuel usage. On the other hand it shows that people are more supportive and enthusiastic when it comes to developing more renewable energy. Moreover people in this survey demonstrate a positive attitude towards wasting less energy and being more resource efficient in order to demonstrate their support and willingness to move to a more sustainable energy system. Thus given the public sentiment largely opposed to fossil fuels, and in favour of renewable energy, perhaps the demise and eventual cessation of the opencast coal industry in Wales is now inevitable.

## THE CASE OF “FFOS-Y-FRAN LAND RECLAMATION SCHEME” IN MERTHYR TYDFIL

Merthyr Tydfil is a town located in South Wales which is known to have played a very important role in the economic development of the UK. During the XVIII and XIX century reserves of iron ore, coal, limestone and water were found around Merthyr Tydfil and Rhymney which made the area a perfect location for flourishing development of the iron industry mainly represented by the building of merchant vessels and warships to supply the British naval power (Mason, 2013). The coal found around the area of Merthyr Tydfil was extracted by the deep-mining method until the late XX century when there was a substitution of the technique with a cheaper and more efficient method which is the opencast coal extraction (Mason & Milbourne, 2013). These mineral reserves have been beneficial to the economic situation in the UK but have left coalfield areas like Merthyr Tydfil, Rhymney and others in the South Wales region and the UK deprived in terms of land degradation, high unemployment rates, bad general health and high percent of claimant rates for incapacity or out-of-work benefits (Mason & Milbourne, 2013).

### % of LSOAs/datazones<sup>4</sup> in most deprived 30% in Great Britain

<b>1.</b>	<b>Wales</b>	<b>54</b>
<b>2.</b>	West Cumbria	52
<b>3.</b>	Durham	51
<b>4.</b>	N Staffordshire	51
<b>5.</b>	Ayrshire/Lanarkshire	50
<b>6.</b>	Coalfield average	42
<b>7.</b>	Great Britain average	30

Table 7: Deprivation rates in the coalfield areas in the UK  
Source: Foden, Fothergill & Gore (2014)

	% with general health bad or very bad	% with a lot of limitation on day-to-day activity
<b>1. South Wales</b>	<b>9.8</b>	<b>14.9</b>
<b>2. Durham</b>	8.6	12.6
<b>3. N Staffordshire</b>	7.9	11.8
<b>4. West Cumbria</b>	7.7	11.8

as in the UK

<sup>4</sup> “Each of the coalfields has been matched to its constituent Lower Super Output Areas (LSOAs), or datazones in Scotland, to enable local statistics to be generated” (Foden, Fothergill & Gore, 2014, p.12).



In April 2005 the Welsh Government granted planning permission to private contractor Miller Argent to start the “Ffos-y-fran Land Reclamation Scheme” (Miller Argent, 2014a). This operation is part of the East Merthyr Reclamation Scheme which was launched in 1980 by the Secretary of State for Wales that aimed at recovering “*derelict and dangerous*” land around the East part of Merthyr Tydfil using the “*opencast coal mining operations,[to restore]the land to beneficial use at no cost to the public purse*” (Miller Argent, 2014a). This opencast site is a huge development project with the size of 367 hectares, 20 years of operation and around 11 million tonnes of coal that would be extracted (Mason, 2013). “*There has never been a hole quite like it here, and our government’s climate change policies are about to fall into it*” (Monbiot, 2007, par.1, line 8).

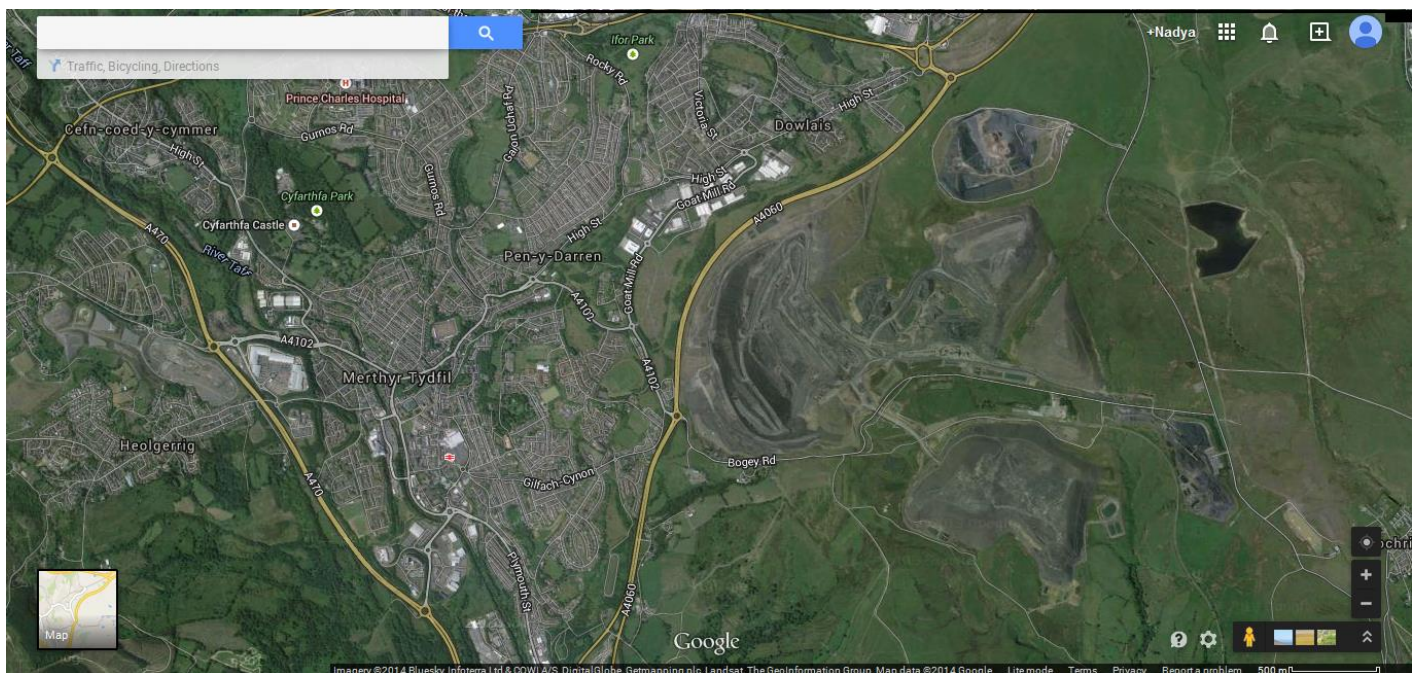


Fig.4. Map of Merthyr Tydfil and Ffos-y-fran Land Reclamation Scheme  
 Source: Google Maps (n.d.)

The contractor Miller Argent has guaranteed that precaution measures would be taken by the company and the Town Council to minimize the negative impacts that the mine would cause to the environment and the people of Merthyr Tydfil (Miller Argent, 2014b). However, local communities in Merthyr Tydfil did not agree either with the reasons for granting this site a planning permission in the first place, nor with the false promises that the local government and private company gave them. As many local residents have lived in the area for a very long time they know what the characteristics of the landscape are and are aware of the “derelict and dangerous” land, which according to them could be secured properly without the need to dig massive holes in the ground (Residents against Ffos-y-Fran Group, 2009). The Local Authority has escalated the problems of the pits left in the ground from past mineral working by declaring them highly toxic and a threat to human life, and yet they hold no record of any negative impacts to human health caused by these pits (Austin & Austin, 2014). Moreover the “Research into the failure to Restore Opencast Coal Sites in South Wales” has indicated that “*based merely on the*

*likely cost of bulk earthmoving of those overburden mounds, and the final restoration and treatment of the surface of the 400 ha site, it is likely that the fixed bond of £15m held by the LPA, Merthyr Tydfil County Borough Council, falls well short of a worst case restoration cost which could be in excess of £50 m based on the collected information” (Ellison, & Griffiths, 2014, p.39).*

The people from the area of “Ffos-y-fran Land Reclamation Scheme” have started fighting against the opencast site as early as possible but since they could not prevent the granting of planning permission of the site, as it had been supported by the Westminster and the Welsh Government as well as the Merthyr Tydfil Council Borough, they have formed a group under the name of Residents against Ffos-y-Fran Group to try and prosecute the contractor on any legal ground they can (Residents against Ffos-y-Fran Group, 2013). Alyson and Chris Austin are a family living in Merthyr Tydfil and they are concern citizen and active campaigners for social and environmental justice for more than 11 years. Austin & Austin (2014) describe what negative impacts the local residents bare after the start of the opencast operations. The family explains that whenever the winds blow from the east (both south- and north-eastern directions) many of the neighbourhoods in Merthyr Tydfil are directly affected by the dust and noise coming from the mines. Heavy machinery such as diggers and lorries, and blasting explosions start early in the morning and continue often for 16 hours a day. Because the noise is so constant there are times when the family cannot bare to stay in the house so they go out and drive somewhere just to escape from the intrusion of their privacy. The family has taken the case to the Environmental Department in Merthyr Tydfil, presenting them dust samples collected from the front and the back garden of their property, together with statements of the wind direction on the day of the samplings and other relevant information. However the Local Authority did not consider them as a sufficient evidence to legally prosecute the contractor for dust issues. In 2011 the Austin family with a help of an environmental solicitor has tried to gather signatures from local residents to form a Group Litigation Order to bring the mining company to court for statutory nuisance (Environmental Protection Act, 1990). After collecting more than 500 signatures they filled a case but the court rejected a Group Litigation Order on the basis of excessive financial risk and perceived lack of funding. Under the *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (1998)*, ratified by all parties on 17<sup>th</sup> February 2005 (UNECE, n.d.), the UK Government is obliged to allow access to the public “*to administrative or judicial procedures [who wish] to challenge acts and omissions by private persons and public authorities which contravene provisions of its national law relating to the environment*” (Article 9 (3.)) and to provide “*appropriate assistance mechanisms to remove or reduce financial and other barriers to access to justice*” (Article 9 (5.)). This means that citizens are protected by the law from any financial hardship considering the access to justice in environmental matters. However, even in this condition the court still refused access to the legal system. Since then the Austin family and other local residents have bounced between the European and National court system but without any intention to stop demanding for their rights.

As Residents against Ffos-y-Fran Group (2013), Monbiot (2007) and Mason (2013) have written, the opencast coal mine violates many rules and causes negative short- and long-term effects on both the community and the environment. There is no buffer zone around the

site as the closest homes are located just 36-37 meters from the edge, leaving these people without any protection from the noise, dust and vibrations that the operation is generating. According to the Ffos-Y-Fran Health Impact Assessment Steering Group (2007) there is significant data confirming the poor health of the residents in Merthyr Tydfil concerning chronic illnesses like chronic obstructive pulmonary disease, as well as ischemic heart disease and strokes, mental illnesses, etc. can be related partly to the long heavy industry of the town in the past. The UK Office for National Statistics (2010) ranks the 404 local areas in the UK according to the life expectancy at birth (years) where 1<sup>st</sup> is the Highest and 404<sup>th</sup> is the Lowest. The area of Merthyr Tydfil is ranked in 389<sup>th</sup> place. This means that increased dust issues, like the ones coming from the opencast site, will only contribute to the already bad health condition of the people in the area.



## BEST PRACTICES

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There are many countries in the world that are still dependent on fossil fuels to generate electricity, produce energy and sustain their economies, but there are even more cities and areas which are still struggling to overcome the negative impacts of the decline of the Industrial Revolution and which are striving to compete in the new era of innovation and technology. Some of these cities are very good example of how political will and commitment, public awareness and support, and market engagement can work together and achieve remarkable improvements and sustainable development in all its forms. Over the years there have been many European and worldwide platforms created to unite communities and authorities around the world, small or big, that wish to achieve sustainable development within their areas. These programmes and initiatives include information of the aspect of sustainable development created in the urban and rural environment, policy guidelines for making places more resilient to climate change, and best practices that promote creativity, participation, engagement and innovation. Such examples are the Sustainable Cities Europe<sup>5</sup>, Cities for Climate Protection Campaign<sup>6</sup>, Local Governments for Sustainability<sup>7</sup>, Renewable Cities<sup>8</sup> and many more.

In this research there are two good practices briefly reviewed and for any additional information that may be required references and footnotes are included in the text. One of the examples is the Local Government in Gelsenkirchen, Germany and the other one is the Danish Government. The reason for this choice is that the cases represent different policy approach by the authorities in the two areas, one represents the national policy and the other one the regional and local policy. Both of them have set ambitious goals and both are achieving impressive results. Also in both cases there is a clear transition from a fossil fuels energy system to renewable energy.

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<sup>5</sup> <http://www.sustainablecities.eu/home/>

<sup>6</sup> <http://www.iclei-europe.org/ccp>

<sup>7</sup> <http://www.iclei.org/>

<sup>8</sup> <http://www.renewablecities.ca/>



## GERMANY

Gelsenkirchen is located in the Ruhr region, North-Rhine Westphalia, Germany and has played a very important role during the Industrial Revolution because of its coal reserves (Energy cities, 2002). The coal and steel industry transformed this settlement from a small village with only 7,000 residents in 1840s to a city of 340,000 residents by the 1920s (Musco, 2010). Like many former coalfields area in Europe after the coal crisis, the city of Gelsenkirchen was characterized by declining population and changing economy. Alike many of the most deprived and industry dependent areas in Wales the city of Gelsenkirchen and the neighbouring areas were devastated economically by the overseas competitors which resulted in environmental degradation, 30% population loss, doubled unemployment and cancer rates and an aging trend, all above the national average (Musco, 2010). All of this “triggered a process of structural change, away from coal and steel and towards new technologies such as solar energy and towards the service society” (Energy cities, 2002). The decision made by the Local Authority has had radical impact on the city in transforming it from a former coalfield area into “Solar City Gelsenkirchen” (Solarstadt Gelsenkirchen, n.d.).

The solar project in Gelsenkirchen was part of the “International Building Exhibition at Emscher Park” launched in 1989 in Germany that aimed at transforming the old industrial fields in the Ruhr Region to serve new recreational purposes (Musco, 2010). As described by Musco (2010) and on the website of the “Solar City Gelsenkirchen” project<sup>9</sup> the first step of the solar city strategy began with a building of a technology center - Science park Gelsenkirchen on the place of the former steel foundry. “In 1996, a 210 kilowatt (kW) photovoltaic power plant was built on the roof of the technology centre, the largest of its type in the world at this time” (Musco, 2010, p.280). This project was supported both by Local and Central Government and subsidized partly by the ERDF. In order to involve residents in this transformation process in 1997 a new project called Gelsenkirchen-Bismarck solar housing estate was implemented with the goal to improve the urban living environment.

These housing estates together with one eco-friendly school were built in a former mining site

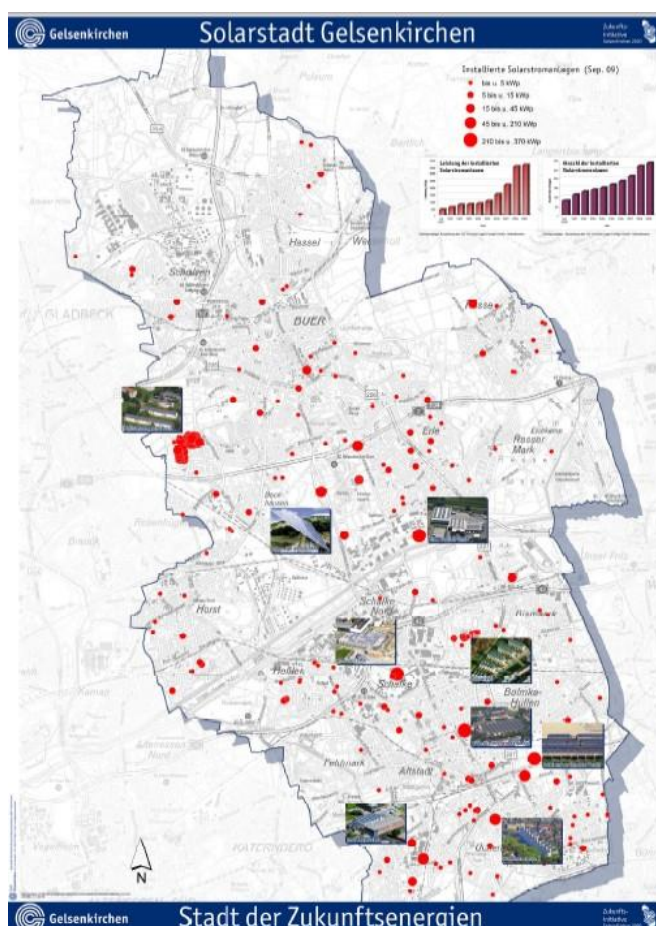


Fig. 6. Solar power plants in Gelsenkirchen  
Source: Solarstadt Gelsenkirchen (n.d.)

<sup>9</sup> For more information on the step-by-step process visit <http://www.solarstadt-gelsenkirchen.de/en/about-us/chronicle/> or see Musco (2010)

just over a mile from the city center. Not long after that a state-of-the-art solar cell manufacturing factory, laboratory and service centre, and a student lab for climate protection and energy efficiency were open in Gelsenkirchen. This allowed many more houses to be build and renovated with solar panels creating many job places in the solar panel industry as well as in side related jobs which made Gelsenkirchen attractive to new and old residents once again.

In 2008 the city was successfully certified as a European Energy Award Municipality and it is to become the “City of Future Energies” as the city does not produce energy only by its solar panels (Solarstadt Gelsenkirchen, n.d.). Many other projects such as wind power, and bio-power are introduced and implemented in the area. Furthermore the Local Authority organized information meetings and provided information brochures where the public had the opportunity to see and learn more about the projects. Moreover information about climate change, energy efficiency and ecological footprint made people more aware of and engaged in the projects. Many of these development projects are usually implemented in areas with population and economic growth where new houses and businesses are emerging. However the city of Gelsenkirchen has demonstrated that does not necessarily need to be the case, as cities in economic restructuring and with decreasing population can also be successful examples of redevelopment of old industrial fields and renovations of the existing building stock and thus creating and implementing urban planning policies that achieve sustainable development (Musco, 2010).

Denmark was one of the countries with the highest CO<sub>2</sub> emissions per capital in the world, dependent on fossil fuels to meet its energy demand (Lund & Mathiesen, 2009). Now, more than thirty years later, the Danish Government has made major and radical changes of the country's policy vision and direction to make it what it is today. According to the Danish Ministry of Climate, Energy and Building (2014), in 2012 the share of the renewable energy in the country was 26%. This allowed the share of oil in the energy system to drop significantly and the goal of the Government at present is to reach 29% decrease in the share of all fossil fuels by 2020. Alongside this, Denmark's goal to reduce carbon emissions in line with the Europe 2020 strategy is going in the right direction. Achieving all of that and gaining the confidence that they could achieve much more, now the Danish Government have set two major goals: one is to reach 50% renewable energy by the year 2030 and the second one is to achieve 100% independency of fossil fuels and nuclear power using renewable energy from biomass, together with wind, wave and solar power by 2050 (Lund & Mathiesen, 2009). One of the major challenges in accomplishing these goals is the transport sector which reported by the Ministry of Climate, Energy and Building (2014) will undergo "*efficiency improvements through electricity and district heating production being converted into fuel-free production with a modest conversion loss*". Other challenges were improvements in the energy production sector and substitution of fossil fuels by renewable energy. In order to formulate and guarantee the feasibility of the two ambitions goals the Danish Government held 40 seminars during "Energy Year 2006" where more than 1600 participants "*discussed and designed a model for the future energy system of Denmark*" (Lund & Mathiesen, 2009, p.524).

In Lund & Mathiesen (2009) case study research on Denmark the conclusions are that the country has the full potential to reach the first of its set goals but will have to work harder to achieve the second one. This research shows that the goal to reach 100% renewable energy system by 2050 is a very complex process which will require both horizontal and vertical coordination. Yet the research demonstrates, throughout computer simulations, that Denmark has the capacity to implement these policies and achieve remarkable results. This would be a major step for Denmark and a very good example for other fossil fuel dependent countries around the world. However the Danish Government is not fighting to accomplish these aims on its own, as many stakeholders like local authorities and community groups are making their contribution. Copenhagen, for example, has set goals on its own to become "*the first carbon neutral capital b 2025*" thus providing good examples for green solutions (Go 100%, 2014). It has already included pedestrian centres and miles of bicycle lines that incentives people to get out of their cars, but provided free parking for electric cars as well to incentives people to more sustainable solutions to their everyday activities (Go 100%, 2014). This is just one in dozens of examples in Denmark where local and central authorities and society have managed to work together in formulating common goals.

## CONCLUSION

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Considering the 4.6 million tonnes of coal reserves in the strata of the UK, the applications for new opencast sites, the 41% electricity generated by coal power plants and the guidelines in the political framework of Wales and the UK, coal will most likely continue to be an easy and “cheap” source of energy and therefore extracted and used in the foreseeable future. The main reason for this is the centralized political state where Wales does not have much authority over its own energy system as it is part of the UK mixed energy grid. Each Local Authority must comply its development plan with the Central Body and in this plan it has to include mineral development projects that contribute to the local, regional and national interests of the country which per se demonstrate how much control these local authorities really have. As the mineral rights of all UK coal reserves are in the hands of the Coal Authority, Wales does not have autonomous power over its own resources which is a precondition for the existence of inequalities in the decision-making process. This is particularly evident within some areas and societies in Wales that are ranked as the most deprived in the UK.

Research, reports and serious community opposition over the years have demonstrated and proven that the coal extraction and usage is one of the dirtiest and most destructive processes of industrial exploitation. From environmental point of view opencast operations cause land degradation, destroy the flora and fauna, and lead to bad drainage and low crop yields. From social perspective it creates dust, noise and vibrations that lead to bad mental and physical health and private nuisance to local residents. It has also been proven that former coalfield areas leave communities in a deprived state where unemployment, lack of professional development and aging of the population is “normality”. Even since the 1980s, if not before, the British Government has ignored the alerts of the short- and long-term negative effects of the mining industry. The Flowers report was the first document to fully comprehend the process of coal mining in terms of policy implementation, environmental and social impacts and to give more than clear recommendations that the volume of opencast coal mining should be allowed to decline. The local communities of opencast coalfields have formed groups and have persistently shown their resistance of opencast operations in their areas. Despite the outcry the central Government has neglected the needs of many local communities, as it has increased the volume of extracted coal over the years and has granted planning permission for new opencast sites in areas where the environment and communities have already been devastated by former coalfields.

From a future perspective it is clear that the UK cannot achieve either a resilient economy or sustainable development if it continues to depend on fossil fuels which are non-renewable and vulnerable to regulatory and market failure energy resources. There can neither be an integrated political approach if the different sectors continue to act as separate units. Both environmental protection and sustainable development are of great importance for every local authority and government, but many times they have been opposed to the national interest (the one that industry can provide) which helped greatly in lowering the protection measures in certain areas. But national interest and environmental protection should be seen more as partners than rivals. Environmental protection can help economies move to a more sustainable, community friendly and clean energy system which in any case is of national interest. Sustainable development can promote and Governments can incentivize innovation,



participation and engagement of all stakeholders within the energy system thus creating a shift from a fossil fuel dependent economy to an alternative and more sustainable one.

For this to happen though many changes must be undertaken, changes that give more control to the Welsh Government over its mineral resources, more independence for the energy system, more power to the local authority and more platforms for public participation and engagement. Indeed these kinds of changes require time and resources and are very complex yet they are crucial for Wales if the country wishes to achieve all its sustainable development goals and keep all international commitments. Many countries and regions have already joined the movement to a more sustainable future demonstrating that strong political will, public awareness and support, and market engagement can make every goal feasible.

## BIBLIOGRAPHY

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- Anonymous Interview conducted by Nadya Dedikova (2014). 'Policy implication regarding opencast coal mining permits and restoration activities'. [Interview] 18<sup>th</sup> October 2014.
- Austin, A. & Austin, C. (2014) 'Research on the impact of opencast coal mining on local communities'. [Interview] 18<sup>th</sup> October 2014.
- Beynon, H. et al. (2000). *Digging up trouble: the environment, protest and opencast coal mining*. Rivers Oram Pr.
- Bish, G. M. (1986). Opencast coal mining in South Wales. *International journal of mine water*, 5(2), 1-12.
- Clubb, G. (2014) 'Opencast coal mining in Wales'. [Interview] 15<sup>th</sup> October 2014.
- Commission on Energy and the Environment (1981). *Coal and the Environment*. London: HMSO.
- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters 1998*, adopted on 25<sup>th</sup> June 1998, ratified on 17<sup>th</sup> February 2005 [Online] United Nation Economic Commission for Europe. Available from: <http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf> [Accessed: 11<sup>th</sup> November 2014].
- Council Directive 97/11/EC. Directive on the assessment of the effects of certain public and private projects on the environment. 3 March 1997. *Official Journal L 073, 14/03/1997 P. 0005 – 0015*.
- Countryside Commission (1993). *Opencast Coal Mining. Advice on landscape and countryside issues*. Countryside Commission Postal Sales, Northampton.
- Danish Ministry of Climate, Energy and Building. (2014) *Baseline projection 2014: The transition to a green Danish energy system is accelerating*. [Online] Available from: <http://www.kebmin.dk/en/news/baseline-projection-2014-the-transition-to-a-green-danish-energy-system-is-accelerating> [Accessed: 19 November 2014].
- Demski, C., Spence, A. & Pidgeon, N. (2013) *Transforming the UK Energy System: Public Values, Attitudes and Acceptability – Summary findings of a survey conducted August 2012*. (UKERC: London).
- Department of Energy and Climate Change. (2013). *Appraisal report from Department of Energy and Climate Change ("DECC") relating to records of the former National Coal Board ("NCB") (latterly British Coal Corporation ("BCC")) – a statutory corporation created in 1947 and wound up in 2004*. Appraisal Report. August 2013. London
- Department of Energy and Climate change. (2014). *Historical coal data: coal production, availability and consumption 1853 to 2013*. London

- Ellison, R. & Griffiths, G. (2014). *Research into the failure to Restore Opencast Coal Sites in South Wales*. [Online]. Welsh Government. Available from: <http://wales.gov.uk/docs/desh/research/140424failure-to-restore-opencast-coal-sites-in-south-wales-en.pdf> [Accessed: 14<sup>th</sup> October 2014].
- Energy cities (2002) *Solar Energy: Solar Housing Estate. Gelsenkirchen (Germany)*. [Online] European Commission. Available from: [http://ec.europa.eu/energy/res/publications/doc2/EN/GESLS\\_EN.PDF](http://ec.europa.eu/energy/res/publications/doc2/EN/GESLS_EN.PDF) [Accessed: 24<sup>th</sup> November 2014].
- Environmental Protection Agency (1995). Particulate Matter (PM-10). [Online] AIRTrends 1995 Summary. Available from: <http://www.epa.gov/airtrends/aqtrnd95/pm10.html> [Accessed: 8<sup>th</sup> October 2014].
- Ffos-Y-Fran Health Impact Assessment Steering Group (2007). A Report of a Health Impact Assessment Study of an Opencast Scheme at Ffos-Y-Fran, Merthyr Tydfil. [Online]. Final Report, June 2007. Available from: <http://www.stopffosyfran.co.uk/files/Final%20report%20June%202007.pdf> [Accessed: 12<sup>th</sup> November 2014].
- Field, J. P., et al. (2009). The ecology of dust. *Frontiers in Ecology and the Environment*, 8(8), 423-430.
- Foden, M., Fothergill, S. & Gore, T. (2014) *The state of the coalfields. Economic and social conditions in the former mining communities of England, Scotland and Wales*. Centre for Regional Economic and Social Research. Sheffield Hallam University, June 2014.
- FoE Scotland & RSPB Scotland. (2013) *Opencast coal mining. Liability for restoration works*. Parliamentary Briefing [Online] Available from: [http://www.rspb.org.uk/Images/opencast-coal-mining\\_tcm9-353523.pdf](http://www.rspb.org.uk/Images/opencast-coal-mining_tcm9-353523.pdf) [Accessed: 5<sup>th</sup> November 2014].
- Go 100%. (2014) *City of Copenhagen*. [Online] Available from: [http://www.go100percent.org/cms/index.php?id=19&id=69&tx\\_ttnews\[tt\\_news\]=20&tx\\_locator\\_pi1\[startLat\]=45.93583305&tx\\_locator\\_pi1\[startLon\]=-0.97011545&cHash=a52da45151ba542f81a343243818acf1](http://www.go100percent.org/cms/index.php?id=19&id=69&tx_ttnews[tt_news]=20&tx_locator_pi1[startLat]=45.93583305&tx_locator_pi1[startLon]=-0.97011545&cHash=a52da45151ba542f81a343243818acf1) [Accessed: 19 November 2014].
- Google Maps (n.d.) *Merthyr Tydfil and Ffos-y-fran Land Reclamation Scheme*. [Online] Available from: <https://www.google.co.uk/maps/@51.7507683,-3.355662,3882m/data=!3m1!1e3?hl=en> [Accessed: 12<sup>th</sup> November 2014].
- GREAT BRITAIN (2014). *Carbon capture and storage (CCS)*. [Online] Available from: <https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/carbon-capture-and-storage-ccs> [Accessed: 13<sup>th</sup> November 2014].
- GREAT BRITAIN. Circular DE 28/87 and WO 54/87. (1987) *Joint Circular from the Department of the Environment and the Welsh Office on Opencast Coal Mining*. HMSO, London.

- GREAT BRITAIN. *Environmental Protection Act 1990: Part III. Statutory Nuisance and Clean Air (1990) 79(1)*. [Online]. Available from: <http://www.legislation.gov.uk/ukpga/1990/43/part/III> [Accessed: 11<sup>th</sup> November 2014].
- GREAT BRITAIN. *Housing and Planning Act 1986*. (1986) London: The Stationery Office.
- GREAT BRITAIN. *Opencast Coal Act 1958*. (1958) London: The Stationery Office.
- Hammond, G. P., & Pearson, P. J. (2013). Challenges of the transition to a low carbon, more electric future: From here to 2050. *Energy Policy*, 52, 1-9.
- Hammond, G. P., Howard, H. R., & Jones, C. I. (2013). The energy and environmental implications of UK more electric transition pathways: A whole systems perspective. *Energy policy*, 52, 103-116.
- Horne, R., & Frost, S. (1991). Opencast coal mining in England and Wales: a review of legislation and policy. *Land Use Policy*, 8(1), 29-35.
- IPCC (2007). *Climate Change 2007: Mitigation of Climate Change*. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom.
- Jenkins, W. L. (1854). *History of Cardiff*. Charles Wakeford.
- Lund, H., & Mathiesen, B. V. (2009). Energy system analysis of 100% renewable energy systems—The case of Denmark in years 2030 and 2050. *Energy*, 34(5), 524-531.
- Mason, K. & Milbourne, P. 2013. Open-Cast Coalmining in the South Wales Valleys. *Cardiff Case Studies*. Cardiff University
- Mason, K. (2013) *A dirty black hole*. Red Pepper [Online] August 2013. Available from: <http://www.redpepper.org.uk/a-dirty-black-hole/> [Accessed: 6<sup>th</sup> November 2014].
- Miller Argent. (2014a) *The Project*. [Online] Available from: <http://www.millerargent.co.uk/about-the-site/> [Accessed: 10<sup>th</sup> November 2014].
- Miller Argent. (2014b) *Frequently asked questions*. [Online] Available from: <http://www.millerargent.co.uk/faqs/> [Accessed: 10<sup>th</sup> November 2014].
- Mineral Planning Guidance 2: Applications, permissions and conditions. (1988) Welsh Government [Online]. Available from: <http://wales.gov.uk/docs/desh/publications/880101mpg2en.pdf> [Accessed: 26<sup>th</sup> September 2014].
- Mineral Planning Policy Wales (2000). [Online]. Welsh Government. Available from: <http://wales.gov.uk/docs/desh/policy/120522planningmineralpolicyen.pdf> [Accessed: 26<sup>th</sup> September 2014].
- Minerals Technical Advice note2: Coal (2009) [Online] Welsh Government. Available from: <http://wales.gov.uk/docs/desh/policy/090120coalmtanen.pdf> [Accessed: 26<sup>th</sup> September 2014].

- Monbiot, G. (2007) *The new coal age*. The Guardian [Online] 9<sup>th</sup> October. Available from: <http://www.theguardian.com/environment/2007/oct/09/energy> [Accessed: 6<sup>th</sup> November 2014].
- Musco, F. (2010). *Local Governments and Climate Change*. F. M. M. van Staden (Ed.). Springer Netherlands.
- National Coal Museum. (n.d.) *Statistics*. [Online]. Available from: <http://www.ncm.org.uk/docs/collections-documents/statistics-in-mining.pdf?sfvrsn=2> [Accessed: 16 September 2014].
- Office for National Statistics (2010). *Life expectancy at birth and at age 65 by local areas in the United Kingdom, 2007-2009 - Results for the United Kingdom*. [Online] Available from: <http://www.ons.gov.uk/ons/datasets-and-tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=Life+expectancy+at+birth+%28years%29+and+rank+order%2C+by+local+authority+in+the+United+Kingdom> [Accessed: 12<sup>th</sup> November 2014].
- Peart, J. & Rutherford, L. (1986) *A review of Opencast Coal and its Environmental Impact*. School of Law and Surveying Newcastle. Newcastle March 1986.
- Rees, D. & Evans, I. (1954) *A survey of the South Wales coalfield*. Western Mail Commercial and Industrial Review
- Residents against Ffos-y-Fran Group (2009). *Questions and Answers Page*. [Online] Available from: <http://www.stopffosyfran.co.uk/FAQ.html> [Accessed: 12<sup>th</sup> November 2014].
- Residents against Ffos-y-Fran Group (2013). *This fight is not over - not by a long chalk - we will get justice for Merthyr*. [Online] Available from: <http://www.stopffosyfran.co.uk/index.html> [Accessed: 12<sup>th</sup> November 2014].
- Scottish Mine Restoration Fund. (2013) *How we work* [Online] Available from: <http://www.smrtrust.org/what-we-do/how-we-work.aspx> [Accessed: 6<sup>th</sup> November 2014].
- Solarstadt Gelsenkirchen (n.d.) *Chronicle: How it all began*. [Online] Available from: <http://www.solarstadt-gelsenkirchen.de/en/about-us/chronicle/> [Accessed: 24<sup>th</sup> November 2014].
- The Coal Authority [n.d.] *About us*. [Online]. Available from: [http://coal.decc.gov.uk/en/coal/cms/about\\_us/about\\_us.aspx](http://coal.decc.gov.uk/en/coal/cms/about_us/about_us.aspx) [Accessed: 24<sup>th</sup> September 2014].
- The Coalfields Regeneration Trust. (n.d. a) *About us*. [Online] Available from: <http://www.coalfields-regen.org.uk/about-us/> [Accessed: 4<sup>th</sup> November 2014].
- The Community Enterprise Network. (2014) *Community Enterprise Network (Wales)*. [Online] Available from: <http://www.communityenterprisenetwork.org/about-the-network/> [Accessed: 4<sup>th</sup> November 2014].

Trigg, A. & Dubourg, W. (1993). Valuing the environmental impacts of opencast coal mining in the UK: The case of the Trent Valley in North Staffordshire. *Energy policy*, 21(11), 1110-1122.

Trucost (2013). *NATURAL CAPITAL AT RISK: THE TOP 100 EXTERNALITIES OF BUSINESS*. [Online]. Trucost PLC, April 2013. Available from: [http://www.longfinance.net/images/PDF/trucost\\_naturalcapital\\_2013.pdf](http://www.longfinance.net/images/PDF/trucost_naturalcapital_2013.pdf) [Accessed: 6<sup>th</sup> October 2014].

UK Coal Forum (2013) *A Strategy for Coal in the UK 2013*. [Online] UK Government. Available from: <http://www.coalpro.co.uk/documents/Coal%20Forum%202013%20Coal%20Strategy.pdf> [Accessed: 26<sup>th</sup> September 2014].

UNECE (n.d.) *Aarhus Convention: Parties to the Aarhus Convention and their dates of ratification*. [Online] United Nation Economic Commission for Europe. Available from: <http://www.unece.org/env/pp/aarhus/map.html> [Accessed: 11<sup>th</sup> November 2014].

Walsh, F. et al. (1991). *The environmental assessment of opencast coal mines*. University of Manchester, Department of Planning and Landscape, EIA Centre.

Welsh Government (2013). *Welsh Government Policy Statement: Preparing for a changing climate*. [Online] Welsh Government Climate Change Team. Available from: <http://wales.gov.uk/docs/desh/publications/130307preparing-for-changing-climate-policy-en.pdf> [Accessed: 13<sup>th</sup> November 2014].