Water Resources Allocation
Sharing Risks and Opportunities

Chapter 5

A "Health Check" for Water Resources Allocation

This chapter sets out a "health check" for improving the performance of allocation regimes. It builds on both the analytical framework for allocation developed in Chapter 2 as well as the practical experience of a range of examples collected via the OECD Survey of Water Resources Allocation analysed in Chapter 3. It uses a series of "checks" to identify whether key elements of an allocation regime are in place and how their performance could be improved. In some cases, several options for the design of elements are proposed.

Key messages

- The overall policy guidance for improving water allocation arrangements is presented in this chapter as a ***"Health Check" for Water Resources Allocation***. It is a tool to review current allocation arrangements to check whether the elements of a well-designed allocation regime are in place and to identify areas for potential improvement.
- Since the risk of shortage is dynamic, in both the short-run and the long-run, **a well-designed allocation** should have two key characteristics: it should be **robust** by performing well under both typical and extreme conditions and demonstrate **adaptive efficiency** with the capacity to adjust to changing conditions at least cost over time.
- Allocation regimes need to be tailored to specific conditions. In the early stages of developing a water resource, or where the risk of shortage is low, a relatively simple design can be used with decisions made conservatively to avoid over-allocation and over-use. As scarcity increases and the value of water use rises, the **benefits of a more elaborate allocation regime increases**.

Many current water allocation regimes have evolved in a piecemeal fashion over time and are strongly conditioned by historical water usage patterns. As a result, they are usually not well-equipped to deal with mounting pressures on the resource, such as changes in water demand and climate change, or shifts in societal pressures, such as increasing value placed on environmental flows to support ecosystem services. The challenges for allocation are aggravated by the entrenchment of weak water policies (under-pricing water or lack of regulating use), which contribute to structural water scarcity, increasing the risk of shortage for users and for the environment. The significant path dependency of allocation regimes, which manifests in laws and policies, and even in the design and operational rules of existing water infrastructures, can make adjustments to allocation arrangements very contentious and costly. The result is that many allocation regimes are no longer "fit for purpose" and require adjustments in order to adapt to changing conditions.

To address this challenge, policy guidance for improving allocation arrangements is presented in this chapter as a *"Health Check" for Water Resources Allocation.*[1] The Health Check is designed as a tool to review current allocation arrangements in a specific context to check whether the elements of a well-designed allocation regime are in place and to identify areas for potential improvement. Since the risk of shortage is dynamic, in both the short-run and the long-run, a well-designed allocation should have two key characteristics: it should be robust by performing well under both typical and extreme conditions and demonstrate adaptive efficiency[2] with the capacity to adjust to changing conditions at least cost over time.

The Health Check can be applied to various scales of water governance, depending on the context. For example, it can be used at the national, provincial/state, or river basin level, or used for a specific irrigation district. Used iteratively, the Health Check can be used to drive further improvements and refinements to more fully reap the benefits of a well-designed allocation regime and to adjust to changing circumstances. Box 5.1 provides a summary of the Health Check. Each of the elements are discussed in detail in this chapter.

An allocation regime should be tailored to specific conditions. In general, as the risk of shortage increases, the benefits of a more elaborate allocation regime increases. In the early stages of developing a water resource, or when the risk of shortage is low (e.g. due to water abundance), a relatively simple allocation regime can be used with decisions made conservatively to avoid over-allocation and over-use. However, the basic building blocks of a robust regime should still be put into place at an early stage, which can allow for adjustment at least cost as needed over time. As scarcity increases and the value of water use rises, the case for the introduction of a more elaborate allocation regime based on clear, adjustable limits on abstraction and clear, legally defined volumetric entitlements increases. When water over-allocation and/or over-use already exists, there is an opportunity to use the characteristics of a more elaborate allocation regime to reduce the extent of the problem and bring use in line with sustainable limits.

Scarcity conditions can be understood as a continuum. Water scarcity is typically a slow onset risk resulting from a water deficit that accumulates over time, in contrast to a sudden impact caused by a singular event, such as a storm or flood (OECD, 2013a). No or low scarcity conditions exist where there is general water abundance and a low incidence of drought. As long as there is sufficient water available to meet both latent and current demand sustainably,[3] water resources are neither over-allocated nor over-used. Moderate scarcity conditions exist where scarcity is either an emerging threat (e.g. due to increased

Box 5.1. **A "Health Check" for Water Resources Allocation**

Check 1. Are there accountability mechanisms in place for the management of water allocation that are effective at a catchment or basin scale?

Check 2. Is there a clear legal status for all water resources (surface and ground water and alternative sources of supply)?

Check 3. Is the availability of water resources (surface water, groundwater and alternative sources of supply) and possible scarcity well-understood?

Check 4. Is there an abstraction limit ("cap") that reflects *in situ* requirements and sustainable use?

Check 5. Is there an effective approach to enable efficient and fair management of the risk of shortage that ensures water for essential uses?

Check 6. Are adequate arrangements in place for dealing with exceptional circumstances (such as drought or severe pollution events)?

Check 7. Is there a process for dealing with new entrants and for increasing or varying existing entitlements?

Check 8. Are there effective mechanisms for monitoring and enforcement, with clear and legally robust sanctions?

Check 9. Are water infrastructures in place to store, treat and deliver water in order for the allocation regime to function effectively?

Check 10. Is there policy coherence across sectors that affect water resources allocation?

Check 11. Is there a clear legal definition of water entitlements?

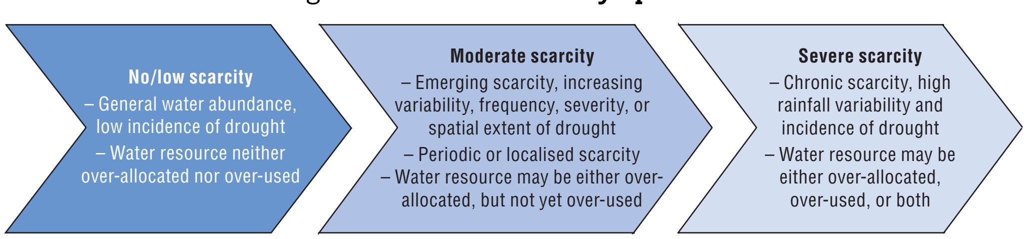
Check 12. Are appropriate abstraction charges in place for all users that reflect the impact of the abstraction on resource availability for other users and the environment?

Check 13. Are obligations related to return flows and discharges properly specified and enforced?

Check 14. Does the system allow water users to reallocate water among themselves to improve the allocative efficiency of the regime?

demand, increased variability or incidence of drought) or a periodic and localised threat to water supply. In this case, water resources may be over-allocated, but not yet over-used. Finally, severe scarcity conditions exist where scarcity is a chronic issue due to significant climatic variability, incidence of drought, or situations where demand outstrips available supply, thus generating scarcity conditions even in average years (e.g. structural scarcity). In these cases, the water resource is often either over-allocated or over-used, or both. Figure 5.1 provides an illustration of the scarcity spectrum.

Figure 5.1. **Water scarcity spectrum**



Over time, countries and regions may move along this spectrum. An increasingly elaborate allocation regime is appropriate as scarcity conditions become more acute. Many of the illustrations in boxes in this chapter would be most suitable for moderate or severe scarcity conditions. However, the presence of no or low scarcity conditions does not mean that attention should not be paid to the design of an allocation regime. The building blocks of a well-designed regime should still be put into place and designed in a way that would encourage adaptive efficiency should conditions evolve. This includes avoiding design elements with a high level of path dependency, which are costly to change (see discussion in Chapter 4).

As discussed throughout this report, allocation regimes consist of a combination of policies, mechanisms, and governance arrangements (entitlements, licenses, permits, etc.) that are used to determine who is allowed to abstract water from a resource pool, how much may be taken and when, how much water must be returned (and in what quality), and the conditions associated with the use of this water. Some elements are best managed at the system level and others at the user level. The robustness and adaptive efficiency of an allocation regime can be improved by unbundling the various elements and using separate instruments to pursue various objectives (see Box 2.4). The system can also introduce measures to allow water users to reallocate water among themselves to improve the allocative efficiency of the regime. For example, market instruments such as water entitlement exchange centres or entitlement transfer contracts can help alleviate extreme scarcity conditions, as was the case in Spain during the drought period 2005-08.

System level elements of a water allocation regime

This section focuses on options for the management of system-wide challenges in regions where water scarcity either is or is expected to be a constraint. System level elements are those that are most efficiently and equitably dealt with at the scale of the water resource, whether it is the basin, catchment, river, stream or aquifer. Usually, they take the form of conditions expressed in water sharing plans and other similar documents that determine how system wide decisions are taken. Those that apply to all water resources can be contained in regional and national legislation.

Check 1. Are there accountability mechanisms in place for the management of water allocation that are effective at a catchment or basin scale?

- Authorities and organisations responsible for allocation should have well-defined roles and accountability mechanisms that actually work in practice, as well as sufficient resources (financial and otherwise) to execute their function. A **River Basin Management Plan** (or other similar planning instrument) that has the status of a statutory instrument that must be followed can be used to set out a clear framework for allocation. A clear and **transparent process** should be in place to facilitate stakeholder engagement in the definition of the sequence of priority uses and other key allocation decisions.

Check 2. Is there a clear legal status for all water resources (surface and ground water, as well as alternative sources of supply)?

- A **clear legal status** should be in place for all types of water resources (surface and ground water, as well as alternative sources of supply, such as treated wastewater). This status needs to define whether the resources are publicly or privately owned, or in cases where there is no ownership of water resources, *per se*, who has the authority to determine access to the resource. In cases where a plurality of legal regimes relating to water resources exists, **competing claims need to be clarified**, to avoid "allocation by litigation" or "allocation by adjudication". Any contradictory and overlapping legal arrangements relating to the ownership of the resource itself as well as legal entitlement to access and use water resources should be clarified. A clear legal definition of waste water as a resource would be useful to promote waste water re-use.

- Obligations under **international agreements** related to **transboundary water resources** should also be clearly specified. (See Box 2.3 on the Albufeira Convention,[4] a good example of clearly defined transboundary co-operation between Spain and Portugal.)

Check 3. Is the availability of water resources (surface and ground water, as well as alternative sources of supply) and possible scarcity well-understood?

- A **robust scientific basis** is needed to identify the available water resources (surface and ground water, as well as alternative sources of supply, such as treated wastewater), understand how they may be interconnected, when they are available (seasonality) and how they may change over time. This requires an assessment of water resources at the relevant scale for allocation with a view to determining which water resources are currently under pressure from water scarcity or are likely to be so in the future. This may be particularly challenging for groundwater resources, for which there seems to be a relatively low or insufficient level of knowledge (see OECD, 2015). The **comprehensiveness of the assessment** should correspond to the degree of scarcity conditions, with water resources under greater pressure deserving more in-depth assessment as compared to resources where scarcity is not yet an issue and not expected to be in the near future. In general, it is not possible, nor is it necessary, to obtain complete knowledge of water systems. Instead, the aim should be to acquire sufficient knowledge of the available water resources in order to make appropriate and tailored decisions (see Box 2.5 for examples from Spain and France). The information should be made publically available.
- Managing **system interconnectivity** is essential for ensuring the hydrological integrity of the system. For instance, careful consideration needs to be given to the impact of groundwater bores located next to a river. In such situations, extraction from the bore may in fact be extraction from a river. In order to avoid double-counting that will result in over-use in such circumstances, the amount of water that may be taken from the river needs to decrease and the amount of water taken from the aquifer can increase. Arrangements need to be in place to adjust for changes in flows between groundwater and surface water systems. Well-designed regimes can also encourage water users to seek out opportunities to take surface water, for example, and store it in an aquifer.
- Where economically viable, **non-conventional water sources**, such as treated wastewater and desalinated water, could be considered as an alternative to conventional freshwater supplies during drought periods or as a complement to conventional supplies during normal periods.

Check 4. Is there an abstraction limit ("cap") that reflects in situ *requirements and sustainable use?*

- Defining a **limit on the maximum volume or proportion** of water that can be abstracted from a system is arguably the most difficult and yet most important challenge in managing water scarcity. Setting an abstraction limit requires consideration of the amount of water that must be put aside to meet *in situ* requirements and downstream obligations (in the case of surface water), as well as needs for non-consumptive uses and environmental needs. Both policy-related and technical limitations on the quantity of water available for sustainable use need to be recognised. Technical restrictions limit economically viable water use. Policy-related limitations may include obligations related to minimum flows for transboundary rivers, environmental flows, or indigenous rights. Environmental flows are needed to meet ecological objectives, but also to protect downstream users. The definition of the "cap" also needs to consider quality (including temperature) requirements. Different options can be considered to define how these flows are treated within an allocation regime (see Box 2.6).

- Two types of abstraction limits are needed:
  - A **long-term limit** that defines the maximum volume of water that can be abstracted at any point in time. Once this limit has been fully allocated, no new entitlements should be issued unless the process is accompanied by an arrangement that reduces someone else's entitlement by an equivalent amount. A **mechanism to adjust the long-term limit** is needed for adaptive management. This is especially the case in regions with high rainfall variability and expectations of adverse impacts of climate change, but can also relate to the need adapt to other drivers of change, for instance as a result of new scientific evidence about ecosystem needs. The long-term limit can be used to guide strategic water-dependent investments.
  - A **short-term limit** on the amount of water that can be taken at a particular point in time. In addition to limits on the maximum amount of water that can be taken over the long-term, in most regions, it is also necessary to be able to **adjust the amount of water that can be taken** within a season. In the definition of a short-term limit, one must take into account the time needed for water users (including irrigators) to adjust. For instance, the short-term limit needs to be determined and announced in advance of the planting season if it is to influence cropping decisions.

Check 5. Is there an effective approach to enable efficient and fair management of the risk of shortage that ensures water for essential uses?

- "**Essential**" water uses should be defined and assured the highest priority. This includes drinking water for humans and national security uses (such as flood protection or cooling for nuclear power plants). Water needs for the environment that reflect the dynamic flow regime should also be secured.
- Efficiency in allocation can be improved if a suite of entitlement classes is established and users are allowed to invest in a **portfolio of reliability classes**. This allows users to manage the degree of supply risk they wish to take. In order to allow for the efficient management of long-term supply risks, at least two priority classes are needed: a high priority and a low priority class. Most allocation regimes already have three or four priority classes implicit in their current structure, so it may be easier to establish more classes than fewer. With such an approach, allocations are first made to the high priority class. Once these entitlement holders have received 100% of their entitlement, allocations are then made in turn to each of the lower classes according to their priority. Provided that there are at least two priority classes and shares in them are freely tradable, investment risks can be managed by varying the proportion of each share type held.

- As an alternative, "second best" option, a **sequence of priority uses** can be established that is applied in periods of scarcity, or used to guide the allocation of entitlements in "normal" periods. Priority regime banning is a pragmatic approach and works as a short-term strategy in cases where shortage incidents occur infrequently. It has a relatively low cost of implementation and there is little need for investment in the development of elaborate administrative arrangements. However, it can be a source of "lock-in" and make managing tensions among various users more difficult. It also places the risk of shortage disproportionately on users designated as "low priority". If a sequence of priority uses is in place, it should generally reflect the ranking of relative value of water across various uses. The determination of a sequence of priority uses needs to take into account the sustainable use of the resource.

Check 6. Are there adequate arrangements in place for dealing with exceptional circumstances (such as drought or severe pollution events)?

- The conditions that constitute an "exceptional circumstance",[5] such as a drought or severe pollution event, need to be clearly specified. Stakeholders should be involved in the process of determining what constitutes exceptional circumstances. A **responsible authority** that has authority to declare an exceptional circumstance and manage the response needs to be designated. Water users need to be informed regularly about the developments relating to exceptional circumstances and the how they will be affected by the response. The more advance warning that users can be provided, the more opportunity that they will have to adjust their behaviour and effectively manage their risk of shortage. Advance warning can encourage the conservation of resources and help to minimise the impact of their abstraction on the environment.

Check 7. Is there a process for dealing with new entrants and for increasing or varying existing entitlements?

- In cases where the defined resource pool is fully allocated, the resource should be considered "closed". Once access to the resource is closed, the only way a new entrant may secure an interest in abstracting water from the resource or an existing use may expand an existing entitlement is to ensure that **another user foregoes use of an equivalent amount**, thereby transferring the water entitlement to the new entrant or the existing user expanding an entitlement.

Check 8. Are there effective mechanisms for monitoring and enforcement, with clear and legally robust sanctions?

- An appropriate level of **monitoring** of the resource, ecosystem requirements, abstractions, and discharges that reflects the level of pressure on the water resource needs to be in place. Losses in the water distribution network should be monitored as well, to inform decisions about leakage reduction. Rigorous monitoring requires an assessment of the volume of water being taken by each user. This requires the installation of meters, meter reading, and accounting protocols. Appropriate accounting arrangements that track water use and consumption, as well as leases and trades where permitted, need to be in place to support the monitoring of water use and water entitlements.
- Appropriate **sanctions**, such as fines or curtailment of water entitlements need to be in place and applied as required.

- **Uncontrolled uses** and any significant interception need to be periodically reviewed to gauge their potential impact on the integrity of the system. When uncontrolled uses and significant interceptions begin to have a significant impact on the water system, they must be brought into the formal water entitlement system. This sends a clear signal to existing entitlement holders that the expansion of these uses will not undermine the efficiency of any investments they have made.

Check 9. Are water infrastructures in place to store, treat and deliver water in order for the allocation regime to function effectively?

- Adequate water **infrastructures** are needed to store, treat and deliver water to various uses and users and a lack thereof can place constraints on the flexibility of allocation regimes. Pervasive uncertainty about future climatic conditions increases the value of scalable and "adaptable" water infrastructure, which are typically capital intensive and long-lived, often with high sensitivity to climate. Scalable, modular, less capital intensive approaches to infrastructures (including grey or "green") can provide an additional "option" value, as they are more easily adjusted to future conditions (OECD, 2013b).
- Water infrastructures and their **operational rules** need to be managed in a way that effectively contributes to the aims of the allocation regime. When appropriately managed, multi-purpose infrastructures can contribute to allocative efficiency.

Check 10. Is there policy coherence across sectors that affect water resources allocation?

- The existing policy settings related to water resources management as well as water-related sectors, such as agriculture and energy, need to be coherent. Even a well-designed allocation regime can be undermined by perverse incentives in other sectors, such as subsidies that encourage over-consumption of water resources or pollution that degrades water quality.

User level elements of a water allocation regime

User-scale elements refer to those factors that are most efficiently and equitably dealt with by specifying the arrangements that apply to an individual user. Typically these take the form of arrangements specified in water entitlements (also referred to as permits, abstraction licenses, etc.).

Check 11. Is there a clear legal definition of water entitlements?

- Well-functioning allocation regimes need to have **clear, quantified, legally defined water entitlements**. Options for defining how users can access water and how much they are allowed to take range from a requirement that the user own land adjacent to a river to a requirement that all abstractions be metered and that the amount abstracted always be inferior to that credited to a water account. The choice of the most appropriate way to define these entitlements depends on the value that access to water brings to an economy and the contribution it makes to the environment. To improve the flexibility of the allocation regime, water entitlements can be **unbundled** from land titles. Flexibility at the system level can be balanced with security at the user level by managing water entitlements separately from allocations in a particular season.

- There are benefits to defining water entitlements as a **proportion**, or shares, of the available resource pool (as opposed to an absolute volume). This approach allows for flexibility to respond to changing conditions without having to pay compensation for adjusting water entitlements. This approach is also consistent with the full assignment of risk. Conversion from a volumetric or seniority regime to a proportional regime is possible, although it may be challenging.
- Water entitlements must be defined for an **appropriate duration**, with a clear, reasonable expectation for renewal. This could be a fixed period of time, or water entitlements could be defined in perpetuity. The longer the entitlement is granted for, the more it will encourage long-term investment in water-related activities. Uses that require significant investment to benefit from the water entitlement merit a longer duration.

Check 12. Are appropriate abstraction charges in place for all users that reflect the impact of the abstraction on resource availability for other users and the environment?

- Appropriate **abstraction charges** should be levied on all users, in line with the "beneficiary pays" principle. They need to reflect at least the full cost of providing access to water resources. Proxies can be used to estimate the negative externalities associated with water abstractions so that they can also be reflected in abstraction charges. In cases of non-renewable water resources (such as certain groundwater resources exploited beyond sustainable yield), a charge reflecting the scarcity value of the resource could also be applied, reflecting the trade-off between mining water now or in the future.

Check 13. Are obligations related to return flows and discharges properly specified and enforced?

- Water entitlements need to be specified in a way that defines the **"net" amount of water** consumed, rather than the "gross" amount of water abstracted. In practice, there are numerous technical challenges that make it difficult (if not impossible) to measure net consumptive use with precision. However, rules of thumb can be applied to provide an estimation of net consumption according to the type of use. This approach can be used to maintain the integrity of the allocation regime, even while efficiency of use increases. There are alternative options to managing this issue (see discussion in Chapter 2, and example in Box 2.7).
- In addition to defining returns flow requirements from a quantitative perspective, the quality requirements (including thermal changes) for **discharges** also need to be clearly specified (see Box 2.8).

Check 14. Does the system allow water users to reallocate water among themselves to improve the allocative efficiency of the regime?

- Once the elements of a robust allocation regime are in place (including the role of government as the steward for the environment, as specified above), allowing water entitlement holders to **trade, lease or transfer** water entitlements (long term) and allocations within a given season (short term) can improve efficiency in allocation and resource use. It can also provide the conditions for improved management of risk of shortage, as water users have better incentives to manage risk and greater capacity to adjust to scarcity conditions. To avoid potentially negative impacts of trading arising from changing the location of water use, water entitlements and trading arrangements must be consistent with the overall limits of the resource. Where the trade, lease or transfer of water entitlements is possible, clear rules should be in place to facilitate transactions. Voluntary forfeiture of un-used water entitlements should be provided for.

- **Transaction costs** related to trading, leasing or transferring water entitlement and allocations should be kept **as low as possible**. This requires limiting trading costs to administrative costs that are unavoidable and also limiting third party interference in individual transactions.

Notes

1. This "Health Check" draws significantly on the background paper prepared for this project by Mike Young (2013), *Improving Water Entitlement and Allocation*.
2. Adaptive efficiency addresses the least cost path to maximise social welfare over the long term in the context of complex resources, unpredictability, feedback effects and path dependencies (Marshall, 2005).
3. "Latent demand" refers to demand reflected by entitlements that have been granted, but are not currently being exercising to take water at present. "Active demand" refers to demand reflected by entitlements that have been granted and in active use.
4. The agreement was signed by Spain and Portugal in 1998 and subsequently modified to comply with the EU WFD requirements on minimum annual flow for international rivers.
5. The management of exceptional circumstances, such as drought, is an art in itself, and merits a more in-depth examination than can be provided within the context of this *"Health Check" for Water Resources Allocation*.

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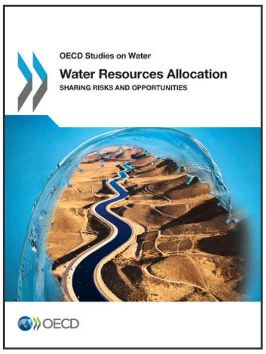

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