

Chapter 4

Reforming water allocation regimes

This chapter examines common themes related to reform, drawing on case studies documenting the experience of water allocation reform in 10 OECD and BRIICS countries. Although water allocation reform is inherently a political process unique to its time and place, valuable insights can be drawn from the experience of other countries. These can be instructive for those contemplating allocation reform or actively pursuing it. This chapter examines the drivers of reform, the process of identifying and selecting reform options, stakeholder engagement, and other key aspects of the reform process, drawing out insights and lessons learned.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Key messages

- Engaging in an **appropriate policy dialogue to support a water allocation reform** can help to avoid adopting an overly technical and technocratic approach to reform. The “Health Check” for Water Resources Allocation (Chapter 5) can provide useful guidance for such a dialogue.
- Water allocation reform is not a discrete, time bound process. It tends to be an iterative process, which **extends over many years or even decades**. Institutional path dependency can raise the cost of improving the flexibility of allocation to respond to changing or novel conditions.
- **Concerns about water scarcity** and **insufficient water for ecosystems** are often cited drivers of allocation reform, along with broader political or structural reforms. Droughts can provide a salient, visible event to trigger action.
- The reform process allows for **ample opportunities for participation and negotiation**. **Willingness to engage stakeholders** and appropriately **compensate** potential “losers” facilitates the process. Compensation can take various forms, such as financial transfers or permission to build storage structures.
- Before introducing changes to an allocation regime, it is essential to determine a **sustainable baseline** (how much water is available for allocation once *in situ* requirements, including for the environment, have been satisfied) and consider possible **unintended consequences**.

A significant number of countries are either currently reforming their allocation arrangements or have recently done so. Findings from the OECD Survey on Water Resources Allocation indicate that 60% of countries surveyed have recently reformed their allocation regimes. Over half of respondents indicated that allocation reforms are ongoing. In this analysis, “reform” is understood broadly, to encompass both transformational reforms that can entail fundamental changes to significant aspects of an allocation regime, as well as incremental changes in the policies, laws, and mechanisms that have a tangible impact on allocation arrangements.

Reforming water allocation arrangements can be a very difficult political challenge. Reforms can lower the volume of water some users will have access to, they can change the distribution of the risk of shortage across water users, and they can affect infrastructure and investment needs. Even incremental changes to an existing allocation regime can create opposition and require costly compensation to free up water by buying out existing water users.

Although water allocation reform is inherently a political process unique to its time and place, valuable insights can be drawn from the experience of other countries in dealing with political economy challenges related to reform. These insights can be instructive for those contemplating allocation reform or actively pursuing it. Drawing on case studies documenting the experience of water allocation reform of 10 OECD and BRIICS countries, this chapter draws out useful insights and lessons learned. It examines common themes related to drivers of reform, the process of identifying and selecting reform options, the reform process itself, and assessments of reforms that seek to determine if they reached their aims.

Why reform? Building the case for water allocation reform

It can be difficult to pinpoint the key drivers of allocation reform. Often the reform is driven by an accumulation of factors over time. The impetus from a “trigger event” can also help to spur reforms on. Nevertheless, looking across a range of country experiences, some common themes emerge. Concerns about water scarcity and insufficient water for ecosystems due to growing demand and/or reduced supply have provided the rationale for reviewing existing allocation arrangements in a number of countries. The case of Alberta, Canada illustrates the need to adjust to changing conditions, such as increasing demand, by maturing the existing allocation regime which had been previously fit for purpose, but was no longer seen to be so, given changing circumstances. In some cases, authorities have had to claw back entitlements to over-allocated and over-used resources, or find alternative sources of supply, such as in the case of Israel.

A drought is often seen as a good opportunity to make the case for change, even if change is long overdue. Such a crisis can help to catalyse action, as authorities are under pressure to respond to both the short term, acute crisis as well as engage in a longer term process, aimed at preventing future crises. Motives outside of the water domain, such as broader political reforms to improve economic efficiency (e.g. Australia, Israel) or equity in the distribution of resources (e.g. Chile, South Africa) have driven allocation reform. However, as illustrated by the case of England and Wales, a well-documented and broadly accepted case for reform does not necessarily translate into immediate action. Finally, two cases clearly highlight that perceived risks to the government, such as the threat of litigation, can either spur reform (as in the case of France) or, on the contrary, delay its implementation (as in the case of South Africa).

Allocation reforms have also taken place in the broader context of a general shift in water management approaches over the past several decades. Until the 1980s, water resources management in most OECD countries put the emphasis on infrastructure, or “supply-side” technical solutions, to aim to harvest the maximum amount from the resource. This “supply side” approach has since shifted to place greater emphasis on the sustainable management of the resource with reliance on “demand side” economic solutions, including a greater role for market-based allocation mechanisms (see, for example, OECD, 2010).

As illustrated in several cases, there are multiple motives that drive allocation reform and these are dynamic over time. The focus of policy objectives for allocation can also shift over time. A common pattern is a progression from a focus on regional development, towards more efficient water resource use, to increased attention to the value of water for sustaining ecosystem services. Equity concerns arise in multiple stages, often in an attempt to remedy past allocations that are no longer perceived as fair, or to address unintended consequences of previous reforms. This section will examine each of these reform drivers in turn.

Concerns about growing water scarcity and lack of water for the environment

Concerns about growing water scarcity and lack of water for the environment is a frequently cited reason for reviewing existing allocation arrangements. Concerns about scarcity can be fuelled by increasing demand or shifts in water availability, or due to degraded quality, or climatic shifts. In particular, droughts can provide a salient, visible event to trigger action (see Box 4.1). Efforts to secure adequate water for ecosystems can be driven by new legislation, such as the EU Water Framework Directive, or visible environmental deterioration, such as rivers running dry. In some cases, reforms have sought to address issues that have arisen from previous allocation reforms. The cases of Alberta, Canada, Australia, Chile, Israel, England and Wales, and South Africa provide insight on this theme.

In the case of Alberta, Canada, concerns about meeting future water requirements arose with increasing urban development (notably in the southern half of the province) and a drought in 2001-02. By the early 1990s, there were already conflicts between farmers and environmentalists over low flows in the rivers. At the time, there was little experience of monitoring actual water use and managing water shortages. The situation prompted a review and adjustment of allocation arrangements, which the provincial government characterises as a process of maturing rather than reforming, *per se*. The old system worked well given the prevailing circumstances, but the maturing of the system became inevitable as water demand exceeded available resources. A review of the Water Resources Act of 1931 and past policies was undertaken. The process took five years and resulted in the enactment of the Water Act of 1999. The concerns regarding growing scarcity resulted in authorities halting the issuance of new water licences in certain basins and establishing a mechanism that allowed existing licenses to be transferred among users.

In a similar vein, Israel faced rapid change in demographic and economic trends that put water resources under significant pressure. Hence, the increasing shortage of natural water resources was the major driver for the reform. Over the last 18 years, the average renewable quantity of water dropped to an average of about 1.2 million cubic meters per year (MCM/Y) from an average of about 1.4 MCM/Y over the last 50 years (Feinerman et al., 2013). The water sector was under constant pressure also as a result of a substantial increase in population

Box 4.1. **Never let a good drought go to waste**

Winston Churchill's oft-repeated quote "never let a good crisis go to waste" alludes to the opportunity that such events create to change the *status quo*. This also applies to water resources reform, where droughts provide a salient event that makes visible the impacts and costs of water scarcity and poorly managed allocation. Even when a case for allocation reform has been long recognised, a drought can provide the needed trigger to spur action on the reform agenda. This is reflected in several cases. For instance, in New Mexico, United States, the need for reforming the water allocation regime had been built up during a period of several decades. The very severe drought in 2002 can be seen as a catalytic event that advanced reform. The entire state was considered a drought disaster area and all users suffered from shortage. Further, the state had difficulties complying with its obligation of delivering water to the neighbouring state Texas, as agreed under the Pecos River Compact (Bossert, 2013). In California, United States, a multi-year drought in the late 1980s and early 1990s helped the water market take off by spurring direct state purchases and the development of an emergency drought water bank. In the case of England and Wales, coincidentally, the *White Paper "Water for Life"* which set out the proposals for abstraction reform was published during a severe drought, while culminated in a risk of supply failure to London in 2012. This raised expectations about the abstraction licensing reform and a major stakeholder engagement process was started. Finally, the heat wave of 2003 in France led to the development of the National Plan against droughts (*Plan sécheresse*) in 2004, which laid some of the groundwork for the subsequent allocation reform.

(multiplied almost twelve-fold over the past 60 years) and an increase in the standard of living. Up until a few years ago, water supply was almost entirely dependent on the renewable-storage capacity of three main natural sources (Feitelson, 2013).

However, the water crisis also resulted from previous policy decisions, which resulted in over-allocated resources. During the first decades of the Israel's existence, water allocation policy gave priority to accelerated economic development, particularly in the agricultural sector, over the naturally available quantities. This caused a continuous and increasing erosion of the operational storage capacity in the natural sources (which worsened during drought years) up to a "crisis" when shortage amounted to almost equal the level of annual overall consumption. This has occurred twice since 2000 (State Comptroller, 1990; Bain Committee, 2010).

For South Africa, there was a growing recognition of increasing water scarcity and pollution challenges arising from industrial expansion and population growth, along with the need, in line with the concept of sustainable development, to protect the aquatic ecological base. South Africa is a water scarce country, with large semi-arid areas. In addition, extensive mining has left a legacy of water pollution, exacerbated by industrial and agricultural practices. An intricate network of infrastructure transports water between catchments to areas of high demand. However, the options for further infrastructure development were increasingly expensive and alternative options to expand water supply were needed. Several of South Africa's most economically important river basins were facing closure and increasingly complex approaches were required to reconcile water availability and demand. A long history of managing scarce and variable water resources established a core of experienced water managers who foresaw that greater control over

and understanding of the water allocation process held the key to maintaining economic growth in the face of growing scarcity. There was also a strong sense that the existing legislation was based on the legislation of well-watered European countries and needed to be amended to address the water issues in a water scarce country with high levels of climate variability. Moreover, the introduction of legislative requirements for environmental flows introduced new challenges, potentially requiring the State to claw back allocated water in some places. This required a shift away from the riparian doctrine, in which land owners are entitled to a fair share of water on or under their properties, to an allocation system based on usufruct, quantified entitlements.

England and Wales faced similar challenges, but years passed before there was sufficient momentum for moving the reform forward. Strains on the environment due to pressures on water resources had been long recognised. The growing recognition of the scarcity of resources (counter-intuitive to the perception of England as a wet country) and the unacceptability of dry rivers, led to calls for reform in the early 1990's. In 1997 the then Deputy Prime Minister gave a government commitment at a Water Summit (called after a very severe drought in 1995-96) that the abstraction licensing system would be reviewed. Despite ongoing public pressure for reform to progress, legislation in 2003 merely delivered some minor amendments to the then 40-year old system. In 2011 the momentum was regained when the government published the *White Paper "Water for Life"*, which included firm proposals for abstraction reform. Crucially, it was supported by "The Case for Change", which was an assessment by the Environment Agency of the potential impact on water availability of climate change, coupled with increased demand for water from population growth and energy supply (Box 4.2).

Like England and Wales, escalating environmental concerns were among the key drivers of allocation reform in Australia, along with broader reforms to promote economic efficiency. From 1981 to 1983, the River Murray mouth closed for the first time since regulation of the river system began, leading to increased awareness of environmental water requirements. Over time, as the water market developed and water trading expanded, it became clear that not only was the system over-allocated, but the cost of not dealing with the issue would increase severely in the future. As a response, the Australian government introduced in 2007 the Buyback programme to purchase water entitlements for the Environmental Water Holder from voluntary sellers in the market.

Similar to Australia, Chile also faced challenges related to the over-allocation of water resources in a market-based system leaving insufficient water for the environment. Recent reforms in 2005 included amendments to the prevailing allocation regime that sought to correct issues related to social equity and environmental sustainability that were not reflected in the Water Code of 1981. Prior to the 1990s environmental and water management policies did not pay much attention to meeting water requirements of the environment and as a result, the totality of river flows was allocated to users. This gradually changed. In 1994, an improvement was made in the system of Environmental Impact Assessment that proposed the establishment of an ecological flow as a mitigation measure against potential negative environmental externalities associated with water trading. Amendments to the Water Code in 2005 formally established minimum ecological flows to be considered in the granting of new water use rights by the Directorate General of Water (DGA).

Box 4.2. Making the case for water abstraction reform in England and Wales

The example of England and Wales demonstrates the value of making a clear case for change, including ensuring that the shortcomings of the current system are widely understood. To support the proposals for abstraction reform set out in the *White Paper "Water for Life"* (2011), the United Kingdom Environment Agency developed "The Case for Change", which assessed the potential impacts on water availability of climate change, coupled with increased demand for water from population growth and energy supply needs. The assessment considered 11 emission scenarios from the United Kingdom Climate Projections (UKCP09) and their potential impact on river flows.

The conclusions were varied, but suggested that average summer river flows could reduce by up to 80%. This reduction would not be offset by increased winter precipitation. Attempting to maintain current (aspirational) levels of environmental protection would reduce significantly the water available for abstraction. Similarly, demand pressures under a range of socio-economic scenarios would pose a threat to environmental limits. The analysis considered averages; drought events would have greater impact. The south and east of England is already water stressed from a combination of low rainfall and high demand. But the wetter west and north could not be relied upon to make up any shortfall: the analysis suggested that these catchments would be most affected by climate change consequences.

The "Case for Change" spelt out the future challenges and pressures on water resources. However, in order to understand how the allocation system should be reformed to respond to those challenges it was important to understand its shortcomings. In December 2013 the government published "Making the Most of Every Drop", a consultation on abstraction reform, which set out why reform was necessary:

- The current system does not systematically link access to water to availability. Only a quarter of licences have controls to stop abstraction to protect the environment or other abstractors during periods of low availability. Conversely, the system struggles to allow additional water to be taken during higher flows.
- The system does not help abstractors to trade available water effectively, and to provide price signals to promote efficient water management.
- Abstractors are not currently incentivised to manage water efficiently.
- Much of the water (generally less than half) that is licensed is not actually used. This potentially denies access to others.
- The current process to change most licences that are causing damage to the environment is expensive and time consuming. As the climate changes and flows reduce or become more variable, more licences are likely to require changes, making this problem much worse and more expensive.
- The system fails to incentivise abstractors to manage risks from future pressures on water resources.

The government stated in its consultation that "these weaknesses may constrain economic growth due to reduced resilience and getting sub-optimal economic value from available water, while not efficiently protecting the environment". Officials from the Department for Environment, Food and Rural Affairs (Defra) worked closely with the Environment Agency, and representatives from a wide range of other organisations, in order to fully develop the policy options for reform.

Source: Barker, I. (2014).

Overall, these examples highlight how concerns about growing water scarcity and insufficient water for ecosystems can figure among the key allocation reform drivers. These strains can arise from rapid demographic and economic changes, droughts, and climate change, or over-allocation of the resources for consumptive uses. Although rivers running dry can provide a powerful signal to policy makers and society, concerns about the environment can be broadly recognised for a long period of time, without necessarily spurring action on their own.

Motives from outside of the water domain

Beyond concerns about the state of water resources, motives from outside of the water domain are often a contributing, and even decisive, factor in allocation reform. Two factors are often cited: the drive to improve economic efficiency of resource use and the equity of resource use. Perceived legal risk can also spur or hinder reforms, depending on the context (Box 4.3).

Box 4.3. Perceived legal risk: A help or hindrance for water allocation reform?

In addition to the reform drivers discussed in this section, the cases of France and South Africa highlight the influence of perceived risks by authorities on allocation reform. Interestingly, the perceived risk has opposing effects depending on the specific example. In France, rising judicial risk spurred action to deal with a depleted aquifer. In another instance, proposed revisions of licenses were stalled after water users took the authority to court. In South Africa, the perceived risk of potential litigation had stalled the implementation of allocation reform. The example from South Africa is further discussed in Box 4.5.

In France, when water tables ran dry in one particular aquifer (*nappe de Beauce*), environmental NGOs took notice and action. Faced with a rising environmental risk (frequent and damaging low flows), the government created special zones for water sharing (*zones de répartition des eaux* or water apportionment areas, WAAs, in English) in 1994. WAAs are areas that have known regular water stress situations, where access to water can be restricted (stricter conditions to get abstraction licenses and greater water abstraction taxes). WAAs are in accordance with the 1992 Water Law. They have been revised in 2003.

In 2003, France was affected by a heat wave, which led to a national plan against droughts (*Plan sécheresse*) in 2004. Before the plan passed, some local initiatives had been taken to reform allocation regimes. For instance in the Poitou-Charentes region, additional demands for water license triggered tensions between water users and NGOs. The local State representative (“*Prefet*”) revised the water licenses, with a view to address over-allocation. Water users took the State to court, and the State lost all the cases because the decision was not backed by a legal procedure: granted licenses could not be withdrawn that easily. Changes had to be anticipated and compensation had to be negotiated according to the local situation. This particular experience confirmed that the State was facing a judicial risk, if it was to revise existing water licenses. Facing rising judicial risks, France considered that the *status quo* was not an option, and hence examined options for allocation reform.

The drive to improve economic efficiency was among the key reform drivers for Australia, Chile, and Israel. For Australia, in addition to the escalating environmental concerns discussed above, the pursuit of economic efficiency was a decisive factor behind the establishment of a comprehensive water market in the Murray-Darling Basin.

Similar to Australia, reforms in Israel were linked to broader economic reforms. The Ministry of Finance established the need to continue “*structural reforms to further enhance the public sector, increase competition, reduce the public expense and increase its efficiency, and promote a responsible and growth-supportive fiscal policy...*” (Government of Israel, 2013). In this framework, aspects of the water sector and its management were extensively addressed. From the early 1990’s a number of reports by the State Comptroller and several inquiry committees pointed at administrative and structural failures regarding a multitude of aspects in the water sector policies. It is mainly the resulting recommendations and their implementation which led the reform (Arlozorov Committee, 1997; Magen Committee; 2002; Bain Committee, 2010).

For Chile, the economic liberalisation of 1973-89 was a key driver of water reforms in the 1980s. The economic paradigm had shifted from a state-controlled economy to an emphasis on market-based approaches. Although private water use rights existed in Chile prior to the Water Code of 1981, the legislation at the time restricted the creation and operation of efficient water markets consistent with the new economic system. These restrictions related mainly to ways in which water use rights were defined, the amount of information available to users, transaction costs, the way third-party impacts were dealt with, the approach to conflict resolution, and the legal framework necessary for the market to operate properly (Donoso Harris, 2003; Donoso Harris, 2011). The enactment of the Water Code of 1981 sought to remove these constraints and created legally defined tradable water use rights to facilitate economically beneficial reallocation of water (Bauer, 2004; Büchi, 1993; Hearne and Donoso Harris, 2005).

Subsequent reforms in Chile sought to remedy some of the issues related to equity and environmental sustainability that arose from earlier reforms. For example, with the introduction of Water Code in 1981, a rapid increase of requests for water use rights for speculation and hoarding purposes occurred,¹ which resulted in monopolistic behaviour and a reduction of water resources available for allocation to other potential uses (even though they were not actually being used). This created an impediment to the development of new investment projects on account of not being allowed to acquiring new rights (Pena et al., 2004; Bitran and Saez, 1994; Donoso Harris, 2003; Donoso Harris, 2011).

To address this speculation and hoarding, the government introduced a non-use tariff for unused water. Once the water use right is determined to be “unused”, the tariff is levied, based on a system of escalating charges.² As a result of the reform of the Water Code in 2005, along with other measures, speculation and the hoarding of non-consumptive water use rights have been reduced (Pena, 2010) freeing up water to be accessed by a broader number of potential users, thereby improving the equity of allocation.

Equity in allocation was a primary driver of water reform in South Africa. Water allocation reform in South Africa was driven during the political transition to democracy in 1994 and formed part of a broader suite of legislative reforms aimed at fundamentally transforming the South African political and economic context. The primary driver was the need to transform a society in which the black majority had been excluded from access to natural resources (including water) or the benefits derived from such natural resources.

Thus, in 1994, around 95% of the water used in South Africa was in the hands of the white minority. The water allocation reform proposed in the 1997 *White Paper on a National Water Policy for South Africa*, and the ensuing National Water Act were aimed at addressing this historical injustice.

Policy options appraisal for water allocation reform

The appraisal of policy options is a key step in the reform process. Focussing on remedying the perceived shortcomings of the existing system strongly influenced the identification of options in several countries. The cases studies also show that international experience is frequently considered in the course of developing policy options. However, different countries may draw different lessons from the same experience. At the same time, policy options can be constrained by limitations imposed by other policy areas (e.g. tax policy), strong opposition by stakeholders, broader political or economic considerations, or conflicts with existing well-entrenched principles (e.g. first in time, first in line). Finally, while it can be difficult to quantify all of the costs and benefits of alternatives, economic assessment has proven to be useful in option selection. This section explores the process of developing policy options across these themes, with illustrations from the case studies.

The perceived shortcomings of the existing water allocation system strongly shapes the reform options considered

Focussing on remedying the perceived shortcomings of the existing system significantly influenced the identification of options in several countries. The cases of Alberta, Canada, England and Wales, France, and South Africa provide useful illustrations. In addition, a few cases demonstrate how allocation reform options can be differentiated within a country, to address varying degrees of scarcity, or risk of shortage (Box 4.4).

In Alberta, Canada, the concerns regarding growing scarcity influenced the development of policy options to improve the allocation regime. As a response to growing scarcity, authorities halted the issuance of new water licences in certain basins and established a mechanism that allowed existing licenses to be transferred among users. New rules were created with provisions for permanent and temporary (in-season) transfers and trades, subject to the approval of the Alberta Ministry of Environment and Sustainable Resource Development (Alberta Environment, 2003).

Changes in allocation arrangement were also made to address the issue of licenses held for water that was not being put to beneficial use. To address this, authorities introduced a new feature for all new water licenses issues after the Water Act took effect. All new water licenses would have expiry dates and the licence holders would have to apply for renewal. This enabled reallocation of water that has not been put to beneficial use. However, this change met with some concern, as imposing expiry dates could be interpreted as taking away licensees' property rights.

Similar to Alberta, in England and Wales addressing the shortcomings of the current system played a key role in working up and testing options for consultation. In "Water for Life" the government substantially revised the 1999 policy objectives, as follows:

- to send clear signals on water availability, so as to drive adaptive behaviour by abstractors
- to better reflect the value of water to customers and ecosystems

Box 4.4. Differentiated approaches tailored to different degrees of water scarcity

A differentiated approach to allocation can be used to tailor reform options to different circumstances. Both the cases of South Africa and England and Wales provide good illustrations.

South Africa's allocation reform recognised different approaches should be taken depending on water scarcity and the potential economic impact of allocation reform in a particular area, as follows:

- In catchments where **water availability was not likely to limit growth**: the focus would be on actively seeking opportunities for viable black or women owned enterprises who could be allocated water entitlements, without compromising existing users, or relicensing users.
- In catchments where **water is becoming limited, but which were not prioritised for compulsory licensing**: the process would not actively seek new water users, but would encourage water trading among water users. If viable black or women owned enterprises made application for licences, these would be issued, in effect slightly lowering the assurance of supply to existing users. Should the volume of water required by new Broad-Based Black Economic Empowerment users warrant it, the catchment would be prioritised for compulsory licensing.
- **Catchments prioritised for compulsory licensing**: in these catchments, a rigorous process of assessing the availability of water for allocation, determining the extent of existing lawful water use, determining the opportunities for uptake by black and female users, and assessing the impacts on existing users would be followed.

For England and Wales, the reform components to better link abstraction to flows and facilitate trading would only be introduced in catchments where there were clear environmental and economic benefits due to water scarcity and the potential for trading – so-called “**enhanced catchments**”, where much of the benefits of reform would be found. Catchments that do not show clear environmental or economic benefits for enhanced reform would undergo basic reform only – “**basic catchments**”. However, as the climate changes and the demand for water increases, the number of basic catchments is likely to decrease. The impact assessment of the reform took account of the way in which particular elements of reform were likely to be implemented. Both reform options were estimated to have set up costs of GBP 10-16 million, with water shares being more expensive because of its increased complexity.

Source: Quibell, G. (2014); Barker, I. (2014).

- to recognise the value of discharges
- to drive efficiency in water use
- to be fair and equitable
- to be flexible and responsive (this was seen as one of the key aims in order to help manage the uncertainties inherent in climate change and demand forecasts)
- to meet water needs for people and the environment at least cost.

These policy objectives were an effective litmus test of the options appraisal, set against the assessment of the shortcomings of the current system. The first option, “Current System Plus”, would build upon existing good practice to strengthen the link between water availability and abstraction to allow more water to be taken when more was

available. Trading would be made easier, by pre-approving temporary low risk trades. The second option, Water Shares, would be more radical. It would provide abstractors with a share in the available water resource, rather than an absolute amount. In each specified part of a catchment the regulator would assess how much water was required to protect the environment. The remaining “available resource” would then be divided between abstractors as shares with differing reliability.

Furthermore, given that one of the catalysts for reform is that the current system is no longer fit for purpose in the face of future challenges, stakeholders and government were concerned that the new system should be implemented from a sustainable baseline. In other words, that the legacy of damaging or potentially damaging abstraction licences should be addressed before the transition. There is a clear recognition that to fail to do so would result in the sort of unsustainable market seen in the Murray-Darling Basin in Australia. Accordingly, the intention is that unsustainable abstractions will be resolved before implementation of any new system.

For France, the identification of options was strongly influenced by the pursuit of options that would address perceived collective action failures. The main objective of the reform was to anticipate and manage the risk of shortage by apportioning available water among water users. France was looking for an option for allocation reform that would combine the capacity of users to self-regulate and provide an incentive to farmers to act collectively. This option reflected French experience with the development of irrigation and the management of scarcity. In France, experience shows that when water users associations were in place at catchment level, over-allocation was properly managed, as the Chair of the water user association (along with the members) regulates water uses among members in cases of scarcity. Problems emerged in situations where irrigation expansion followed individual plans and decisions, as individual entrepreneurs failed to factor in the consequences of their decisions on the local community.

This experience provided the rationale for France’s reliance on OUGCs (*Organismes uniques de gestion collective*) to allocate water and to adjust to shifting circumstances. The objective was to define an institutional framework or policy tool that could provide for the revision of water entitlements, revisit the “first come first served” practice, and grant local farming communities the capacity to self-manage.

In the case of South Africa, the issue of the racial transformation of access to water to address entrenched inequity was on the agenda from the beginning of the process. The policy positions were developed arising from the consultative process and under the strong political guidance of the Minister of Water Affairs. To guide the reform, the Department of Water Affairs, in consultation with stakeholders on a national and regional basis, developed a set of underlying principles. These clarified the overall intention of the process, provided a point of focus for stakeholder consultation processes and established the “policy” or approaches, which would underlie the compulsory licensing process put into place. The elaboration of the principles established allocation reform as a proactive process of actively pursuing the development of water-using enterprises that aligned with national, provincial and local political and development objectives, albeit with a view toward greater efficiency of allocation, rather than a passive process of simply reallocating water.

International experience frequently influences water allocation reform options considered, but leads to different conclusions in different countries

The cases reviewed for this report indicate that international experience is frequently considered in the course of developing policy options. For example, in China, water allocation reform benefitted from keen attention to international experience (tradable water rights in Australia, the EU Water Framework Directive, water quality management in France, etc.). The cases of Israel, England and Wales, and France also illustrate this point. Countries differ in terms of their hydrological endowments, demand positions, institutional arrangements, and preferences for policy approaches, and thus draw different lessons.

In the case of Israel, a review of international experience helped to guide option development. For example, international experience factored into the decision regarding the possibility for private owners of desalination plants to sell water directly to end consumers. An extensive analysis of the advantages and disadvantages was conducted and a comparative study of the situation in OECD countries showed that almost always the local optimum is reached at the cost of the national optimum (Bain Committee, 2010).

To contribute to the options appraisal for the ongoing abstraction licensing reform in England and Wales, the Department for Environment, Food and Rural Affairs (Defra) commissioned reviews of international experience in water allocation. Given that one aim was to make it easier to trade, the Environment Agency also commissioned an international review of other sectors such as fisheries quotas, airport slots and emissions trading. The case studies covered a wide range of experiences of transitions to market-based approaches in sectors either where markets did not previously exist, or where reforms were introduced to improve the way that markets functioned. Parallels with water abstraction were identified, including defining rights that can be traded, managing a gradual transition to markets, and dealing with concerns over market dominance.

France also considered international experience with market instruments for allocation, but drew different conclusions. France has not been impressed by the performance of market instruments for water allocation abroad. In particular, concerns arose about the capacity of tradable water right regimes to factor in environmental and social considerations. Considering issues with water markets abroad on the one hand, and assessing the national needs of France on the other, preference was given to non-tradable water allocation. Thus, France opted for an alternative option, based on an innovative administrative body (the OUGC).

Several factors can constrain the range of policy options considered for water allocation reform

While the range of policy options considered is significantly influenced by the perceived problems with the *status quo*, policy options can be constrained by a number of factors. Limitations imposed by other policy areas (e.g. tax policy) can render some options not legally viable. Strong opposition by stakeholders can also cause certain options to be rejected. In the cases reviewed, certain approaches to pricing provoked particular issues. Conflicts with existing well-entrenched principles for allocation, such as the principle of “first in time, first in line” can constrain the options considered. Broader political or economic considerations provide constraints as well. Finally, institutional path dependency, can raise the cost of improving the flexibility of the allocation regime and reallocating water to higher value uses (see Libecap, 2011). Examples from England and Wales, Alberta, and Israel provide illustrations.

In the course of options development and appraisal in England and Wales, eventually, three preferred options were developed to be ready for formal consultation. One of these – Variable Administered Pricing – was rejected at a relatively early stage. It proposed that the regulator would set a water price according to local water availability. The price would decrease as availability increased, and vice versa in order to protect the environment. During the options appraisal it became clear that this would mean that the charges would be classed as a tax, and so subject to tax policy, which requires that taxes are predictable and stable.

Water pricing provoked strong opposition in Alberta, notably from irrigators, since they perceived it as a type of tax. The consideration of options also generated conflicts with well-entrenched allocation principles. Proportional sharing of water during drought, where all users lose the same proportion of their entitlement, was considered as an option. However, this would be in conflict with the “first in time, first in right” principle, which the government and water users preferred to uphold. Nonetheless, there was recognition among water users that strictly following the priority allocation principle may not be in everyone’s best interest in times of drought. An example from the 2001-02 drought illustrated this clearly. In one basin, water entitlements were to be cut off for junior users (with licences newer than 1959). However, this meant that potato growers with senior water entitlements could not send their produce to the processing plant, since it was cut off from water. To address this issue, while retaining the priority allocation principle, the preferred option made it possible for the senior licensees to temporarily assign seniority to some junior licensees.

In Israel, a wide range of different alternatives for reforming allocation and exploring new sources of supply were considered over the years and were studied in many ways. Among the options considered was importing bulk water from Turkey. However, this alternative was discarded after thorough examination due to economic considerations (price of transportation), technological considerations and strategic considerations (creating dependency upon another country).

Economic assessment has proven useful for options appraisal

While it can be difficult to quantify all of the costs and benefits of alternatives, economic assessment has proven to be useful in option appraisal in several countries. For instance, in France, discussion of reform options benefitted from a thorough assessment of the economic and social costs of reduced water licences. Such an assessment was commissioned in the Adour Garonne Basin and Vendée, for example, and generated data which could be used as a reference in the negotiations related to the development of OUGCs.

The case of England and Wales highlights both the challenges of quantifying costs and benefits as well as innovative approaches to deal with them. The impact assessment undertaken in the course of options appraisal highlighted the challenge of quantifying the costs and benefits of the reform options, for several reasons. It requires an understanding of the long-term future scenarios to take into account risks of future water scarcity. It involves the representation of complex trading rules and environmental standards linked to continuously varying water resources. It also involves the representation of short and long-term decision making on water management in the context of uncertainty.

An innovative way of attempting to address these challenges was the use of combined “agent-based” behavioural and hydrological models of four catchments, running in daily steps between 2025 and 2050. Abstractor “agents” were asked to make short and long-term decisions on water management, trading and investment driven by economic and other factors, drawing on behavioural economics. The assessment took account of climate change impacts, and incorporated a range of climate change and socio-economic scenarios. Despite the complexity of the modelling, and its inherent uncertainties, it was valuable in understanding the mechanisms by which policy options might play out, and to present illustrative estimates of likely economic impacts.

The cost-benefit assessment indicated that the reform options provide economic benefits compared with the current system in all scenario combinations. In England, the benefits ranged from about GBP 100 million up to GBP 500 million net present value over 25 years. The impact assessment took account of the way in which particular elements of reform were likely to be implemented estimating the set up costs of GBP 10-16 million for both options, with water shares being more expensive because of its increased complexity. No attempt was made to monetise the benefits to the environment since both options are designed to achieve the same environmental outcomes set in legislation. However, it could have been useful to attempt to do so, providing further insight into the expected net benefits related to the environment of the reforms.

The water allocation reform process

The cases reveal that water allocation reform is not a discrete, time bound process. Instead the process typically extends over many years, even decades, adjusting to changing circumstances. Stakeholder engagement has become common practice for allocation reforms. To mitigate the negative impacts of the reform, negotiating accompanying measures, such as appropriate compensation, and striking compromises among divergent interests are often used to facilitate progress.

Water allocation reforms tend to be iterative processes that extend over many years, even decades

Water allocation reform is not a discrete, time bound process, but instead, the process typically extends over many years, even decades. Reforms tend to be an iterative process in which current “problems” aim to be “fixed” with new measures, which may engender their own problems, which are then addressed by later reforms. The reform process, in many cases, could be seen as a process of maturing the regime, as changes are put into place to address challenges that arise from changing circumstances. Further, while the process of developing of new policies and legislation may be relatively short (2-3 years), an overly technical and complex process to put provisions into practice can stall implementation for decades. A number of cases highlight these dynamics.

Allocation reforms have extended over multiple decades in the Murray-Darling Basin, Australia, in Chile (from the enactment of the Water Code in 1981 to subsequent amendments over the following decades), and in the Yellow River Basin, China, where the allocation regime has been in constant flux over the last 30 years. In South Africa, while the initial expectation was for medium time-frames for the fully implementation of the provisions of the National Water Act adopted in 1998, sixteen years later, there are still significant challenges in implementation (Box 4.5).

Box 4.5. Factors stalling implementation of water allocation reform in South Africa

The Water Allocation Reform programme in South Africa recognised early on that getting the pace of reform right was key: move too slowly and you are likely to see radicalisation of policy as the political imperative for redress increases, move too fast and you may threaten the economic value of existing water use, limit the value of improved management of the resource, and increase the likelihood of legal challenges. However, an overly technical and precautionary approach has been taken, and sixteen years since the adoption of the National Water Act (1998), there are still significant challenges in the implementation.

Compulsory Licensing, which had never been implemented anywhere in the world previously, posed particular issues. The concept of Compulsory Licensing was introduced in the Act as a method for the re-allocation of water, primarily from the white minority to the black majority that had been excluded from access to water under Apartheid. This clause enables the minister to call for all water users and potential water users within a specified area to apply for new water use licences, and for the minister then, through a consultative process, to re-allocate the water.

A number of factors have made compulsory licencing difficult to implement. The definition of the reserve for ecological and basic human needs also posed a challenge early on. The Act requires that the ecological and basic human needs reserve be determined prior to the consideration of any licence application. However, there were, initially, no procedures in place for the determination of the ecological reserve. The South African aquatic ecologist community set to work in developing such procedures, facing the challenge of making the transition from a scientific analysis approach to developing assessment tools that would serve the purpose of the Act. The need to determine the ecological reserve for significant water resources in the country prior to the consideration of licence applications significantly delayed the issuing of licences for a number of years. In addition, the translation of the reserve requirements into licence conditions was often difficult. For example, where the reserve determination required a fluctuating flow in the river over different months, where a farmer wanted to construct a simple dam with no mechanisms for releasing such fluctuating flows. In addition, the monitoring of the achievement of the ecological reserve has been weak, and so there is a break in the feedback loop between the issuing of licences and the achievement of the ecological reserve.

The first was that all existing water users were required to register their water use with the Department of Water Affairs (DWA), in order to enable the DWA to have a clear record of who was using how much water and where. However, once a process was introduced to check on the accuracy of this registration and the legality of the water use, it was found that an extremely high proportion of the registered water uses were inaccurate, often irrigation farmers over-registering their water use. This required an intensive process of validating the registration, which is still ongoing. In addition, the failure to put in a requirement that the DWA was informed of any transfer of irrigated land-ownership meant that the registration records were out of date where land had been sold. Since Compulsory Licencing was predicated on having a fairly accurate record of existing water use, this delayed the process.

This rigorous reconciliation process is also intensely legal in nature, which may also underpin the hesitancy the DWA has shown in rolling out the process. Legal challenges could delay the process considerably and the DWA may wish to be very sure of their position before tackling large and difficult compulsory licensing processes.

Source: Schreiner, B. (2014); Quibell, G. (2014).

For Israel, the extensive reform of all of the major pillars of the water allocation system has spanned nearly 20 years. Reforms in Alberta, Canada stemmed from conflicts over low flows as early as the beginning of the 1990s. The allocation reform process in England started in 1997 and is still continuing. For New Mexico, US, after a long build up, allocation reform has been ongoing since 2002 and is still under implementation. Finally, allocation reform has spanned several years in France as well. The 2006 Law on Water and the Aquatic Environment (*Loi sur l'eau et les milieux aquatiques*, LEMA) initiated the reform, which is still ongoing. There have also been numerous delays in implementing the reform, in particular due to farmers asking for further technical and scientific studies, which add to the delays.

Stakeholder engagement has become common practice in water allocation reforms

The case studies attest to the importance of stakeholder engagement³ in the course of allocation reforms. Stakeholders may be involved at several distinct phases of the process, including the identification and selection of preferred options. While achieving consensus is unlikely, preferred options can sometimes be agreed upon by the majority of stakeholders. In some cases, a thorough review of options can reveal a strong preference for sticking with the *status quo*, despite recognising existing problems. They can also side-track reforms somewhat as preferred solutions can distract from the original aims of the reforms. For instance, in the case of abstraction licensing reforms in England and Wales, certain stakeholders took a view that “markets were the answer, now what is the question?” Stakeholder engagement might not yield the preferred directions towards reform, but can still be valuable for gaining a deeper understanding of the preferences of different water users and spell out what the proposed reform would mean for them. A recent OECD survey on stakeholder engagement indicates that inclusive decision-making leads to better acceptability of decisions on water issues and a greater sense of ownership across the different actors affected (OECD, 2015). Both of these elements are critical for the effective implementation and sustainability of allocation reform.

In Israel, mechanisms encouraging public participation were in place already in the 1959 Law when the Water Council was established. The crisis situation (in the context of the drought) in which the reform took place greatly increased the public media attention to water sector policies. Inquiry committees (with all their collected public testimonies), intensive parliamentary debates on various aspects, and a significant increase in number and influence of NGOs involved in the field are just a few examples of the public's participation in the reform.

In Alberta, Canada, the reform leading to the development of the new Water Act involved public participation at several stages. These included the review of the 1931 Water Resources Act and policies, study visits to neighbouring states undergoing reform, and engagement of technical and legal water specialists to provide expert advice.

Stakeholder engagement also influenced the reforms in New Mexico, United States at several stages. A series of stakeholder forums provided an opportunity to suggest reform options and debate preferences related to these options. The 2002 drought prompted an interim Water and Natural Resources Committee of the New Mexico Legislature to collect stakeholder opinions on how to best reform the water allocation system. Through this process, the preferred option identified (though not a consensus) was to give greater authority to the Office of the State Engineer in terms of administering water rights in locations where court adjudications were still pending (Bossert, 2013).

While this court process was ongoing, a couple of parallel initiatives were taken to investigate the best way to reform the prior appropriation system, which included public hearings. Six stakeholder forums were held in several key cities in which participants were asked to give their views on four suggested reform options. In the end, none of the options was preferred to the *status quo*. The discussion did however help reveal the range of opinions, dilemmas and tensions that exist among the stakeholders (Romero-Wirth and Kelly, 2012). In addition, stakeholders have been engaged in developing voluntary shortage sharing agreements which clarify how water is to be shared during times of drought. These agreements have been largely successful, although mediation has been required in some cases.

Similar to New Mexico, in South Africa, extensive stakeholder engagement was embedded in the reform process, providing multiple opportunities to contribute to and influence the process at several stages. The reform recognised that the successful execution of Compulsory Licensing, while maintaining the rule of law and the right of access to the Courts, was predicated on effective stakeholder participation. Significant objections to the proposed allocation schedule, or significant appeals to the Court could delay the process, and increase its costs significantly, perhaps to the point that it would become moribund. Hence, extensive stakeholder participation was considered essential to the reform process.

In the United Kingdom, it was not unusual for a government consultation on a major reform to be developed behind closed doors and then to be released to a surprised and defensive audience. However, all concerned in the abstraction licensing reform in England and Wales recognised the importance of engaging with those most affected and interested, involving them in the process of development, and using their feedback to refine the options. A series of sector-based and broad-based facilitated workshops helped this process. There was also regular independent expert peer review and analysis, all of which helped with the credibility of the reform.

However, it must be acknowledged that although abstraction reform is intellectually stimulating in itself, for many stakeholders it is peripheral to their core business; what matters to them is how much water they will have, on what terms, and at what level of reliability. Although the “Case for Change” made a compelling scientific argument, which was swiftly accepted, it did not and could not set out what the future might hold for individual abstractors. Further, much of the initial emphasis was on water trading, and this became something of a diversion from the key aim of the benefits of having a reformed, more flexible and dynamic allocation system.

Negotiating accompanying measures and finding compromises to balance divergent interests is essential

To mitigate the negative impacts of the reform, negotiating accompanying measures and striking compromises among divergent interests are often used to facilitate progress. This can include finding a middle ground on contested issues, such as water pricing, or providing compensation in exchange for agreement about reductions to existing water entitlements. Providing an interim period to allow users to adjust to new allocation measures (e.g. prices, changes in entitlements) can also be useful. In some contexts, a powerful central authority can be determinative in resolving disputes. Examples from Israel, France, Australia, South Africa, Alberta, Canada and the Yellow River Basin in China provide illustrations.

An example of finding a middle ground on contested issues can be seen in the case of determining an appropriate level of water pricing for irrigation in Israel. In the course of the allocation reforms, the issue of allocation water for irrigation at very low price was criticised as the State Comptroller determined that “the low selling price of water to the agricultural sector is, to a great extent, the cause of the constant weakening of the water sector” (State Comptroller, 1992). This shift coincided with a rising conflict between the “agro-economic coalition” represented mainly by the Ministry of Agriculture which wished to maintain the subsidised water prices for the agricultural sector, and the “economists coalition” represented mainly by the Ministry of Finance which advocated for an economic-based scale of tariffs as well as a mechanism to regulate the demand and increase the sector’s efficiency (Menachem and Gilad, 2013). This dispute caused years of stalemate between these power centers, which left the pricing system for agricultural uses as low and subsidised as possible.

Finally, as part of the efforts to establish the Water Authority, an agreement was reached between the government and the agricultural organisations regarding principles for new water tariffs. The main agreed principle was to relate the sector’s freshwater price to the average production and supply costs (including desalination), throughout Israel (Feinerman et al., 2013). In order to assist the agricultural sector due to the expected increase in water tariffs, it was agreed to have an interim period in which incentives by the government would be given to increase water use efficiency.

The reform of the agriculture tariff system came at a timely moment in the lengthy reform process as it coincided with the development of alternative sources of water supply, namely reclaimed water. Encouraging the use of reclaimed water was done by providing wide-scale infrastructure that allowed permanent supply, supported by a financial incentive.

Striking a balance with farmers was also a facilitating factor for France’s recent allocation reforms. Over the course of the reform process, farmers would frequently ask for public support to finance the construction and operation of local storage infrastructure to capture abundant winter flows and store water to be used in the dry summer months. Successive governments found a compromise, whereby farmers affected by a reduction of their water licence would be compensated by a licence to build local storage infrastructures. While the compromise was acceptable to farmers, environmental NGOs disputed the measure, claiming that such infrastructures negatively affect landscapes and undermine farmers’ incentive to improve water efficiency. As a result, this approach generated significant delays for the reform, as: i) discussions were initiated with several hundred local stakeholders; and ii) economic and ecological consequences of the operation and management of local storages capacities had to be considered.

Accompanying measures were also required to secure sufficient water for the environment in the Murray-Darling Basin, Australia, which entailed significant costs. The government established the Commonwealth Environmental Water Holder to manage the environmental water portfolio and projects to improve the water quality and ecological health in the Murray Darling Basin. AUD 3 billion was committed to buy back water entitlements from irrigators and nearly double this amount (AUD 6 billion) was allocated to upgrade communal and private irrigation infrastructure with the aim to save water for the environment (Cooper et al., 2014).

The thorny issue of compensation has presented challenges for the allocation reform process in South Africa and has been a source of delays in implementation. With regard to compensation, the National Water Act (the Republic of South Africa, 1998) states:

“Any person who has applied for a licence in terms of Section 43 in respect of an existing lawful water use as contemplated in Section 32, and whose application has been refused or who has been granted a licence for a lesser use than the existing lawful water use, resulting in severe prejudice to the economic viability of an undertaking in respect of which the water was beneficially used, may, subject to Subsections (7) and (8), claim compensation for any financial loss suffered in consequence.”

The amount of compensation payable is to be determined in accordance with the Constitution, and may not include any reduction in water occasioned by the provision of water for the Reserve, to rectify an over-allocation of water from the resource, or to rectify an unfair or disproportionate water use. The Act gives the Department the right to offer an allocation of water rather than paying the compensation. It also indicates that any claim for compensation has to be lodged with the Water Tribunal set up under the Act which would determine the compensation payable (although the Department of Water Affairs has subsequently disbanded the Water Tribunal, normal recourse to the courts remains).

Although the Agricultural Unions considered challenging the constitutionality of the compensation clauses of the Act, they were advised that a challenge would be more likely to succeed after water had been expropriated without compensation. The lack of legal clarity about the compensation clause led to the reform making all efforts to avoid severe prejudice to the economic viability of enterprises.

While compensation issues are of particular concern in some reforms, in others, a balance was struck between giving greater flexibility within the system and maintaining the security of supply of senior entitlement holders. In the case of Alberta, Canada, measures were put into place to do just that. This measure was the allowing for the possibility to transfer the assignment of priority from one rights holder to another. Basically, this means that a senior user may temporarily assign his seniority to a junior rights holder. Compensation may be paid. Assignments are used mainly to improve the position of junior licensees, whose supply of water is threatened by the priority principle (“first in time, first in line”) in times of drought (Adamowicz et al., 2010). At the same time, the security of the allocation of a given entitlement is maintained. Such agreements can be entered into in anticipation of a dry period.

Some municipalities have an existing set of contracts with senior entitlement holders that take effect during a drought, to secure the city’s water supply. For example, Calgary, a growing city, fuelled by its energy sector, holds entitlements above its current needs. They have made provisions for water conservation, despite expected population growth. They do not trade their unused water allocation, but share it with other cities during times of scarcity. This mechanism was put into practice by water entitlement holder during the drought of 2002. Some senior users gave their priority over to junior users. This was fully in line with the Water Act of 1999 and not a separate mechanism that users came up with independently. The sharing agreements were facilitated by steering committees made up with community leaders who had interest in communities beyond their own, to ensure that they would negotiate for an agreement that would benefit all.

The case of the Yellow River Basin in China shows that even within a unitary system, preparing an allocation plan posed significant political challenges, requiring resolution of divergent interests. In some contexts, a powerful central authority can be determinative in resolving disputes. Ultimately though, in the absence of a consensus amongst regional governments, the presence of a powerful central government and the capacity of China's State Council were critical in imposing and resolving disputes. So far, adjustments and revisions have been co-ordinated by central administration, usually in response to tensions.

Assessment of water allocation reforms

Given the long timeframes for many water allocation reforms, many cases judged that it is too early to tell if the reform process was successful or not. However, even in the absence of formal and rigorous assessments of reform, evidence of positive developments or disappointment are still available. The cases of Israel, Alberta, Canada, New Mexico, United States and South Africa illustrate positive, mixed or disappointing results.

The impact of water reform in Israel has resulted in significant improvement for the two main drivers that first initiated the reform: addressing significant stress on water resources and improving the economic aspects of water allocation. While the shortage of water remains the key issue in the water sector, and the need to manage the reservoirs between dry and wet seasons and years is the top priority for those responsible for the water sector, authorities have been given enhanced tools to cope with the challenge. Desalination provides a permanent water source, independent from climate variables and a sound basis for domestic consumption. There has also been a noticeable decrease in agriculture's dependency on freshwater, due to extensive use of reclaimed water. Israel today is now a world leader in this area, reusing around 80% of treated wastewater. As a result, in the decade 1997-2007 the use of freshwater in agriculture dropped by 37%, and the use of marginal water grew by 50%. Total water consumption was reduced by 10%, whereas the general efficiency of the agricultural sector with regard to water use increased by 62% (Knesset Research and Information Center, 2008).

The reform has also improved the governance and economic arrangements for water management. The administrative structure of the water sector has changed, with powers concentrated in the hands of the Water Authority, led by the Water Authority Council. The tariff system for all consumer types has improved, since the economic considerations (such as covering the cost for providers) have been given greater importance and the tariff system is simpler and more equal and transparent than it used to be.

In the case of Alberta, Canada, the impact of the allocation reform is generally seen as positive, yet a number of concerns remain. While there has been no formal assessment of the revised regime, there are no major conflicts, court cases or judicial reviews either. Water entitlement holders have keenly embraced the assignment and transfer options introduced by the revision. At latest count, 94 water transfers have been undertaken, most of which are permanent rather than temporary transfers.⁴

However, concern has been expressed about how effective the new rules around trading, transfer and assignment of water rights will be in preventing over-abstraction. The trading scheme intended to include considerations for environmental flows, but this has not been very well-developed and implemented to date. There is a provision in the legislation that stipulates for a given water trade, 10% of the traded volume can be held by

the regulator for in-stream uses. This provision contributes to the hesitancy of senior water users to engage in trading. Since there is no effective water metering, it is difficult to determine the 10% and this provision has been inconsistently applied so far.

Furthermore, there is a concern that water markets might activate the unused portions of existing water allocations and thus further strain already overused river systems. In Alberta's *Water for Life* strategy, the government expressed its commitment to evaluate the merits of using economic instruments, such as water pricing, to meet key water conservation objectives (de Loë et al., 2007). A study based on a network model of the entire river basin in southern Alberta found that the relative efficiency gains from introducing market pricing could range from under 3% in a year of surplus flows to more than 15% in a drought year (Mahan et al., 2002).

In a similar vein, the informal assessment of the reform in New Mexico highlights current perceptions of the benefits and drawbacks of Active Water Resources Management⁵ (AWRM) put into place to facilitate re-allocation of water. On the positive side, conflicts can be resolved more quickly compared to the lengthy court adjudication procedure. The use of voluntary and temporary transactions through water leases or shortage sharing agreements has also been facilitated. A good example of this is from southeast New Mexico where there is currently an oil and gas boom and farmers lease their water rights to oil and gas companies.

Another development is the facilitation of in-stream flows protection. Unless denied by the State Engineer or challenged in court, any individual (including the State) can lease or purchase existing consumptive water rights and convert them for environmental use while maintaining ownership of the rights (Scarborough, 2010). An additional feature of the new water allocation regime is that historical water users have been given a say in water transfers. *Acequias*⁶ or qualifying ditch companies are allowed to adopt bylaws requiring their approval as a condition to surface water transfers (Western Governors' Association, 2012).

On the negative side, AWRM is a resource dependent procedure. It requires more human resources since water masters in the field are needed in each basin. It is also dependent on metering of water use and many users do not currently have meters and are not very keen on installing them. The Office of the State Engineer can require meter installation by law, and has funds to do so, but prefers users to do it voluntarily, as a legal process would be required to compel users to do it. Further, some have negative views of the prerogative of OSE to not be obliged to strictly follow the principle of "first in time, first in right" but instead put more focus on interpreting the principle of "beneficial use" (a principle which is indicated but not explicitly defined in the Water Code). This gives more weight to uses that produce higher economic values, such as industrial and urban uses.

In contrast to positive or mixed assessments of water reform in the cases above, for South Africa, the results overall have been disappointing. There have been a number of independent assessments the water allocation reform process.⁷ For example, Muller (2013) argues that it is too early to draw lessons about the success of the water reform in South Africa, partly because hydrological favourable conditions (i.e. the lack of a major, nationwide drought) since 1994 have not 'tested' the system. Secondly, he argues that demand for water from the agricultural sector has been relatively stagnant due to slow progress in rural land reform.

However, other observations are more critical of the process. Merrey (2008) argues that the focus on large scale users militated against enabling poor users to get access to water for productive purposes. He also refers to the lack of an integrated approach across departments, particularly in relation to the land, agricultural and mining sectors. Merrey is also critical of “the optimism about using water as a lever to achieve social and economic reforms” (2008). In his view, this was unrealistic due to the cautious, technocratic approach taken to implementation and even more importantly, the lack of a alignment and integration with land and agricultural reforms. Movik (2009) argues that what was initially an extremely political approach to water allocation reform ended up in a technicist approach with implementation that was too complex in a context of limited human resources for the purpose resulting in stalled delivery.

What is clear is that the water allocation reform programme in South Africa has failed to meet expectations, with very limited water allocations having been made to black South Africans after 20 years of democracy, and little evidence of effective implementation and monitoring of the ecological reserve.

Conclusion

The case studies illustrated in this chapter reveal insights and lesson learned on the reform of allocation regimes. The experience of allocation reform is unique to its time and place, but nevertheless, common themes emerge across the case studies relating to reform drivers, key elements of the reform process and implementation.

Allocation reform is often driven by an accumulation of factors, with concerns about water scarcity and insufficient water for ecosystems as commonly cited drivers. These concerns are often combined with broader political or structural reforms to improve the economic efficiency and equity of allocation arrangements. Several cases illustrate how droughts can provide a salient, visible event to trigger action.

Water allocation reform is essentially a socio-economic and political process, and adopting an overly technical approach can result in delays to the water reform programme. It also benefits those who have the greatest capacity for engaging with strongly technical and legal processes, which tend to be the already privileged. The reform process allows for ample opportunities for participation and negotiation, which can make it difficult to maintain control over a tight implementation plan and schedule. However, the negotiations can be an effective means to devise compromises and appropriate compensation measures to mitigate the potential negative impacts of the reform given that the reform process is technically, politically and legally challenging. This must be recognised from the outset, and as such extensive stakeholder engagement is a must. The case studies illustrate the various forms such participation can take at various stages throughout the process.

In terms of developing options for reform, the case studies illustrate how reform options are significantly shaped by the perceived shortcomings of the existing system. Hence, the way in which the “problem” of allocation is defined strongly influences the potential solutions considered. International experience is frequently drawn on in the process of formulating reform options, but different countries draw different lessons, in particular with regard to the desirability of market-based approaches. The feasibility and desirability of options can be constrained by various factors, such as legal constraints and strong stakeholder opposition. The cases of France and England and Wales illustrate how economic assessment has proved useful to aid the selection of options, even if it may be difficult to quantify all the costs and benefits of alternatives.

The cases also highlight lessons relating to the sequencing of reform and approaches that can help to minimise unintended consequences. Allocation reforms require a holistic view of the system, since the reform of only one aspect of allocation can have unintended impacts on other parts of the system. In terms of sequencing, the cases attest to the importance of determining a sustainable baseline (to determine how much water is available for allocation), before introducing changes to an allocation regime. Similarly, ensuring the hydrological integrity in the allocation system by accounting for return flows is important, especially when introducing trading that can shift water among uses with different rates of consumption. For instance, if entitlements are based on total withdrawals and a transfer is made from a user that has low consumptive use to one that has high consumptive use, return flows to the basin are reduced, putting pressure on the sustainability of the resource. The potential impact of reforms on non-exercised water entitlements should be fully considered in advance as well.

Multiple cases attest to the desirability of increasing the flexibility that water users have to adjust to changing conditions and reallocation water use among themselves. Several cases have used water trading and markets to achieve this. The case of France illustrates an institutional arrangement that allows for collective bargaining to try to achieve a similar effect. However, institutional path dependency can raise the costs of improving the flexibility of allocation arrangements to respond to uncertainty and reallocating water to higher value uses. Allocation arrangements, such as prior appropriation in the United States, introduced to meet historical objectives, constrain contemporary economic opportunities and cannot be easily modified or replaced *ex post* (Liebert, 2011). Finally, the recognition that policy and legislative reform is only as good as the ability to implement it, calls for appropriate support, and capacity for implementation.

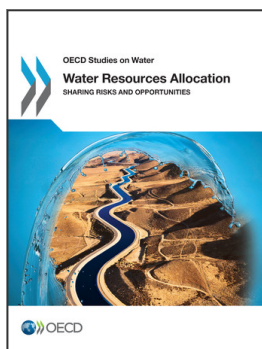
Notes

1. For example, according to Riestra (2008) among the 15 000 m³/s granted non-consumptive uses, right only 2 800 m³/s was actually being exercised.
2. For example, the non-use tariff for the shortest time period (0-5 years) is determined by a pre-set rule. This charge doubles if the right is not used during 6-10 years and quadrupled from 10 years onward (Madden, 2010).
3. In this context, stakeholder engagement is defined as the process by which any person or group who has an interest or stake in a water-related topic may be directly or indirectly affected by water policy and/or has the ability to influence the outcome (positively or negatively) is involved in the decision-making processes (OECD, 2015).
4. Some transfers simply changed the piece of land to which the water entitlement was attached, under the same owner. A limited number of trades have occurred in the South Saskatchewan basin. Trades between different types of users (e.g. agricultural to domestic) have been rare.
5. In essence, Active Water Resource Management strengthens the authority of the State Engineer in New Mexico to temporarily reallocate water by establishing “water master districts”, where a water master is appointed in charge of administering water rights. Rights that are junior to an “administration date” set by the State Engineer can be curtailed. Uses that are not prioritised can apply for a “replacement plan”, for a maximum duration of two years. Water users are also allowed to submit joint “replacement plans” or to find voluntary shortage sharing agreements, through negotiations (Romero-Wirth and Kelly, 2012).
6. Associations managing communal irrigation canals.
7. See Merry (2008), Movik (2009), and Muller (2013). In addition, in 2013 the minister requested a policy review in tandem with a review of the national water legislation.

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