

“Europeans are taking the risks presented by climate change seriously, and responding.”

The Push for Proactive Climate Adaptation in Europe

LAURA BOOTH AND ANTHONY PATT

Europe, and the European Union in particular, have struggled with major policy challenges in recent years, from the Greek debt crisis to an influx of refugees from the Middle East and Africa. But climate change adaptation is one area where things are working relatively well. The need for long-term planning that incorporates scientific insights is a good match for the technocratic competence to be found at EU headquarters in Brussels. Indeed, responding to climate change is an area where the continent can provide world leadership. French President Emmanuel Macron is particularly vocal on this front, promising to replace every dollar cut by the Trump administration from US funding for climate scientists, and even offering them multi-year, all-expenses-paid, “Make Our Planet Great Again” grants to relocate to France.

Changing with the Climate

Sixth in a series

Part of this European ambition is in the area of climate mitigation—reducing greenhouse gas emissions—but adaptation is on the same political agenda. In Brussels, and in many European capitals, mitigation and adaptation are handled in the same government offices and ministries.

Whatever the motivation, there is growing evidence that Europeans are taking the risks presented by climate change seriously, and responding. Legislative frameworks, tied to government funding, are emerging. There is a desire to adapt in a way that does not repeat some of the mistakes of the past. Hard engineering options, which might fix the immediate problem but create additional sources of vulnerability, are giving way to softer methods

LAURA BOOTH is a postdoctoral fellow in climate policy at ETH Zurich (the Swiss Federal Institute of Technology), where ANTHONY PATT is a professor of climate policy.

that increase longer-term capacity to adapt. For example, managed realignment schemes allow the sea to regain territory from the land in some places; authorities “pick their battles,” choosing to sacrifice some areas for the sake of others. Rather than working against nature, they are learning to work with it. Along with better-informed decision-making, we are seeing more cooperation between neighboring states.

European experts working on climate change adaptation identify their single biggest challenge as keeping the public informed about climate risks. Funding for climate impact and adaptation research requires scientists to maintain closer collaboration with the media and policy-makers. The hope is to ensure that decision-making is objective and based on the best available data.

RISKS AND VULNERABILITY

Europe faces an expanding array of climate risks. Rising sea levels threaten to flood low-lying coastal cities; increasing warm temperature extremes and longer heat waves adversely affect human health; longer periods of drought worsen water scarcity; desertification prompts migration of habitats and species and raises the risk of forest fires. Increasing water temperatures in rivers and seas along with rising acidity levels affect fish stocks, as decreasing crop yields place additional pressure on agriculture. Glaciers are thinning and thawing slopes have become more unstable in mountainous areas, leading to greater risks of landslides.

European winters are expected to become more humid, while summers will be drier. At the same time, periods of heavy rainfall have increasingly subjected Europe to severe flooding (notably in 1993, 1995, 2002, and 2013). Rising snow lines in the Alps not only affect the ski industry—which is roughly three times the size of its US counterpart—

but shift river runoff from summer to winter, with consequences for flood management, irrigation, and hydropower production. Climate change is also widely regarded as the main reason fire seasons are becoming longer and more destructive. In 2017, Portugal experienced its deadliest year of wildfires on record.

Climate change headlines in the media often create a confusing picture that appears to contradict statements made by the scientific community. What's important to understand is not that new risks may emerge, but rather that climate impacts are felt more intensely, more frequently, and for longer periods, all of which puts current systems under increasingly unsustainable pressure. Coupled with political and demographic shifts, such as the migration that occurred following the eastward expansion of the European Union, climate impacts can exacerbate stresses on the provision of public services, particularly in densely populated regions. Climate change adaptation efforts in Europe focus on a few key systems, or "hot spots," which are especially vulnerable to climate impacts, including cities, rivers, mountains, and coastal zones.

CITIES UNDER STRESS

European cities are increasingly susceptible to negative aspects of climate change. Depending on their location, many European cities are already vulnerable to climatic events such as heatwaves, water scarcity, or flooding, and there is evidence that all of these are becoming more frequent and intense as a consequence of climate change. Researchers in Amsterdam, for example, estimate that the economic risks from Rhine River flooding in cities such as Basel, Mainz, and Cologne will rise by as much as a factor of three over the period from 2000 to 2030. Climatic events affect infrastructure and services such as energy, transport, and water supply. They also can threaten air quality and the health of urban inhabitants.

Governments and organizations at the EU, national, and regional levels have developed political and legislative frameworks for helping cities to implement adaptation measures. These include the EU Adaptation Strategy and the Covenant of Mayors for Climate and Energy initiative. But more work is needed.

A 2016 European Environment Agency report outlines the comparative progress of cities such

as Copenhagen, Rotterdam, Barcelona, Bologna, and Bratislava, which have begun to look more closely at their vulnerability, but it also identifies many more European cities that are not yet planning for climate change. Those that are engaged in planning are doing so at different paces. Austrian municipalities, for example, have been exceptionally proactive in signing up for the Resilient Cities scheme, a global initiative that aims to promote measures cities can take to withstand, respond to, and adapt more readily to shocks and stresses. The short- to medium-term goal for cities should be to share resources and collaborate on successful programs like this one.

RETHINKING RIVERS

Many European cities are connected by international rivers, such as the Danube, Elbe, Rhone, and Rhine, which act as threads in a patchwork quilt of cultures and governance regimes. These navigable waterways built Europe, providing trade highways, centers for industry, and suitable locations for major cities. Now they are creating opportunities for cooperation in adapting to climate change.

The Danube Basin, for instance, was one of the world's first major transborder river basins to adopt a climate adaptation strategy, in 2012. As with other rivers in Europe, the Danube's flow pattern is changing due to more intense storms, accelerated glacial melting, and a shift in precipitation from snow to rain.

Countless adaptations made to European rivers over the centuries reflect evolving social attitudes. The Upper Rhine Valley owes much of its current flood risk to human intervention. During the nineteenth century, the natural riverbed was altered to improve navigability and make the adjacent land more accessible to agriculture. Engineers straightened the river's course and built dikes to prevent floods. This paved the way for hydroelectric installations along the Franco-German border, which interrupted the river's ecological continuity. Eliminating natural meanders significantly reduces the flood retention area while increasing the velocity of flood waves.

Nowadays, maintaining natural buffer zones is seen as a sensible alternative to hard engineering options. Applications to build on natural flood plains, which would have been approved in the

Opportunities for international cooperation can and ought to be seized in Europe like nowhere else.

past, are denied today. Increased media coverage of flood events and growing pressure from the insurance sector helped drive a major shift in thinking in recent decades.

The International Commission for the Protection of the Rhine's Action Plan on Floods, part of the "Rhine 2020" initiative, comprises a series of basin management actions with a budget of 12 billion euros, aiming to lower extreme flood levels and reduce potential damage by 25 percent. The program also seeks to increase public awareness by distributing maps of flood-prone zones, such as the Rhine Atlas 2015, and to improve early warning systems by establishing collaboration between upstream and downstream observatories. The International Commission for the Protection of the Danube River is another example of a river basin platform that organizes officials from different levels of government, as well as the private sector, for concerted multilateral action.

Legislative advances, such as the 2000 European Water Framework Directive and the 2007 European Directive on the Assessment and Management of Flood Risks, provide frameworks in which regions can develop plans and set priorities reflective of their operational and natural environments. The EU Floods Directive has undoubtedly had a positive impact. Many floods progress from one country to another. The Elbe River, for example, spawned floods moving from the Czech Republic to Germany in 2002 and again in 2013. The second time around, there was better coordination between the two countries, with the effect that decisions were made upstream with the downstream consequences in mind, reducing property losses substantially.

ADAPTING IN THE ALPS

Warming has been felt most strongly in Europe's Alpine regions. Temperatures in the Alps have risen by almost 2 degrees Celsius over the past 120 years, almost twice as much as the global average, and researchers predict a further 2-degree increase in the next forty years. There appear to be at least two reasons for this: a decrease in snow cover allows the ground to absorb more solar radiation during the winter and spring, and a weather pattern dominated by the Mediterranean Sea seems to be expanding, bringing warm air from Italy and

southern France up and over the Alps more frequently.

The effects have been dramatic. Rapidly receding Alpine glaciers provide the most striking visual evidence of climate change. But there are also threats to people, most notably landslides and rockfalls from the combined effects of more intense precipitation and retreating permafrost.

The Alps are a region where three policy areas intersect. One is adaptation, which in the Alps means protecting people from increasing weather-related hazards such as avalanches and flash floods, which often hit tourist destinations. The second is climate mitigation: the Alps provide the main source of renewable energy for several countries, with reservoirs that can provide hydropower when the windmills to the north are standing still, but both the water regime that feeds the reservoirs and the power markets that finance them are changing, not necessarily for the better. Switzerland's major hydropower operators have seen profits vanish in recent years as a result of the influx of new solar and wind power supplies.

The third intersecting policy area is economic development. As with many rural regions, the ongoing loss of family farms and the businesses they support has led to an exodus of people from the Alps. The challenge is

to replace lost economic sectors with new ones.

Like its rivers, Europe's mountainous regions are increasingly viewed as platforms for cooperation. In 2009, an Action Plan on Climate Change in the Alps set out targets such as stimulating growth in high-tech sectors of the economy to make the region less dependent on winter tourism.

Sustainable transportation schemes have been set up; the *Tiroler Gemeinden Mobil* project in Austria distributes pocket-size timetables to encourage the use of public transport and carpooling. The government of Slovenia, with financial assistance from the EU, is granting subsidies to families and public bodies for using renewable energy sources (biomass boilers, solar collectors, or heat pumps). Austria's Diex municipality is taking advantage of its intense solar radiation and comparative lack of fog by investing in the use of photovoltaic solar energy technology for residential buildings, road signals, information boards, and street lighting. In 2016, the Alpine Climate Board was created to "bundle together" these climate change adaptation activities carried out within the framework of the

*Warming has been felt
most strongly in Europe's
Alpine regions.*

Alpine Convention, a platform for information exchange and joint decision-making.

Alpine resilience has often been homegrown at the local level, through projects bridging gorges, channeling meltwater, stabilizing valley slopes, and protecting property from avalanches or debris flows. Adaptation techniques are highly evolved in Europe's mountainous regions and offer valuable lessons that could be transferred elsewhere, particularly concerning how communities can rapidly make themselves more resilient where change is happening fastest.

COASTAL QUESTIONS

Europe's coastal zones are the front line where climate change adaptation is arguably at its most urgent. Rising sea levels and increased storm intensity threaten vulnerable settlements and assets where the coastline is slowly (or in some places, rapidly) being eroded. In the English coastal village of Happisburgh, for example, the natural turnover of the building stock is gradually moving people in one direction—away from the sea—by an average of 50 meters per decade. The retreat represents a reversal of Victorian-era development patterns; in the nineteenth century, the flat coastal plain was viewed as ideal for railroad construction and the settlements that came with it.

With expected temperature increases of over 2°C, and potentially over 3°C, the map of Europe could change considerably. The likely submersion of large tracts of valuable farmland in Lincolnshire will drastically alter the shape of England's eastern coastline.

Italy's Venetian Lagoon is also under threat. Venice has long been fighting against the risk of inundation from rising sea levels, exacerbated by subsidence problems beneath the city. Its latest set of floodgates will be installed by June 2018; the aim is to effectively plug the lagoon to protect it from the Adriatic Sea. Venice's heritage value to Europe is enormous, so protection efforts are (for now) keeping up with the risk. London is another city making progress to secure its future, with the installation of the Thames Barrage, a set of movable flood barriers that can be raised to shield the Thames estuary from storm surges.

Are places like the Lincolnshire coast too big to defend and destined to be sacrificed? Can climate change projections be relied on, and how do authorities balance asset valuation with cost-effective defense? Does it make financial sense to keep defending cities like Venice? These are immediate

concerns, since even if all emission reduction targets were met tomorrow, the warming trend would not be reversed.

Europe is trying to answer these difficult questions in both theory and practice. The Climate Change (Scotland) Act of 2009, for instance, requires the development of an adaptation program in response to the UK's Climate Change Risk Assessment. The Dynamic Coast project is working to create a shared evidence base to support more sustainable planning decisions with intensive mapping of the changing coastline and vulnerable assets.

In 2014, sections of the coastal railway at Dawlish in Devon, England, were destroyed in heavy storms, cutting off Cornwall and the rest of the South West peninsula. Railway planners in the UK have started the task of evaluating the vulnerability of coastal rail lines to climate change, to identify places where these lines need to be rerouted inland.

INSTITUTIONAL CHALLENGES

The EU has a combined population a little more than twice that of the United States, living on a little less than half the land area, divided into 28 sovereign states and separate cultures. A trip down the Rhine—about half the length of the Colorado or Columbia rivers and a third of the Mississippi's—starts in the Swiss mountains and ends at the Dutch coast, passing through or along five other countries in between, with as many distinct languages. The Alpine mountain chain covers half the distance of the Appalachians, but crosses eight countries.

Opportunities for international cooperation can and ought to be seized in Europe like nowhere else. It provides a unique arena for transborder climate change adaptation—for exploring cooperation between states and helping them learn from each other. There are, however, barriers that must be overcome.

During the campaign leading up to the June 2016 referendum in which the British voted to leave the EU, one of the strongest charges levied against the European project depicted it as a bureaucracy led by a group of technocrats with no accountability to the European people. By and large this is correct. EU policies and legislative proposals usually do not originate in debates between elected officials of different parties, but rather in the offices of the European Commission, a set of administrative agencies sprawling across Brussels.

The bureaucrats in those buildings decide that there is a problem that needs solving, order studies to come up with possible solutions, and ultimately assemble all the pieces of a new policy package that they present to the elected officials in the European Parliament and the European Council for approval, which typically comes as a matter of course. The process may not always work for handling immediate political problems, but it serves well for pushing steadily forward on climate change adaptation and appears to inspire creative responses among the member states.

EU strategies set out common goals that filter down and adapt to reflect the character of the individual nations in the bloc. This approach complements many successful grassroots and nongovernmental initiatives at the local level, which help generate vertical transfers of knowledge. In one community in Poland, for example, scientists in an EU-funded research project not only identified the need to reconfigure an irrigation reservoir to cope with rising temperatures, but also worked with local farmers to seek the needed funding for the change.

The European Commission funds innovative projects for climate change adaptation at the international level. One of them is Enhancing Synergies for Disaster Prevention in the European Union (ESPRESSO). Launched in 2016, ESPRESSO addresses three core challenges: facilitating collaboration between climate change adaptation and disaster risk reduction experts, bridging the science-policy divide, and improving transborder management of crises in Europe. Another project, Enhancing Emergency Management and Response to Extreme Weather and Climate Events, is developing a pan-European platform to provide authorities with better forecasts.

In November 2017, the European Commission launched rescEU, a new system for responding to natural disasters. It comprises a reserve of civil protection capabilities including fire-fighting aircraft, water pumps, urban search and rescue units, field hospitals, and emergency medical teams that can be deployed to complement national assets when countries are hit by disasters such as floods, forest fires, earthquakes, and epidemics. In parallel, the Commission will help member states to boost national capacities by financing adaptation, maintenance, transport, and operational costs of existing resources. The European Civil Protec-

tion Pool will make shared assets available when a member nation finds itself overwhelmed by a natural crisis.

These initiatives demonstrate EU officials' commitment to responding to climate change, which is echoed by many member state governments. However, it can take years to decide on simple policies such as standardizing the diameters of fire hoses used in Germany, France, and other EU nations in order to allow for equipment sharing in a transborder crisis. When trained foreign responders are not allowed to assist unsupervised in a cross-border disaster because their qualifications are not recognized, something needs to change.

CROSSING BORDERS

Interactions between European countries and regions are complex. They are less understood and less prioritized than the traditional "top-down channels" between the European Commission and EU member states. Among the barriers that hinder cooperation are language, differing political priorities, divergent funding mechanisms, and mismatched timescales for implementation.

A tendency toward isolated national thinking, coupled with lack of political will, is perhaps the biggest stumbling block for implementing better transborder policies, tools, and practices. There is a common perception that climatic disasters can be handled without assistance from neighboring countries, or from EU support mechanisms, unless they occur directly on a border. (Germany and the UK have acquired reputations for being especially self-reliant). While most disasters and emergencies within the EU are indeed on a scale that modern industrialized nations can manage alone, such isolationist thinking is potentially problematic given that climate change may lead to unprecedented hazards and risks on both sides of a border.

In France's Oriental Pyrenees region, plans for a formal agreement for international cross-border assistance so far have been frustrated. On the French side, the region has sufficient authority, but on the Spanish side, regions such as Catalonia do not have foreign policy authority; central government involvement is required. This hinders cross-boundary crisis management.

Climate change also adds to competition for access to transborder natural resources. Alpine lakes,

Does it make financial sense to keep defending cities like Venice?

for example, play host to a variety of competing users. In the Swiss/Italian Ticino region, Italian agricultural requirements lead to greater demand for water in times of summer drought, which must be balanced against Swiss flood-risk mitigation requirements. Rarely are such intricacies of trans-border issues communicated upward beyond the local level, leaving community leaders sometimes feeling detached from the national policies they are supposed to align with.

Stakeholders who do communicate regularly with their cross-border counterparts are generally less dependent on state assistance in times of crisis. Response times, as a result, are greatly reduced. For example, the Swiss city of Basel, in a corner of the country bordered on one side by France and on the other by Germany, runs regular drills with its counterparts in those countries to ensure that communication channels remain open. This is done proactively at the local level; success depends on the counterpart authorities matching the initiative. Efforts like this can help fill the gaps in cooperation.

Fighting against nature, rather than working with it, is ultimately a losing battle. European governments are recognizing this, but policies need to catch up. People working in local and regional government often become frustrated that the tools are not yet available to allow them the flexibility to set priorities where work is needed. Huge strides have been made in climate change adaptation, but gaps between attitudes, policy, and practice still need to be closed.

In Switzerland, artificial snow installations, once heralded as a reliable means of maintaining thinning runs in ski resorts, are now seen as only a quick-fix option. Diversification into summer tourism is increasingly favored as a more sustainable investment. However, decisions to diversify

are usually made at the local level, often by pioneering individual businesses that do not always have support from local government. This can result in conflicting plans and investments that pass over the more sustainable option.

Europe is learning its lessons. Increasingly cost-effective, sustainable strategies will focus on flexibility in adaptation, broadening the scope for cooperation among sectors that may have had little contact in the past and opening up new avenues for research and innovative policies. Advances in communication, forecasting, and prediction promise to help close the gaps between policy and practice. Such efforts are being supported by key sectors, such as an active and engaged insurance industry, in places like Switzerland. But there is work to be done to make this approach the norm rather than the exception.

With improved forecasting, Europe is able to get a clearer picture of how climate change impacts might be felt and plan better approaches to mitigate those impacts. Adaptation measures are increasingly developed with the understanding that while we can manipulate our environment, we cannot ultimately control it—and any changes we make will always come at some cost. We must weigh these costs along with the short-, medium-, and long-term benefits our actions are likely to yield.

The importance of sharing data and aligning adaptive strategies is increasingly recognized. There is heightened appreciation throughout Europe of the need to work across borders in mutually beneficial ways. Boasting a spectrum of cultures within a relatively stable political setting, as well as strong economic and intellectual resources, Europe holds huge potential to set examples for transborder cooperation in responding to climate change. ■