

# Chapter 12

## Cross-cutting Perspective on Nature

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### 12.1 Introduction

In this chapter, we delve into the nature perspective in order to supply cross-cutting insights to the interlinkages between nature and drought. *These interlinkages are not just found in the two regions that have chosen this perspective as the subject of their pilots, but are also to some extent relevant in the other four areas.* For the purposes of this chapter, the term nature is applied as a broad proxy for several nature-related concepts. Most generally, nature here refers to areas designated for nature conservation. This includes nature areas under explicit protection. This concept of nature also extends to natural elements within conservation areas, including river and catchment systems, the diversity of species present and/or threatened, and ecosystems and their ecosystem services. In addition, implicit to this framing of nature is the policy context that extends across nature conservation and land use management measures. This includes sustainable land use policies and practices.

### 12.2 Drought and Water Scarcity Problems Related to Nature

To understand the relationship between nature and water scarcity and drought problems, we turn our attention to five case studies to illuminate key points. We introduce the areas and their specific relationship to nature and ways in which drought is already impacting natural areas and their ability to cope. The policy

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context is also elaborated to provide insight to the current milieu, including relevant actors and relevant economic and social challenges.

In *Flanders* there are two types of drought sensitive areas. In some parts in the west the horticulture is so dependent on sufficient quantities of good quality water that any present or future disruption in the provision of servicing water is likely to lead to high economic costs. In the higher altitude sandy parts of Flanders that are dependent on groundwater and rain, drought sensitive nature areas no doubt suffer from periods of desiccation, such as in adjacent areas in the Netherlands. However, it is remarkable that how little attention this gets in Flanders.

In the area of *Eifel-Rur*, nature is very important. Large parts of the area are covered by woods with the National Park Eifel spanning approximately 110 km<sup>2</sup>. The national park promotes itself as a “wood and water wilderness”. Preserving a vulnerable landscape that also attracts tourists is therefore one of the objectives of the water authority, which cooperates with other actors to achieve beyond its legal duties. The national park authority was the only actor to mention drought as an issue threatening this area. Though dryer summers have been the trend across most of the area, until now no severe droughts have struck the region that endangered the role of water for nature. There are limits to increasing water levels in the spring in order to create buffers for dry periods due to the flood protection function of the reservoirs, which require sufficient retention capacity.

The area of *Groot Salland* includes a national park that spans 35 km<sup>2</sup>, mainly consisting of wooded hills and slopes and also areas of heather. A large part of it is Natura 2000 area. Several smaller Natura 2000 areas are included in the territory under the water authority. One main concern for the area is the buffer zones, which enable water levels that are adapted to the envisioned land use (higher levels for nature, somewhat lower water levels for agriculture). Moreover, groundwater extractions by drinking water companies and farmers in and directly around the buffer zones have a direct impact on desiccation of nature and pose a threat to the quality requirements of nature management under Natura 2000.

In the *Vilaine* catchment area the centre piece consists of a large wetland area, the Vilaine and Redon Natura 2000 area spanning 100 km<sup>2</sup>. Oddly, the main threat of drought for these wetlands is indirect and does not imply desiccation, but flooding. The Vilaine catchment terminates in a big reservoir adjacent to the sea. The water levels of the marshes are controlled by this dam. The water level of the reservoir is adapted to the needs of flood protection and drinking water production and not to the needs of the wetlands. To protect drinking water reserves and prevent salinization, especially during relatively dry periods, the water level of the reservoir is kept up. This has the consequence that during the dry periods the wetlands actually get largely submerged! The building of the dam and reservoir itself also had big impacts on the area: without the reservoir the tide impacted the waterways as far as 60 kilometres inland. After the dam was constructed the accumulation of deposits from the river drove the mussels farming and eels fishery outside the original area. A third and more common problem for the eastern portion of the area stems from conflicting water use needs, where irrigated crop agriculture competes with the needs of the nature areas during dry periods.

As the Visit *Somerset* website ([www.visitsomerset.co.uk](http://www.visitsomerset.co.uk)—June 2015) describes: “The Internationally important Somerset Levels and Moors form a unique patchwork landscape steeped in history and brimming with rare wildlife. Today the area is mostly grassland and arable with willow grown commercially”. Not surprisingly, with its rich wildlife, including the largest lowland population of breeding wading birds, the area is specially protected and supports a number of protected areas.

The quote shows both the important natural value of the area, and the fact that it currently is and historically has been used for human purposes. However, the area is vulnerable to both floods and droughts. Climate change is increasing the frequency and severity of both events.

Water shortages due to prolonged droughts can be quite harmful for the wetlands, particularly habitat and peat loss. Agriculture and villages, however, are more afraid of flooding. After some years of severe drought in 2010–2012, a lengthy flood submerged much of the area in the winter of 2013–2014. The peat soils provide various ecosystem services not only for nature itself, but also for carbon storage, food production, and the protection of the historic environment. The impacts of dry periods can create irreversible changes, such as compaction and land subsidence, which not only decreases the buffer capacity of the land, but also increases flood risks down the line.

The water authority of Vechtstromen produced analysis that concentrated on the *Twente* region. In the region, various nature areas suffer from desiccation in dry periods. About 90 % of the creeks run (almost) dry in the summer. Much of this region is dependent on rain and groundwater.

While the area does not have one large designated nature area, it includes many valuable woods, heather fields and wetlands of various sizes in a mostly small-scale landscape. For this reason it was considered an official “National Landscape”, and is, despite the termination of this national policy programme, still considered so by all regional actors involved.

Due to climate change the annual water balance gets dryer affecting also groundwater levels. This in turn can influence river discharge while in dry summers creeks are often fed by groundwater. Not only in streams and their valleys, but also on higher ground nature will deteriorate with desiccation. The map below shows both the patchwork of existing nature areas and the areas in dotted green and yellow where even smaller spots of nature that are mingled with agriculture will be developed with a priority for nature.

For most of these nature areas desiccation is a serious challenge, but often nitrogen from air pollution and farming is an even bigger one. The map also shows some main waterways in the rain and sometimes even groundwater fed creek system (Fig. 12.1). The development of drought resilience measures with farmers always has to cope with some distrust that nature development is restricting rather than codeveloping with farming, which can actually be true in some instances.

The overview in this section shows that most areas involved in the DROP project do have *drought sensitive nature areas*, even though their nature and the extent to which they are threatened by droughts vary. While it is very hard to find data on drought impacts on Flemish nature areas, given the characteristics of the area it is



### 12.3 Drought Issues and Other Climate Change and Competing Sectors' Risks for Nature

Building on the contextual relationship between drought and natural areas, here we broaden our understanding of drought issues within the context of climate and additional competing sectors to formulate a brief glimpse into the interacting pressures that colour each case study region.

In *Flanders* the attention for the drought consequences of climate change for nature is still in its infancy. If there is emphasis on drought, the consequences for agriculture and other economic interests are the main drivers. Projects in which climate resilience of water systems will be improved are still rare.

The sequence of reservoirs in the Eifel-Rur area serves a flood protection goal. However, the water abstractions are also important and can compete in the future in periods of water scarcity. A minimal flow requirement, that often has environmental purposes, serves mainly to preserve the supply to industries downstream. The water board itself has a council in which various stakeholders are represented including all relevant governments and major water right owners. However, users of smaller quantities such as farmers, fishermen and nature organization have no direct representation. These users and their sectoral representatives, including nature, are invited to roundtable discussions on the initiative of the water board. This proactive network building is highly appreciated by them. In discussions on water abstraction forestry and nature organizations are therefore also involved. Public perception of the function of the reservoirs in flood protection is not very well recognized. Rather, the tourism and sailing functions are seen as main purpose of the reservoirs. In this sense, preventing future drought effects on nature could get some public support. Such measures however will face resistance from water right holders when they intrude therein.

The buffer zones and irrigation around nature areas in *Groot Salland* is a classic example of the competition between nature and agricultural sector interests. While the EU nature policy is influential, involvement of nature conversation NGOs is limited. There have been cuts in the amount and the way the nature NGOs get support from the province, implying that they often cannot send real experts to the roundtables for which they are still invited. In some flat parts of the area it is actually possible to let water in from bigger waterways. This helps farmers, though such external and less pure water is not used directly to restore the water balance in the sensitive nature areas. The pilot project of the water authority in DROP is a waterway that can be used for dual purposes: to get rid of water in the wet season, but also to let water in during droughts. Flood protection and drought resilience are thus combined.

The building of the dam and reservoir in the *Vilaine* catchment area turned a salty marsh into a freshwater area that could more easily be used for farming and drinking water production. The desalination of the marsh was thus a strong intervention in the natural system. Apart from this, flood protection was the main goal since high river waters could not any longer coincide with peak sea levels causing

risk of serious flooding. Drinking water production is the priority use for this water. Other goals such as tourism and yachting, agriculture, and nature are acknowledged, but clearly as secondary objectives. Fisheries were hit hard, but recovered by relocation and more recently by creating fish passages and minimal flow requirements. A new anti-salinity lock should enable yachting while preserving as much freshwater as possible and keep the ecological quality high. In this way engineering interventions initiated for flood defence created the need for further interventions to modify ecological side effects.

The clearest example of climate change impacts increasing the frequency of both droughts and flooding in *Somerset*. It is not considered a water-stressed area because on average there is no problem with the supply and demand balance. There can however still be scarcity for nature, especially during times of drought. While droughts in other parts of South England even have been hitting harder, the Somerset nature areas are particularly vulnerable. After the 2013–2014 floods the Somerset Levels and Moors Flood Action Plan replaced a number of drought and flood resilience plans with a combination of measures in which flood protection had an overriding priority. Apart from improved flood defence measures and dredging of waterways, also dredging around the Levels and Moors is included in the plan.

The science is inconclusive on whether this is the most appropriate set of measures, even for flood protection, while it certainly would increase the risks of drought impacts on nature. A catchment approach that also would balance the needs of nature and agriculture is an emerging agenda in the region and country but there is still discussion on the effectiveness of these approaches. Farmers have no incentives now to accept higher water levels at the expense of the usability of their meadows to buffer for dryer periods. Some even muddle with the water system for purposes of irrigation. Another issue is peat extraction for which often old licenses are still valid. Yet another issue is water extraction rights that are not regarded flexible enough for future challenges. Nevertheless the growth of larger conservation NGOs have increased the awareness of the importance of the wetlands for the region.

The Twente region in *Vechtstromen* is in general not a flood-prone area. Nevertheless, heavy rains that are more frequently occurring due to climate change surpass the water drainage capacity in several areas, causing short term flooding (“water on the streets”) problems and damages like in the summer of 2013. The main stream in the pilot area is the river Dinkel, a transboundary river that remained mostly unmodified at the Dutch side, while upstream at the German side all meanders were removed and the river was “normalized”. This increased the flooding risk of the Dutch stream valley, including both agricultural fields and many nature areas. August 2010 was the wettest month in this area in 100 years, causing the Dinkel to submerge large areas and even parts of the town of Losser. An interesting background is that the German measures were part of a transboundary plan, but while insights in water management changed the Dutch decided to stop its implementation. Nature would have been severely damaged and drought risks increased by the kind of measures proposed in the 70s and 80s. At other places, also in Twente, the water authorities had already started to undo precisely these kinds of

measures. Instead they compensated all adjacent farmers by paying them the difference in land value between their land in its natural status and in a well-drained status. Sectoral rivalries regarding nature and drought exist in the pilot area in the form of water extractions in or near nature areas by both drinking water companies and framers. In the nature area of Mander a large drinking water well is exploited.

Fierce discussions between the water authority and the drinking water company were resolved for the time being by a “gentleman’s agreement” in 2008 that the extraction would be stopped as soon as alternatives had been found. While working on this, such alternatives still have not been placed into effect, also because there is a structural shortage of water for drinking water production in the Twente region, requiring the drinking water company to even import water from Germany. The water extraction by farmers for irrigation is less of a problem for nature in Twente, since most of the creeks run almost dry in summer anyhow and have permanent extraction bans and pumping groundwater is very expensive. This pressure might rise however in the future as the lifting of the milk quota will make farmers strive for higher productivity. For the rest, similar rivalries than in Groot Salland exist concerning the desired water levels for nature and those for agriculture and the buffer zones that are required for this difference. Promoting the acceptance of generally higher water levels by farmers is one of the drought resilience measures taken.

This overview shows that across the Northwest European area *climate change has a double impact* of intensifying both drought and flood risks, demonstrated by more extreme weather events and periods. While the areas with water reservoirs can cope relatively easily with these impacts also in those cases further climate change effects can disturb that picture in the future. The water scarcity impacts of climate change on nature areas are worsened by sectoral *rivalries* with other water consumers, like drinking water extractions and agriculture, especially when it is irrigated agriculture. In Eifel-Rur also industry and in Vilaine also tourism (yachting) present competing claims on the water availability.

## 12.4 Multilevel and Multiscale Issues and Nature Measures

Nature protection runs the risk of just leading to isolated patches of natural beauty. To create viable ecosystems their relationships need to be considered. Likewise, also the governance of nature needs to be multilevel with the involvement of all relevant administrative levels.

In *Flanders* the municipalities are handing over responsibilities for small waters to the provinces. As a consequence they get “out of the loop” on these issues. This reinforces that there is very low awareness of drought as a problem and economic interests prevail over environmental ones. Thus if anything, it is the agricultural consequences that get attention at the local level, not the nature consequences.

The consequences of increasing water demand are discussed at the provincial level but not at the local level.

In the *Eifel-Rur* area droughts are not yet seen as a threat to nature. However, strict EU Natura 2000 requirements can impact the measures taken. EU Environmental policies seem to play an important role in introducing a more holistic and synergistic approach to the management of the reservoirs. The water board has a co-responsibility for nature conservation, as the districts have. In addition, local groups like the “Salmon initiative” have started actions that were picked up by the district authorities.

In the area of *Groot Salland*, the issue of the protection and upgrading of Natura 2000 areas is a central concern. Motivated by fears that the Natura 2000 requirements would block any agricultural development in close proximity to nature areas, the Overijssel province has reserved a very large budget for measures in and near the buffer zones, including compensation payments for farmers and if necessary the buying of land to enable farmers a fresh start elsewhere. Because old extraction permits are valid indefinitely, it is difficult to use involuntary measures in the buffer zone. Apart from European-level influence, recent transfer of responsibility from the national level to the provinces plays a role as well. Another multilevel aspect is related to the development of a joint irrigation policy by all the water authorities in the Rhine East subbasin. Whereas in the past, each water authority had its own rules regarding temporary irrigation bans, now this regulatory framework is similar. The nature NGOs found the new policy made too much in a rush and thus, with technical shortcomings. The results were restrictions to new extractions in Natura 2000 areas as well as the buffer zones. However, the existing extractions are left untouched and are not even fully known. The water authorities ask the individual farms yearly to communicate their extraction levels. However, compliance is not monitored.

In France, climate change adaptation, especially with regards to drought, is mainly a national endeavour. In the *Vilaine* area, the Water Plan (SAGE) is the geographically largest in France, and aims to improve the water quality, aquatic environment and the wetlands in the Vilaine catchment. The Water Plan was created by a local water commission with two geographical subcommittees: one for the estuary and one for the wetlands. The latter incorporates elements from the 2008 Natura 2000 plan. For the eastern area, it is relevant that the entire catchment is not regarded anymore a water-sensitive region. As a consequence, the new Water Plan lost its instruments for drought management. The issue of small hillside reservoirs was extensively discussed while some feared that what would be initially accepted for vegetable growth soon would be diverted to irrigate crops like corn and thereby markedly increase the water demand of the area creating future drought problems for the wetlands. A further problem mentioned is that local implementation is difficult since often local politicians are too close to the farmers.

In *Somerset*, the management of the flood crisis illuminated the inherent levels and scales of the problem. Though historic collaboration between the various governance levels of the rather complicated and partially privatized British system, there was an immediate lack of funding on behalf of the higher authorities. When the flood crisis struck, local and regional stakeholders retreated. Simultaneously, the

crisis became an (inter)national media event, prompting the national government to step in and restore balance amidst the public outcry for more drainage. From the crisis, the observed one-sided approach to addressing European nature and water quality directives was a clear disaster. Alternative plans proposed by the Drainage Boards have the potential to deal with the double objectives better. While highly protected nature areas will remain protected and will continue to receive national funding, the danger is that intermediate areas that connect the designated nature areas will deteriorate and the habitat hotspots remain isolated.

In the eastern part of the Netherlands, all water authorities, provinces, municipalities, relevant NGOs, such as nature organizations and the farmers union, and drinking water companies agreed to develop and co-finance a working programme on fresh water supply in 2014. Projects like the *Vechtstromen* pilot fit perfectly in this programme. Another multilevel issue is the retreat of national government from nature and landscape policies. The Twente pilot area had been declared a “National Landscape” and an action plan was already developed when the national government stopped the policy programme leaving regional and local stakeholders to carry on with reduced support. In 2010, national government also cut nearly all support for the development of the National Ecological Network, a longstanding Dutch nature policy that aimed to halt this biodiversity loss by conserving nature, maintaining ecosystem function and service through connecting habitats. In the Twente pilot area, finding successful ways to upscale small-scale projects such that they cover larger areas, and also areas nearby, was difficult. This was not only true for farms, but also for nature conservation. Small fragments and discontinuities in nature areas are more vulnerable compared to areas that are linked and provide flora and fauna the ability to freely flow among areas. In this way, the ecological network approach was the ideal approach for the area. Now the Province of Overijssel had to step in to safeguard as much as possible, but could never do it to the same extent as would have been the case with more national support.

All in all, the *multilevel* interactions are quite varied between the regions studied. In most cases, water authorities have taken the lead in drought resilience management, though in the *Somerset* case, the primary actor is less apparent. In France, the national authorities have the lead in drought management, partly because of the centralized governance structure, and partly in response to the severe 2003 heat wave crisis. In the *Somerset* case the national authorities stepped in when the flood crisis became a big media event. In the two Dutch cases, national authorities withdrew from essential aspects of nature and landscape development. The European Union policies had strong indirect effects as a result of existing nature policies. Apart of the multilevel governance, the *multiscale* aspect of the measures and effects were also visible. In Eifel-Rur, the linked reservoirs spread out all over the area making measures at one spot relevant to other areas. In Vilaine, the reservoir level impacts areas far inland. In Twente, the challenge is to link the various scattered project areas where measures are taken into larger programmes that cover bigger areas.

## 12.5 Awareness on Nature Effects of Drought and the Public and Political Agenda

While nature protection not always directly affects human purposes, the awareness of threats to the integrity of the natural areas as ecosystems is not always self-evident. Sometimes the areas superficially look as nice as ever, even while droughts have undermined their viability.

In the higher sandy parts of *Flanders* that are dependent on groundwater and rain, drought-sensitive nature areas no doubt suffer from periods of desiccation, like adjacent areas in the Netherlands. However, it is remarkable how little attention this gets in Flanders. This phenomenon is highlighted in the Flemish Environment Report site ([www.milieurapport.be](http://www.milieurapport.be)—June 2015). The report does not mention nature effects of drought at all. While the Institute for Nature and Forest Research does give mention of its “nature indicators” with drought impacts as a keyword on its site ([www.natuurindicatoren.be](http://www.natuurindicatoren.be)—June 2015), there is a lack of content on the specific impacts. In light of this, the fact that the Flemish Environment Agency, as part of DROP, is considering nature protection as one of the goals of drought adaptation is big advancement.

The Velve and Dommel sub-pilots are within this drought-sensitive area. However, the activities there were more attuned to the impacts of agriculture (soil moisture) and calibration of the models. In the ongoing discussions on drought-related issues, environmental NGOs find it difficult to make their voices heard, due to the focus on agriculture and economic development.

While drought awareness is low in the *Eifel-Rur* area, drought can sometimes “piggy back” on more mainstream issues. For instance, protection of fish populations requires minimal water levels during periods of relative water scarcity which is also indirectly relevant to addressing drought. It is also a good objective for the national park authorities. Nature conservation groups, and to a lesser extent agriculture, are beginning to view the negative water balance during dry summers as a problem that needs to be addressed.

In the region of *Groot Salland*, most attention is focused on flood risk rather than drought. Still it would be unfair to state that drought risks are completely out of scope. In the 1980s, the Netherlands, established the term “desiccation of nature areas” as one of the “environmental themes”. That said, despite this, very little was done to solve the problem in practice. Drought effects on nature remained a “soft” interest. When irrigation bans are issued in times of drought (often both for agriculture and garden watering) these measures have sufficient legitimacy. However, the relation with nature protection is not clear to the public in this case. Under the new irrigation policy, making sure that there is enough recharge of ground water levels quickly became a co-responsibility among farmers.

While drought effects on nature are not a big issue in *Vilaine*, nature protection as such is indeed an issue. A nature NGO named “Vivre les Marais” is promoting the responsible care for the Vilaine and Redon Natura 2000 wetlands. There is also a Natura 2000 plan for this in the works. The nature NGOs are involved in consultations, for example concerning the Water Plan. However, the NGOs involved

have expressed feeling heard but not listened to. In the case of the wetlands, the main issue is not drought, but flooding. Here, the water level is controlled by the dam. In addition, drinking water and recreational (yachting) use provide incentives to raise reservoir water levels especially during normally dryer times, and often consequently flood inland marches at odd season. Beyond this scope, drought protection is not considered a serious issue for the region at the moment. Some awareness is evolving among the stakeholders, but its development is slow.

Even when in *Somerset* a number of subsequent droughts in 2010–2012 occurred, it was not always treated very seriously by the people in the region. Unlike nature organizations and some farmers who experience the variation of the water levels continuously, for most town dwellers droughts do not have immediately observed consequences as they do for nature. For town dwellers, drought is mostly correlated to fine weather. Nevertheless, all organized stakeholders were quite advanced to integrate drought aspects into their water-related climate adaptation plans. There was a proactive approach to drought management that was addressed across water supply, environment and even nature. After the big floods climate adaptation was reframed as recovery and mitigation from flooding, and reduced opportunities to include double-sided measures in the proposals to support the resilience of nature areas. Though the region is still recovering from the flood, there is still much reluctance to “piggy back” the flooding recovery with the issue of climate adaptation. This is likely remaining unchanged at least until the next big drought. Even then its consequences for nature should be cleverly communicated to a mostly urbanized society to increase the legitimacy of drought resilience measures.

While drought certainly is not a chief concern in the Twente region of *Vechtstromen*, awareness of drought risks for nature is widespread among institutional actors such as governments and NGOs. Water authorities and as well as province administration and the nature organizations also take the issue of drought seriously. This is less so among the broader public and parts of the agricultural community. The aim of pilot projects in the area is to raise awareness. Nature organizations in the region do regard desiccation as a serious problem, though the impact of nitrogen deposits is sometimes even more serious. Over time, the awareness is gradually growing, while the drought issue is repeatedly mentioned as one of the consequences of climate change. For the same reason occasional flooding is not interrupting this development: both sides of the coin are almost always mentioned together, and thus both floods and periods of drought contribute to the feeling that climate change is not a prediction anymore but an ongoing phenomenon.

The overview shows that the levels of *awareness* of climate change and drought impacts on nature are generally not very high and that they vary among different actors within each region. Among regions there is some variation in awareness, with the Twente region of *Vechtstromen* being most aware of drought and its impacts. The *Somerset* region is a close second in level of awareness. The floods events in 2013–2014 caused a great disruption, displacing drought awareness and placing concerns over drought in the rear. In spite of this, the *development over time* of drought awareness is showing a gradual increase. Consistent communication of the impacts of droughts and floods has helped to promote awareness and sustain dialogue and action surrounding both.

## 12.6 Conclusion: Highlighting the Main Issues and Their Prospects

In an attempt to synthesize the broad variation observed across the drought and nature policy context, the interplay of actors can be analyzed and summarized using the three components of the contextual interaction theory, based on their motivations, cognitions and resources. Here, the motivation, cognitions and resource of actors in the nature context are explored to analyze cross-cutting opportunities and challenges for the drought policy context.

### 12.6.1 Motivation

Motivation refers to the goals and values, external pressure, and orientations that drive the actor in a specific way. Among nature and conservation actors, the context of water scarcity and drought produces highly varied motivations. In many cases, the motivation of nature conservation stakeholders is triggered to a large extent by their own goals and values. On the whole, both nature organizations and farmers are aware of the implications of water scarcity and drought on nature areas, such as the loss of flora and fauna in river systems, algae blooms and crop failures. Such external pressures on a global environmental change scale serve as a primary internal motivator among these actors.

In addition, external governance pressures, such as the requirements set forth by the Natura 2000 regulations provide a strong impetus to implement measures to combat drought. Regulations, incentives and communications play a large role in motivating action among stakeholders. The EU Directives in particular have created pressures on relevant stakeholders (e.g. water boards) to devise collaborative solutions to address water scarcity and drought. Despite such top-down pressures, large regional disparities in resources and water use create cascading pressures at the local level. Lack of resources tends to motivate local led initiatives to develop their own innovative tools for drought-related problems.

Despite strong economic interests, governance pressures can override them depending on the strength of the regulation. For example, in the case of Somerset, motivated actors from nature conservation organizations, including the Royal Society for the Protection of Birds (RSPB) and the Somerset Wildlife Trust (SWT), developed long-term visions for transforming the landscape from human-centred to exclusively for nature by restoring open grassland landscapes. In the face of strong economic interests, the benefits of a more resilient and robust landscape in the face of extreme weather outweighed competing pressures. Such harmonization of initially competing motivations is at the heart of sustainable and integrative land and water management as well as coping with extreme weather events, including drought and flood (Robins 2014).

### **12.6.2 Cognitions**

Cognitions refers to the observations of reality, the frames of reference, and the interpretations of the actors at hand. While motivations among actors tend to differ widely, all actors across case studies tend to share similar cognitions based on observed changes in the regional water balance. There are general observations among nature conservation actors that precipitation regimes are changing in unexpected ways and that these regime changes influence both flora and fauna habitats. In recent years, a large number of creeks have gone dry, leaving behind almost non-existent vegetation. Damages from droughts are increasingly affecting agricultural yields in rural areas, while cities and their urban infrastructure are also more and more at risk as a result of lower reservoirs.

The visibility of drought has increased in recent years, both in the farming and urban contexts as well, which in turn has contributed to widespread cognitive shifts among all nature conservation-related actors. More and more, stakeholders coherently and consistently agree that water scarcity and drought is, and will increasingly become, a problem. In response, strategies to combat drought impacts have already been developed into guidelines that keep water longer in the ground and in surface waters, employ water use efficiency schemes, and develop medium- and long-term possibilities for extra water transport. These strategies further contribute towards a more unified cognitions in nature arenas. As a result, it is expected that coherence among stakeholders will increase moving forward, with more experience with drought and water scarcity likely to develop into the future.

Nature-related regulations, including the WFD and the Habitats and Birds Directives, in addition to creating driving pressures, also contribute to shifting cognitions among relevant actors as drought protection measures become more ubiquitous.

More broadly, there is general cognition and awareness regarding the need for collaboration across a wide range of actors, including both public and private, at all levels. Because water scarcity and drought can impact both land, marine and freshwater ecosystems, connectivity is key to addressing the crises. Such a cognitive approach is particularly important in moving away from strictly legal incentives as the main motivators. In an effort to place less reliance on legal incentives, improving communication between actors and providing the tools and space for negotiating the relationship is the key. This approach allows for competing motivations to find more harmonious solutions before resorting to a priori legal recommendations.

### **12.6.3 Resources**

Resources refer to the available capacity and power available internally and/or externally. On the whole, the resources dedicated to dealing with drought issues are limited. Amongst nature conservation actors, insufficient resources in terms of access to funds and general support are the most commonly cited barriers to

engaging with water scarcity and drought issues. This is largely due to severe cuts in government funding, which have drastically reduced the amount of funding available for stakeholders. At present, in order to access funds, proposed measures in Germany require up to 80 % minimum co-financing by municipalities. When the remaining percentages are not achieved, the initiatives are either tabled or die. This not only leaves a large number of initiatives critical for addressing water scarcity and drought and other issues unfunded, but also it leaves the funds unused. This in turn has led to a large accumulation of financial resources that are available but not accessible.

In addition, actors within the nature conservation arena have increasingly resort to project acquisition (such as LIFE or INTERREG) as well as available funding at the state level for specific projects, such as Natura 2000 monitoring. An alternative approach, particularly applied in governing nature reserves, that has emerged are public–private partnerships (PPPs). PPPs are increasingly the trend to maintain conservation areas and the ecosystem services which they provide. While the trend is promising, it also underscores the decreasing flexibility of governance systems to address new policy issues such as drought and water scarcity.

Simultaneously, there is a lack of resources in terms of the competencies among nature conservation actors that has limited them to tackling issues of drought. Due to a lack of power, and also agency, they often lack the flexibility that other actors, such as the water boards, possess.

Lastly, there exist limited resources in the legal sense as well. Competing interests between agriculture and nature areas have been at the heart of legal tensions as impacts of drought are felt on both sides. Though measures to encourage water efficiency schemes have helped to divert tensions, there is a critical need for more integrated land and water management perspectives in order to avoid resorting to legal tools.

The interplay of motivations, cognitions and resources in the case study processes shows that keeping the nature perspective influential is sometimes a difficult task. Even so, in many areas there are actors that see it as a vulnerable aspect of drought resilience and are prepared to protect it.

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