LISD LIECHTENSTEIN INSTITUTE FOR STRATEGIC DEVELOPMENT

UNSW AUSTRALIA | Built Environment

BERLIN – BRANDENBURG: A 10-YEAR COAL EXIT AND ENERGY TRANSITION STRATEGY

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EXECUTIVE SUMMARY

Since the turn of the industrial revolution, coal and other forms of fossil fuels have been critical to advancements in technology that have shaped human interactions and global development. The use of fossil fuels has been increasing in step with economic growth and has transformed our way of life.

Yet reliance on fossil fuels for continued economic advancement has also brought about changes in our environment. Atmospheric CO_2 levels which contribute to global warming have been rising since the industrial revolution and have increased rapidly over time. Global warming and the impacts of climate change are now front and centre in the political arena with governments across the world committing to reduce emissions in an effort to minimise the rate and impact of climate change.

These events are promoting a shift from the use of fossil fuels to renewable energy as a means to facilitate sustainable development and mitigate global warming. While this shift is underway, there are many challenges that must be overcome to meet climate change targets.

This research report is focused on the German states of Berlin and Brandenburg and seeks to facilitate a structural change in the energy system for these states. Specifically, it develops an environmentally, socially, economically, fiscally and spatially relevant Coal Exit and Metropolitan Energy Transition Strategy for the Berlin-Brandenburg region.

The state of Brandenburg contains some of Europe's largest coal mines and coal-fired power plants which have traditionally provided for the energy needs of both Brandenburg and Berlin. Since the re-unification of Germany in the 1990s, many coal mines and coal fired power plants have closed, and the state is transitioning to the production and use of renewable energy.

This report presents a clear strategy to support and accelerate this transition to renewable energy, broaden the economic base of the region and inspire confidence in its regional identity. The strategy seeks to facilitate the cessation of mining without fear of structural collapse.

A 10-year plan has been developed with an emphasis on place-based local economic development actions to offset negative impacts resulting from the region's economic restructuring and exit from coal. It identifies key impediments to a coal exit and energy transition, and sets out a plan to overcome these to achieve renewable energy and climate targets.

One such impediment is the lack of a clear direction from all levels of government regarding a timescale for an exit from coal. This has resulted in market uncertainty and inhibited investment in new industries.

The 10-year plan is underpinned by a Compact for the Coal Exit and Metropolitan Energy Transition (CEMET Compact) that publicly and jointly commits all levels of government to exit coal and transition to renewables. The Compact is intended to establish support for a new corporate entity, the Berlin-Brandenburg Transition Corporation (BBTC), with representation from all levels of government and industry sectors.

The BBTC would be responsible for implementing the following six policies which are core recommendations for the achievement of a coal exit and metropolitan energy transition:

Policy 1

- *Invest in strategic infrastructure to support the development of places and communities in mining affected regions and act as a catalyst for further economic growth.*

Policy 2

- *Develop an Economic Development Fund for mining affected communities to provide finances for projects and programs that create and/or enhance employment opportunities, improves the regional tax base or otherwise enhances quality of life for the community.*

Policy 3

- *Establish a skills-based transition program for the 8,000 affected coal workers in the Lusatia region.*

Policy 4

- *Prepare a Lake Environmental Resource Plan to capitalise on the benefits artificial lakes provide as an asset to the region and position Lusatia as a world leader in artificial lake development for mine-site rehabilitation.*

Policy 5

- *Establish a new narrative for Brandenburg to better capture and promote its rich and diverse regional identity in consultation with community.*

Policy 6

- *Commit to achieving 100% renewable energy supply for Berlin-Brandenburg by 2025.*

These policy recommendations will help to clarify the profile of the region's future energy systems and provide much needed certainty for investors in the energy sector. Keeping pace with emerging opportunities in the renewable energy sector will provide a competitive advantage for Berlin-Brandenburg region. It will also support regional strategic planning, local economic development, and investment in strategic infrastructure.

Most importantly, the 10-year plan will provide the much-needed tools to allow an exit from coal to occur without a fear of structural collapse. The joint commitment from all levels of government will also allow industry, local businesses, investors and the community to plan ahead with confidence.

INTRODUCTION

Energy underpins the global development model. From the steam engines that fired the early industrial revolution to the fossil fuels and power stations that have supercharged urbanisation from the late nineteenth century to the present day.

Today, energy is everywhere. From the electricity powering homes and businesses, to the oil contained in synthetic fibres and clothing, and the coal used to make steel for cars and buildings.

Even this brief history shows that when economies and societies become more sophisticated, the energy technologies and sources they use also become more sophisticated. It shows that continued global development does not rely on any one technology or source.

CHANGING ENERGY SYSTEMS

Changing energy sources and technologies have enabled major economic benefits and improvements in the human condition. The natural tendency to focus on positives means it is easy to forget what gets left behind and too often the environment and communities have come off second best when energy systems change.

Workers can find their skills no longer match the needs of new energy technologies, whole towns can be wiped off the map to access the non-renewable resources that lie underneath, and our ecosystems are damaged as we extract and make use of these resources.

Governments at all levels play an important role in facilitating and managing the costs and benefits of such change. The scale of financial investment involved, vested interests in the industry, and the challenge of managing conflicting interests means that energy policy is fraught with political difficulties. These difficulties combine with the technological complexity of energy infrastructures to slow down systemic change.

THE NEXT CHANGE

It is clear that the world is undergoing another major change in our energy system. Governments are beginning to more adequately account for the long-term costs of carbon, rendering fossil fuels unviable as the basis for continued global development.

Today, technological advancement has enabled the world to harness cleaner, cheaper renewable sources to underpin the next wave of sustainable global development. As this change is made, it is incumbent on society to learn from the past, address the impact of fossil fuels, and ensure no one is left behind as the renewables age dawns.

As with prior shifts in the energy system, governments will play a vital role managing the impacts and politics of this change. This has already begun with governments committing to cleaner energy as the driver for a new age of sustainable global development.

As more people come to live and work in our cities, urban regions are increasingly critical to this new age and offer the potential for huge gains in transitioning to new energy systems. Increasing urbanization means energy can be used more productively as more people use the same buildings and transport systems.

But doing more with less is not enough. Some cities and regions are already on track to overshoot global climate policy commitments (Carbon Market Watch, 2017) and this means urban lifestyle must change to reduce overall energy use.

In cities and urban regions, energy takes on a spatial dimension and new ways of shepherding a changing energy system can be found. Today, industry policy is no longer the only tool to manage a changing energy system. Spatial policy targeted at cities and urban regions can be equally effective.

If governments are to meet global energy commitments, it is crucial they get the relationship between industry and spatial policy right.

SCOPE

The Lichtenstein Institute for Strategic Development (LISD) has tasked a team of researchers from the Master of Urban Policy and Strategy at Australia's University of New South Wales (UNSW) to shed light on structural change in the energy system and consider how this relates to the future of Germany's Berlin-Brandenburg region.

LISD prepared an initial brief for the team on what a changing energy system could mean for the region's future. It asked the team to consider the technological, social, economic, and infrastructural dimensions of transitioning from fossil fuels to renewables as the major source of power and heat for the region, including:

- the major geographic and structural issues of Berlin and Brandenburg;
- the role of coal in urban development;
- coal transitions and regional development in Berlin and Brandenburg against a backdrop of similar global changes;
- climate change and other environmental impacts of coal and fossil fuel dependence;
- the case for energy transitions and specifically their impact on the Berlin Brandenburg region;
- the motivations, progress and barriers in changing from old to new energy sources.

After arriving in Berlin and Brandenburg, the team discussed the brief with LISD and refined it to:

> *Develop an environmentally, socially, economically, fiscally and spatially relevant Coal Exit and Metropolitan Energy Transition (CEMET) Strategy for Greater Berlin and Brandenburg.*

ASSUMPTIONS AND LIMITATIONS

Initial research and fieldwork has confirmed that the coal exit and energy transition are already underway in the region. The team's main focus has therefore been to develop options and provide recommendations for what can make the exit and transition more environmentally, socially, economically, fiscally and spatially relevant to the region.

The report

1. describes options for the region's future under the CEMET Strategy;
2. identifies the preferred options for the region's post-coal future; and
3. recommends policies to achieve this future including the rationale, context and further detailed policy direction.

The report is subject to the following limitations:

- Only one week of fieldwork was possible, limiting the scope of engagement with regional stakeholders.
- There are complex market and infrastructural feedbacks within the energy system and detailed technical assessment of the implications of these feedbacks could not be undertaken.
- The study has focussed on energy supply issues. The energy transition also requires the reduction of energy demand, for example through improvements to the energy efficiency of buildings and transport systems, however these issues are outside the scope of the research.

METHOD & APPROACH

The bulk of the research and policy development was conducted over two weeks including intensive fieldwork in Berlin and Brandenburg. The team consisted of six practicing professionals drawn from the fields of planning, architecture, policy and politics.

Prior to the fieldwork, the team met in Australia to review the LISD's initial brief and conduct background research on the region and its energy transition, and the relationship between energy system changes and urban development.

The research method followed is outlined below and illustrated in Figure 1:

1 **Analysis of brief**: breakdown of the client brief into desktop and field research.
2 **Desktop audit**: desktop research exploring background material.
3 **Refine brief**: meeting with LISD to refine the brief following desktop research and initial orientation in Berlin-Brandenburg.
4 **Interviews**: meetings and interviews with selected stakeholders to develop the desktop research across context, policy, governance, technology, environment, and economics. A list of meetings and interviewees conducted are included in Appendix B.
5 **Site visits**: the team visited significant sites and regions to appreciate contextual and practical issues.
6 **Research tools**: the team used a selection of tools to frame the research. These included:
    a ***Horizon scanning*** to identify mega-trends (far-reaching and sustained), micro-trends (industry or region specific) and weak signals (seeds of change) impacting the energy transition.
    b ***Future casting*** to articulate the current situation and envision possible, probable, and preferable futures. These have informed the three options outlined in this report.
    c ***Actors and arenas analysis*** to identify the individuals and organisations determining common goals and contributing resources, and the 'spaces' where these goals are defined.
    d ***Strengths, weaknesses, opportunities, and threats (SWOT) analysis*** of the issues impacting the energy transition at different spatial scales. The *STEEP framework* (social, technological, economic, environmental, and political) was used to generate and theme these issues.
    e ***Back-casting*** to identify actions that can contribute to desired long-term outcomes. These were then framed into policies.

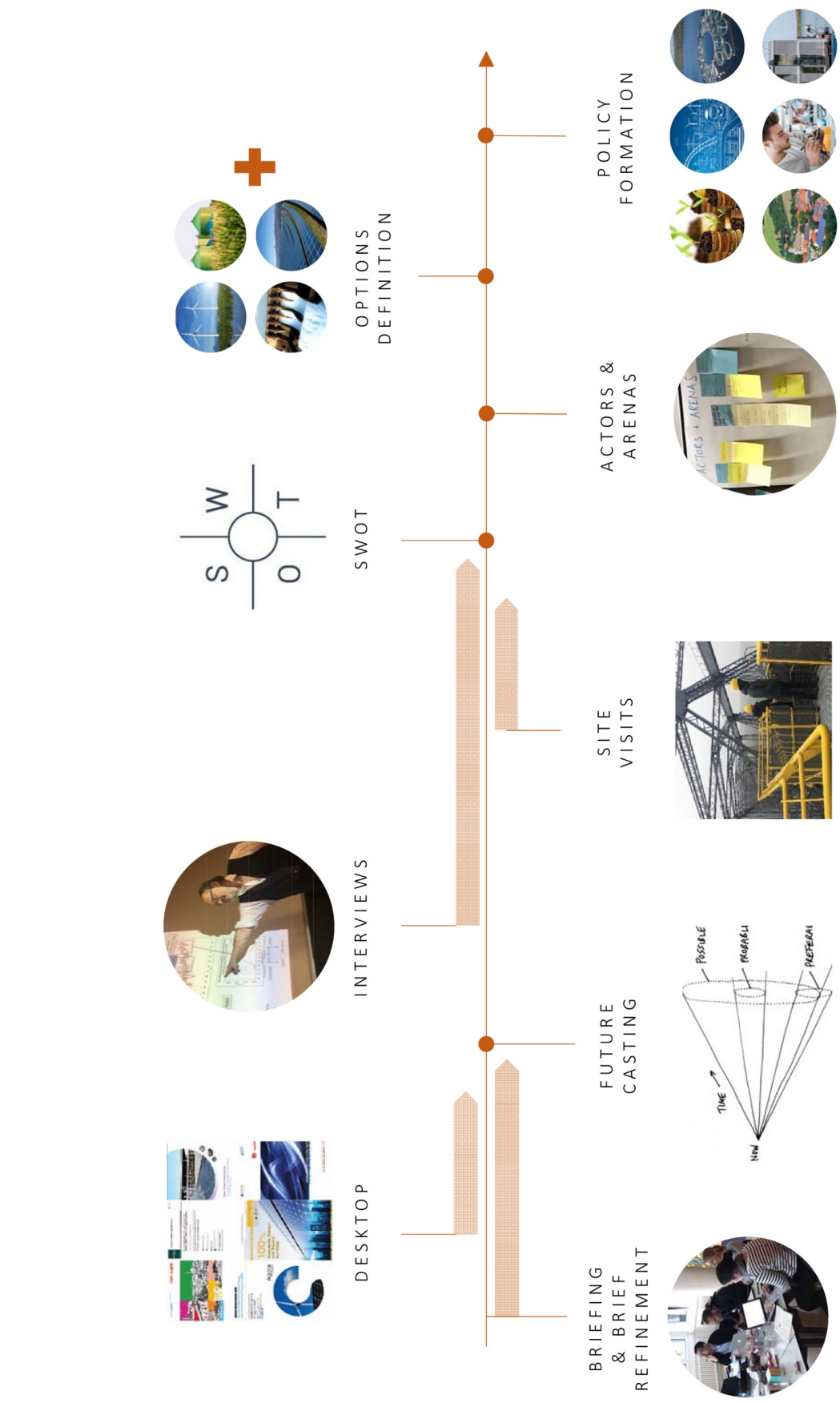


Figure 1: Timeline of method

ENERGY IN GERMANY AND AUSTRALIA

The global trends that underpin changing energy systems converge on Germany and Australia more so than most. Both countries have long and strong traditions in the fossil fuel energy industry, and have amongst the most highly urbanized populations in the world. They have both produced major industrial innovations such as new technologies that reduce the danger of mining the fossil fuel lignite from unstable, wet coal seams and removing water when coking this coal to create steel.

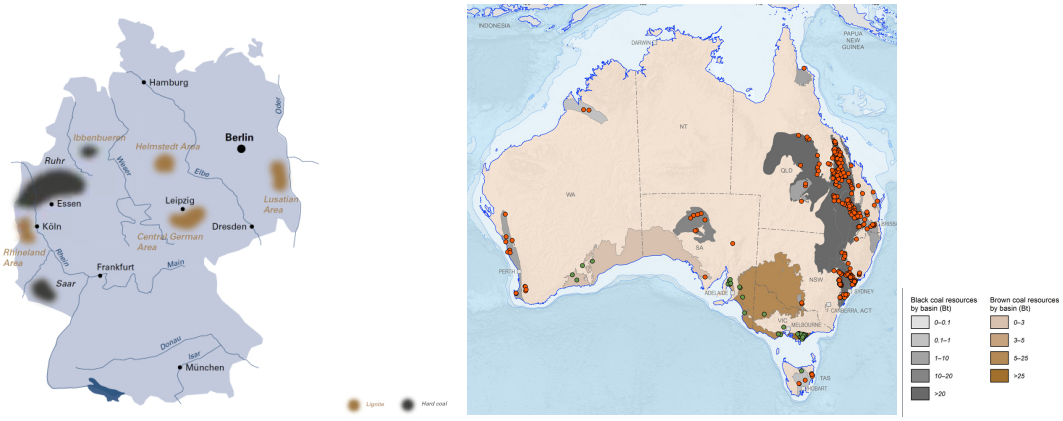


Figure 2 – Coal mining regions in Germany (Source: Euracoal)
Figure 3 – Coal mining regions in Australia (Source: Australian Government)

Mining has supported the meteoric rise of proud resource regions in Germany and Australia whilst royalties from the industry have enabled value added investment in economic growth, sophisticated infrastructure projects and generous social safety nets. But coal mining has also placed both countries amongst the world's highest carbon emitters and damaged or destroyed world-renowned landscapes and precious ecosystems. As non-renewable resources run dry and are taken offline, a crushing socio-economic collapse could follow if this change is not well managed.

Germany and Australia have reaped the economic benefits of extracting fossil fuels to power the world but their environments and communities have suffered. In Australia, the resource region of Moranbah faces bankruptcy as house prices shot above AU$1,000,000 at the height of the boom but are now worth just AU$250,000 (Ludlow, 2016). In Australia, re-tooling resource regions to advanced manufacturing have helped manage the economic impact of coal mine closures.

In Germany, the political shocks of re-unification in the early 1990s compounded the economic and social pain of East German industries shutting down as they were integrated into the more efficient capitalist economic model of West Germany (De la Motte, 2009). Covering less than half the land area and with a more favourable interior climate than Australia, Germany has focused on returning and restoring mining lands to more economically productive and environmentally conscious uses.

Whilst changes such as these have been hard, the economies and communities of Germany and Australia have demonstrated remarkable resilience, and both are now listed amongst the top 20 most prosperous nations in the world (Legatum Institute, 2016). This has placed both countries in a position to develop vast renewable energy resources to put renewables at the heart of their energy systems, with Australia's proportion of households with PV systems being the highest in the world (Energy Supply Association of Australia, n-d).

GLOBAL RENEWABLE POWERHOUSES

Germany and Australia are at the forefront of the renewables age. In addition to an abundance of resources, they play leading roles in research and development and scaling up new technologies such as solar thermal and battery storage whilst Germany has demonstrated strong leadership in global climate policy efforts and ambition in setting domestic renewable energy targets.

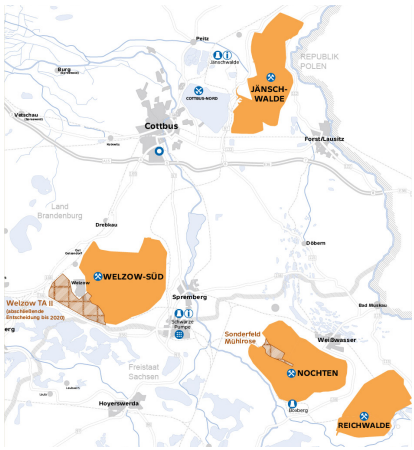
Challenges however remain. In Australia, the construction of one of the world's largest new coal mines is under active consideration, and villages in Germany are still being cleared to make way for yet more new mines. In Germany, the politics of managing structural change are making it harder for resource communities to see a bright future beyond fossil fuels. The continued dominance of Germany and Australia in fossil fuels and their emergence as renewable powerhouses means both could suffer further or climb higher through the next change to the energy system.

Policy leadership and technological capability are only part of the story. As Germany and Australia reach make or break point for transitioning their energy systems and development models to more sustainable sources, their governments must re-double efforts. They must consider and clearly articulate what a brighter future looks like for the places where these changes manifest on the ground. It is in these places that support for a brighter future is most crucial but difficult to achieve.

ENERGY IN BERLIN-BRANDENBURG

The State of Brandenburg encircles Berlin and includes the mining region of Lusatia. Once the heart of East Germany, it contains come of Europe's largest coal mines and coal-fired power plants and has always provided for Berlin's energy needs, encapsulated by its tagline as Germany's 'energy region'.

The gradual shut down of inefficient coal-fired power plants means Brandenburg's energy make up looks different today than it did in the 1990s. It is home to some of country's best wind resources, which are providing new economic opportunities for the area and are crucial for Germany to meet its renewable energy targets.



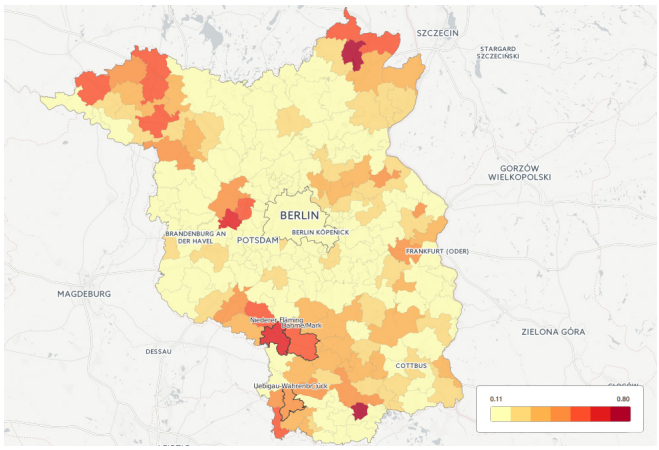


Figure 4 – LEAG Concept for brown coal mining in Lusatia, March 2017 (Source: LEAG)
Figure 5 – Wind turbine density in Berlin-Brandenburg (Source: Berlin Institute of Technology)

Berlin is Germany's largest city and its goal for carbon neutrality by 2050 (Senate Department for the Environment, Transport and Climate Protection, no date) is central to meeting the country's ambitious renewable energy targets. However, because of its limited land resources, Berlin must focus not only on developing new renewable resources nearby, but also on how different sectors within Berlin use energy.

The destinies of Berlin and Brandenburg are entwined, based on a share history and future of energy resources. This means it is one of those places that could suffer further or climb higher depending on how the shift to renewables is managed in the region.

BERLIN AND BRANDENBURG BEYOND ENERGY

Both Berlin and Brandenburg are about so much more than energy. Standing alongside London, Paris and Barcelona as one of Europe's four 'poles', Berlin is rising from the political, economic and social turmoil of German re-unification.

Strategically located at the crossroads of East and West Europe, Berlin-Brandenburg's history encapsulates the grand monarchies and picturesque European villages of the middle-ages, the distinctive twinning of communist and capitalist industrial production models, and the scars of violent conflict.

Berlin and Brandenburg contain regions with unique cultural identities, pristine world heritage listed environments, and highly productive agricultural lands. As Germany's capital region, advanced technology, manufacturing and innovation ecosystems are booming. Vibrant arts, cultural and start-up scenes are also attracting creative and knowledge economy workers from across the world.

The future of Berlin-Brandenburg is unbelievably bright and this has been recognised by numerous regional stakeholders that have drawn compelling visions for the region's future that draw on its many natural and competitive advantages. It is also no wonder that investment, jobs, tourism and migration are all growing strongly across the region. However, these bring more immediate challenges, such as housing shortages and stretched infrastructure, which crowd out the spatial policy agenda and make it easy to forget the longer-term structural change in the energy system.

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS ANALYSIS

As part of the research team's investigation of policy options for the Berlin-Brandenburg region, the team undertook a Strengths, Weaknesses, Opportunities, and Threats analysis (SWOT). This considered the Berlin-Brandenburg region as a whole, with a particular emphasis on Lusatia. This drew on findings from the desktop audit, interviews, and site visits, with issues clustered following the STEEP framework (social, technological, economic, environmental, and political). The SWOT is reproduced in Appendix 1.

The SWOT identified a range of strengths and opportunities which Lusatia (a sub-region of Brandenburg) can build on as the region transitions to a post-coal economy. The region has a strong sense of community and local identity based on its pre-industrial heritage, craft traditions, the presence of the indigenous Sorb population, and the legacy of mining. Internationale Bauausstellung (IBA) projects such as the F60 bridge visitor attraction and Lauchhammer Bio Towers celebrate the industrial heritage of the region and Lusatia is now promoted as a twenty first century "energy region" (Energieregion Lausitz-Spreewald GmbH, n-d) broadening its brand beyond coal.

The memory of the structural collapse of the 1990s has resulted in continuing fears of widespread unemployment and understandable opposition to the closure of the four remaining coal mines in affected communities (Morton and Müller, 2016). Unemployment is however declining as existing residents retire from small-scale manufacturing and service businesses (*Labor Market Overview - Monthly Report September 2017 - Oberspreewald - Lausitz*, 2017). There are also good prospects for the creation of new jobs, taking advantage of low rents and the availability of open space to develop new industries and expand renewable energy installations which cannot easily be accommodated in dense urban centres such as Berlin. The prospect of widespread entrenched unemployment appears unlikely provided suitable re-training opportunities are made available to the existing workforce.

In contrast to Berlin and its hinterland, homes in Lusatia are still affordable and the region presents significant lifestyle opportunities with good access to greenspace and countryside. There is potential to develop regional parts of Brandenburg to attract returning residents and young families. This has potential to generate a virtuous circle of economic benefits through the growth of associated service industries. This will however require infrastructure investment, for example to improve public transport access to isolated communities, to reduce commuting times to metropolitan centres such as Berlin and Dresden, and for the expansion of social infrastructure such as schools and healthcare.

The region still faces significant challenges. While there has been significant investment in skills, research and development, for example at the Brandenburg Technical University at Cottbus-Senftenberg, the lack of a clear signal from government regarding the timescale for a final coal exit results in market uncertainty and inhibits investment in new industries.

The SWOT also highlights political and governance challenges. At local level, community, industry, and special interest groups, together with mayors, and chambers of commerce are actively promoting innovation in the region. Their efforts are however hampered by weak network governance and a history of mistrust between leadership in the region, and centrally directed measures from Potsdam and Berlin. This is reflected in the lack of support for the existing Joint Spatial Plan following two years of public consultation.

There are also environmental challenges. Very significant investment has taken place in the rehabilitation of former open cast mining landscapes to form lakes intended to support leisure and tourism and integrate with regional water courses. Maintaining acceptable water quality requires ongoing treatment, often at public expense. The rehabilitation of landscapes at remaining mines is to be funded by private mining operators however it remains to be seen whether the contractual basis of this is sufficiently robust to avoid additional costs to the tax payer. If future remediation and water treatment is not completed to an acceptable standard this may jeopardise efforts to rebrand the regional as beacon for sustainability and attract investment in new industries and tourism.

EXAMINING ALTERNATIVE STRATEGIES

Having gained an understanding of the opportunities and challenges within the Berlin-Brandenburg region, the research team turned its focus to the development and consideration of alternative strategies to achieve the intent of the research objective.

This section provides an overview of the alternatives considered. This high-level examination was used to shape the development of the overall coal exit and energy transition strategy and specific policy recommendations.

OPTION 1: STATUS QUO – NO FURTHER INTERVENTION

A key question considered by the research team was whether or not any additional form of policy intervention is required to assist the region's exit from coal mining and the transition to renewable energy sources.

The change in economic circumstances and advancements in renewable energy technology are already impacting investment decisions for lignite coal mines and power stations. Only four mines remain active in the region, although there are a further 33 sites with theoretical mining capacity. With financial lenders concerned about 'stranded asset risk' and little security for the future of coal power stations in the region, mining remains a marginal activity and the opportunity to expand or open new sites is unlikely. In 2017, two new mine sites in Lusatia were 'skipped' on this basis (Mining-report.de.com, 2017).

Meanwhile, many initiatives supporting the energy transition are underway. For example, some 30 projects developed by the Internationale Bauausstellung (IBA) Fürst-Pückler-Land aim to find new land uses for the former coal mining sites in Lusatia. In conjunction with the local university, the Chamber of Commerce in Cottbus has established 'Innovationsregion Lausitz' (Energy Region Lusatia), which is working to support the transition of organisations within the coal supply chain.

There are several significant risks that need to be evaluated in a 'no further intervention' approach. Firstly, the lack of clear decision-making on the energy transition process is discouraging new investment and creating uncertainty for existing mine and power station operators as well as renewable energy providers, related businesses and affected communities.

Furthermore, there is also a significant risk that identified long term goals for the region to reduce carbon emissions and reliance on fossil fuels will not be achieved without a greater level of policy intervention.

In addition, economic growth and diversification in the coal industry areas of the Brandenburg region has been slow. This is despite the very significant levels of current and future investment in the rehabilitation of mine sites by the German government.

The key weakness identified within this option is that too much of the transition process is left to chance. Without explicit policy interventions, investment in renewable energy technologies may be stunted, resulting in a protracted reliance on coal for energy. Achievement of the region's long-term energy transition cannot therefore be guaranteed. On this basis, the research team discounted this option.

OPTION 2: ACCELERATING THE TRANSITION TO RENEWABLE ENERGY

The slow pace of transition to renewable energy systems and the continued use of lignite fired power stations are a compelling reason to accelerate the transition and more directly address the region's energy future. This requires establishing a fixed date to cease coal mining and coal based energy systems and unambiguous policy tools to support the transition to renewable energy.

The political and logistical path to achieving these aims through direct policy intervention is not straightforward. The affected regions have for decades relied on coal mining and coal power stations for employment. The impacted communities, workers unions, regional chamber of commerce and others have opposed, and are likely to continue to oppose policies which enforce the coal exit.

Just as local communities in Lusatia have resisted existing from coal, others have mobilised to accelerate the transition and this has become a divisive social issue cross the broader community. Opposition to coal and nuclear power formed the basis for two grassroots initiatives which attempted to take control of Berlin region's energy network in 2011. Both the Berlin Energy Roundtable (BET) and Citizen Energy Berlin (BEB) initiatives reflected a commonly held belief that the Berlin Senate's energy strategy was insufficient for the effective transition from coal and nuclear power. In addition, it was felt that the Berlin-Brandenburg region's incumbent energy operator's vested interests were hampering an effective energy transition process (Blanchet, 2015 p. 249).

Option 2 requires a bold framework and commitment to change, largely focussed on exiting the coal industry through investment in renewable energy. However, given the narrow focus and likely negative impacts of structural change across local communities and employment sectors this approach is unlikely to gain the broad and lasting level of popular and political acceptance required to successfully deliver the region's renewable energy transition. Failure to achieve community and political support for Option 2 risks jeopardising the process of energy transition. This approach was therefore discounted by the research team.

OPTION 3: A STRATEGIC APPROACH TO ENERGY TRANSITION

After exploring the regional context of the existing energy systems in Brandenburg and Lusatia, and speaking with a range of local stakeholders, the research team developed a third option which involves broadening the approach to future energy transition. This approach emphasises local place-based economic development actions to offset the impact of the region's economic restructuring.

While delivery of an accelerated program to exit the coal industry and achieve renewable energy and emissions reduction targets remain a core focus, ensuring new economic growth opportunities and a socially, economically and environmentally sustainable future for the directly affected communities requires additional policy responses.

Option 3 explores the future of the communities most directly affected by the region's economic restructuring and proposes policy tools that will assist in creating new and diverse employment opportunities in place of the existing mining and traditional power sectors. On this basis, the research team considered this option to be the most appropriate strategic approach to underpin the region's energy transition.

Option 3 requires a broad set of policy responses to simultaneously accelerate the process of energy transition and economic growth within communities directly affected by the structural change which are set out in the next section of this report.

OVERVIEW OF POLICY RECOMMENDATIONS

The research team has developed a 10-year plan with a broad suite of specific policy recommendations to ensure a seamless and inclusive Berlin-Brandenburg coal exit and energy transition.

The team's two-week visit to the region, interviews with community members, industry leaders and policy experts and desktop research highlighted two underlying issues:

- The need for an institutional framework to provide a structure for community visions and projects for the region; and
- The need for a multi-faceted policy approach that brings community to the forefront of future investment and decision-making.

The policy recommendations reflect how these requirements could be facilitated, noting the inherent limitations of this research.

An overarching governance framework is required through which all levels of government can commit to the energy transition. As a basis for this, we recommend a public 'compact' which formally commits all levels of government to renewables energy targets and helps align regulatory, policy and funding levers.

We recommend signatories to the compact establish a new corporate entity, provisionally named the "Berlin-Brandenburg Transition Corporation" (BBTC) to distribute funds, and engage, manage, and deliver a suite of six policy recommendations, and also implement programs, projects and initiatives that result from these policies.

The six policies recommendations are designed to enable growth across the region:

1. *Strategic Infrastructure Investment*
2. *Economic Development Fund*
3. *Skills-Based Transition Program*
4. *Lake Environmental Resource Plan*
5. *Regional Identify*
6. *Commitment to 100% Renewable Energy by 2025*

The delivery process for these six policies is reflected in Figure 6, on the following page.

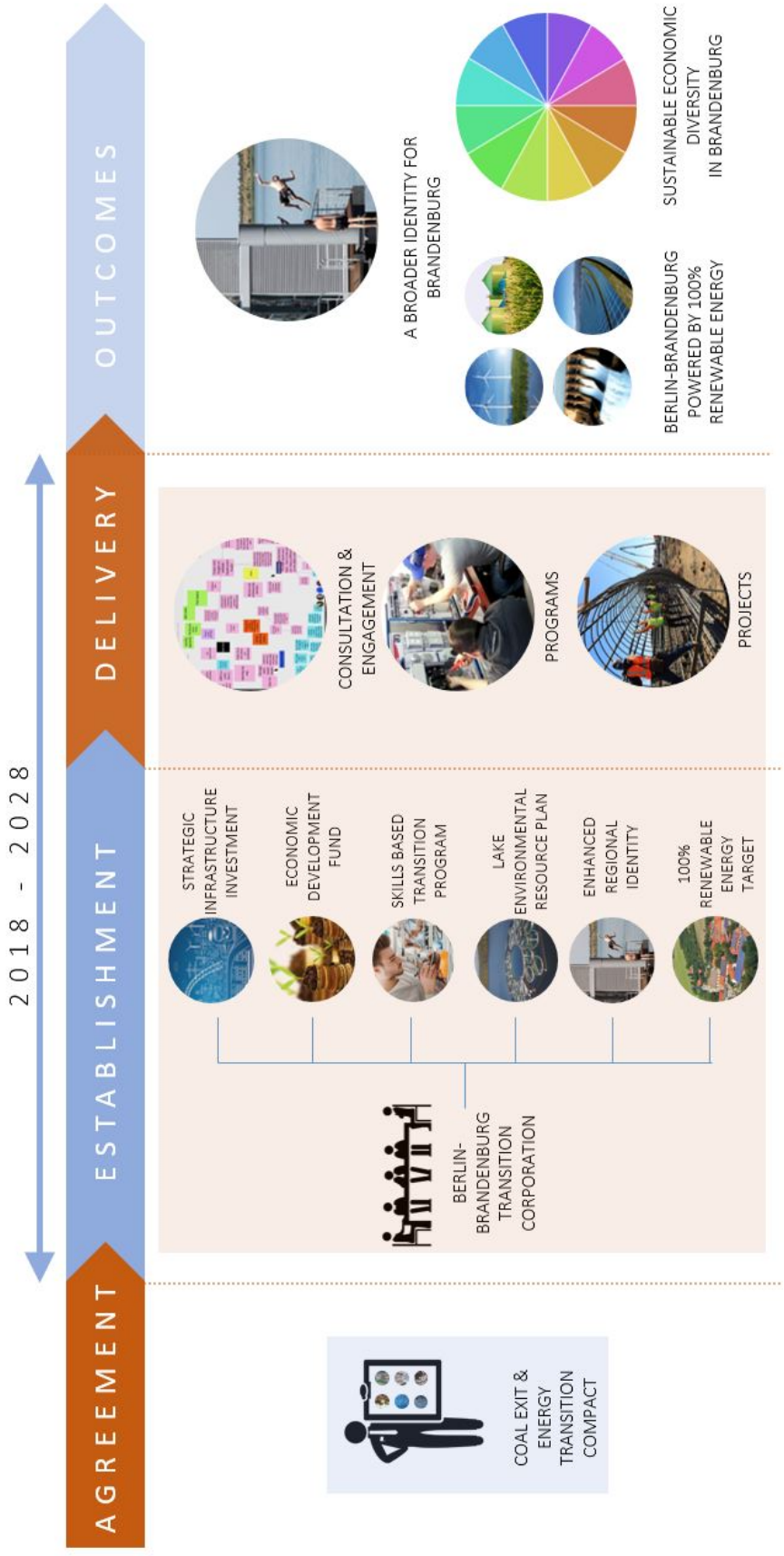


Figure 6: 10-year plan for a Coal Exit and Metro Energy Transition Strategy for Berlin - Brandenburg

POLICY RECOMMENDATIONS

WHOLE OF GOVERNMENT COMPACT AND TRANSITION CORPORATION

At the heart of the research team's recommendations is the introduction of a new governance framework to deliver the ten-year plan:

The governments of Germany, Berlin and Brandenburg publicly and jointly commit through a Compact, to 100% renewable energy for the region, sourcing funding for implementation of the CEMET Policies, and establishing the "Berlin-Brandenburg Transition Corporation" (BBTC) to be accountable for and enable local participation in implementation.

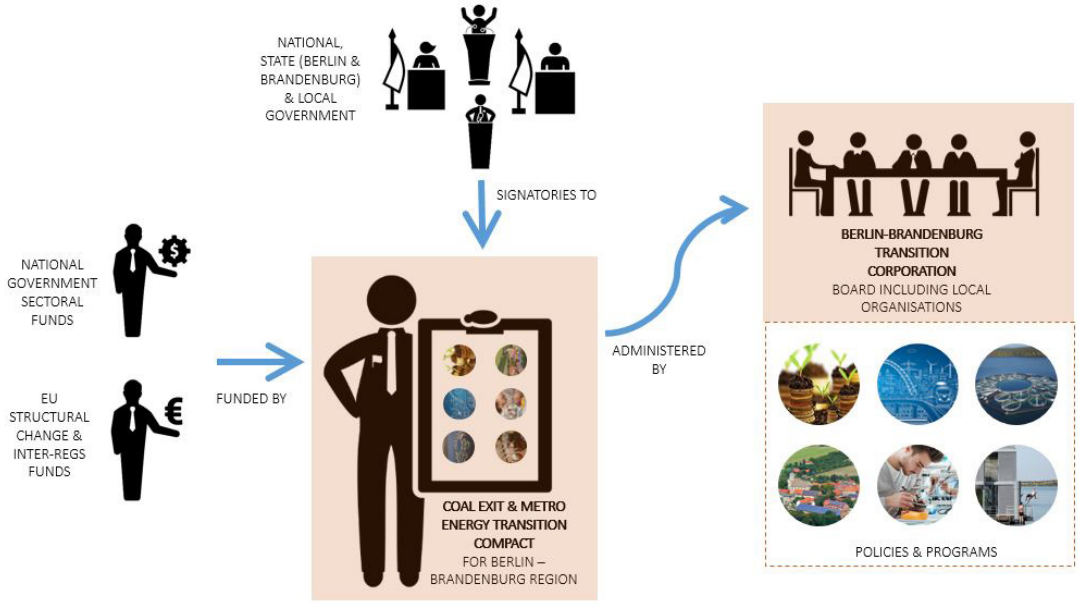


Figure 6: Delivering the CEMET: A Coal Exit and Metro Energy Transition Compact for Berlin – Brandenburg

Policy Context

The German Government has demonstrated world leadership and ambition in setting renewable energy targets. The States of Berlin and Brandenburg have a history of working together to develop and implement spatial policy and drive innovation across the region. They have also committed, respectively, to carbon neutrality and a renewable energy target outpacing Germany's national targets. In addition to this, local governments and stakeholders in Berlin-Brandenburg have developed compelling visions for a brighter future for the region.

All levels of government, the private sector and non-government organisations also have access to funding that can assist regions manage structural change. Individually each has some of the power and resources needed to achieve the CEMET outcomes and by combining their powers and resources, they can more effectively achieve them. However, the region's capacity for networked governance needs improving.

For example, the Cottbus Chamber of Commerce's "Innovationregion Lausitz" (innovation region Lusatia) initiative is working to build new markets for local businesses supplying the coal industry. But these businesses need government funding to help bring new products to market. The compelling visions developed by local stakeholders will remain no more than ideas unless supported with enabling regulation and policy.

The more substantial fiscal resources available to invest in the region's future are held by the European Union and German Government. The new spatial reality for the region is enabled by State Government regulation and policy. And the visions that sketch what this reality should be and what funding should be put towards are held in the minds of local stakeholders that permit government to act on their behalf. This underscores the importance of different levels of government coming together in the region to drive a brighter future for it.

Across the world, governance arrangements are being re-scaled to better match the nature of public problems and the resources needed to solve them. In countries such as Canada, France, Australia, the United Kingdom, and the Netherlands, all levels of government are using new governance vehicles to combine their powers and resources. Underneath this joining of forces are public commitments to work better together and use every lever available to them to help guide how places change.

A new corporate entity, provisionally named "The Berlin-Brandenburg Transition Corporation" (BBTC) is recommended to be established to implement and monitor delivery of CEMET Policies made jointly by the governments of Germany, Berlin and Brandenburg. This would establish accountability of these governments to regional and local stakeholders.

Precedent exists for such a Transition Corporation, with the Australian city of Townsville establishing the Townsville Development Corporation, following a commitment made with the Australian and Queensland governments (Townsville City Council, 2017).

The BBTC Board could include representatives of the German Chancellor's office and Energy Department, the joint Berlin-Brandenburg Spatial Development Unit, the Lausitz Region Inter-Municipal Economic Development Association, the Cottbus Chamber of Commerce, local community groups, mining companies and industry unions. This would bring together the necessary capacities to drive place-based change including policy and regulatory levers, funding, and private and non-government support at regional and local levels.

The Berlin and Brandenburg governments have identified strategic infrastructure projects and the BBTC could prioritise and recommend these for joint funding by the governments of Germany, Berlin and Brandenburg. The BBTC could administer the CEMET Economic Development Fund and the recommended board structure also positions the BBTC to oversee the CEMET Workforce Transition and Regional Identity policies.

POLICY RECOMMENDATION 1: STRATEGIC INFRASTRUCTURE INVESTMENT

Invest in strategic infrastructure to support the development of places and communities in mining affected regions and act as a catalyst for further economic growth.

Policy Context

Following the structural collapse of mining and associated industries after reunification Lusatia has seen significant infrastructure investment. A large proportion of this has been state-funded and focussed on the recultivation of landscapes impacted by mines. While this work is of high ecological and social importance, and presents opportunities for tourism and leisure, this landscape-led approach risks missing opportunities to target investment in ways which will most effectively support the strategic economic development of mining affected communities.

The Brandenburg state government's economic development package is based on the concept of four 'regional growth centres': airport-led development at Schönefelder Kreuz, power generation and industries at Spremberg, automotive, specialist engineering and logistics in West Lusatia, and energy and railway manufacturing at Cottbus (Energieregion Lausitz-Spreewald GmbH, n-d).

In parallel with the 'regional growth centre' concept, the Joint Innovation Strategy of the States of Berlin and Brandenburg (innoBB) seeks to promote "innovation clusters" associated with new industries with economic potential. (Land Brandenburg, 2014).

The focus of the "regional growth centre" model appears to be on larger-scale and in some cases longer-established industries while the "innovation cluster" approach emphasises the growth of new, often smaller-scale enterprise. Both define specific regions where targeted infrastructure investment can support place-based approaches which can help support employment and economic development as the region develops 'beyond coal'.

Place-based approaches support both economic growth and human capital and are suited to tackling irregularities and social inequalities across regions. They lend themselves to the promotion of clusters which can create virtuous economic cycles based on geographic concentrations of enterprise, local markets, workforce capability and contributing to innovation (Burkett, 2012).

The Berlin and Brandenburg governments have developed a list of priority projects for Lusatia many of which target place-based needs. These include regional investment in roads, rail and gigabit fibre optic internet as well as local projects such as city-centre and local region e-mobility, local railway upgrades, accessibility to schools, and energy efficiency improvements (Joint Spatial Planning Department Berlin-Brandenburg, n-d).

The priority regional road and rail projects depend on Federal Government evaluation and finance and there appears to be a lack of an overarching framework to prioritise investment to suit the needs of the community and ensure benefits flow to all stakeholders.

This policy initiative involves integrating infrastructure investment decisions to ensure they are informed by local community and industry needs and build real pathways to recovery as remaining coal mines and power plants close, and associated industries decline. Investments must take a

strategic, long term horizon and contribute to building strong local communities for the new post-coal economy.

While investment in regional and city-shaping infrastructure such as public transport requires public subsidy, new emerging industries present significant opportunities for the private sector. The investment approach should therefore consider a range of investors with different social impact and financial return expectations.

The recommended Berlin-Brandenburg Transition Corporation provides the vehicle for prioritisation of strategic infrastructure projects and lobbying for EU and federal government funds. Examples of projects include:

- improvements to local and regional transport to link residential and employment centres, promote planned innovation clusters, improve connectivity with the metropolitan centres of Berlin, Dresden and Leipzig, and encourage cross-border economic activity with Poland;
- infrastructure to improve the knowledge economy, such as gigabit fibre optic network;
- urban development and open space improvements to attract and retain the new economy workforce;
- consolidation and improvement of social infrastructure facilities and services, such as health and education.

The investment in critical regional infrastructure could be showcased to raise the profile of former coal-mining regions and to act as a catalyst for further investment and economic growth opportunities.

POLICY RECOMMENDATION 2: ECONOMIC DEVELOPMENT FUND

Develop an Economic Development Fund for mining affected communities to provide finances for projects and programs that create and/or enhance employment opportunities, improve the regional tax base, or otherwise enhance quality of life for the community.

Policy Context

This policy recommendation has at its core the need to continue to diversify the economic base of the region to facilitate a successful transition from coal.

Work has already begun in this area. In 2009, an Inter-Municipal Economic Development Association was formed. Its aim is to improve the economic sustainability and future perspectives in the energy region of Lusatia through:

- identification of regional fields of competence;
- initiation and implementation of regionally operative projects;
- promotion of knowledge and technology transfer;
- initiation and support of regional business networks;
- acquisition of funds from the EU, national government, and federal state governments as well as from private enterprise; and
- locational marketing for the region to strengthen its economic base and improve its image (Energieregion Lausitz, n.d.).

While the association focuses on assisting and promoting economic development within the region, there is an opportunity for the creation of a specific Economic Development Fund which would provide seed funding for strategic projects that support growth and innovation and have potential to broaden the economic base of the region. The fund would provide opportunities to start new businesses, shore-up existing businesses, grow sales and diversify operations, while creating and expanding employment in the region.

The fund would have direct application to one of the core goals in the *State Development Plan Berlin-Brandenburg (LEP B-B):* to encourage stakeholders at municipal and regional levels to create scopes for action. In this way, the fund should be designed to contribute to projects that meet a set of pre-determined criteria with a focus on those projects that the community and other stakeholders have an interest in investing and which would otherwise not occur.

The importance of fostering entrepreneurship at the local level should also be recognised and supported through the fund, with research highlighting the importance of this approach in reviving distressed urban districts previously dominated by industries now in decline (OECD, 2003).

The Berlin-Brandenburg Transition Corporation would administer the Economic Development Fund, commencing with a review of economic success factors for the region to determine project criteria and an assessment methodology.

POLICY RECOMMENDATION 3: SKILLS-BASED TRANSITION PROGRAM

Establish a skills-based transition program for the 8,000 affected coal workers in the Lusatia region.

Policy Context

Since the re-unification of Germany, the number of coal workers in the Lusatia region has fallen from 100,000 to 8,000 and only four coal-fired power stations remain (Darby, 2017). Uncertainty regarding the future of coal means no plan is in place to enable a skills-based transition for these 8,000 workers.

Mine closures have become a political issue for Brandenburg, with many residents fearing a repeat structural collapse that would threaten the future of employment in the Lusatia region. Establishing a skills-based transition program emphasises the importance of a just transition and provides a strategic response to ensure unions and coal workers are included in the framing of Brandenburg's future vision.

'Innovationsregion Lausitz' (innovation region Lusatia), established in conjunction with the local university by the Chamber of Commerce in Cottbus, is already working to address the transitioning of organisations within the coal supply chain (estimated at 30,000 workers). The organisation brings together a cross-section of local businesses, wider industry organisations and the community to drive innovation in the region and help establish the workforce skills required (Innovations Region Lausitz 2017). 'Innovations Region Lausitz' should be commended for its vision and regarded as an example of best practice for structuring a whole-of-community approach to innovation.

We recommend that the Berlin-Brandenburg Transition Corporation (BBTC) establish a foundation to oversee the delivery of a skills-based transition program and work in consultation with 'Innovationsregion Lausitz' to identify growing industries and map job opportunities.

The Foundation may also consider implementation of:

- job placement and information services, including an awareness campaign about opportunities available through the foundation;
- retraining that can be undertaken while either still employed or, in the event of full-time and part-time study, the provision of a supporting wage provided by the national government; and
- provision of travel subsidies and relocation assistance.

Precedent for the establishment of a foundation exists elsewhere in Germany, notably in the Ruhr and Saar regions where, between 1996-2014, 2,210 workers were redeployed, 26,560 workers underwent retraining and obtained new qualifications, and 40,880 workers entered early retirement (ACTU 2016, p.21).

In 2007 the hard coal mining company RAG-Stiftung, the national and state governments, unions and workers came together to broker a deal in response to the phasing out of two of RAG-Stiftung's mines, set to occur by 2018/19. Amongst a number of commitments, the foundation has taken responsibility for the provision of qualification training for employees and providing information about new job opportunities (ACTU 2016, p.21).

A similar Foundation established in Lusatia could bring together federal and state governments, financing from Lausitz Energie Bergbau AG (LEAG) as well as unions and their workers to ensure that as Brandenburg transitions to renewable energy no coal workers are left behind.

POLICY RECOMMENDATION 4: LAKE ENVIRONMENTAL RESOURCE PLAN

Prepare a Lake Environmental Resource Plan to capitalise on the benefits artificial lakes provide as an asset to the region and position Lusatia as a world leader in artificial lake development for mine-site rehabilitation.

Policy Context:

Following the reunification of Germany, many of the open cast mines in the Lusatia region were closed. While this had significant impact on the economic and social fabric of the region, the question of what to do with the expansive open cast mines that scarred the landscape also needed to be addressed. In response, the Government set up a new company, the Lausitz and Middle Germany Mining Administrative Company (LMBV) to decommission and rehabilitate these former mine sites (Sullivan, 2016).

The rehabilitation plans require the former open cast mines to be filled with water, creating large artificial lakes. The Internationale Bauausstellung (IBA) Fürst-Pückler-Land commenced in 2000 and over the next 10 years identified 30 projects to transform the landscapes associated with these newly formed lakes. These projects include the development of tourism infrastructure to support recreational opportunities such as marinas and sandy beaches, as well as hotels, restaurants and infrastructure for the existing community. When complete, the lakes will span 80km by 30km in area and will provide recreational and tourism benefits for the region (Mellgard, 2014).

While the work of the LMBV and the IBA has assisted in the transformation of the landscapes of the former open cast mines, the focus has been primarily on aesthetic and recreational benefits. Environmental issues presented themselves early on in the rehabilitation process, most notably in relation to water quality. The groundwater which was used to fill the lakes had low pH levels, as well as high iron and sulphur concentrations.

Attempts are being made to improve water quality through approaches such as infilling the lakes with water from the river Spree and adding lime to the lake water. Both of these approaches have limitations, with concerns around continued water supply from the river Spree, and the sustainability of the chemical treatment program (Meier et al., 2004).

Recently, a multidisciplinary project has been formed with the aim of identifying long-term self-sustaining acidity removal methods that present viable alternatives to the expensive treatment methods currently employed (Fyson et al., 2017).

As outlined above, much work has been done to manage the transition of Lusatia's former mine sites to the expansive lake network being created today. It is important to note however that the methods employed to date in managing this transition are somewhat untested and still being developed.

Rehabilitation of these former mine sites is critical to the future success of the Lusatian region. Several billion Euro has been spent to date on the rehabilitation process, funded primarily by government but also through private investment. Significant economic, environmental and political risk exists should the current rehabilitation process fail.

More needs to be done. A Lake Environmental Resource Plan which prioritises actions to improve the environmental attributes of artificial lakes would help to create a competitive advantage in the sustainable rehabilitation of post-mining landscapes. A multi-disciplinary approach should be taken to the development of the Plan, with input from academics, businesses, community stakeholders and administration to ensure real contributions to sustainable development can be made.

A living 'lake lab' could be established as part of the Plan, to advance water based renewable energy technology such as the ability to harness evaporation of lake water as a source of energy (Cimons, 2017) and lake water as a source of heat pump generation (Fink et al., 2014).

Through these initiatives, Lusatia could position itself as a world leader in the sustainable rehabilitation of post-mining landscapes and minimise the risk of long term environmental impacts from the formation of these artificial lakes.

POLICY RECOMMENDATION 5: ENHANCED REGIONAL IDENTITY

Establish a new narrative for Brandenburg to better capture and promote its rich and diverse regional identity in consultation with community.

Policy Context

Brandenburg is culturally rich, historically significant, strategically located and a potential future global leader in renewable energy. A broadening of Brandenburg's narrative to intertwine these factors could create a stronger sense of regional identity and attract more tourists, residents and businesses. Such a policy could build upon the existing work of the Lusatia Region Inter-Municipal Economic Development Association to draw further investment to the region. Community input to this narrative could assist in capturing the concept of 'heimat', which underpins the German sense of attachment to place.

A number of events and attractions already showcase Brandenburg's unique history. In the Lusatia region, Sorbian festivities take place every year. The Sorbian Shrovetide can be seen from mid-January to early March (Sorbian Cultural Information Centre 2017). In contrast, attractions such as the F60 Bridge pays tribute to the mining history of the region.

The transition to renewable energy provides an opportunity to build upon this rich and diverse history. A regional marketing and branding strategy which emphasises the renewable energy transition could be developed to drive more sustainable practices within communities across Brandenburg while attracting greater investment to the region.

The German National Tourist Board forecasts that by 2030 international tourists visiting Germany will have increased by 80 per cent (OECD 2016). Brandenburg must position itself to ensure it is well placed to take advantage of this growth. A formal assessment of growth opportunities in the tourism across Brandenburg could be undertaken to establish how developing a new narrative can help increase visitor numbers.

International visitors currently stay in Berlin for an average of 2.4 nights (Visit Berlin 2017) but this falls to 1.8 nights in regional areas such as Cottbus (Land Brandenburg 2016, p.26). Outcomes from the assessment of growth opportunities could include greater investment in infrastructure, marketing or a possible joint Berlin-Brandenburg tourism strategy to promote regional dispersal and longer average stays for both domestic and international visitors.

Initiatives to promote tourism should engage community and business leaders to facilitate local buy-in and ward off anti-tourist sentiment, which has recently developed in a number of towns and cities internationally.

Developing Brandenburg's narrative can generate benefits outside tourism. Given Brandenburg's proximity to Berlin it could be promoted as a lifestyle region for families wanting to escape the fast pace of urban life. Regional cities such as Cottbus offer a lower cost of living – rent in Berlin has increased 70 per cent since 2004 (Anderson 2017). Other advantages include more green space and access to smaller towns and big cities like Dresden and Berlin.

POLICY RECOMMENDATION 6: 100% RENEWABLE ENERGY TARGET

Commit to achieving 100% renewable energy supply for Berlin-Brandenburg by 2025.

Policy Context:

Structural change within the energy sector is already occurring across the Berlin-Brandenburg region. Technological advancements in renewable energy are occurring rapidly. In October 2011, the first hybrid power plant capable of producing hydrogen with wind power in continuous operation was built in Prenzlau, in northern Brandenburg. This new technology means that non-storable sources of energy (e.g. wind power) can be converted into storable forms of energy (e.g. hydrogen). This concept could be a key component of future intelligent power grids (OECD, 2013, p.40).

Brandenburg is a windy state and at the end of 2011 had a total of 3053 wind turbines with a total capacity of 4600 megawatts in operation. Several important photovoltaic plants have been constructed in the region including the Solarpark in Lieberoser Heide (with 53 MW it is the second largest PV-plant worldwide) (OECD, 2013, p.40).

Social awareness of the capacity for and advantages of renewable energy use is also growing. However, the current policy environment for Berlin-Brandenburg is largely silent around how the nation's renewable energy targets of at least 35% renewable energy sources in electricity consumption by 2020, and at least 80% by 2050, will be achieved (Federal Government of Germany, 2012 p.59). The absence of clear direction for the region's future energy use has resulted in a variety of impacts, including:

- regional strategic planning efforts being stunted;
- planning and commitment to fund key growth infrastructure being deferred;
- uncertainty within the investment environment preventing growth in the renewable energy sector;
- current consideration being given to the creation of a gas fired power station in Lusatia relying on natural gas imported from Russia; and
- local businesses, communities and individuals being unable to plan ahead effectively.

Growing the region's renewable energy systems will not only assist in keeping energy prices affordable over the longer term, but may also provide a competitive advantage over other regions. Being at the front end of the application of renewable energy systems will provide new opportunities to develop and export technologies and learnings to other regions. The OECD (2013, p. 20) report that some of the main sources of 'green' employment growth include:

- confidence from investors with greater predictability and policy stability;
- the creation of new markets from the demand for 'green' technologies, goods and services and the employment opportunities these new markets will bring; and
- productivity enhancements through greater efficiencies in resource use.

The solar power industry has already become one of the most innovative growth sectors in Brandenburg. The OECD (2013, p. 40) estimate that more than 40% of the solar panels produced in

Germany are produced in this region and there are significant opportunities for further research and development linked to the application of renewable energy systems across the region.

Leadership is required to establish a policy environment that will effectively facilitate the region's transition to renewable energy. Complementary policies which support growth in the renewable energy sector are also needed.

To assist the achievement of this policy recommendation the following additional recommendations should be considered concurrently:

- Step points to monitor the region's growth in renewable energy:

  Step 1: By 2020 55% of electricity for Berlin and Brandenburg will be supplied by renewable energy sources

  Step 2: By 2023 85% of electricity for Berlin and Brandenburg will be supplied by renewable energy sources

- Seek formal endorsement by the proposed CEMET Compact to ensure a whole-of-government commitment to implementing the actions required to achieve the policy aims.
- Undertake community engagement to build a shared understanding and commitment to achieving these policy goals and specific implementation actions with key stakeholders.
- Establish a renewable energy growth fund to provide financial assistance for strategic investment opportunities in renewable energy technology with specific application to the Berlin-Brandenburg region, including:
  a. solar photovoltaic power applications,
  b. wind energy systems,
  c. The potential to repurpose coal fired power station sites to biogas, and
  d. renewable energy technologies that utilise lakes through either the evaporation of lake water as a source of energy or heat pump generation.
- Task the proposed Berlin-Brandenburg Transition Corporation to oversee the delivery of an action plan to address regulatory and infrastructure barriers in the expansion of renewable energy systems.

It must be acknowledged that achieving the 100% renewable energy goal will also effectively bring a closure to the region's mining and use of lignite. The restructuring of the region's energy system is unavoidable and is already occurring. Accelerating this change with supporting policies that assist local economic development opportunities will ensure the continued growth and prosperity of affected regions and communities while also removing the burden of ongoing subsidies to support the coal based power sector which for the period 1970 to 2014 totalled €538 Billion (1970 to 2014) (Van der Burg and Pickard, 2015).

FINANCING AND FUNDING OF THE TEN-YEAR PLAN

The policies recommended in the ten-year plan require new finance and funding arrangements. Governments across the world are exploring innovative finance strategies to bridge the fiscal crisis they face when funding new policies. A range of options are available such as bonds and general or specific-purposes grants. However, bond rates and investment are at historic lows whilst grants are unlikely to attract matching private sector investment.

One potentially suitable strategy for the CEMET policies is to use the future tax revenues they generate to fund projects and programs under the policies. As economic activity increases over time as a result of these projects and programs, governments can recoup their investments through higher future income, corporation, business and property tax receipts.

This opportunity exists for the CEMET. The Economic Development Fund and Skills-based Transition Program aim to encourage new business activity in the region and transition mine workers to higher wage and taxing jobs. Over time, initial expenditure in the Fund and Program could be recouped through increased future corporate, business and income taxes. Expenditure in the Fund and Program would also accelerate the coal exit and avoid current costs incurred by governments subsidising the industry through public budgets.

LEAG could also assist with covering the Skills-based Transition Program costs, as occurred with transitioning RAG-Stiftung's 35,000 hard coal miners in the North-Rhine Westphalia and Ruhr regions (Centre for Media and Democracy, n-d). Further, strategic infrastructure investment would increase property values through improved accessibility to infrastructure, and the government outlay for this infrastructure could be recouped through the corresponding increase in property taxes over time.

Governments could also use the promise of higher future corporation, business, income and property taxes as security to cover initial financing of the CEMET Policies. This arrangement is known as Tax Increment Financing, whereby banks and institutional investors accept increases in future government tax revenues as loan security. For example, in the UK, City Deals are using Tax Increment Financing to finance new joint investment by central and local governments in infrastructure and skills programs, and this investment will be recouped through increased business and property taxes (O'Brien & Pike, 2015).

Crucial to this would be ensuring selection criteria for strategic infrastructure projects and those invested in by the Fund and Program would generate an increase in business activity, property values, or higher paying jobs. This would provide government or its lenders with certainty that overall taxes would increase in the future and that government could recoup or payback this initial outlay to lenders. Because corporation (i.e. new businesses), business (i.e. increased economic activity), income (i.e. higher wages for more productive jobs), and property (i.e. higher land value) taxes are shared between Germany's national, state, and local governments, all are in a position to pool their collective fiscal resources in contributing to these finance arrangements.

CONCLUSION

Structural change within the energy sector is already transforming the Berlin-Brandenburg region. Technology is presenting a future with cleaner, cheaper energy powered only by nature.

However, given the breadth of impacts, the vested interests of stakeholders, the complexity of technological changes and the scale of financial investment required – energy is a policy area fraught with political difficulties. The level of leadership and direction required to successfully guide the region's energy transition should not be underestimated. There are key social and economic considerations associated with this change. The coal industry has for decades been the main source of employment for many communities within regions of Brandenburg such as Lusatia. The future of these communities and the economic drivers that will create new investment and employment opportunities is an important aspect of the transition.

To accelerate the process of energy transition in a way that is environmentally, socially, economically, fiscally, and spatially appropriate, supporting policies that assist local economic development within affected regions and communities are needed. A program to strategically guide this transition process will bring many benefits including access to cleaner and cheaper energy and eliminating the burden of ongoing subsidies being used to support the coal based power sector.

The research team have recommended a 10-year plan which comprises a broad suite of policy recommendations to guide the region's transition to renewable energy and deliver outcomes which are socially, economically and environmentally equitable. Growing the region's renewable energy systems will not only assist in keeping energy prices affordable over the longer term, but may also provide a competitive advantage over other regions.

The 10-year plan will help to ensure the region's future and provide much needed certainty for investors in the energy sector. Just as importantly, it will also support regional strategic planning, local economic development, and investment decisions for key growth infrastructure. The community is central to the success of this strategy and effective ongoing engagement is required. With joint commitment from all levels of government as recommended, government agencies, energy providers, local businesses, investors, communities and individuals will be able to plan ahead with confidence.

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APPENDIX A – SWOT ANALYSIS

STEEP Category	Strengths	*Location*	*Comment*	Weaknesses	*Location*	*Comment*	Opportunities	*Location*	*Comment*	Threats	*Location*	*Comment*
Social	**Local identity and Culture**	Lusatia	There is strong sense of community, local identity, and culture across the region	**Some have a lack of hope for the future**	Lusatia	Entrenched disadvantage and loss of optimism following reunification	**New Beginning**	Lusatia	Coal exit presents the opportunity to re-establish the region	**Fear of repeated socio-economic collapse**	Brandenburg	Experience of structural collapse following reunification results in resistance to coal exit
	Sorb Community	Lusatia	Unique cultural identity and heritage of Sorb community	**Negative reputation**	Lusatia	Association with 'dirty' industries and extreme right political views	**Potential for new identity**	Lusatia	Adjustment of former reputation as a coal region to a new twenty first century "Energieregion" (energy region)	**NIMBY opposition to renewables installations**	Brandenburg	Local resistance to new installations
	Proximity to Berlin	Brandenburg	Many areas within manageable commuting distance from Berlin	**Fractured identity**	Brandenburg	Sense of identity compromised by history of political divisions (East / West)	**Returning population**	Lusatia	While young people who left in the 1990s have established new lives elsewhere there is the opportunity to attract recent leavers, for example young adults returning after study and early graduate careers in Berlin	**Aging Population**	Brandenburg	Aging population and movement of young out of the region strain public services and prevent succession employment
				Population movement	Brandenburg	Loss of young / mobile population to Berlin and former West Germany						

STEEP Category	Strengths	*Location*	*Comment*	Weaknesses	*Location*	*Comment*	Opportunities	*Location*	*Comment*	Threats	*Location*	*Comment*
Technological	**Research and Development**	Berlin and Brandenburg	Active R&D into renewables across Berlin's four public research universities, at the Brandenburg Technical University, and a large number of public and private research institutes and companies	**Coal**	Lusatia	The current energy transition strategy continue to rely on coal				**Electricity Grid Requirements**	Berlin and Brandenburg	Existing grid technology inhibits decentralised renewables
				Grid infrastructure	Lusatia	Electricity grid requires investment to support de-centralised supply				**District Heating Redundancy**	Berlin	Alternative technologies required to replace district heating installations relying on waste heat from non-renewable power generation

STEEP Category	Strengths	*Location*	*Comment*	Weaknesses	*Location*	*Comment*	Opportunities	*Location*	*Comment*	Threats	*Location*	*Comment*
Economic	**Tourism Infrastructure**	Lusatia	Significant tourism infrastructure already in place	**Narrow Economic Base**	Lusatia	Historical dominance of coal-based industries and emphasis on new energy industries has resulted in a lack of economic diversity	**Creative Industries**	Lusatia	Affordable commercial and residential locations suited to creative industries	**Limited Transport Infrastructure**	Lusatia	Journey times to surrounding metropolitan centres and limited public transport to small towns and villages limit accessibility
	Chambers of Commerce and Industry	Lusatia	The Association is working with stakeholders to promote innovation	**Low Wages**	Lusatia	Wages remain low compared to Berlin and its hinterland challenging recruitment and workforce retention	**Craft Traditions**	Lusatia	Potential for growth of employment through the promotion of existing craft industries	**Uncertain Economic Climate**	Brandenburg	Continuing lack of clarity regarding the timeframe for coal exit inhibits planning and investment
	Affordable Homes	Lusatia	In contrast to Berlin and its immediate hinterland, homes in Lusatia are significantly more affordable	**Polish Border**	Lusatia	Legacy of social and political division and weak economic links at Polish border	**Brandenburg Technical University**	Lusatia	Potential for R&D and development and engineering / technical skills to suit new economy	**Retrofit Costs**	Berlin and Brandenburg	High cost of retrofitting existing buildings to reduce energy demand
	Legacy of Manufacturing Traditions	Lusatia	While mass-market manufacturing declined in the deregulated competitive environment following reunification, local manufacturing traditions survive in areas such as	**Cost of landscape recultivation**	Lusatia	Cost of remediation of former GDR mines continues to be born by public sector, while it is not clear whether existing contractual framework with LIED is sufficiently robust to ensure	**Succession Employment Opportunities**	Lusatia	Employment demand to replace aging service and small business sector workforce approaching retirement age.			
	Energy Region Identity	Lusatia	Lusatia has a well-established identity as a provider of regional energy and is already being promoted as "Energieregion Lausitz" (Energy Region Lusatia)	**Lack of Local Fiscal Autonomy**	Brandenburg	Fiscal limitations on cities	**Structural Funds**	Lusatia	Framework required to manage access to structure funds			
	Mine Decommissioning	Lusatia	Forward planning has already taken place	**Housing Affordability**	Berlin	Lack of affordable housing in Berlin	**Connections to Eastern Europe**	Lusatia	Region centrally located to benefit from economic growth in central and eastern European countries emerging from recession			
	Leisure and Tourism	Brandenburg	Cultural landscapes and heritage towns provide significant leisure and tourism opportunities				**Advanced manufacturing**	Brandenburg	Potential for adaptation of advanced manufacturing for the new economy			
	Regional Resilience	Brandenburg	Brandenburg has shown repeated resilience and ability to adapt to changing social and economic conditions, for example following post-war division and the economic shock of reunification				**Start-Up Culture**	Berlin	Potential to benefit from nearby start-up culture in Berlin.			
	Finance	Berlin	The concentration of government and NGOs in Berlin support access to funding									

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Environmental	**International Bauausstellung**	Lusatia	25 of the 30 projects identified by the 2000-2010 IBA projects are underway	**Environmental Degradation**	Lusatia	Significant landscape areas remain dominated by existing mines, power stations and incomplete landscape recultivation	**Availability of funding for remediation**	Lusatia	Continuing German government investment in landscape recultivation, with private mine-owner funding also designated for recultivation	**Poor Water Quality**	Lusatia	High acidity and water contamination inhibit development of new lakes for leisure and tourism and present water treatment challenges
	Landscape Recultivation	Lusatia	Significant recultivation is underway with provisions in mining agreements for further work following future mine closures	**Regional Connectivity**	Lusatia	Limited connectivity to Berlin	**New landscapes**	Lusatia	New landscapes following remediation present significant amenity with potential for growth in leisure and tourism	**Private sector willingness to commit to landscape recultivation costs**	Lusatia	It is not clear whether existing contractual obligations are sufficient robust to ensure mine owners shoulder the full cost of environmental improvements
	Access to Green Space	Lusatia	The rural Lusatia landscape provides good landscape access	**Pattern of Development**	Brandenburg	Spatially dispersed pattern of development challenges efficient resource allocation and energy use	**Re-establishing the Continental Water Basin**	Brandenburg	Restoration of water table and integration of new lakes to form integrated ecosystem	**Poor quality or incomplete landscape rehabilitation**	Lusatia	Poor quality or incomplete remediation may threaten growth of leisure and tourism
	Heritage	Lusatia	Significant pre-industrial and industrial heritage in towns and villages	**Limited land for Renewables**	Berlin	Dense pattern of development limits land available for renewables	**Space availability**	Brandenburg	Country side settings present opportunities for expansive renewable energy installations such as wind turbines and solar farms			
	Urban Form	Berlin	Berlin's dense urban form helps limit energy demand through public transport access, relatively well insulated housing stock and efficient district heating schemes.	**Tenure Structure Inhibits Investment**	Berlin	High proportion of tenanted apartments disincentivises investment in decentralised renewable and upgrades to deduce energy demand	**Water Sensitive Design**	Brandenburg	Integrated landscape presents opportunities for sustainable water management.			

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Political	**Community Leadership**	Lusatia	A large number of community, industry and special interest groups are active in the region	**Missing Strategies**	Lusatia	While interest groups have strategies to address their specific concerns, there appears to be a lack of strategic, integrated strategies for the region	**Joint spatial planning across jurisdictions**	Berlin and Brandenburg	Current joint spatial planning focussed on Berlin and Brandenburg, with potential for coordination with Saxony and across border to Poland	**Berlin and Brandenburg Mistrust**	Berlin and Brandenburg	Continuing resistance to policies perceived as being imposed by Berlin and / or Potsdam on the surrounding region
	Non-government Organisations	Brandenburg	Upwardly mobile NGO culture	**Fragmented Network Governance**	Lusatia	Despite the efforts of the Chambers of Commerce, Energieregion Lausitz, and Brandenburg Government network governance across the large number of regional stakeholders is fragmented	**EU targets**	Berlin and Brandenburg	EU carbon emission targets present opportunity to leverage change within Germany	**Failure to set a 100% renewable target**	Berlin and Brandenburg	Inconsistencies between carbon neutral and 100% renewable targets delay final coal exit
				Leadership	Lusatia	Lack of leadership for coal exit				**Lack of support for existing (draft) Joint spatial plan**	Berlin and Brandenburg	Lack of agreement on planning priorities
				Joint Energy Transition Strategy Decision Making	Berlin and Brandenburg	Delays to joint energy strategy reflecting political and governance challenges						
				Political Power	Brandenburg	Lack of political power at local level and politicised nature of coal exit						