PART II

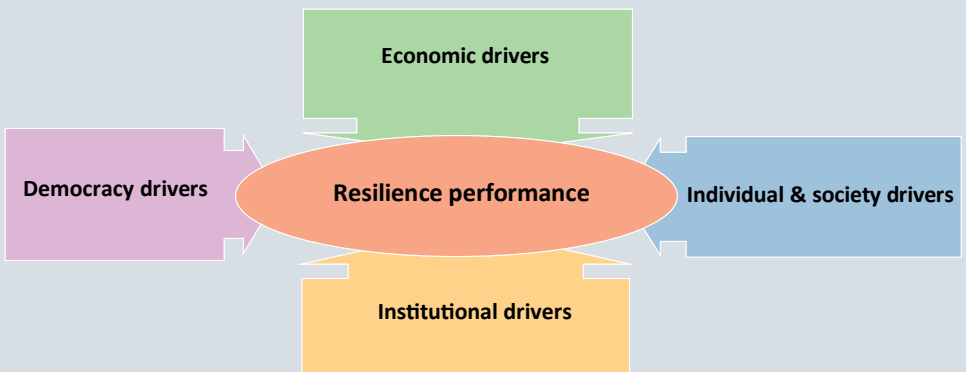
RESILIENCE CAPACITY

The resilience capacity assesses the general pre-shock capacity of a country or region to resist and bounce-back or even bounce-forward from a crisis. It implies to identify and to measure the conditions or driving factors that are hypothesized to position the country/region to respond and recover better (Foster, 2011). It can comprise three different dimensions: absorptive, adaptive and transformative capacity. Absorptive capacity is used to minimize exposure to shocks and pressures by applying preventive measures and appropriate coping strategies to avoid or diminish the negative impacts. Adaptive capacity adds proactive and knowledge-based choices that imply a good understanding of the mechanisms of change. Finally, transformative resilience is driven by complex governance mechanisms and community networks, policies and regulations, infrastructure etc. that enable systemic changes (TANGO, 2018).

The scientific literature uses an enormous number of indicators as proxies for resilience capacity. One can consider it as an "ill-structured" problem, meaning that there is no single solution, formula or set of indicators that can illustrate the capacity of territories to be resilient. Therefore this atlas proposes a structure of indicators integrated into a general resilience capacity index that can be relevant in this case but it should not be taken as a final product/outcome as it could be completed in the future with other relevant drivers.

Nevertheless, in the context of our approach, resilience capacity can be considered a predictor for (future) resilience performance. It also comprises multidimensional drivers that are potential indicators for the ability of the regional or national system to resist and recover. It is a top-down approach that is useful as it applied similar and homogenous indicators for all regions which makes possible common interpretations or comparisons and the replication of the model to other scales or territories.

The conceptual framework grounding the Resilience Capacity Index



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The conceptual framework grounding the resilience capacity analysis is highlighted in the figure above. This has been operationalized by following a two-step methodological approach, as follows:

1. Selecting the significant drivers explaining the resilience capacity

While the Resilience Performance Index was designed to measure the behavior of different systems in the wake of shocks, the Resilience Capacity Index takes a step further in order to explain this different behavior across EU regions. Therefore, the Resilience Performance Index, as well as the two embedded components (resistance and recovery) were modeled in order to find the significant drivers that may explain the variant resilience capacity across regions. The following econometric model was estimated:

$$Resilience_i = \alpha + \delta \sum_{j=1}^{R} \omega_{i,j} Resilience_j + \beta X_i + c_i + v_{i,t}, \; u_i = \delta \sum_{j=1}^{R} \omega_{i,j} u_j + \varepsilon_i$$

where $Resilience_i$ represents the value of the resilience index for region i, X_i includes a set of potential determinants that have been added in the model to explain resilience, C_i are the country fixed effects which account for the unobservable time invariant effects specific to each state, and $\boldsymbol{\varepsilon}_i$ is the residual term. Given that spatial dependence was shown to be an issue, a spatial lag of the dependent variable was also included, as well as a spatial error term (in the models where the spatial lag was not sufficient to solve the spatial dependence of errors). Thus, $\boldsymbol{\omega}_{i,j}$ is an element of the spatial matrix Ω of dimension $R \times R$. Besides the model explaining the Resilience Performance Index, the same potential determinants were also tested in alternative models that separately explain its resistance and recovery components. The specification is similar to that presented in the equation above, except for the dependent variable.

2. Designing the Resilience Capacity Index by aggregating the significant drivers

As derived from the scientific literature on resilience, a total of 31 potential drivers were tested. The correlation matrix has guided us in choosing the variables that should not be included simultaneously in the model to avoid possible multicollinearity problems. One needs to mention that the same determinants were included in each of the three models, namely the one explaining the Resistance Index, the Recovery Index and the Resilience Performance Index. Following the econometric analysis, 11 drivers were finally selected and their full description can be found in the table from page. 81. Once the drivers were shown to be significant in explaining the resilience performance, following the cross-section analysis, the Resilience Capacity Index could be replicated in dynamics, according to data availability (2007–2017). Similar to the Resilience Performance Index, the aggregation of the 11 indicators included in the Resilience Capacity Index was carried out by using the principal component analysis. The weights applied were computed following Nardo et al. (2008) and can be consulted in the table from page 81.

Finally, the cartographic expression of resilience capacity brings valuable insights into the territorial similarities and dissimilarities, highlighting groups of regions that confront issues that have to be addressed. Therefore, illustrating resilience capacity through maps could serve policy making by indicaing the priority areas for intervention.