European Commission

Toolkit

Managing post-coal assets through spatial and strategic planning

Energy

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Directorate B – Just Transition, Consumers, Energy Security, Efficiency and Innovation
Unit B.1 - Consumers, Local Initiatives, Just Transition

EC-ENER-JUST-TRANSITION@ec.europa.eu

European Commission
B-1049 Brussels

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European Commission

SUPPORT MATERIALS

Providing support materials to coal regions in transition

The Initiative for coal regions in transition developed the following support materials to assist practitioners in coal regions (including peat and oil shale regions) across Europe. Click below to download the toolkits.

- Transition strategies
- Governance of transitions
- Green skills
- Technology options
- Environmental rehabilitation and repurposing
- Clean air
- Transition financing
- District Heating

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How to use this toolkit

Slides / Pages 5-20

This section gives an overview about the topic of spatial planning for managing post-coal assets for EU coal+ regions and covers the **main messages & recommendations** with regards to the topic.

For each slide, more detailed information can be found in the report section.

In-depth report / Pages 21-44

The more in-depth report follow the same structure as the slides and offer a **more detailed look into each section**, including an overview about different land use cases for post-coal areas with further resources, links, examples, and case studies.

AIMS AND SCOPE

This toolkit explains the **central role of spatial planning for a sustainable transition** at local and regional level, in particular how to deal with former coal mining assets, including infrastructure, land, and buildings.

WHO IS THIS TOOLKIT FOR?

- Regional and local authorities
- Spatial planning authorities
- Relevant stakeholders engaged in spatial planning (NGOs, social partners, local business development agencies)

WHY DO WE NEED THIS GUIDANCE?

Local development strategies are often focusing on a sectoral approach, risking that transition projects become insular solutions.

An integrated spatial planning process helps to address and manage competing land use cases, which is particularly important for developing former coal and industrial sites.

KEY MESSAGES

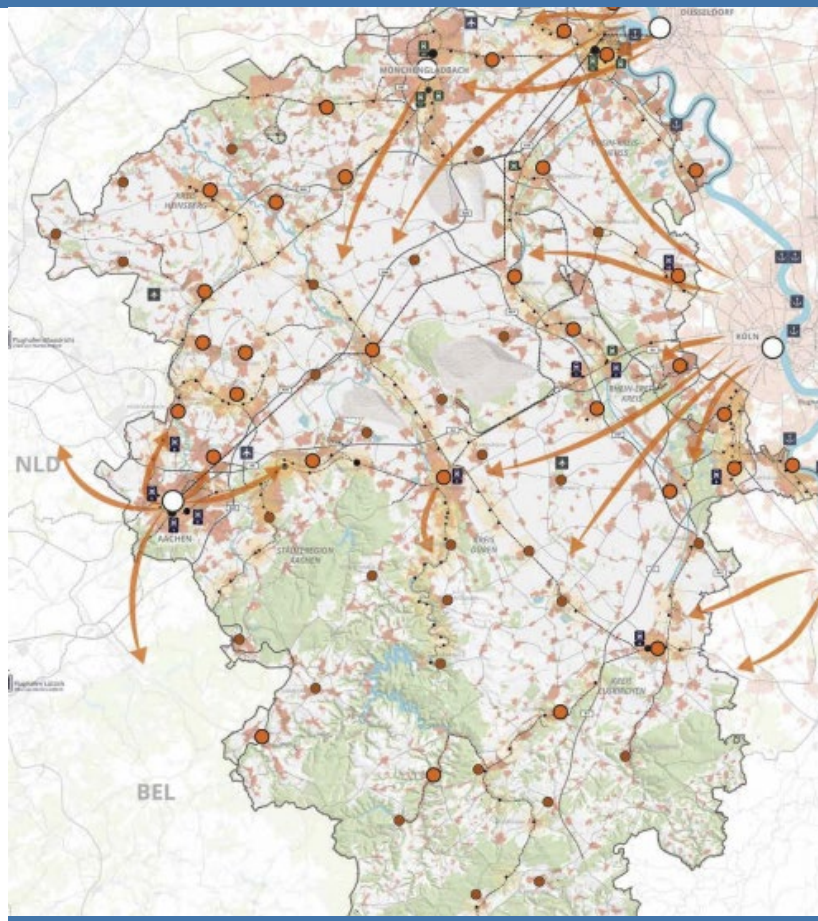
- Strategic spatial planning helps **address complex land use conflicts** and integrate economic, social, and environmental aspects of the transition.
- **Key steps for developing spatial plans** are data gathering & management, policy alignment, stakeholder engagement, and development of plans on different levels and detail.
- Former coal sites can be repurposed for various uses. In many cases, a **mixed land-use approach** can be considered as the 'gold standard' for a climate-proof, sustainable spatial development.
- Funding mechanisms like **green procurement** and **public budgeting** are important for implementing spatial plans and supporting sustainable development.
- **Tools** like GIS, CAD, trade-off analyses and life cycle assessments can help manage the development of spatial plans and evaluate different planning options and their long-term impacts.

Why strategic spatial planning is important

Coal regions will likely face '**wicked problems**' as competing land use cases, for example:

Renewable energy installations	**vs.**	forest conservation or agricultural use
Expansion of cities (see figure) and a need for new (affordable) housing	**vs.**	maintain biodiversity and ecosystem services
Increase food production	**vs.**	reduce chemical inputs into soil and preserve natural habitats
Building transport networks or energy infrastructure	**vs.**	limit land take and soil sealing

➡ Strategic spatial planning can help to act as a way to **address competing land use needs** and integrate that into a comprehensive, resource- and efficiency optimised way.

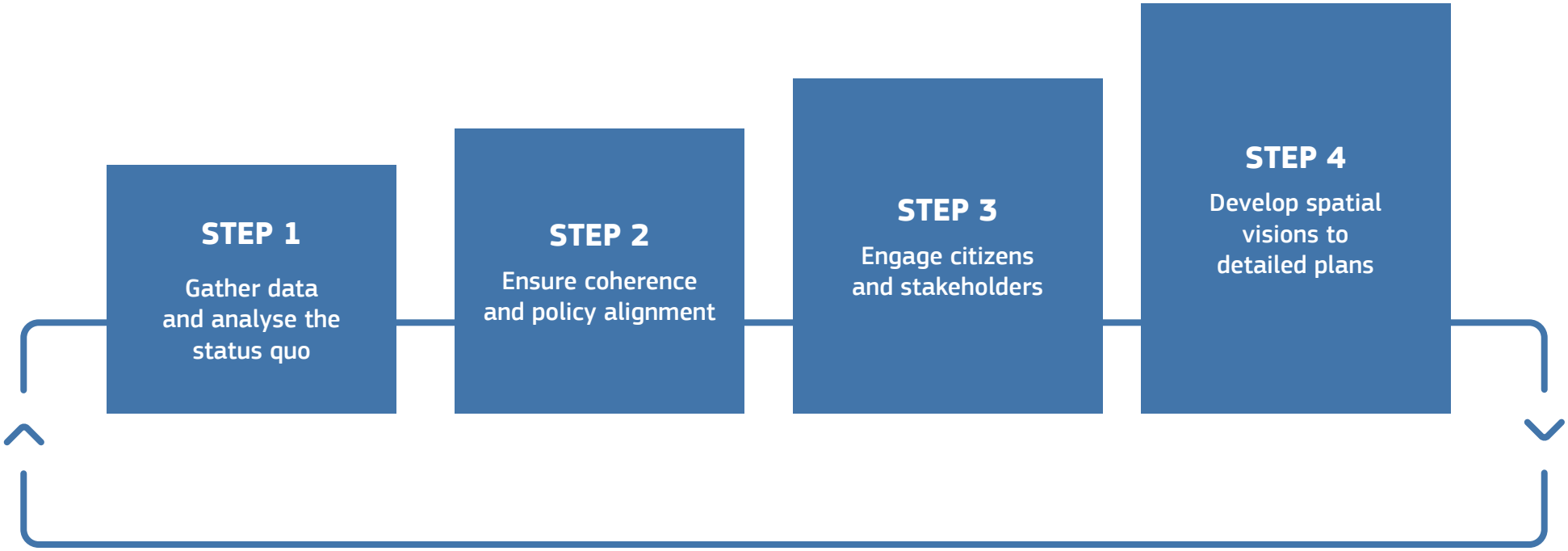


An example for a spatial analysis of urban spillover effects in the Rhenish mining region.

Source: RWTH Aachen, 2023.

APPROACH

How to design a successful strategic spatial plan



Source: Own depiction

How to design a successful strategic spatial plan

Step 1: Gather data and analyse the status quo

Analysing the status quo of transition-related activities enables to **define the scope** for spatial planning on a local level, e.g., by performing

- **A mapping** of relevant visions, action plans, strategies, policies
- **Stakeholder analysis**: identifying actors and their positioning

For developing spatial plans, **data gathering and management** is a prerequisite and can support not only policy making, but also project development (see example).

EXAMPLE: INFORMATION PLATFORM FOR POST-INDUSTRIAL AND DEGRADED AREAS IN SILESIA (OPI-TPP)

OPI-TPP is an online database providing comprehensive information on over 1,000 post-industrial sites in the Silesia region. The platform includes crucial data on environmental conditions, infrastructure, and land use, enabling investors, city planners, and spatial development experts to make informed decisions about potential site redevelopment.

➲ Read more: Official website (in Polish) and case study

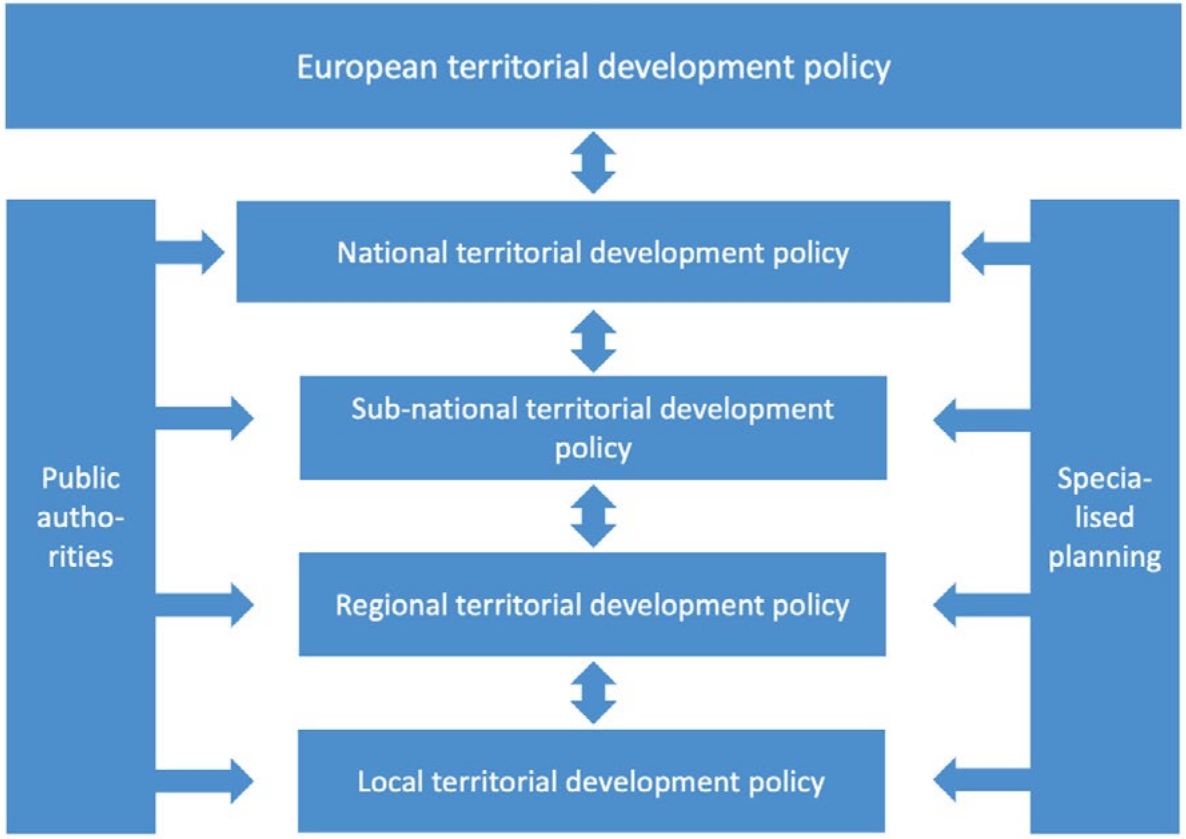
How to design a successful strategic spatial plan

Step 2: Ensure coherence and policy alignment

To maximise their effectiveness for the transition, spatial plans need to be aligned across different levels:

1. **Sectoral** alignment
2. **Target** alignment
3. **Policy** alignment
4. **Temporal** alignment

This includes main international agreements, such as the *UN SDGs*, the *Paris Agreement*, the *European Green Deal* and the *Territorial Agenda 2030*.



VERTICAL POLICY ALIGNMENT FOR SPATIAL DEVELOPMENT.

Source: Own depiction based on Miosga/Norck, 2017

How to design a successful strategic spatial plan

Step 3: Engage citizens and stakeholders

Engaging stakeholders is a key step to ensuring **ownership of the community** for which the spatial vision, strategy or plan will be developed.

The role of governance structures and inclusion of stakeholders for the transition as a whole are captured in more detail in the Governance of transitions toolkit.

EXAMPLES FOR CITIZENS AND STAKEHOLDER ENGAGEMENT WITHIN SPATIAL PLANNING PROCESSES

- 'Luxembourg in Transition' process, which both include a dedicated collaborative visioning process and a citizens committee
- Cornwall Plan 2020-2050, UK
- Planning lab 'Spatial Images Lusatia 2050', Germany
- Just Transition Development plan for Greece, 2020
- 'Raumstrategie 2038', Rhenish mining region, Germany
- Spatial Development Strategy 2050, Slovenia

How to design a successful strategic spatial plan

Step 4: Develop spatial visions to detailed plans

Each coal region should develop **visions** and **strategies** that entail guiding principles and then subsequently evolve them into **spatial structure plans** (framework plans) and **design plans**, from regional to site-specific levels.

VISION/STRATEGY

Example: 'Spatial Images Lusatia 2050', Germany

STRUCTURE PLAN

Example: Avila, Spain

DESIGN PLAN

Example: Katowice South

Source of figures: Wuppertal Institute

How to design a successful strategic spatial plan

A DEDICATED SPATIAL STRATEGY DEVELOPMENT PROCESS FOR THE RHENISH MINING AREA, GERMANY 'SPATIAL STRATEGY 2038'

The spatial strategy process in the Rhenish mining area largely uses and describes the steps outlined in this toolkit, including a spatial analysis of spatial-related potentials and challenges (including the development of detailed maps), citizen and stakeholder inclusion processes, links to broader development strategies and monitoring processes.

What was unique about the approach is that the process started with the development of three visions in parallel (see picture), which are planned to be merged into one to ensure that multiple perspectives and development pathways are considered.

Read more

Source: RWTH Aachen, 2023

Land use cases of post-coal areas

Cultural Spaces and museums

- On sites with **industrial buildings** and other **monuments**, an after use as cultural space or as a museum can enhance **cultural identity**, boost **tourism**, support the **rebranding of the region**, improve the **quality of life** and **attract new businesses**.
- *Tool for redeveloping heritage sites: ForHeritage*

For coal regions, developing the sites of former mines, power plants and related infrastructure is one of the top priorities. The following slides provides an **overview of use cases** for former coal related areas along with examples for (re) development.

*This overview **excludes** the management of **mine rehabilitation** and **power plant redevelopment**, as this is addressed in the **Environmental rehabilitation and repurposing toolkit** and **Technology options toolkit**.*

Land use cases of post-coal areas

Industrial and commercial areas

- Former coal sites and other brownfields can be used for **industry** and **business development**.
- Spatial plans need to consider business needs such as **sufficient space**, good **transport links** and **accessibility**, **proximity to customers**, a certain **building typology**.

Examples:

- Saša Industry and Technology Park Velenje, Slovenia
- Business Park Phoenix West, Dortmund, Germany
- Nikiszowiec, Katowice - the new technologies district
- Brainergy Park, Jülich, Rhineland Mining Area, Germany

A TOOL FOR SUSTAINABLE REGENERATION OF BROWNFIELD SITES: A 6-STEP GUIDE FOR LOCAL AUTHORITIES

Read more

Land use cases of post-coal areas

Green Infrastructure and public spaces

- Developing green infrastructure is not a 'nice to have', but necessary to provide various ecosystem services, counteract soil sealing and biodiversity loss.
- Former coal sites provide good opportunities for developing green infrastructure (after a rehabilitation process) and there exist many examples to look into for replication, e.g.:
  - *Landscapes: Lusatian Lake District, Germany, Mostecké jezero, Czechia*
  - *Parks: Parco Archeologico e Tecnologico delle Colline Metallifere Grossetane, Parque de la Minería de Almadén*

Tool: SITxell territorial analysis system

Land use cases of post-coal areas

Mixed land-use areas

- In a lot of cases, a **mixed land use** with businesses, housing, supply, cultural venues, social infrastructure, as well as public and green spaces will be the preferred use case.
- Examples:
  - Belval, Esch-sur-Alzette, Luxemburg
  - C-Mine, Genk, Belgium
  - Lake Phoenix, Dortmund, Germany
  - Lyon Confluence (former industrial site, non coal region)

Land use cases of post-coal areas

Renewable energy production

- Given the need to **expand renewable energy production to reach climate goals**, former coal sites should be also considered as possible sites, especially as they often already have **existing energy infrastructure** that can be used further.
- An overview of the technologies available and examples can be found in the technology options toolkit.

Mobility and transportation

- **Coal-related sites** often have **existing infrastructure** such as **railways and roads** that were used for the operations and can be reused if there is a suitable use case.

Spatial planning through strategic funding design

Many of the EU funds can be used for infrastructure and projects on former coal related sites. CRiT's Transition Financing Toolkit provides an overview about **available public funding sources** on the EU level and how to set up a **dedicated financing strategy**.

Green Procurement

Green procurement is the practice of using **products and services** that have a **reduced impact on the environment** compared to products that serve the same purpose, e.g., purchasing sustainable building materials or electric buses.

Read more

- What does green public procurement mean?
- Role of Green public procurement in improving resource efficiency

Public Budgeting

Public budgeting is the process through which governments **plan**, **allocate**, **and manage financial resources to achieve public policy objectives** and provide services to the community.

Read more:

- Green budgeting in the EU
- UNICEF-European Commission Social Budgeting Toolkit
- Gender Budgeting

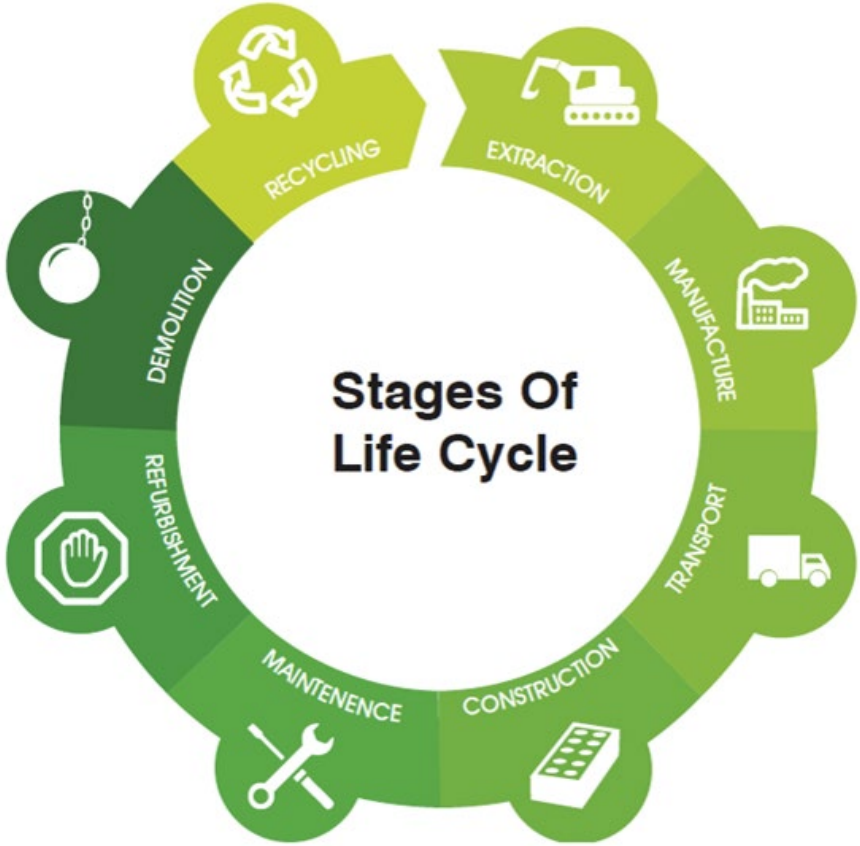
Helpful tools for spatial planning in practice

Digital spatial planning tools

- Computer Aided Design (CAD)
- Geo Information Systems (GIS)
- Spatial simulation and modelling tools
- Statistical software

Further tools for decision making towards a sustainable spatial development

- SWOT analysis
- Trade-off analysis
- Material flow analysis
- Life Cycle Assessment



MAIN STAGES OF A LIFE CYCLE ASSESSMENT

Source: Envirolink

European Commission

In-depth report

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Aims and scope

The aim of this toolkit is to explain the central role of strategic and spatial planning for a sustainable transition at local and regional level, in particular how to deal with former coal mining assets, including infrastructure, land, and buildings.

The toolkit aims to enable practitioners in coal+ regions to **understand the link between spatial planning and (just) transition strategies**, and in particular, the relationship between social and environmental aspects of the transition.

It also strives to provide various **examples** of regional spatial planning of coal-related infrastructure, tools, and links to additional materials that can support the implementation of changes on the ground. Examples have bene chosen with a specific focus on geographic balance and come from coal phase out regions, but also from other parts of Europe, if relevant in the described context.

Who is this toolkit for?

The target audience for this toolkit comprises all stakeholders in transition planning in coal+ regions, although the principal stakeholders span:

- **National, regional and local decision makers involved in the transition of coal regions**
- **Spatial planning authorities** involved in territorial development and wishing to learn about practices for coal site development options and integration into local strategies.
- **Businesses in the region, including SMEs** that actively would like to shape their region and want to ensure an integrated approach to developing their (own) land and premises.
- **NGOs** in the environment and economic development fields.
- **Local business development agencies & chambers of commerce** with a macro perspective on business interests in a region.

Why do we need this guidance?

While strategic planning is important in all regions to build pathways to become climate-neutral by 2050, coal regions face some specific challenges as they are often left with an abundance of different kinds of coal mining legacies; these include energy infrastructure, such as pipelines, high-capacity grid connections, but also brownfields with good transportation access, industrial sites, or historical buildings. This industrial heritage can be a burden, but it is also a source of cultural and social legacy generating pride that that makes the locals proud and self-aware and can ultimately be the basis for new development opportunities.

It is imperative that complex circumstances in every coal region call for place-based approaches that take local circumstances and prerequisites into account. Much has already been written about strategy development, including our own Transition strategy toolkit for coal regions in transition. However, local strategies often focus on a sectoral approach, for instance by identifying core economic development potentials and financial support for individual business projects, while the question of land use itself is not an integral part of these strategies. This generates the risk that **visions and strategies are not synched enough with territorial planning** and might lead **to a situation in which transition projects may become insular solutions**, unable to push the region as a whole towards climate neutrality, and even creating new lock-ins or problems. In the worst-case scenario, sustainability goals and existing spatial planning systems may be mutually detrimental, blocking solutions and acting as a barrier to reaching transition that would lead to a climate neutrality.

On the other hand, a successful, smart, and integrated strategic spatial planning can help to tackle multiple problems and elements of the transition simultaneously. Applying a spatial lens to regional development helps to take into account not only economic development and jobs (which are in the centre of the debate for a climate and energy transitions), but also other aspects of the transition, such as housing (including sustainable use of materials and energy efficiency), transportation infrastructure & connectivity, space for culture and leisure, but also the environmental effects of soil sealing, biodiversity, or climate mitigation and adaptation. All of that has a spatial

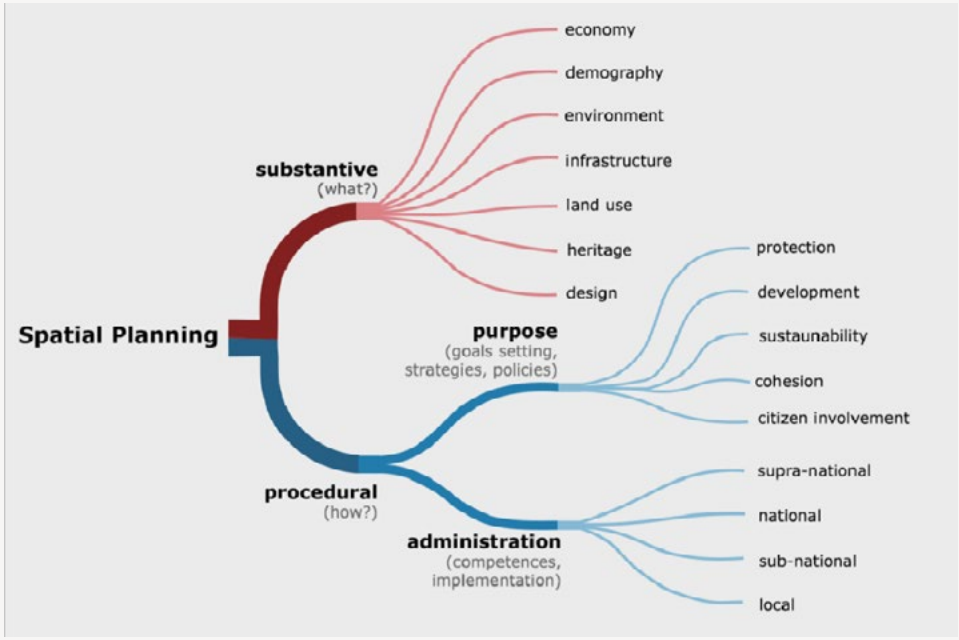

FIGURE 1: SPATIAL PLANNING IN RELATION TO TOPICS, GOALS AND ADMINISTRATIVE LEVELS

Source: ESPON Compass, 2018

dimension. In fact, **spatial planning linked to strategic decision making should be considered one of the most important** policy tools **for coal regions to steer the transition** in the desired direction – both due to its influence on transition-related policies and the fact that many regions or municipalities have the legal authority to set the primary rules for how the available space is organised and used.

Introduction

In the context of sustainable transitions, coal regions need to undergo a variety of transformations to become climate-neutral. It is not limited to phasing out coal, but also covers prioritising finding economic alternatives for the region, decarbonising industry, and transport, rehabilitating former mining areas and protecting biodiversity and human health through climate adaptation measures.

Spatial planning, and more specifically the tools and methods of strategic spatial planning, offer several opportunities to manage this transformation in all these areas. Land availability is a critical factor in the transition, as multiple uses will compete with each other. Thus, the process and prioritisation of land use needs to be actively organised. In essence, this is what spatial planning is for: it is the process of organising and designing the use of land in a given area. However, there are different variations of spatial planning in the literature (see Figure 1), according to diverse scopes and approaches:

- **Spatial Planning** encompasses the processes and regulations that guide development and land use at all levels, from a specific neighbourhood to an entire region. It focuses on practical matters such as zoning, infrastructure sitting and planning permission.
- ***Strategic* Spatial Planning** takes a panoptic view, considering long-term goals and potential challenges. Strategic planning involves setting a vision for the development of an area, taking into account economic, social and environmental factors. It considers wider trends and aims to create a coherent plan that fits into the bigger picture, such as sustainable development or links with the outside of the region. In this toolkit, we focus mainly on strategic spatial planning, as the effectiveness of transition measures will depend very much on the extent to which spatial planning and overall regional planning 'feed off' each other.
- **Territorial Governance** is sometimes used as a synonym for spatial planning (see above), but often describes an even broader view of spatial planning systems, focusing on the processes and institutions that govern a territory, which could be a city, a region or even a whole country. Territorial governance considers not only land use, but also economic development, social equity, environmental protection and political decision-making.

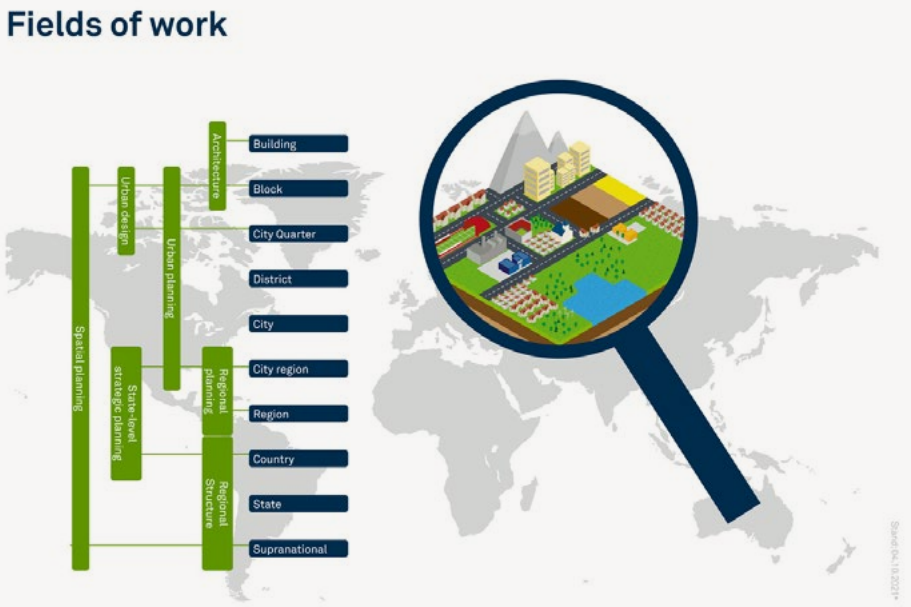

FIGURE 2: SPATIAL PLANNING IN THE CONTEXT OF VARIOUS GOVERNMENTAL LEVELS

Source: TU Dortmund, 2021

Article 192 of the Treaty on the Functioning of the European Union defines land use as well as town and country planning as one of the areas in which the EU shall define action programmes, which had been broadly applied under the themes territorial development and cohesion policy. Apart from this, the main legislative authority for spatial development is at the EU member states level and below. Due to varying historical, cultural, legal, and political contexts, **spatial planning systems in Europe exhibit significant diversity** (see Figure 2).

While most countries have national, regional, and local planning levels[1], the emphasis and power distribution between these levels vary: Some countries such as France or Greece have strong national-level planning, while others such as Germany, Poland and Belgium focus more on regional or local planning.

As the administrative diversity makes it impossible to develop uniform guidance that can be effectively applied across all countries, this toolkit focuses on the key spatial planning tools that could be applied in various ways across the EU, and on measures that are applicable on a regional level (if national framework conditions allow). It further provides an overview of various land use cases for former coal-industry related sites. In order to make the knowledge as useful as possible, the toolkit integrates a range of examples, tools and links to external sources.

1 Some countries have only two administrative levels (such as Slovenia), while others have three (Belgium; Bulgaria; Czech Republic; Estonia; Greece; Spain; Hungary; Poland; Romania; Slovakia;) or four (Germany; Ireland).

BOX 1: PRECONDITIONS FOR IMPLEMENTATION: COAL REGIONS IN ALL COUNTRIES NEED CHANGES IN NATIONAL FRAMEWORK CONDITIONS FOR TERRITORIAL DEVELOPMENT

Many coal phase out regions have set ambitious commitments to contribute to a climate neutrality of their countries. However, municipal and regional administrations can hardly achieve them without a close cooperation with the national governments, both generally, but also more specifically in relation to spatial planning.

Several studies (such as CSE, 2023) across Europe have shown that there is a significant gap between the perceived potential of spatial planning and its performance in implementation. On the one hand, they need significantly changed framework conditions at upper political levels. On the other hand, an unwavering commitment to the implementation of the necessary measures are required, as well as active contribution from local and regional politicians, administrative units, local companies and initiatives, and even local people.

In the wider context, for a best-case adoption of spatial strategies, coal phase out regions would need to:

1. **advocate to higher political levels** to create the necessary national framework conditions for ambitious, municipal and regional climate protection through spatial legislation.
2. **promote capacity building**, enabling the structural, personnel and process adjustments that are necessary in administrations.
3. **foster systemic or integrated policy design** that takes into account synergy potentials and potential conflicting goals of climate neutrality and sustainability with other fields of action and tasks of municipal development.
4. Advocate for a clear link of the local and regional strategies and plans with the available financial tools.

Why spatial and strategic planning is important in the context of sustainability transition

Regions phasing out of coal face significant challenges in transitioning from fossil fuels; they need to diversify their economies, establish new value chains and jobs, address social impacts of the transition, and plan the land restoration of former coal-related infrastructure. In this process, they will face what can be described as a 'wicked problem', i.e. a complex, multifaceted challenge that inherits conflicting priorities of how land should be used. For example the diverging interests may compete between:

5. Renewable energy installations and environmental solutions, such as forest tree planting, or agricultural land use.
6. Expansion of cities and a need for (affordable) housing and the need to maintain biodiversity and ecosystem services.
7. Pressure to increase food production with efforts to reduce chemical inputs and preserve natural habitats.
8. Building transport networks, business or energy infrastructure and efforts to limit land take and soil sealing.

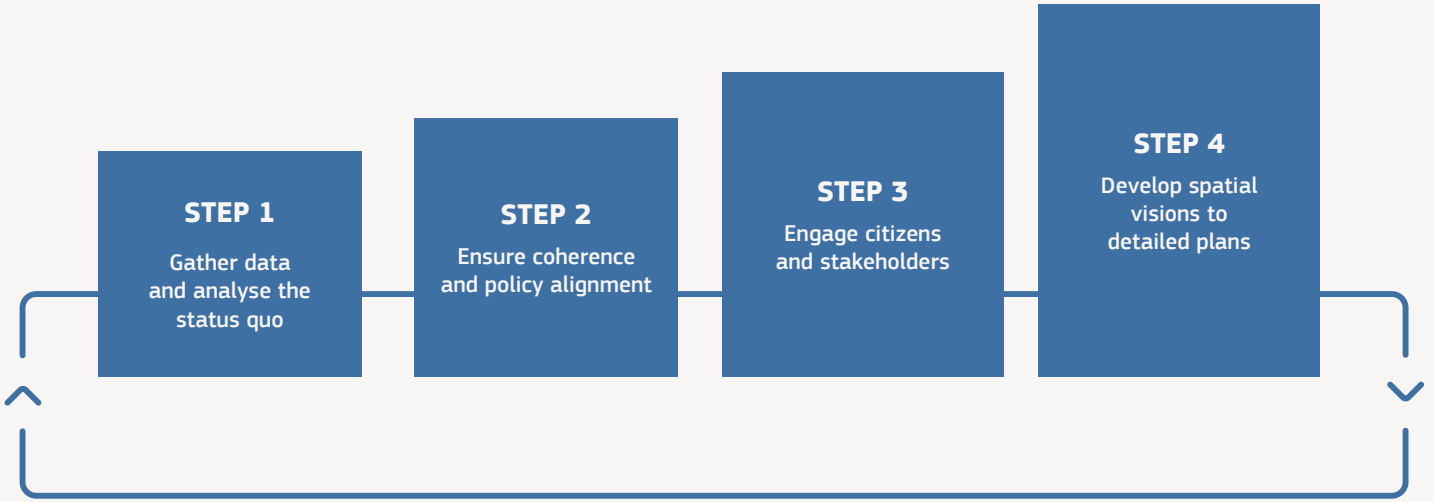

FIGURE 3: FOUR STEPS TO DESIGN A SUCCESSFUL SPATIAL PLAN

Source: Own depiction

Strategic spatial planning can help to act as a way to **address the various land use needs** and integrate that into a comprehensive, resource- and efficiency optimised approach. It may not solve the wicked problem, but can enhance understanding of the issues, support collaboration, inform decision-making, and enable more integrated and adaptive approaches to sustainability planning. By focusing on questions of how to use the available land and sites and especially how to deal with areas that have **post-coal assets**, strategic spatial planning can also be seen as an additional tool to sustainable development approaches.

BOX 2: EU STRATEGIES AND POLICIES ON SPATIAL PLANNING

The EU **Territorial Agenda 2030** is a strategic framework document which Member States voluntarily agreed upon. It underlines the importance of and provides orientation for strategic spatial planning and calls for strengthening the territorial dimension of sector policies at all governance levels.

The EU Territorial Agenda 2030 takes into consideration the recent developments described in various reports by the European Commission, the European Committee of the Regions, the European Investment Bank and the European Spatial Planning Observation Network (ESPON). It takes into account of the main recent policy frameworks and agendas, including the United Nations' **2030 Agenda for Sustainable Development** and the **Sustainable Development Goals (2015)**, the **Paris Agreement (2015)**, the United Nations' **New Urban Agenda (2016)**, the European Commission's reflection paper '**Towards a Sustainable Europe by 2030**' (2019), the revised **Leipzig Charter (2020)**, the OECD's **Principles on Urban Policy and on Rural Policy (2019)** and the **European Green Deal** (2019).

How to design a successful strategic spatial plan

The formulation of spatial visions, strategies and plans should follow the same principles as broader concepts of strategy development for sustainable transitions (see Transition strategies toolkit). Based on a policy cycle approach, developing a spatial strategy should be structured as a continuous process that evolves over time and is based on reflection, learning, and adapting to new knowledge and situations. In this toolkit, we propose a five-step approach to highlight some of the most important aspects of spatial planning processes. However, this can only provide a very broad overview and should always be adapted to regional and local circumstances.

Based on a stocktake of available good planning practices developed within the Integrated Energy, Climate and Spatial planning project (IN-PLAN), four steps are presented below on how to design a successful spatial plan (see Figure 3).

Step 1: Gather data and analyse the status quo

As every country and region has their own policy framework conditions, regions can start with assessing the framework conditions for spatial development. This can be done by **mapping out relevant visions**, **action plans**, **strategies**, **policies** to eventually **define the scope** for strategic spatial planning. This analysis should also include relevant policies, strategies and targets from international levels (see Box 2). The regions should also incorporate an analysis of responsibilities of planning, so that it is clear what things regional policy makers and institutions can accomplish themselves on a policy level, and what needs to be undertaken at the national level. A **stakeholder analysis** that dives into the relationship between institutions, organisations and companies can provide further insights about how the *process* of planning should be carried out, and what barriers or veto players obstructing implementation could be.

Helpful tools that can support regions in that regard are the New Climate Institute's Actor and policy mapping tool, or the Just Transition Readiness Evaluation Tool for coal and carbon intensive regions (JT:READY), which allows a mapping of relevant local policies based on a holistic approach to a just transition.

For the spatial process itself, **data gathering and management** is crucial, including site characteristics such as assets and liabilities, land capability, topography etc. For Data management, using tools such as Geographic Information Systems (GIS) is imperative (see Box 3). **Spatial models** can be used to illustrate the potential impacts of different land uses and illustrate a region's characteristic, e.g. mobility networks, ecological structures or settlements (see Figure 4).

The SITxell territorial analysis system is a good practice tool for data gathering and spatial planning on the local and regional level. It enables the comparison of various land-use characteristics and environmental factors, helping to create a balanced

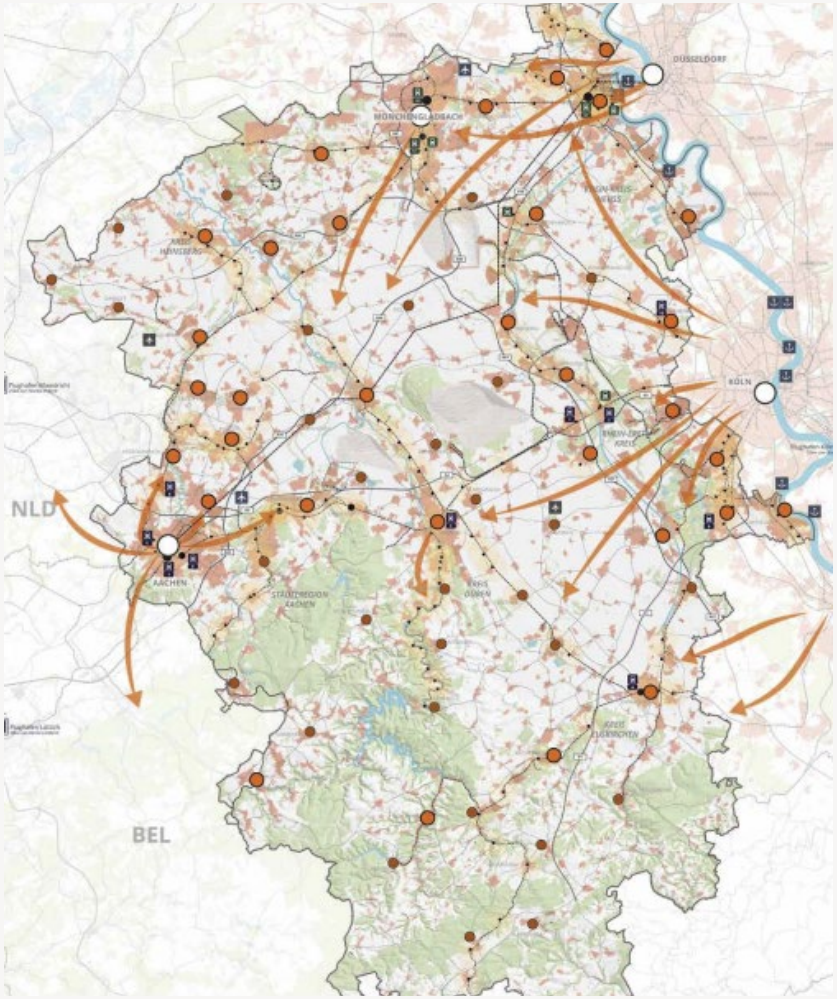

FIGURE 4: AN EXAMPLE FOR A SPATIAL MODEL FOR THE RHENISH MINING REGION SHOWING URBAN SPILLOVER EFFECTS WHICH HAS BEEN DEVELOPED AS PART OF THE 'SPATIAL STRATEGY 2038' (SEE ALSO BOX 7)

Source: RWTH Aachen, 2023

overview of the area that can serve as a foundation for spatial plans. First developed for the metropolitan area of Barcelona, Spain, it also has been applied in smaller municipalities and rural areas, e.g. in Central Hungary.

Step 2: Ensure coherence and policy alignment

Understanding spatial development and planning as a way to direct activities towards an integrated approach for sustainability, with a focus on creating policy and strategy coherence, becomes fundamental. Broader visions of the future, as well as concrete targets and policies, therefore act as criteria for weighing land use cases against each other and ultimately deciding on a spatial plan that reflects a balanced mix of long-term optimised land uses. Mechanisms for identifying and managing trade-offs between different policy objectives will also be key to implementing a just transition, ensuring that no one is left behind, and that progress in one area does not undermine progress in another. The increasing complexity of governance, and multi-level and multi-stakeholder processes make policy coherence even more important.

To be most effective, spatial plans need to be aligned across sectors, targets, policies and time.

1. Sectoral alignment

Sectoral alignment requires a ***horizontal*** coordinated response from various sector departments within an administrative system. Policy sectors such as energy, agriculture, economy, and mobility have a relatively strong influence on spatial planning and need to be taken into account.

The EU's spatial planning ESPON project developed a case study about 'Cross-fertilisation between Spatial Planning and EU Cohesion Policy in the Czech Republic' that provides further lessons learnt for ways to increase policy coherence between those two domains and comprise an analysis of institutional setup and policy processes in the Czech Republic. The study lists seven policy recommendations that can also be helpful in the context of the regions' efforts to govern transition.

2. Target alignment

Target alignment involves ***vertical*** coordination among the levels of government, from the local to international. This includes a need to align with international climate targets (Paris Agreement, SDGs, etc.), national strategies and other important frameworks that will shape the amount of room for development in each region.

Based on the popular doughnut economics model, the 'Cornwall Plan 2020-2050' provides an example of how a region integrated international, national and sub-national goals (not only sustainability-related, but more holistically for a just transition) into an umbrella strategy.

OECD's Policy coherence for sustainable development initiative provides a range of tools in order to help countries and regions to implement sustainability targets effectively, including spatial planning coherence tools.

BOX 3: INFORMATION PLATFORM FOR POST-INDUSTRIAL AND DEGRADED AREAS IN SILESIA (OPI-TPP)

The Information Platform for Post-Industrial and Degraded Areas in Silesia (OPI-TPP) is an innovative online database developed by the Marshal's Office of Silesia Voivodeship in partnership with the Central Mining Institute in Katowice, Poland. This publicly accessible GIS-based tool provides comprehensive information on over 1,000 post-industrial sites in the Silesia region. The platform includes crucial data on environmental conditions, infrastructure, and land use, enabling investors, city planners, and spatial development experts to make informed decisions about potential site redevelopment.

The platform is continuously developed further. Upcoming version 3.0 should also support monitoring processes for spatial development and include additional data and analysis that should help to assess future use case of individual post-industrial and degraded sites.

Read more: **Official website** (in Polish) and **case study**

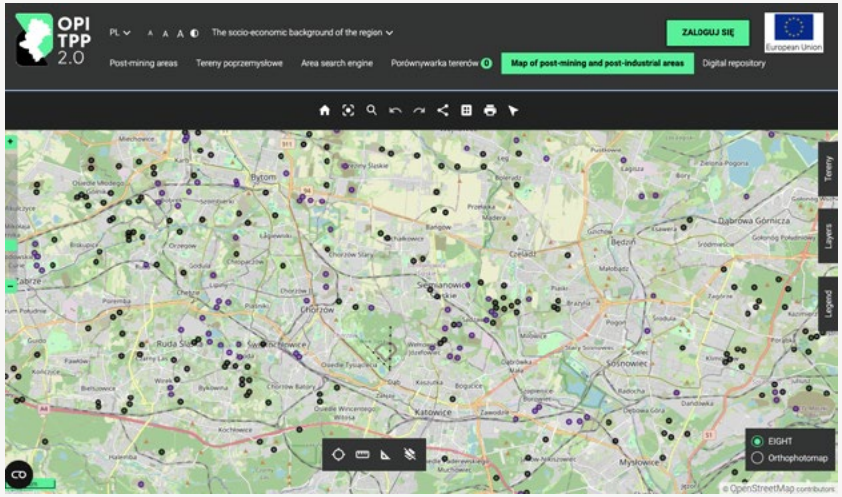

FIGURE 5: MAP VIEW OF POST-MINING AND POST-INDUSTRIAL AREAS COVERED BY THE OPI-TPP TOOL

Source: OPI TPP 2.0

3. Policy alignment

To achieve consistency in spatial planning itself, it also must be coherent across various spatial scales, from the national level to provincial, municipal, neighbourhood and building levels. That means, each level should convey consistent language regarding socioeconomic context, landscape, and settlement structure, with increasing detail at more localised levels (see Figure 6).

4. Temporal alignment

Temporal alignment in spatial planning requires plans with different future horizons to be interconnected. Short-term plans should align with medium- and long-term goals and programs. This ensures that projects in short-term plans contribute to the broader objectives outlined in longer-term plans, creating a cohesive planning framework over a 25-year period or more, specifically in the climate-sensitive timeline until 2050. This will also be necessary in regards to climate adaptation, that requires the planning of risk reduction infrastructure such as rainwater management or heat reduction (see also Box 11). Furthermore, temporal alignment should also include aligning spatial planning with investment schedules, such as available EU funding.

A good example for policy coherence across all four dimensions is the Regional Spatial and Economic Strategy 2019-2031 (RSES) of the Eastern and Midlands Region in Ireland. It integrates general strategy development with spatial planning, economic development, an investment framework and a climate action strategy. It also describes the governance mechanism across policy levels and links to national and international development objectives.

Step 3: Engage citizens and stakeholders

As spatial planning is oriented towards the common good, all interested parties should be included so that common solutions can be found. In general, actors with a crucial role in spatial planning are local and regional decision-makers, spatial planners/ local authorities, civil society and other stakeholders, such as unions and energy companies, but also businesses and local business development initiatives. Engaging stakeholders is a key step to ensuring ownership of the community for which the spatial vision, strategy or plan will be developed.

Box 5 provides an example of a good practice of citizen and stakeholder involvement for spatial planning processes, but s everal other examples in this toolkit also include participative elements, such as Planning lab 'Spatial Images Lusatia 2050', (Germany), Just Transition Development plan for Greece, 2020, the Spatial Development Strategy of Slovenia 2050, the 'Spatial Strategy 2038' in the Rhenish mining region (Germany), the Regional Spatial and Economic Strategy (2019-2031) of the Eastern and Midlands Region (Ireland) or the Cornwall Plan 2020-2050 (UK).

The role of governance structures and inclusion of stakeholders for the transition as a whole are captured in more detail in the Governance of transitions toolkit.

BOX 4: SPATIAL OPTIMISATION ALGORITHMS CAN HELP WITH TARGET ALIGNMENT

The use of spatial optimization algorithms can help planners balance competing policy objectives. For example, digital tools can identify land use configurations that simultaneously minimise environmental impacts, maximise economic benefits, and promote social inclusion. This helps address the challenge of conflicting stakeholder values in wicked problems and can be helpful in decision making.

Read more

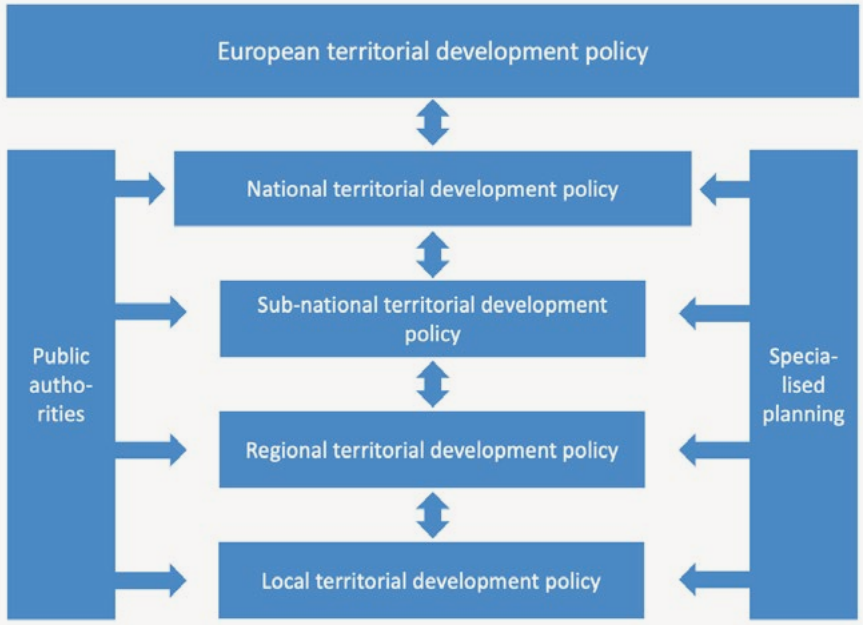

FIGURE 6: VERTICAL POLICY ALIGNMENT FOR SPATIAL DEVELOPMENT

Source: Own depiction based on Miosga/Norck, 2017

Step 4: Develop spatial visions to detailed plans

Irrespective of the planning tradition and the level under which those activities will be performed, **each coal region should develop visions and strategies that entail guiding principles and then subsequently cement those into spatial plans from regional to site-specific levels**. The more concrete spatial planning becomes, the deeper it should be formalised and integrated into regulations. The following describes briefly the most important instruments for spatial planning:

Spatial visions are conceptual frameworks that outline the desired future state of a region or area. They can be helpful in setting objectives in the regional or local context. Those spatial visions should entail **guiding principles** that are in line with other relevant development principles and targets (see also Step 2). Several coal regions in Europe developed such spatial visions, often in a collaborative process with citizens and relevant stakeholders (see also Step 3).

In Czechia, the Green Mine Project in the Usti region aims to transform the active mine into a lake with renewable installations, a new urban development area and space for agriculture and businesses. The project Planning lab "Spatial Images Lusatia 2050" started a process to develop spatial visions and guiding principles (in German) to develop the lignite-mining region Lusatia in Eastern Germany until 2050. Four different teams suggested spatial visions that were transferred into a final report.

FIGURE 7: EXAMPLE OF A SPATIAL VISION

Source: Wuppertal Institute.

BOX 5: THE EXAMPLE OF 'LUXEMBOURG IN TRANSITION'

The 'Luxembourg in Transition' initiative exemplifies a comprehensive approach to strategic spatial planning through policy integration across classic spatial planning, urban design, landscape architecture, and related disciplines. The project, supported by the Ministry of Energy and Spatial Planning, demonstrates a recognition of the need for a holistic strategy to address future challenges in spatial development.

To kick-off the planning process, the Ministry launched an urban-architectural and landscape consultation titled 'Luxembourg in Transition – Spatial visions for the low-carbon and sustainable future of the Luxembourg functional region'. This initiative aimed to develop a territorial strategy that addresses both global environmental concerns and aligns with broad public consensus.

Key aspects of the project included:

1. **Collaborative visioning process**: 10 international multidisciplinary teams were brought together to envision scenarios for achieving carbon neutrality by 2050 in Luxembourg and its border regions.
2. **Citizen involvement**: A Citizens' Committee (**Biergerkommitee Lëtzebuerg 2050)** consisting of 30 participants evaluated the project outcomes.
3. **Policy impact**: The initiative's recommendations contributed to the development of the Programme for Spatial Planning (**Programme directeur d'aménagement du territoire – PDAT**).

This approach highlights the integration of various disciplines, including environmental sciences, humanities, and social sciences, in addressing complex spatial planning challenges. By combining expert knowledge with citizen participation, 'Luxembourg in Transition' represents an innovative model for developing sustainable and widely accepted territorial strategies.

Read more

Based on spatial visions, **spatial strategies** prioritise certain actions and allocate resources to achieve the envisioned spatial development. Again, they should integrate various policy agendas (Step 2) and involve collaboration among different stakeholders (Step 3). Dedicated spatial strategies are relatively rare (see Box 7). Instead, in coal regions spatial considerations are often integrated into broader regional strategies:

The city development strategy for Katowice 2030 in the southern Polish coal regions establishes options for how to cope with the structural change in the city, e.g., developing post-industrial sites and supporting new future-oriented economic structures.

In the Rhenish Mining region, Germany, the regional strategy called the Economic and Structural Programme 2.0 integrates spatial planning as one of four focus topics for regional development (energy and industry, raw materials and agriculture, innovation and education and spatial development and infrastructure).

The Just Transition Development Plan of lignite areas for Greece is a sector-based strategy, but it recognised "space" as an umbrella dimension that can ensure the applicability of the overall plan for the transition. It also concretises the setup of Special Urban Plans for post-coal sites and surroundings.

BOX 6: EXAMPLE OF AN OVERALL STRATEGY OF REDEVELOPMENT WITH ASPECTS OF SPATIAL PLANNING: SUSTAINABLE DEVELOPMENT IN THE JIU VALLEY, ROMANIA: FROM STRATEGY TO ACTION

The development of the Jiu Valley, a lignite-mining region in Romania, aims for a sustainable development of the region in 2030. Therefore, a strategy was created that elicits action in different fields. Four development pillars were defined, in order to cope with existing challenges. The development pillars are:

4. Improving life quality and creating a healthy and sustainable environment
5. Economic diversification, innovation and entrepreneurship
6. Sustainable capitalisation on the local specificity
7. Accessibility, mobility and connectivity

Working with these pillars, 20 development projects were created that partly inherit elements of spatial planning such as integrated sustainable mobility, integrated SMART cities, land restoration, building renovation, an industrial and business park, functional reconversion of mining sites and sustainable tourism. Spatial plans can contribute to ensure the implementation of the objectives.

Read more:

- Restructuring of coal mining in Romania between the climate crisis and the energy transition
- Tracer Project: West Romania
- Supporting reforms to transition to a green economy and fight climate change

BOX 7: A DEDICATED SPATIAL STRATEGY DEVELOPMENT PROCESS FOR THE RHENISH MINING AREA, GERMANY '<u>SPATIAL STRATEGY 2038</u>'

The spatial strategy that was developed for the Rhenish mining area largely uses and describes the steps outlined in this toolkit, including a spatial analysis of spatial-related potentials and challenges (including the development of detailed maps), citizen and stakeholder inclusion processes, links to broader development strategies and monitoring processes.

What was unique about the approach was that the process involved the development of three visions in parallel, which were eventually merged into one to ensure that multiple perspectives and development pathways were considered. Comparing the three visions, they all proposed to support the (already existing) network of smaller and larger towns in the region, to improve the public transport network in the region, to create extensive green networks, and to establish new economic centres. The final spatial strategy summarises this process and will be further developed in the future.

Read more

THREE SPATIAL CONCEPTS WERE DEVELOPED IN PARALLEL UNDER THE FRAMEWORK OF THE SPATIAL STRATEGY 2038 PROCESS-

Source: RWTH Aachen, 2023

A **structure plan** can be drafted at a regional or city level and provides a vision of land use and further important aspects of development, such as transport infrastructures. Similarly, but a bit more detailed, a **framework plan** concretises the structure plan and sets the framework for (re-)development, depicting the site and its surroundings. In this plan, building structures, open spaces, streets and further framework setting elements can be presented. Depending on the size and complexity of the project, the structure plan and framework plan are not detached from one another.

Some examples are the framework plan for the former open-cast mine Hambach, Germany, the structure plan for the city of Avila, Spain and the transformation of a mining area in a park and urban forest in Spain.

The **design plan**[2] is the proposal for the redevelopment and sets out the functional, spatial and design principles for the site. It details the building structure, open spaces, and land uses. It is usually the basis for the preparation of regulatory and binding **zoning plans**. *An example is the Design plan and the Urban Development plan of the quarter Katowice South.*

FIGURE 8: EXAMPLE OF A FRAMEWORK PLAN

Source: Wuppertal Institute.

FIGURE 9: EXAMPLE OF A DESIGN PLAN

Source: Wuppertal Institute.

2 Sometimes sectoral plans are developed in addition on a design plan level, focusing on mobility, climate protection and adaptation, water management, biodiversity. As an example, the climate adaptation plan of Katowice defines measures in the fields of public health, vulnerable groups, undeveloped areas, transport and water management.

Land use cases of post-coal areas and possibilities for spatial development

For developing a spatial plan for a defined area, either for larger framework plans or individual sites, a wide range of use cases can be incorporated into the plans: industrial purposes, economic activities, cultural sites, residential projects, social infrastructure or green and public spaces. As described above, spatial planning as such can be described as a way to mediate different use cases that may conflict with each other. The criteria to decide on a good use case mix will be defined by policy framework conditions in the respective country, region or municipality, as well as the political negotiation outcomes of the involved actors and institutions.

However, planning the individual use case in line with sustainable development and just transition criteria will also be important in order to develop coal regions towards climate neutrality and a future beyond fossil fuels. The following chapter provides an overview of those use cases for former coal related areas along with examples for (re)development. This overview excludes the management of mine rehabilitation and power plant redevelopment, as this has been addressed in the other support materials (see Box 8).

A specific feature of the regions where mining has taken place is the large areas left after mining. Sometimes they are burdened with ecological burdens, such as subsidence (there are subsidence maps that show which areas can be further exploited, etc.). On the other hand, these areas have unique advantages - they are large, potentially well suited for further economic activity, they have built networks (capacity electricity supply, hot water pipelines, water pipelines, gas pipelines, etc.), which are challenging linear structures that do not need to be newly built or can be upgraded, and they do not need complex permitting processes.

The public sector is supposed to create the conditions for entrepreneurship, for job creation. The regeneration of brownfields left over from mining, as well as many other sites left over from failed suppliers to miners or declining heavy industry has a threefold effect:

- economic (space for new economic activity),
- social (new jobs)
- and environmental (old encumbrances and brownfields are removed and greenfields are not taken up for business development or other projects, such as residential).

Investing in site preparation and preparing speculative properties for new investments can create an attractive advantage.

BOX 8: GUIDANCE ON MINE REHABILITATION, INDUSTRIAL SITES AND POWER PLANT REDEVELOPMENT IN PREVIOUS CRIT SUPPORT DOCUMENTS

The **Environmental rehabilitation and repurposing toolkit** provides guidance for the environmental rehabilitation of mines and related areas. It partly also focuses on financing schemes that can deal with liability and remediation cost issues related to site contamination or ownership issues.

The **Technology options toolkit** provides options for the transformation of industries towards a low carbon economy such as technological solutions for the re-use of coal-fired power plants, decarbonisation of energy-intensive industries and hydrogen strategies.

As part of the START technical assistance programme of CRiT, the **Transformation Options Framework** provides hands-on guidance for the identification and assessment of options for the transformation of former mining and industrial sites, including guidance on initial assessments, project preparation, and stakeholder participation. While predominantly developed for the Polish context, it may also be useful for practitioners in other countries.

Historical and cultural heritage

Industrial buildings and other industrial monuments, such as conveyor towers or excavators from mining activities, can be preserved, upscaled and used for new purposes. The use of heritage can enhance cultural identity and can improve quality of life of the city or region, boost tourism, support the rebranding of the region and attract new businesses. Creative and cultural industries can contribute to the regeneration of places as they bring new ideas, and are often drawn to working in special places.

For planning redevelopment of industrial sites, the ForHeritage Interreg Project provides a range of strategic tools for dealing with heritage conservation and reuse.

Examples:

- *Katowice cultural zone, Poland*

  The Katowice cultural zone represents an inner city development of the former Katowice coal mine 'Ferdinand'/'Katowice' that was closed in 1999. The area inherits today many cultural places such as a sports and entertainment area, the Silesian museum associated with the former mining shaft, a cinema, a park that can be used for events and a concert hall and also business related uses as a conference centre.

- *Blegny-Mine, Belgium*

  The Blegny-Mine, Belgium was closed in 1980 and was developed to a museum with a permanent exhibition and the shafts to be visited. The mine is a UNESCO world heritage site today and offers guided tours for groups and schools. The mine is surrounded by a biotope.

- *Centre Historique Minier de Lewarde, France*

  The Centre Historique Minier de Lewarde in France is a mining museum where the heritage of the mine was preserved. The buildings and the shaft can be visited and visitors can learn about the history of the mine.

- *Stara Kopalnia w Wałbrzychu, Poland*

  The Old Mine Science and Art Centre in Wałbrzych located on the site of the former "Julia" mine. The revitalisation of the largest mine in Wałbrzych was completed in 2014. The mine offers visits to the shafts and various exhibitions (see picture)

- *Ferropolis, Gräfenhainichen, Germany*

  Ferropolis, also known as the City of iron, is an open air museum and event venue on the site of a former open-cast mine. It displays gigantic mining machines and serves as a venue for concerts and festivals and a lake.

- *German Mining Museum, Bochum, Germany*

Further preserved sites with heritage conservation:

- *Le Bois du Cazier, Belgium (similar concept as Blegny-Mine)*
- *Podkrušnohorské Technical Museum, Czech Republic*
- *Mining museum Blanzy, France*

THE STARA KOPALNIA MINE TRANSFORMATION

Source: Lower Silesian Tourist Organization

GERMAN MINING MUSEUM, BOCHUM

Industrial and commercial areas

When planning space for economic activities in industrial or commercial areas and attracting new economic activities, urban planning requirements must be combined with the needs of businesses and local authorities. Possible needs of businesses include sufficient space for production or offices, good transport links and accessibility (e.g. motorways or public transport in the vicinity), proximity to customers and, for some businesses, building typology and the urban environment. Some businesses need to be located farther from residential areas because of noise or pollutant emissions, while others, especially service-oriented businesses, benefit from being located in mixed neighbourhoods. As such, not all former coal-related sites are suitable for all kinds of business activities. Box 9 provides an overview of a step-by-step guide for local authorities to develop industrial brownfields for future business activities. Furthermore, the aforementioned Transformation Options Framework provides detailed guidance on transforming industrial sites in coal regions.

Examples:

The Saša Industry and Technology Park Velenje in Slovenia, also known as "TecHub i4.0," is a pivotal project in the economic restructuring of the Savinja-Šalek region in Slovenia. Located in the Stara Vas Commercial Area, this 5,000 m² facility aims to foster innovation and growth by retaining existing technology companies and attracting new businesses. The park is part of a broader initiative to transition the region's economy from traditional industries to sectors with higher added value.

The Business Park Phoenix West, Dortmund, Germany, integrates heritage with new business and cultural uses on the site of former ironworks. Industrial buildings are preserved and supplemented with new buildings for various science and technology companies on the site. Cultural spaces such as an exhibition centre, a brewery museum and restaurants enhance the area's quality of life. The city of Dortmund has been able to attract new businesses to the area and has given existing businesses the opportunity to relocate and expand.

Nikiszowiec, Katowice - the new technologies district (planned by 2026, not yet realised)

In the New Technologies District in Katowice, a new gaming and technology centre will be created on the site of a former coal mine, with educational centres, technology laboratories and office space. Existing buildings will be preserved, modernised and equipped for new businesses in the gaming and technology sector. Moreover, new film and recording studios will also be built on the site. Former worker's apartments will be used for housing. By 2026 the plans should be implemented and the new hub for technology and gaming will be finished.

The Business Park Brainergy Park, Jülich, Rhineland Mining Area, Germany is planned to be implemented by 2027. It is located in the Rhenish Mining Area in Jülich, close to the open-cast mine Garzweiler. The Business Park is not located as a redevelopment on the site but contributes as part of the economic development strategy to the future oriented economic development of the region.

PHOENIX-WEST AREA

BOX 9: A TOOL FOR SUSTAINABLE REGENERATION OF BROWNFIELD SITES: STEP-BY-STEP GUIDE FOR LOCAL AUTHORITIES

The document provides a comprehensive framework for local governments to effectively regenerate brownfield sites. Brownfields, which are also often found in coal regions, are defined as previously used, derelict, or underused areas that may have contamination issues and require intervention. The guide highlights brownfield activation as a crucial tool for achieving sustainable development and provides a step-by-step guide for local authorities to develop new brownfield activation practices (see figure 9).

Read more

FIGURE 10: A 6-STEP GUIDE FOR CITIES, TOWNS AND VILLAGES FOR BROWNFIELD DEVELOPMENT

Source: Ramboll, 2022

Green Infrastructure and public spaces

Green infrastructure and public spaces are essential in land use in every city and region. Green infrastructure is defined by the European Commission as a 'strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services'. Green Infrastructure is beneficial in multiple ways for cities and regions, including making them more liveable by contributing to health and quality of life, maintaining ecological processes, supporting biodiversity, providing food security and improving the microclimate in the area. Green spaces also play a crucial role in climate adaptation and can be used strategically in urban ecosystems to support nature-based solutions. As cities and regions continue to grow and evolve, the incorporation of ecosystem services and green infrastructure into spatial planning becomes increasingly critical for achieving sustainable development goals and ensuring the well-being of both current and future generation.

In regions and cities, different types of green spaces can be distinguished, which vary in size and function (read more in box 10). In a regional context, agriculture, forests, water bodies and nature reserves play a crucial role, up to and including biotope network systems and green links. At the local level, concepts from regional plans are put into practice (e.g. green links, biotope network systems), and smaller green spaces such as parks, green infrastructure (cemeteries, sports grounds, allotment gardens) and private gardens may be planned.

Green networks and parks are the types of green infrastructure often foreseen for the redevelopment of coal-related sites.

Green networks

Green networks are an important part of the **open space structure** of cities and can be connected to **green infrastructure of the region**, outside the settlement. They **provide fresh air**, are often part of a **biodiversity network system** and can provide **ecosystem services**. Green networks are often planned at a larger scale through sectoral landscape planning and are more detailed at a local level through urban or rural spatial planning.

Examples:

- *Lusatian Lake District, Germany*

  In Lusatia, Brandenburg and Saxony, a network of more than twenty lakes with numerous water sports facilities, cycling and hiking trails and holiday accommodations was established by filling former open cast mines with water. A new landscape was established that provides high quality and novel recreational opportunities for inhabitants and tourists.

- *Mostecké jezero lake, Czechia*

  Located in the north west of the Czechia in the Ústí Region, the lake Most is a previous open-cast mine filled with water that underwent a renaturalisation process. Today the lake is used for various leisure activities such as kayaking, paddling and provides a beach. There is also a circular path around the lake for cyclists and pedestrians. Read more in the detailed analysis of georelief development in the Lake Most surroundings.

BOX 10: FIVE PLANNING PRINCIPLES FOR GREEN INFRASTRUCTURE

- **Integration of green infrastructure** as a type of infrastructure that is in sync with other urban structures as buildings, transport networks and water management systems
- **Multifunctionality** of green spaces serving ecological, social, cultural and economic functions at the same time
- **Connectivity** between green spaces of different scales which enhances physical activity
- **Multi-scale approach whereby** different actors (administration, initiatives, etc.) can contribute to the planning of green spaces
- **Multi-object approach encompassing** different kinds of green and blue spaces: natural and semi-natural areas, water bodies, public and private green spaces

Read more: **Benedict and McMahon**

RECREATIONAL AREA AT THE LAKE MOST IN CZECHIA

Source: Jezero Most

- *Parco Archeologico e Tecnologico delle Colline Metallifere Grossetane*

  The park is located in Tuscany, Italy on an area of 24,000 hectares and includes 21 former mining areas of different materials (e. g. lignite, iron and copper metallurgy, silver and copper mine). The park is nominated as a geopark by UNESCO, which is a park with a significant geological heritage. The former mining sites are integrated with natural and landscape resources. One special venue is the Theatre of the Rocks which is a theatre that is located in a former mine.

Parks

Parks are urban green spaces that provide **recreation, fresh air** and **space for native species**. Important elements of parks are lawns, trees and topography. Meadows provide users with different activities, trees provide shade and improve air quality, and topography can be used as a design element. Parks can be designed in different ways and according to different concepts. They range from more natural, less structured parks to conceptually designed parks with clearly separated areas and different functions, and are designed in a range of sizes, going from from residential green spaces to neighbourhood and city parks to large public parks.

Examples:

- *Landschaftspark Duisburg-Nord, Germany*

  The landscape park Duisburg-Nord, Germany is located in the Ruhr Area and was transformed from former ironworks that closed in 1985 into a park where former industrial heritage is preserved. Today, the park offers visitors an industrial history circular trail, hiking routes, and many more leisure activities such as climbing, festivals, events and an open air cinema in summer. It has become a popular attraction for the whole region.

- *Parque de la Minería de Almadén*

  The park is located on the site of a former mine in Almaden, Spain. The park is a cultural and tourist destination that is dedicated to the history, science and culture of the Almadén Mines. It offers guided tours and an exhibition of the history of the mine.

- *Parc Explor Wendel, Petite-Rosselle, France*

  The park Explor Wendel is located in Lorraine, in the east of France. The park is situated on the site of the former Wendel coal mine that was closed in 1986. Today the park hosts a museum, a theme park that illustrates the working conditions of the miners and offers the possibility to visit the mine in guided tours.

- *Westpark, Bochum, Germany*

  In the Westpark, Bochum's transformation from an industrial centre to a modern city of culture becomes tangible. 150 years of iron and steel production have created an area with different levels of elevation and relics from this period.

- *The Be-MINE, Belgium, is a transformed former coal mining site that now offers a variety of attractions, including an adventure playground with hiking trails,*

WESTPARK, BOCHUM, GERMANY

mountain biking routes, and a 60-meter high play area consisting of a pole forest, prismatic play surface, and coal square, all designed to blend the area's industrial heritage with modern recreational opportunities.

- *Halde Hoheward, Herten, Germany is a park on a heap that is built of waste from mining activities. The park is designed in a semi-renaturalised way and offers a good view of the surrounding area. Guided tours are offered about the history of the park and the rehabilitation process.*

Read more:

- Wirth et al. (2018). Green infrastructure: a planning concept for the urban transformation of former coal-mining cities
- Benedict and McMahon (2006). Green Infrastructure: Linking Landscapes and Communities
- Kabisch et al. (2017). Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice

Mixed land-use areas

Mixed land use areas enable a variety of different land uses such as businesses, housing, supply, cultural venues, social infrastructure, as well as public and green spaces. The decision to establish a mixed-use development is dependent on the size of the city, the size of the neighbourhood, and the type of location. Considering contemporary concepts of spatial planning, like the 15-minute city, mixed used quarters can be seen as the 'gold standard' for sustainable spatial development as they will reduce the need for transportation, increase efficiency for resource use, and therefore, avoid land sealing.

A popular example of mixed use quarters in spatial planning is the city of Aspern in Austria. It is one of Europe's largest urban development projects, and was developed as a new, multifunctional urban centre combining housing with office space, premises for manufacturing enterprises and science, research and educational facilities as well as comprehensive urban infrastructure.

Examples for mixed used quarters on former industrial sites are:

- *Belval, Esch-sur-Alzette, Luxemburg: The quarter of Belval was built on the site of a former steel plant and the heritage is still preserved. Today, Belval is a mixed neighbourhood with housing, research institutions, offices and a park. The University of Luxembourg has set up its campus on the site and has created a "city of science". Many start-ups and digital companies have also settled in Belval. Belval has become a mixed-use district that integrates heritage into a contemporary neighbourhood.*
- *C-Mine, Genk, Belgium: The C-Mine in Genk, Belgium, is a former coal mine that now houses cultural facilities, restaurants, art installations and a business park. The site has a visitor centre and serves as a venue for events. It is surrounded by a park with a labyrinth as an attraction. The business park provides space for around 20 companies in the creative industry. For more information about the transition in the region see the case study "Genk's ongoing transition".*

BOX 11: SPATIAL PLANNING NEED TO INTEGRATE CLIMATE ADAPTATION

Climate change adaptation is the process of adapting natural, social and economic systems to the (negative) effects of climate change as extreme weather events such as heavy rainfall, heat waves and storms will become more frequent. The aim is to respond to the impacts that are already being felt and those that can be expected in the future. These changes can have a fundamental effect on the functioning of urban systems and on human health, so it is important to take them into account in spatial planning as well.

Tools:

The EU project NWRM presents measures for climate adaptation with a focus on water retention in agriculture, urban areas, forests and in hydro-morphology. All these measures are described in detail and the benefits of each measure are presented. The project website also features a map with a collection of measures already implemented in EU countries. The EU Climate ADAPT website shares knowledge on adaptation for a climate resilient Europe. It provides information on adaptation in different sectors, case studies, country profiles, and news and events. The website provides useful information and also focuses on climate adaptation and land use planning. The Covenant of Mayors also provides guidance and support for climate adaptation measures on the local level.

Examples:

- Mainstreaming climate change adaptation into urban planning: greyfield land redevelopment in Jena (Germany)
- Multifunctional water management and green infrastructure development in an eco-district in Rouen
- Supporting urban greening and social justice in the city of Barcelona

- *The area around Lake Phoenix, Dortmund, Germany is an example of residential areas on the site of a former steel plant. Lake Phoenix is an artificial lake surrounded by residential and leisure areas. The lake offers many possibilities for leisure activities, and is surrounded by apartment blocks which cover most of the site. Some blocks are mixed use with apartments, offices, restaurants, and cafes.*

More examples:

- *Telliskivi Creative City, Tallinn, Estonia (former industrial site)*
- *Eternitten, Aalborg, Denmark (former industrial site)*
- *Lyon Confluence (internationally considered as a best practice, former industrial site)*

Renewable energy production

Renewable energy development plays a crucial role in former coal regions, not only for a sustainable energy supply but also in terms of creating a new identity and business opportunities for the region. The expansion of renewable energies is heavily dependent on the areas designated for this purpose, and also needs to be steered by spatial planning.

Former coal-industry related sites often have existing infrastructure such as power grids, substations and distribution networks that can be adapted and upgraded to support new land uses, which is a benefit of reusing the sites for renewable energy production. *For instance, in Czechia, the Green Mine Project in the Usti region aims to transform the active mine into a lake with hydro energy storage and floating PV (see picture). In Teruel, Spain, the former coal-fired power plant is transformed into a renewable energy hub, taking advantage of the vast wind energy potential in the region.*

The Technology options toolkit features a broad range of examples for the repurposing of power plants for different kinds of energy production technologies and storage integration.

Mobility and transportation

Coal-related sites often have existing infrastructure such as railways and roads that were used for operations. During revitalisation, this infrastructure can be reused and maintained in a variety of ways. Rails can be continuously used for new public trains if the connection is suitable and there is a demand for transport. If a new rail connection does not fit into the revitalisation concept, the tracks can be used for other modes of transport, such as for streets or cycling paths. Similar principles would apply for existing roads. They should be assessed to see if they are the right size for the mobility needs of the new uses and how they can be transformed to support sustainable modes of transport.

LAKE PHOENIX AND RESIDENTIAL AREAS ON A FORMER STEEL PLANT SITE IN DORTMUND, GERMANY

FLOATING PV PLANTS ENVISIONED AT THE FORMER ČSA COAL MINE IN CZECHIA

Source: Green Mine

Spatial planning through strategic funding design

Securing adequate funding for transformation projects, particularly at the local level, is imperative for supporting the transition towards climate neutrality. CRiT's Transition Financing Toolkit provides an overview about available public funding sources on the EU level and how to set up a dedicated financing strategy. Many of the EU funds can be used for infrastructure and elements that have been defined by spatial planning processes. Green procurement and public budgeting strategies are common tools to support the implementation of spatial plans:

Green procurement

Green procurement is the practice of using products and services that have a reduced impact on the environment and human health compared to competing products or services that serve the same purpose. This approach considers the entire life cycle of a product, from raw material extraction through to manufacturing, use, and disposal, and aims to minimise environmental damage at each stage. Examples of green procurement include the purchase of electric buses, green electricity or choosing sustainable building materials. In spatial planning, green procurement can be used strategically by public authorities to ensure sustainability throughout the process by setting sustainability criteria to be met (e.g. low carbon emissions, good working conditions). The criteria can be used to decide which subcontractors are selected, which measures are implemented, and which materials are procured.

Further reading:

- What does green public procurement mean?
- Role of Green public procurement in improving resource efficiency

Public budgeting

Public budgeting is the process through which governments plan, allocate, and manage financial resources to achieve public policy objectives and provide services to the community. By implementing green, social and gender budgeting, public budgeting can be used to reach a more sustainable outcome. In spatial planning, green, social and gender budgeting can be used to identify policies that contribute to a sustainable spatial structure.

Green budgeting is the integration of environmental and climate change considerations into budgetary policy-making. In spatial planning, green budgeting can promote the social and environmental aims of spatial planning, and avoid non sustainable practices such as further land consumption or building new roads for individual motorised transport. Instead, budgets can be planned for measures that support sustainable spatial planning such as inner urban development, renovation and repurposing of existing buildings, green roofs, renewable energy, climate adaptation or public transport.

Read more: Green budgeting in the EU and OECD Green budgeting guidelines

Social budgeting is the process of integrating social objectives and considerations into the planning and implementation of public budgets. In spatial planning, social budgeting can ensure a just distribution of spaces as for example by supporting social housing, accessible spaces, the introduction of a land use policy oriented towards the common good or a high amount of accessible and multifunctional public spaces.

Read more: UNICEF-European Commission Social Budgeting Toolkit

Gender budgeting is a strategy for integrating a gender perspective into the budgeting process and thereby to reduce inequalities. In spatial planning, gender budgeting can be used in order to promote measures that improve the everyday life for women in public spaces: creating safe spaces (e. g. enough light at night, safe street crossings, safe pedestrian walks and bike lanes) or to create affordable mobility options that take into account the often more complex travel chains of women (work, shopping, dropping off and picking up children).

Read more: Gender Budgeting - How can we apply gender budgeting in the EU Funds? Practical tools and Member State examples

Helpful tools

Digital spatial planning tools

Digital spatial planning tools offer several advantages over traditional methods such as enhancing the efficiency, accuracy, and effectiveness of spatial planning processes.

- **Computer Aided Design (CAD)** programmes help to visualise data as spatial plans or urban designs and to demonstrate possible pictures of a city. CAD programmes offer a wide range of instruments and can be used for 2D and 3D illustrations. Building Information Modelling (BIM) can also be done with CAD programmes and depicts a building with all its aspects in 3D. BIM facilitates the design, visualisation and documentation of construction projects.
- **Geo Information Systems (GIS)** provide a wide range of tools for spatial analysis and display of spatial data. They can generally be used to produce maps and analysis and the results can be used as a basis for decision making.
- **Spatial simulation and modelling tools** can be used to analyse, interpret and depict possible scenarios. Simulation and modelling is useful for a wide range of applications across various fields such as:
  - **Transport modelling** is used to design and optimise transportation networks, model traffic flows, and improve public transport systems. Spatial models can predict congestion and identify areas needing infrastructure improvements.
  - **Disaster Management** is useful in predicting and assessing the impact of natural disasters such as floods, earthquakes, and hurricanes. Spatial models aid in emergency planning, risk assessment, and resource allocation during disasters. This approach can be applied in the planning process for climate adaptation (see Box 11).
  - **Environmental modelling** helps to analyse ecological data, model habitat distribution, assess environmental impacts and manage natural resources. It helps in planning and understanding the effects of climate change. In coal regions, contamination may also be an aspect that could be considered in spatial modelling and used to illustrate potential environmental impacts, and to identify spatial planning constraints. This method can be applied in the planning process for green infrastructure, climate mitigation and adaptation.
  - An **urban digital twin** is a virtual representation of a city's physical assets, processes, and systems which is continuously updated with real-time data to reflect the current state of the urban environment. This digital replica integrates data from multiple sources, including sensors, technical devices and historical records, to create a comprehensive and dynamic model of a city. By using real-time data and advanced analytics, cities can become more responsive to the needs of their residents.
- **Statistical software** can be used to analyse quantitative data such as survey results, population statistics, data on air quality or property prices and present the results for use in decision making. Statistical analyses range from descriptive statistics such as frequency distributions to more complex analyses such as regression or multivariate analysis.
- **Flood or subsidence maps** are specialized cartographic tools used to visualize and assess areas at risk of flooding or land sinking. These maps typically show the extent of potential inundation or ground settlement, often using color-coded zones to indicate different levels of risk or severity. They serve as crucial resources for urban planning, emergency preparedness, insurance assessments, and public awareness. *The rainman project offers a useful toolbox for risk reduction measures, including several case studies and practice examples.*

Read more: Behnisch and Meinel (2018). Trends in Spatial Analysis and Modelling

Rocha and Tenedorio (2018). Spatial Analysis, Modelling and Planning

SWOT analysis

A SWOT analysis is a strategic assessment tool used to identify and evaluate the Strengths, Weaknesses, Opportunities, and Threats of a scenario. In spatial planning, a SWOT analysis can be conducted to analyse possible effects of a plan on a particular area or region. It helps planners understand the internal and external factors that can affect the spatial development and management of an area, facilitating informed decision-making and strategic planning.

Read more: SWOT Analysis - EXACT External Wiki

Strengths: **Internal attributes** of the area that generate advantages and should be leveraged	**Weaknesses** **Internal attributes** that are disadvantages and need improvement
Opportunities **External factors** that the area could exploit to its benefit	**Threats** **External factors** that could pose challenges or harm the area's development

TABLE 1: ELEMENTS OF A SWOT-ANALYSIS
Source: Own depiction based on EXACT External Wiki.

Trade-off analysis

A trade-off analysis in spatial planning is a helpful tool for making decisions about competing objectives or competing interests in developing areas. It involves assessing the benefits and costs associated with different spatial options or scenarios, considering the trade-offs between various competing factors. For this, ranked lists or matrix-based techniques may be used. By systematically analysing trade-offs, spatial planners can strive to achieve sustainable and balanced development that meets the needs of current and future generations. In coal regions, trade-off analyses can be used to compare different options, such as which new land uses should be developed, and whether buildings should be modernised or demolished.

Read more:

- Trade-off analysis
- A systematic review of the methodology of trade-off analysis in agriculture

Material flow analysis (MFA)

A material flow analysis is a systematic method used in urban planning to quantify the flow of materials and energy within a city or urban area. The analysis considers the goods and materials and their dynamics in a system. It helps planners to understand how resources are consumed, transformed, and discarded within an urban system, providing insights for more sustainable resource management and waste reduction. Material flow analysis can help to optimise resource use and reduce waste, to develop lower emission impact on urban systems, and identify opportunities for recycling and reuse in a circular economy (e. g. building materials). In coal phase out regions, a material flow analysis can be conducted in order to steer a more sustainable development by depicting material flows and showing options for reuse and recycling of materials.

In order to define the scope of the analysis, four methodological decisions should be made prior to the analysis: Setting the temporal scope, the spatial scope, the material scope and the system modelling approach.

Read more:

- REPAiR Project
- Wang et al. (2020). An urban material flow analysis framework and measurement method from the perspective of urban metabolism.

Life Cycle Assessment

A Life Cycle Assessment (LCA) aims to describe the life cycle of a building (or product) throughout its lifetime and to evaluate its environmental impact during the whole life cycle (see Figure 12). The stages of a life cycle range from the extraction of raw materials to demolition and recycling of materials. In spatial planning in coal+ regions, a Life Cycle Assessment can be useful in decision making to assess the environmental impact of different options and to choose a less harmful option. For example, it can weigh whether to maintain and modernise an existing building or construct a new building. A life cycle assessment can also estimate how long these options could be maintained.

Read more:

- Building Life Cycle Assessment
- Project EFIResources: Resource Efficient Construction towards Sustainable Design

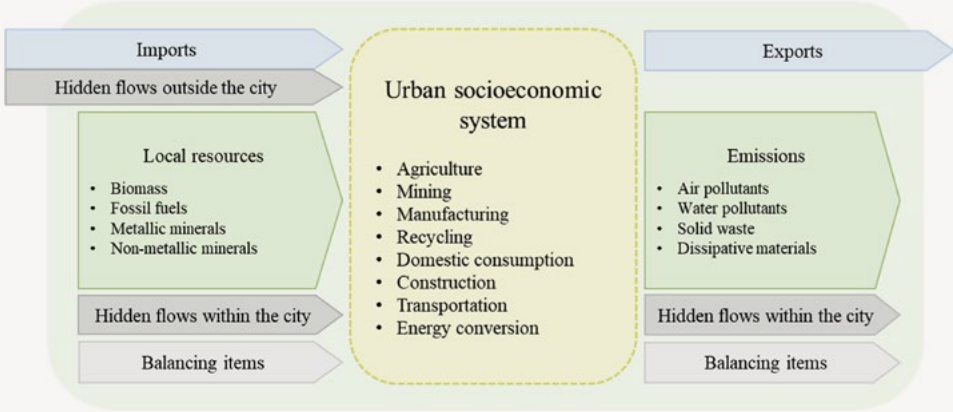

FIGURE 11: OVERVIEW OF A MATERIAL FLOW ANALYSIS

Source: Wang et al. 2020

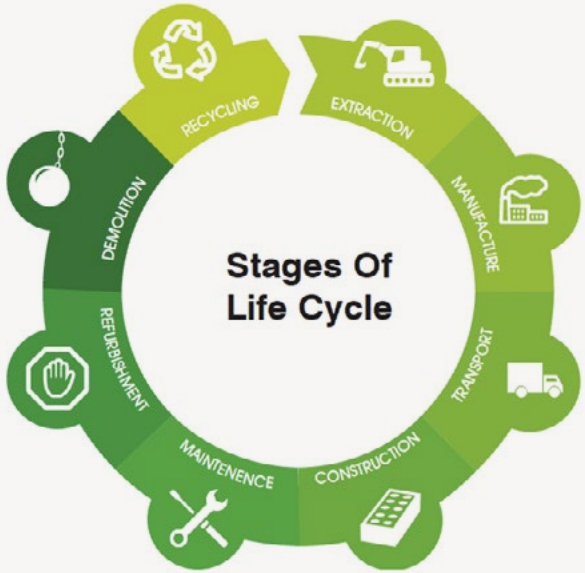

FIGURE 12: MAIN STAGES OF A LIFE CYCLE ASSESSMENT

Source: Envirolink

Further reading

Benedict M.A., McMahon E.T. (2006). Green infrastructure. Linking landscapes and communities. Island Press, Washington, DC https://link.springer.com/article/10.1007/s10980-006-9045-7

Commission for Environmental Cooperation (CEC) (1997). The EU Compendium of Spatial Planning Systems and Policies Commission of the European Communities. Luxembourg, LU: EU Publications Office.

Colantonio, Andrea, und Timothy J. Dixon (2011). *Urban Regeneration & Social Sustainability: Best Practice from European Cities*. Real Estate Issues. Chichester, West Sussex, UK ; Hoboken, NJ: Wiley-Blackwell.

Dühr, Stefanie (2021). „Investigating the Policy Tools of Spatial Planning". *Policy Studies* 44, Nr. 2 (4. März 2023): 258–75. https://doi.org/10.1080/01442872.2022.2040473.

ESPON (2018). COMPASS – Comparative Analysis of Territorial Governance and Spatial Planning Systems in Europe. Final Report. Esch-sur-Alzette: ESPON.

European Commission (2013). Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions. Green Infrastructure (GI)—Enhancing Europe's Natural Capital. COM(2013) 249 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52013DC0249

Fernández Agueda, Beatriz. „Urban Restructuring in Former Industrial Cities: Urban Planning Strategies". *Territoire En Mouvement*, Nr. 23–24 (30. November 2014): 3–14. https://doi.org/10.4000/tem.2527.

Jan Gehl (2010). *Cities for People*. Washington, DC: Island Press. https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib,uid&db=nlebk&AN=348250&site=ehost-live&scope=site.

Kabisch, Nadja, Horst Korn, Jutta Stadler, und Aletta Bonn, Hrsg. (2017). *Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice*. Theory and Practice of Urban Sustainability Transitions. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-56091-5.

Lombard, John R., Eliahu Stern, und Graham Clarke, Hrsg. (2017). *Applied Spatial Modelling and Planning*. London ; New York: Routledge, Taylor & Francis Group.

OECD (2017). The Governance of Land Use in OECD Countries: Policy Analysis and Recommendations. Paris: OECD Publishing. https://www.oecd.org/en/publications/2017/05/the-governance-of-land-use-in-oecd-countries_g1g74afc.html

Reicher, Christa (2022). *Urban Design*. Wiesbaden: Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-34370-5.

Reimer, Mario, Panagiōtēs Getimēs, Hans Heinrich Blotevogel, und Akademie für Raumforschung und Landesplanung Hrsg. (2014). *Spatial Planning Systems and Practices in Europe: A Comparative Perspective on Continuity and Changes*. First edition. London New York: Routledge, Taylor & FRancis Group.

Rocha, Jorge, und José António Tenedório, Hrsg. (2018). *Spatial Analysis, Modelling and Planning*. IntechOpen. https://doi.org/10.5772/intechopen.74452.

Umweltbundesamt (2022). Structural change in coal regions as a process of economic and social-ecological transition – Lessons learnt from structural change processes in Germany. https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2022-01-04_cc_33-2021_lessons_learnt_from_structural_change_processes.pdf

Zoppi (2020). Ecosystem Services, Green Infrastructure and Spatial Planning. https://mdpi-res.com/bookfiles/book/4114/Ecosystem_Services_Green_Infrastructure_and_Spatial_Planning.pdf?v=1718326932

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Lead author
Jannis Beutel, Wuppertal Institute
Carolina Krome, Wuppertal Institute

Reviewers
Michael Buschka, Wuppertal Institute
Lynn Verheyen, Wuppertal Institute
Timon Wehnert, Wuppertal Institute

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secretariat@coalregions.eu

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