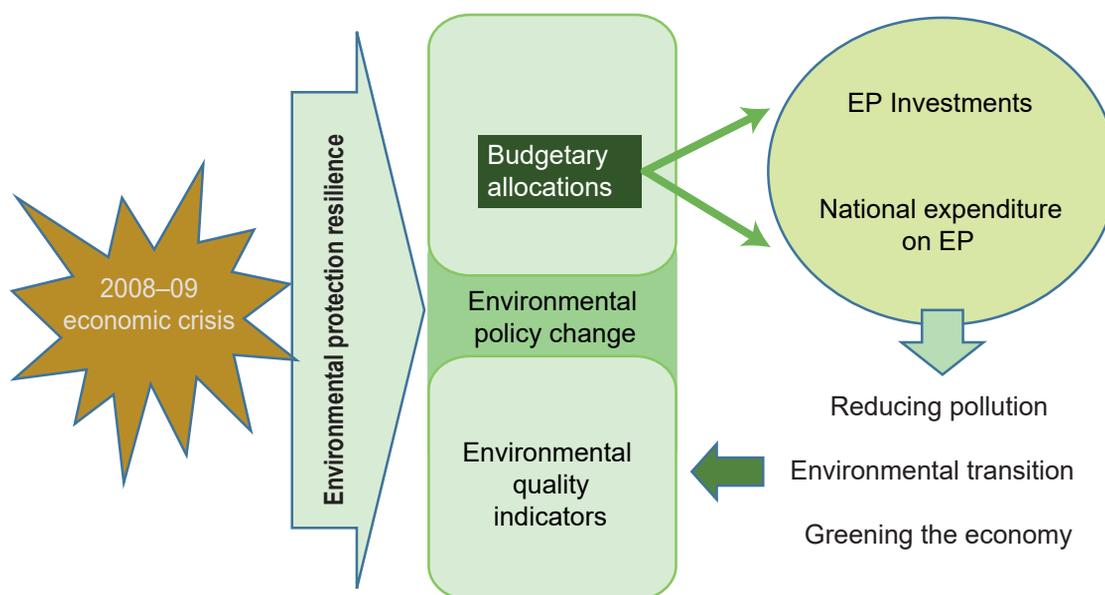
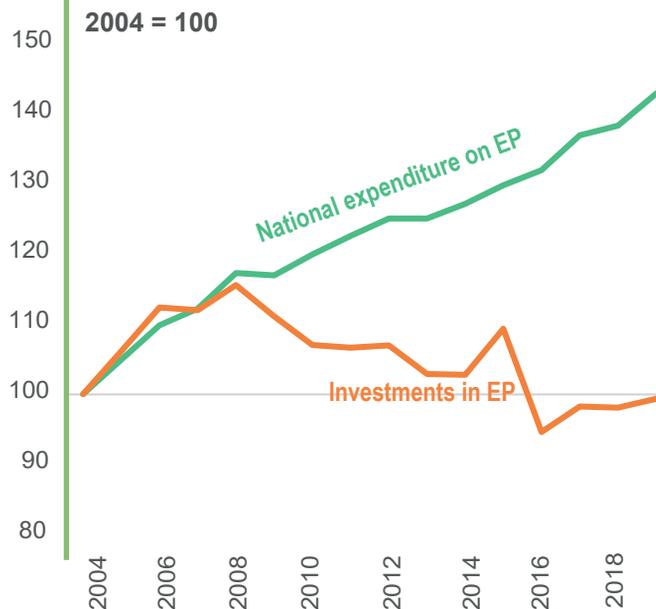


Environmental (protection) resilience

Environmental protection (EP) and economic performance can be seen as either competing objectives with inevitable trade-offs between them, or, on the contrary, as convergent and compatible development pillars (Skovgaard, 2014). Overall, the economic crisis negatively affected the place of environment on the list of EU countries’ priorities, as incentives to develop a greener economy have weakened. Nevertheless, some countries strengthened efforts to achieve low-carbon economic development and environmental sustainability during the crisis (OECD, 2009). Measuring change in environmental policies is rather difficult, but achievable. One solution would be to consider changes in budgetary allocations such as national expenditure on EP and investments in EP as key indicators of the commitment to existing environmental policies, and the potential impact of economic recession on the environment (Lekakis and Kousis, 2013). They can highlight changes in environmental policies and can be associated with certain dynamics of environmental quality indicators. Maintaining the budgetary allocations during a crisis or returning to the previous allocation immediately after the crisis demonstrates resilience and efficiency of environmental policy and contributes to reducing pollution, greening the economy and transitioning to a low-carbon society.



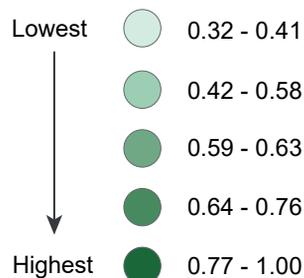
Dimensions composing environmental protection resilience



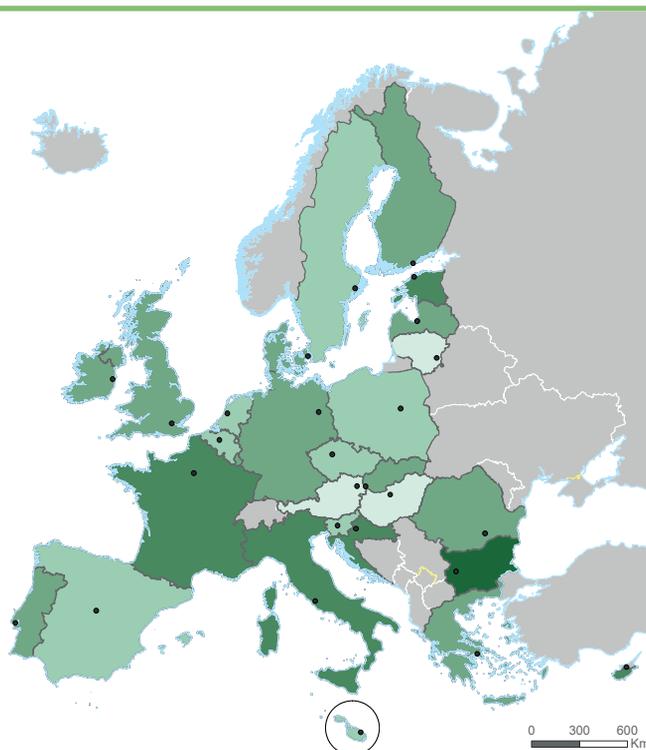
EP expenditure includes measures to prevent, reduce and eliminate pollution and other types of environmental pressure. From 2008 to 2011, at the EU28 level, the national expenditures on EP decreased by 5.4% while the GDP had a drop of only 2.3%, suggesting that EP was more affected compared to other sectors. In the same period, EP investments, which include the costs to create new resources or technologies, decreased by more than 9%, but so did the total investments. Nevertheless, while the total investment surpassed the pre-crisis level in 2016, the EP investments did not recover yet.

Note: both indicators shown as percentage of the 2004 values. Original measurement unit for both indicators has been the percentage of GDP.

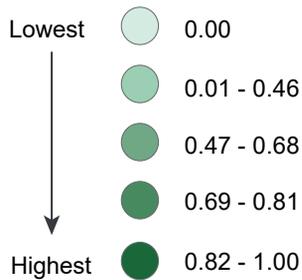
Resilience Index



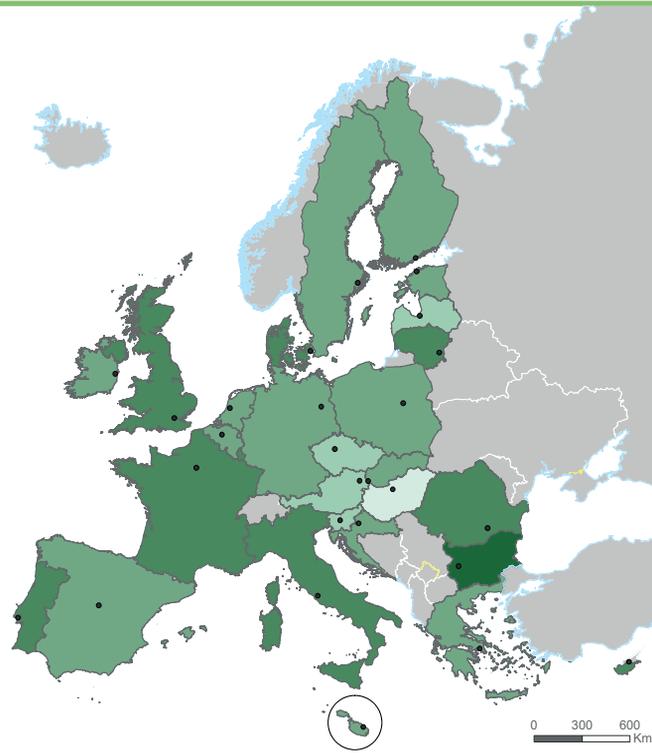
In terms of EP expenditure and investments, the most resilient countries were newer EU members (such as Bulgaria, Estonia and Croatia), where most of the funding came from EU cohesion funds, but also France or Italy where the funding from national budget was higher. The least resilient were Hungary and Austria, countries which considerably reduced EP budgetary allocation.



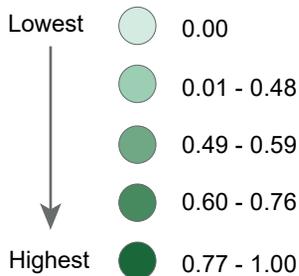
Resistance index



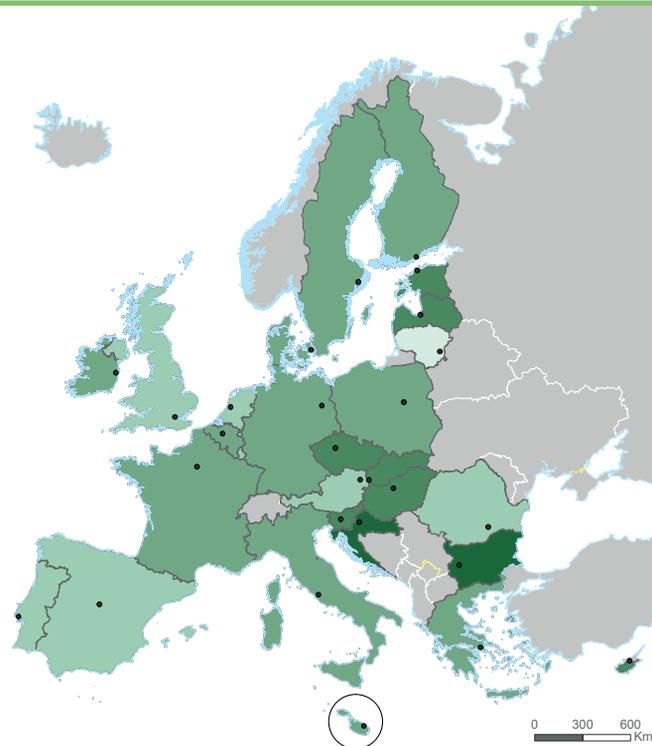
Resistance index shows the differentiation between countries that had a steep diminish of their investments (Hungary, Czech Republic, Slovenia and Latvia) and countries that had a smaller decrease or even an increase in both EP expenses and EP investments during the crisis (Bulgaria, Portugal and Denmark).



Recovery index

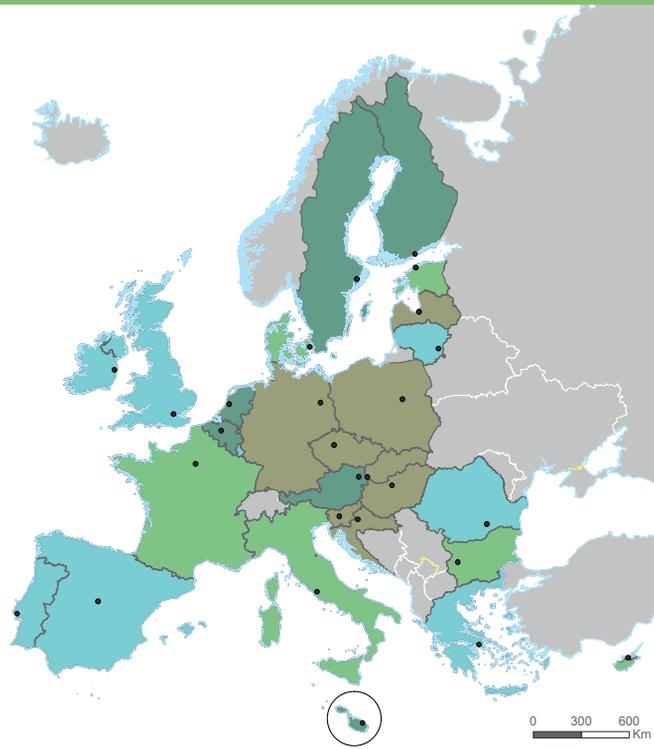


The recovery phase included a variety of situations. For instance, Austria which had some of the highest shares of EP expenses before the crisis did not recover completely to the previous level. However, the least recovered country is Lithuania. On the contrary, Bulgaria and Croatia increased EP expenditures and investments after 2008 (they may have also taken advantage of EU funding more effectively).

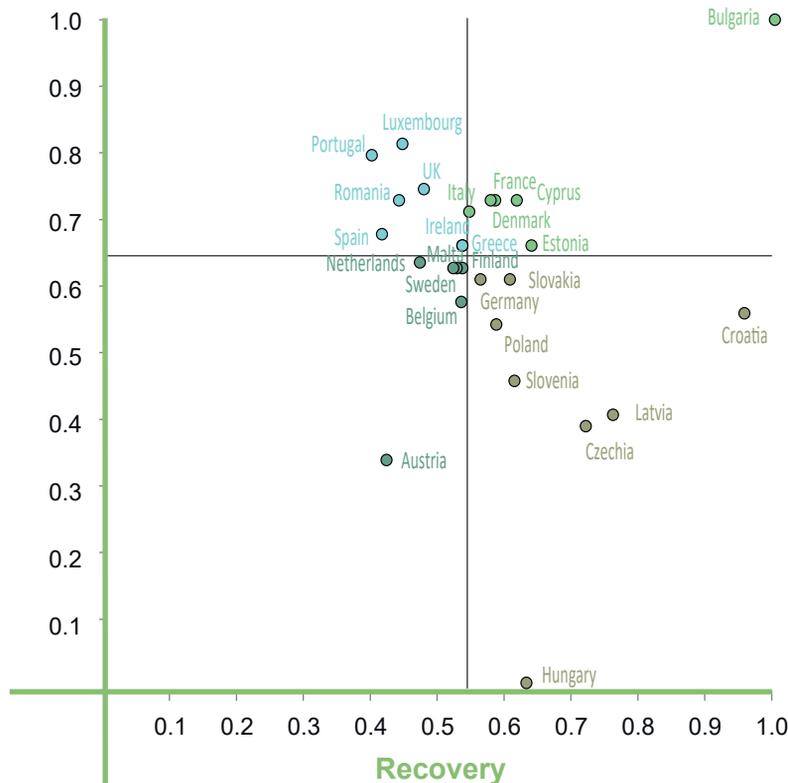


Typology of resilience

Overall, there is a negative relationship between resistance and recovery. Countries that displayed low resistance, managed to recover faster, compared to others that displayed higher resistance. This shows that most EU members remained committed to the environmental targets and tried to maintain or regain the previous levels of EP expenses and investments. Interestingly, the typology resulted from crossing resistance and recovery is rather geographically clustered. The most resilient countries, both during the resistance and recovery phase, are Bulgaria and Estonia in the East (that financed the expenditures by using EU funds), Cyprus, France and Italy in the Western and Mediterranean Europe (mainly due to their national policy and their own budgetary allocation).



Resistance



On the contrary, the least resilient countries were Austria, Belgium, Sweden, the Netherlands, all of them being pre-crisis leaders in the field of environmental and climate change abatement policy. The third cluster comprises peripheral countries that did not diminish EP expenses very much during the crisis, nor did they returned to previous levels (Portugal, Spain, Romania, Greece, UK). Finally, the fourth cluster includes Central and Northern EU countries, which were less resistant, but recovered well, by increasing their EP commitment (mostly new EU members such as Croatia, Latvia, Czechia, Slovenia and Poland).