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14. Climate change adaptation and environmental and pollution control law

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1 INTRODUCTION

Environmental law, including pollution control law, is relevant for adaptation in three ways. First, pollution control law helps to make the natural environment (land, water, air) resilient to change. A natural environment that is already weakened by contamination will suffer greater negative impacts by climate change than a pristine environment. The combination of an influx of nutrients into surface waters, for example, and rising water temperatures can lead to massive harmful algal blooms in both marine and freshwater aquatic environments.[1] Adaptation policies should, therefore, be aimed at further reducing or preventing the emission of pollutants into the environment.

Second, environmental law instruments will have to be applied for adaptation purposes. Installations vulnerable to extreme weather events, flooding or droughts have to be made resilient to these impacts of climate change so as to prevent pollution. Flooding of a chemical industry plant or a waste management site, for instance, can lead to serious pollution in a large area. Therefore, permits and other legal instruments aimed at regulating these activities, have to force the owners of these installations to be prepared for such impacts. Environmental impact assessments can be used to discover whether industrial installations, infrastructure projects or other large-scale human activities are, from a long term perspective, 'climate proof'.

Third, many adaptation measures can or will have negative environmental side-effects. Coastal adaptation measures, such as sea walls and coastal armouring, can impact coastal biodiversity, as will water diversions to combat droughts. Spraying pesticides for disease vector removal may negatively impact the environment. New recreational facilities will be created with a potential negative impact on biodiversity, for instance, in coastal areas that,

[1] S K Moore et al., 'Impacts of Climate Variability and Future Climate Change on Harmful Algal Blooms and Human Health' (2008) Environmental Health 7 (Suppl 2):S4 doi:10.1186/1476-069X-7-S2-S4.

because of temperature rise, are becoming more attractive for tourists, or ski slopes at higher altitudes as lower-lying slopes are increasingly witnessing a decrease in snowfall.

In this chapter, the three roles of environmental law for adaptation will be briefly discussed, focusing on such essential legal instruments as environmental quality standards, environmental permits and environmental impact assessments.

2 APPLYING ENVIRONMENTAL LAW INSTRUMENTS TO ADAPTATION

2.1 Environmental Quality Standards

As mentioned in the introduction, the overall environmental quality determines the level of resilience of the environment to change. Therefore, it is generally thought that adaptation strategies in the field of pollution control law should aim at eliminating particular kinds of discharges and emissions to reduce pollution stressors.[2] In many countries, environmental quality standards have been set to make sure that a certain minimum quality level is achieved. These quality standards may become harder to achieve, leading to increased pressure on norms and requiring quality standards to be set or adapted in order to reduce emissions from existing sources. Higher temperatures, for example, lead to elevated concentrations of ground level ozone, which is harmful to human health as well as to vegetation. Adaptation, then, would at least be aimed at reducing existing emissions, so as to keep achieving the original targets. Preferably, though, stricter targets for ground level ozone and other pollutants should be set so as to increase resilience. The same is true for water quality standards. To prevent or reduce harmful algal blooms, for example, stricter targets for the maximum level of nutrients in aquatic systems need to be set and achieved. Soil quality laws, such as laws that aim to address desertification and erosion,[3] are also affected by climate change, as higher temperatures and changes in precipitation have an impact on the quality of the soil.[4] Hence, quality standards for soils may have to be set (in case they do not yet exist) or adapted to take climate change impact into account.

Environmental quality standards have to be achieved through reducing emissions. This can be done in a variety of ways, ranging from setting emission limit values in

[2] R K Craig, '"Stationarity is Dead"– Long Live Transformations: Five Principles for Climate Change Adaptation Law' (2010) 48 Harvard Environmental Law Review 9, 45.
[3] Implementing the UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD), Paris, 17 June 1994, UN GA, Distr.Gen. A/AC.241/27.
[4] See more extensively Chapter 8.

environmental permits for individual industries, to generic emission limits for cars or prescribing certain agricultural practices. All of these instruments need to be reviewed with the aim of tightening emission controls. By way of example, we will focus on environmental permits as one of the main instruments to achieve an improvement in the overall quality of the environment.

2.2 Environmental Permits

The Fukushima incident in 2011 showed the catastrophic impact an extreme weather event can have on a nuclear power station. The tsunami that hit the Japanese coast caused large scale power outages and a complete loss of external power on the site of the Fukushima nuclear power station. The station's own diesel generators were flooded and could not be used, which then led to the melting of nuclear fuel and to explosions, causing radioactivity to spread across Japan and the Pacific Ocean.[5] Nuclear power stations – but also any industrial plant where toxic chemicals are stored or used, or storage areas of petroleum – are typically installations that may need additional permit requirements to make them more resilient to climate change. Such requirements could include measures against flooding, or against the spread of toxic chemicals in case of flooding; limitations as to the maximum quantities of chemicals present on the premises; resilient back-up power systems; and water saving and storage facilities to ensure the availability of cooling or process water in times of water scarcity. In extremely vulnerable situations, it may be necessary to repeal the permits altogether and look for alternative locations for the installation, for instance removing it from the floodplain to a higher elevated area.

Hazardous waste sites are other important examples of sites that may be vulnerable to climate change. Sussman and others show that in the US, regulators have the authority to conduct new kinds of surveys and mapping to identify hazardous sites at the shoreline and low-elevation areas, as well as waste sites likely to be at greatest risk for leaching as a result of sea level changes.[6] When such vulnerabilities are detected, permits can be updated or repealed.

[5] A detailed account of the disaster and the findings of subsequent inquiries into the causes of the disaster is reported in a Wikipedia article 'Fukushima Daiichi nuclear disaster', http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster, assessed 1 November 2012.

[6] E Sussman et al., 'Climate Change Adaptation: Fostering Progress through Law and Regulation' (2010) 18 N.Y.U. Environmental Law Journal 55, 116.

As already mentioned, environmental permits also need to be reviewed with the aim of improving the overall environmental quality to create resilience. For the US, Craig suggests switching from prescribing 'best conventional control technology' to 'best available technologies'.[7] In the EU, the Industrial Emissions Directive is already aimed at setting emission limits that require the application of best available techniques.[8] When reviewing the way the provisions of this Directive define best available techniques and legislate how regulators are to determine what constitutes best available techniques and emission limit values associated with these techniques in a specific case, it is obvious that the Directive does not require taking the potential consequences of climate change into account. The Directive does state that the emission of greenhouse gases should not be regulated in the permit, because those emissions are regulated under the EU Emissions Trading Scheme (ETS).[9] That, however, does not in any way reduce the potential role of the Industrial Emissions Directive in an adaptation policy. In the author's view, the provisions of pollution control laws like the Industrial Emissions Directive should be reviewed in order to check whether they are 'adaptation proof'. Do the provisions require the permitting authorities to take potential impacts of climate change into account? Do they aim at increased resilience? Do they provide the opportunity to regularly assess permit conditions with a view to changing weather conditions or changing climatic circumstances? The EU Industrial Emissions Directive does require the authorities periodically to reconsider all permit conditions, but it does not explicitly state that expected or experienced climatic changes are a reason to do so.[10] More generally, it must be criticized that this important Directive, centrepiece of EU environmental law, does not in any way refer to adaptation.

2.3 Environmental Impact Assessments

Environmental law relies heavily on impact assessments carried out before taking a decision. Taking the EU as an example, its Member States have to perform:

[7] Craig, above note 2 at 45-46.
[8] Articles 11 and 14 of Directive 2010/75/EU on industrial emissions, (2010) OJ L334/17.
[9] Directive 2010/75/EU, Article 9.
[10] Ibid. Article 21.

- environmental impact assessments of certain projects, such as large infrastructure projects, large industrial activities, power stations, waste disposal sites etc.;[11]
- strategic environmental assessments of certain plans and programmes that are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, telecommunications, tourism, town and country planning or land use etc.;[12]
- appropriate assessments of the impact of plans and projects on so-called Natura 2000 sites, i.e., protected areas under the Birds and Habitats Directives;[13]
- reviews of the impact of human water use on the status of surface and ground water;[14]
- assessments of significant effects of industrial emissions on the environment.[15]

Assessments like these become increasingly difficult because our predictive capacity cannot deal with the many uncertainties involved in climate change. Or, as Ruhl puts it: 'nonlinearities in change dynamics, environmental feedback properties, and the interactions of social and ecological responses will soon exceed the boundaries of environmental stationarity that have allowed environmental impact assessment and cost-benefit analysis to maintain what reliability and credibility they have'.[16]

This, however, should be seen as a challenge that needs to be overcome. Impact assessments do play a very important role in any adaptation policy because they are explicitly designed not only to look into short-term effects, but also into long-term impacts of an activity.[17] Environmental impact assessment legislation is also well-poised to evaluate complex and cumulative impacts.[18] Impact assessments enable the authorities to take into account changing climatic conditions when assessing the potential or likely impact of an activity on the environment and, thus, enable them to require measures to be taken to make

[11] Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, (2012) OJ L26/1 ('EIA Directive').
[12] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, (2001) OJ L197/30.
[13] Article 6 of Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna, (1992) OJ L206/7. See extensively, Chapter 11.
[14] Article 5 of Directive 2000/60/EC establishing a framework for community action in the field of water policy, (2000) OJ L327/1.
[15] Article 12 of Directive 2010/75/EU on industrial emissions, (2010) OJ L 334/17.
[16] J B Ruhl, 'Climate Change Adaptation and the Structural Transformation of Environmental Law' (2010) 40 Environmental Law 363, 414.
[17] K M Baldwin, 'NEPA and CEQA: Effective Legal Frameworks for Compelling Consideration of Adaptation to Climate Change' (2009) 82 Southern California Law Review 769, 805.
[18] C W Christopher, 'Success by a Thousand Cuts: The Use of Environmental Impact Assessment in Addressing Climate Change' (2008) 9 Vermont Journal of Environmental Law 549, 606.

the activity resilient to these changing conditions. Impact assessments also allow the authorities to review alternatives that may be less vulnerable to the impact of climate change. There are many examples of how environmental impact assessments can play a role here. In an environmental impact assessment, various locations of new infrastructure, for instance, may be assessed on their vulnerability to the effects of climate change, such as flooding. Or, when flooding is inevitable in a given area, the vulnerability of infrastructural designs can be assessed, including, for instance, an elevated transport system. Similar considerations are true for any installation that poses a risk to the environment.

Often, environmental impact assessment legislation is formulated in a broad way, so as to include all future potential effects of the activity on the environment. The wording used in impact assessment laws and regulations may already allow for climate change adaptation needs to be included in the process.[19] It seems, however, advisable to explicitly include the obligation to take into account climate change in impact assessments in the relevant laws and regulations, in order to ensure that this is actually done and, when necessary, it can be tested in court.

In the EU, a major revision of the EIA Directive is being used to insert a range of provisions aimed at making the Directive 'climate proof'.[20] These revisions include the duty to:

- assess the effect of a project on climate change and on the 'exposure, vulnerability and resilience' to climate change;[21]
- select projects subject to EIA using the following characteristic: 'impacts of the project on climate change (in terms of greenhouse gas emissions including from land use, land-use change and forestry), contribution of the project to an improved resilience, and the impacts of climate change on the project (e.g. if the project is coherent with a changing climate)';[22]
- describe the aspects of the environment likely to be significantly affected by the proposed project, such as 'climatic factors, climate change (greenhouse gas emissions, including from land use, land use change and forestry, mitigation potential, impacts relevant to adaptation, if the project takes into account risks associated with climate change)' (…) 'as

[19] For instance, this is the case in New York; see Sussman et al., above note 6 at 80.
[20] Proposal of 26 October 2012 for a Directive amending Directive 2011/92/EU, COM(2012) 628 final.
[21] Amended Article 3(b) and (e) respectively.
[22] Amended Annex III under 1(g).

well as the exposure, vulnerability and resilience of [these] factors to natural and man-made disaster risks';[23]

- describe the likely significant effects of the proposed project, such as 'the use of natural resources, in particular land, soil, water, biodiversity and the ecosystem services it provides, considering as far as possible the availability of these resources also in the light of changing climatic conditions' and 'the greenhouse gas emissions, including from land use, land use change and forestry…'.[24]

However, an important shortcoming of impact assessments is that they are all carried out prior to deciding on a new project. Existing installations, infrastructure or other activities that are vulnerable to climate change, therefore, are not subject to these assessments. Sometimes, especially in the case of installations that can only operate after having obtained an environmental permit, legislation requires regular reviews and updates of existing regulations (see section 2.2 above). There may also be sectoral legislation that requires an assessment of the resilience of existing infrastructure, power stations, and other installations, as is shown in the chapters in this book on water management, land use, and electricity. If, however, such sectoral legislation is not in place, or does not cover everything, this gap in the legislative framework for adaptation needs attention from the legislature.

Environmental impact assessments, thus, may help in discovering the weaknesses of human activities from the perspective of climate change and in creating resilience. Some attention should, however, also be paid to the negative impact of adaptation measures. Here, impact assessments have an important role to play as well. Avoiding or reducing negative side-effects of adaptation measures can be achieved through the instruments of environmental impact assessment and strategic environmental assessment. Such assessments offer an instrument to search for the most effective adaptation measure with the least negative side-effects; for instance, sea defences that have the least impact on coastal ecosystems and coastal biodiversity; water diversion projects that do not, or only to a limited extent, harm other legitimate water users; or new recreational facilities located and designed in such a way that they do not harm local biodiversity.

3 CONCLUSION

[23] Amended Annex IV under 1(4).
[24] Amended Annex IV under 1(5)(b) and (f) respectively.

In adaptation literature, relatively little attention is paid to the role of basic environmental law instruments such as environmental quality standards, environmental permits and environmental impact assessments in adaptation law. In this chapter, I have reviewed the three roles these basic instruments can play in adaptation law: 1) create an overall environmental quality that makes the environment more resilient to climate change; 2) reduce the risk of (increased) pollution as a consequence of extreme weather events or of climate change more generally; 3) reduce the negative side-effects of adaptation measures on the environment.

In general it can be concluded that current environmental laws already possess features that are relevant to adaptation, such as the requirement to regularly assess the permit conditions under pollution control law and the requirement to look at the long-term impacts of a project on the environment under environmental impact assessment law. However, it seems that the legislature should explicitly force regulators to take into account changing climatic conditions and extreme weather events when setting environmental quality standards or when requiring certain conditions to be met in environmental permits. Impact assessment schemes aimed at both specific projects and strategic plans should explicitly require the assessors to take long-term climate change adaptation requirements into account. The potential contribution of these environmental law instruments to climate change adaptation is simply too large not to embrace the opportunities they encompass.