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## POLICY BRIEF

# ENACTING POSITIVE TIPPING POINTS TO ACCELERATE LOW-CARBON, CLEAN ENERGY TRANSFORMATIONS IN COAL AND CARBON INTENSIVE REGIONS

**Work Package:** 7

**Leading Organisation:** GCF

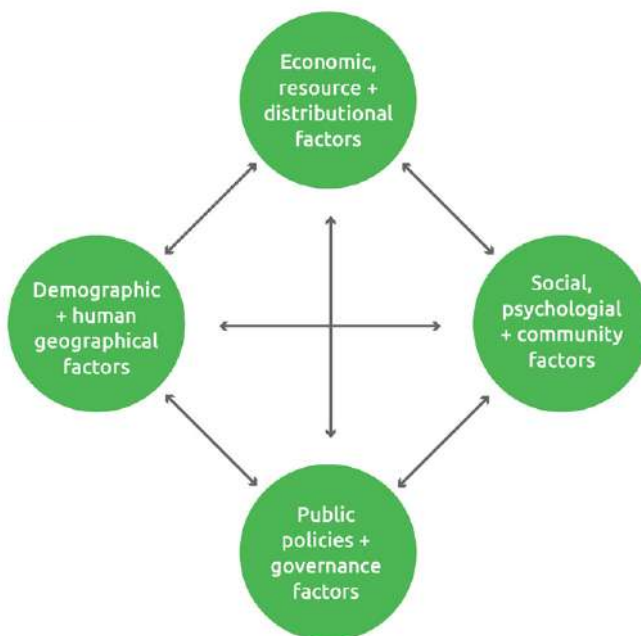
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## Introduction

The TIPPING+ project brought together an international team of social and interdisciplinary scientists who looked at regional dynamics from various angles to study deliberate, fast, low-carbon sustainable transformations in the energy domain. These different perspectives included: (a) human geography and geography (ii) anthropology and social psychology (b) political science and governance studies and (iv) economics. Policies oriented to support deliberate, fast and structural transformations towards low-carbon sustainable development in Coal and Carbon Intensive Regions (CCIRs) can benefit from focusing their efforts on a series of strategic, relatively small actions which the highest potential for systemic change. When this happens, we refer to these processes positive tipping points.



Tipping phenomena are characterized by three main temporal and structural dynamics:

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**1. GENERATING THE ENABLING TRANSFORMATIVE CONDITIONS FOR SYSTEMIC CHANGE:** Deliberate endogenous policy interventions can lead to cumulative changes in the cultural, socio-economic and political conditions within the contexts in which eventually tipping events may occur, which in turn can enable transformative change.
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**2. TRIGGERING THE TIPPING POINT:** A specific additional strategic policy or event can trigger and accelerate an abrupt, structural, qualitative change in a socio-economic system and precipitate the emergence of alternative development trajectories.
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**3. HARNESSING THE POTENTIAL OF THE NEW SYSTEM'S CONDITIONS:** After a tipping point is crossed, new conditions and regional configurations emerge that generate disruptive developments within the system or across multiple systems.



## 1. Generating the conditions for systemic change:

### Recommendations:

- a) Enable positive tipping points in low-carbon pathways by building transformative capacities, networks, and conditions conducive to deliberate systemic change.** This may be achieved by implementing a combination of policy measures (financial incentives, environmental regulations, public investment, public-private partnerships etc.) and by supporting public campaigns aimed at raising awareness and introducing new narratives about the region's future vision for example, consumption and production alternatives.
- b) Create the conditions for actors' second-order learning – doing reflexively things differently under a different paradigm, e.g., low carbon and sustainability principles).** This may be achieved by expanding actions beyond the governance of energy transition to include a whole set of system dimensions and actors' interactions to achieve broader systems' reconfigurations. Enabling conversations between different visions of the future that integrate broader issues of community welfare, cultural diversity, trust in policy and good quality of life, play a fundamental role in tipping regional systems toward sustainability trajectories.
- c) Boost engagement and empowerment of citizens and communities with a special emphasis on equity** by connecting multiple transformations in individual and collective behaviours, lifestyles and social practices in a way that creates synergies across multiple domains and scales in society.

### Case study examples:

In **Sulcis (Italy)**, the historical importance of coal to community livelihoods and identity significantly influenced policy and technology dynamics. Place-related memories, identities, and meanings tied to coal hindered efforts to destabilize and phase-out of coal. Compounded by the potential for income and job losses in a predominantly coal-dependent economy, substantial exit costs from past investments in coal and carbon-intensive industries, and limited preparedness for alternative energy sources, these factors collectively shaped the region's response to disruptions. They impeded the development of alternative visions, identities, and pathways for the region, undermining community capacity to leverage windows of opportunity. Without accounting for these crucial elements, attempts to destabilize and tip CCIRs toward a low-carbon trajectory can be lived as threats and disturbances leading to uncertainties and chaos. In tandem with fostering alternative job markets, economic sectors, and energy sources to tackle the entrenched techno-economic and socio-political factors of coal stability, the formulation of alternative pathways that mobilize place meanings and imaginaries holds the potential to generate legitimated and actionable narratives that can serve to identify policy mixes to guide a just destabilization-reconfiguration pathway.

In **Carloforte (Italy)**, stakeholders unanimously cited energy consumption reduction and subsequent cost savings as their main incentives for participating in renewable energy projects at household level, thus describing themselves as consumers, rather than as citizens or actors of a socio-environmental change. The lack of coupling of technological change with cultural transformation can slow the adoption of sustainable technology and can slow down or even impede the transition. It is crucial for policy makers to understand the socio-cultural preconditions that determine the engagement of local communities in rapid policy-driven fast energy decarbonisation processes. Policy makers must find venues for developing strategies that go beyond deploying individual solutions and consider a second-order framing for collective reflexivity and opportunities for reorganisation, e.g., at community level. This requires beforehand preparing the conditions for systemic change while empowering citizens to move from a consumer to a prosumer mentality.

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In **Indonesia**, the acceleration of adopting proactive measures to transition to low carbon is conditioned by the transformative narratives carried by the actors occupying important political and economic positions in the country. The identification and characterisation of two competing narratives on low-carbon energy transformation -one focused on private and polycentric actors' engagement, and the other based on top-down government involvement- helps to support mutual learning and reframing of original policy strategies. There is a need to consider weak-ties agents like civil society groups and private firms at the local level with their transformative narratives to participate in regional sustainable development goals directly. Therefore, it is important to note the significance of the relationships between the narratives and the social-ecological networks' structure and dynamics, enabling the creation of new, transformation-oriented narratives.

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In **Austria**, efforts to use green hydrogen to produce climate neutral basic materials have been promoted by large and highly emitting companies such as those in the steel and cement sectors. These companies are seen as frontrunners and their technological experience will hopefully spill over to small and medium-sized companies, hence leading to a self-amplifying positive dynamic. However, important prerequisites for scaling-up green hydrogen technologies are the expansion of renewables, the upgrade of the electricity grid as well as the development of transport infrastructure for hydrogen and CO<sub>2</sub>. Investing in the expansion of renewables and the shift from fossil-fuel based to green electricity-based industrial processes is a prerequisite for sustaining in the long term the development of other green technologies and infrastructures at large scale.

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In **Upper Silesia (Poland)**, while there is general agreement to preserve the region's coalmining heritage and respect its history, transformation is seen today as an opportunity to comprehensively carry out major processes that would inevitably take place sooner or later due to increasingly difficult coal extraction conditions and the mining industry's economic situation. Gaining trade union approval of the mine closure program represents a major tipping intervention on the transition pathway. The gradual phasing-out of coal production has also been incorporated into regional development strategies ("Green Silesia 2030") and has become the focal point of the Territorial Just Transition Plan. These changes are constantly reinforced by the vital role of regional authorities and the European Union as leading actors in mainstreaming energy and climate policies.

Building transformative capacity in Upper Silesia is also led by regional authorities. The actions focus on strengthening the engagement of stakeholders in implementing and monitoring structural changes in the region. This is done, for example, by establishing an advisory and consultative council under the Marshal of the Silesian Voivodeship, including representatives from all the groups that participated in developing the TJTP and the social dialogue around this project. Regional scientific and research institutions are also actively involved in building transformative capacities and carrying out projects that provide documentation and assessment of mining and post-industrial areas regarding their reclamation and reuse. These may serve as examples of possible steps to enhance the wide range of stakeholders' engagement in the decision-making process for investments and transition projects. This way, the knowledge developed during the mining development period is harnessed for transition needs and can be utilized within the new paradigm.

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In **Essen and Duisburg (Germany)**, the transition process away from coal has been taken place within the wider structural change of the Ruhr Region. Both cities experienced incremental changes in their demographic dynamics, economic structures, and political arrangements, none of them crossed a tipping point in their transition process yet. However, distinct developments in the cities' policy narratives suggest that their future trajectories will diverge. While Duisburg builds on the old narrative of continued and new heavy industry structures, Essen has formulated an alternative vision for the city, departing from the old mining image towards a greener future. Although success and prosperity are still uncertain, the developmental bifurcation is likely already happening. The strategies to influencing the local narrative building as well as focus on local strength and capacities appear as key mechanisms also relevant for other coal communities in their transition process. These interventions, whether they trigger tipping or not, are still necessary and useful steps towards a prosperous to enable a just transition process and pursue a prosperous future beyond coal.

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## 2 . Triggering the tipping point

### Recommendations:

- a) Identify – at a technological level – windows of opportunity, intervention points with high leverage potential and combinations of intervention points** that can help a relatively small change i.e., in innovation or investment to create disruptive effects once the conditions for systemic change have been prepared. This entails assessing potential thresholds of feasibility, affordability, and profitability (i.e., of a novel technology), which can be done by incentivising **low-carbon innovators to engage and develop chains and networks of low-carbon innovators and service providers**. For example, providing mechanisms matching low-carbon services and products and business needs can lead to significant time and resources savings. By linking mutual low-carbon gains and economic benefits, businesses can achieve higher levels of eco-efficiency, new forms of collaborative innovation leading to higher competitiveness, and creating more resilient regional economies, aligned with the objectives of the EU Mission on Climate Change.
- b) Use public engagement and awareness raising programs** to enable strategic shifts in behaviours from denial to acceptance of a critical segment of the population, which may catalyse positive feedback effects enabling acceptance and actively favouring the new low-carbon energy paradigm. **Changes in behaviour and social norms usually follow a non-linear dynamic:** once a message is adopted by a **critical mass** of population, self-reinforcing expectations may accelerate positive feedback loops, self-propelling transformation processes and overcome resistance to change.
- c) Equip key actors with the transformative capacities** needed to achieve sustainable development goals at the local level. **Regional visions, plans and strategies, as well as new institutional arrangements such as boundary organisations and communication networks** can be used to ensure an active role and commitment of key actors involved about the expected outcomes. Such visions, plans and strategies can provide individuals with a sense of ownership to implement their own pathways towards decarbonisation, and open new opportunities for achieving transition tipping points in their region. **Participatory approaches including diverse stakeholders, considering multiple time scales** and linking transitions of various regions help actors' active involvement and engagement.

### Case study examples:

In **Andorra (Spain)**, the Just Transition Agreement has created a participative vision for the regional development of the region shared by key stakeholders, which focuses on improving employability and working conditions of women and groups facing difficulties to access the labour market, such as the long-term unemployed, people with disabilities, population at risk of exclusion and the youth. To grant evacuation rights of the 1,200MW that were left free after the closure of the coal plant at the connection point known as Nudo Mudéjar, the Spanish Institute for Just Transition issued a tender with just transition criteria to which companies had to submit a diversified industrial plan to be developed in the region which creates green jobs (especially for women and youth), promotes self-consumption and energy communities, generates municipal income and fulfils strict technical and environmental standards.



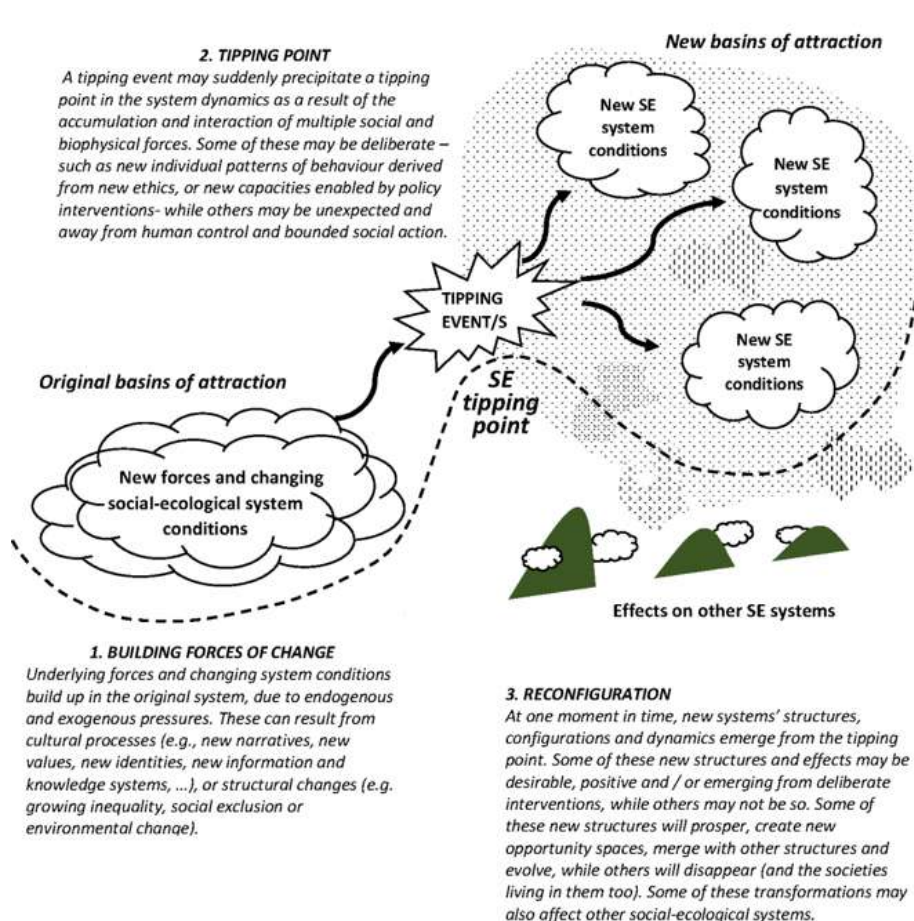
Cooling towers of the Andorra thermal power plant being demolished on 13 May 2022. Photo courtesy of Andorra City Council.

In **Civitavecchia (Italy)**, coal power plants were installed in the 1950 after the city was reduced to rubble in the second world war. They played an important role in a progress narrative about generating jobs and professional qualifications for young people. In 2019, Italian national integrated energy climate plan was published and stated that by 2025 all Italian coal-fired power stations should stop operating. Consequently, it was planned to convert the Civitavecchia existing coal plants to gas. This plan led to opposition from local environmental groups, which decided to engage directly in generating a socio-technical alternative to the continuation of fossil fuel. By establishing alliances with experts and professionals, the alternative generated focused on the energy conversion of the Civitavecchia port (Porto Bene Comune), envisaging the use of green hydrogen to make the port the first zero emission port in the Mediterranean. A second alternative was based on renewable energy based on an offshore wind farm with a total capacity of 270 MW and an annual production potential of approximately 935 GWh, which would have an employment impact in Civitavecchia of 300 to 1,000 jobs. The environmental impact assessment of the project started in June 2022.

In the **Lofoten archipelago (Norway)**, visions of a future dependent on income from offshore petroleum were replaced by alternative future trajectories outlined as a consequence of strong local and national opposition to oil development plans for the region. The emergence and then the collective adoption of an alternative oil free Lofoten vision as a desirable future for the region was rooted in place-based and community-driven engagement, in partnership with national political forces who, based on the increasing popular resistance to oil development and the worry that it might have detrimental environmental effects on the pristine marine ecosystems of the region, could argue for an alternative to oil that made sense both locally and nationally.

It is important for policy makers to understand how such social tipping processes can lead to the exit from fossils fuels and to identify potential agents of transformation that can trigger such social processes. By following the micro-socioecological aspects of destabilizing the 'naturalness' of fossil energy and the practices that disrupted its reproduction and expansion, the conditions of acceptability had been constructed by what started as minority groups which gradually acquired social consistency and legitimacy to decisively oppose fossil energy.

<https://council.science/current/blog/enabling-positive-tipping-points-towards-global-sustainability-in-uncertain-times/>



### 3. Harnessing the potential of the new system's conditions:

#### Recommendations:

- a) **Anticipate possible tipping scenarios and encourage preparation:** Provided that it is not possible to know fully beforehand, whether or when a tipping point will occur and what the exact consequences of these tipping points on the original regional system will be, anticipation is key. Participatory scenario planning and other foresight approaches as well as integrated assessment and system thinking can help exploring various tipping scenarios. These can help to plan and prepare for possible disruptive processes across various dimensions and ensure more equitable transition outcomes.
- b) **Promote (further) diffusion and upscaling of transformative capacities and networks** to sustain the new system's conditions after the tipping point has been crossed. Connecting innovative technologies with mechanisms leading to multiplying co-benefits in different domains and sectors, e.g., in a form of industrial ecosystems is a successful way to promote scaling. When doing so, consider the **effects disruptive developments may have across multiple socio-cultural, political and economic dimensions and alternative development pathways, with particular attention on equity**. Managing and enhancing cascades of positive feedback loops may affect other sectors and systems and may impact distributional and environmental aspects. For example, low-carbon transitions may increase capital concentration, impact positively or negatively equity issues and negatively affect biodiversity.
- c) **Anticipate the consequences of upscaling novel technologies**, considering not only whether the technology is mature enough to replace the incumbent, but also the **implications for the whole system** (including the material – infrastructure/ industry, and immaterial regime – politics, regulations norms) in which the technology is embedded. This includes **workforce availability, re-skilling needs**, the impact on the whole **supply chain** and the required **infrastructure investments** (e.g., for updating energy grids to include a significant share of renewables into the energy mix).
- d) **Empower and support regional leadership in CCIRs**. Help building regional coalitions of action of regional leaders able to demonstrate the feasibility of implementing alternative and sustainable development pathways, following a long-term, place-based transformative, low-carbon vision. Pay particular attention to engaging women, the youth, and vulnerable groups in the regions.

#### Case study examples:

In the **South-Moravian Region (Czech Republic)**, black coal was mined in the Rosice-Oslavany coal basin till 1992, while the mining of brown coal in South-Moravian lignite basin was terminated in 2009 due to economic unprofitability. The transformation of regional economy based on traditional sectors, such as mechanical and electrical engineering and textiles industries to high-tech industries, such as electronics, telecommunications or computer technology succeeded especially thanks to the strong leadership of regional and local politicians and steady inflow of foreign direct investment through joint-ventures, takeovers or greenfield investments taking advantage in the strategic geographical location of the region and its capital Brno on the intersection of trans-European long-distance roads and rail routes. The region effectively used the potential of post-industrial brownfields for new developments and has been effectively re-branding the regional identity from an industrial to an innovative, educational, cultural, and hospitable region (tourism development). While the region has been quite successful in implementing of solar energy, the realizable potential of wind energy is far from being effectively utilized. The investments in green economy might be an answer to the further economic restructuring during the energy transition, where good practice examples and transfer of knowledge are necessary.

In **Megalopolis (Greece)**, following national mandates, the lignite power plants will be shut down by 2025. Due to the shutdown, citizens are expected to face the loss of the lignite-fuelled district heating network, which supplied cheap space heating energy to households. The energy transition plan of Megalopolis foresees the construction of 550MW of solar parks, and all the energy will be fed to the grid. Furthermore, a natural gas distribution network is being developed, and all households in Megalopolis are being supplied with a new natural gas boiler free of charge. Even though this might be seen as a favourable change for the citizens, as they avoid the burden of investing in a new heating means, the anticipated long-term-consequences of relying on natural gas for heating have not been properly analysed. Analysis showed that by covering 90% of the city's electricity demand with direct solar energy from the solar parks of the region, and using heat pumps instead of natural gas for heating, could save households 1700€ per year, therefore leading to tangible positive effects for the citizens in the long-run.





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## About TIPPING+

TIPPING+ provides an empirical in-depth social science understanding of fundamental changes in sociodemographic, geographical, psychological, cultural, political, and economic patterns which give rise to Social-Ecological Tipping Points (SETPs), both positive and negative in relation to socio-energy regional systems. Such empirical and theoretical insights sheds new light on the interdependencies between changes in regional socio-cultural structures and the technological, regulatory and investment-related requirements for embracing (or failing to embrace) low-carbon, clean-energy and competitive development pathways in selected coal and carbon intensive case study regions (CCIRs). The overall goal is to understand why and under which conditions a given social-ecological regional system heavily dependent on coal and carbon-intensive activities may flip into a low-carbon, clean energy development trajectory – or on the contrary may fall into an opposite trajectory with all its negative implications. Towards this goal, main focus of TIPPING+ is the participatory co-production of knowledge on the driving forces and deliberate tipping interventions leading to the emergence of positive tipping points toward clean energy transitions in European CCIRs.

[www.tipping-plus.eu](http://www.tipping-plus.eu)

## PARTNERS



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