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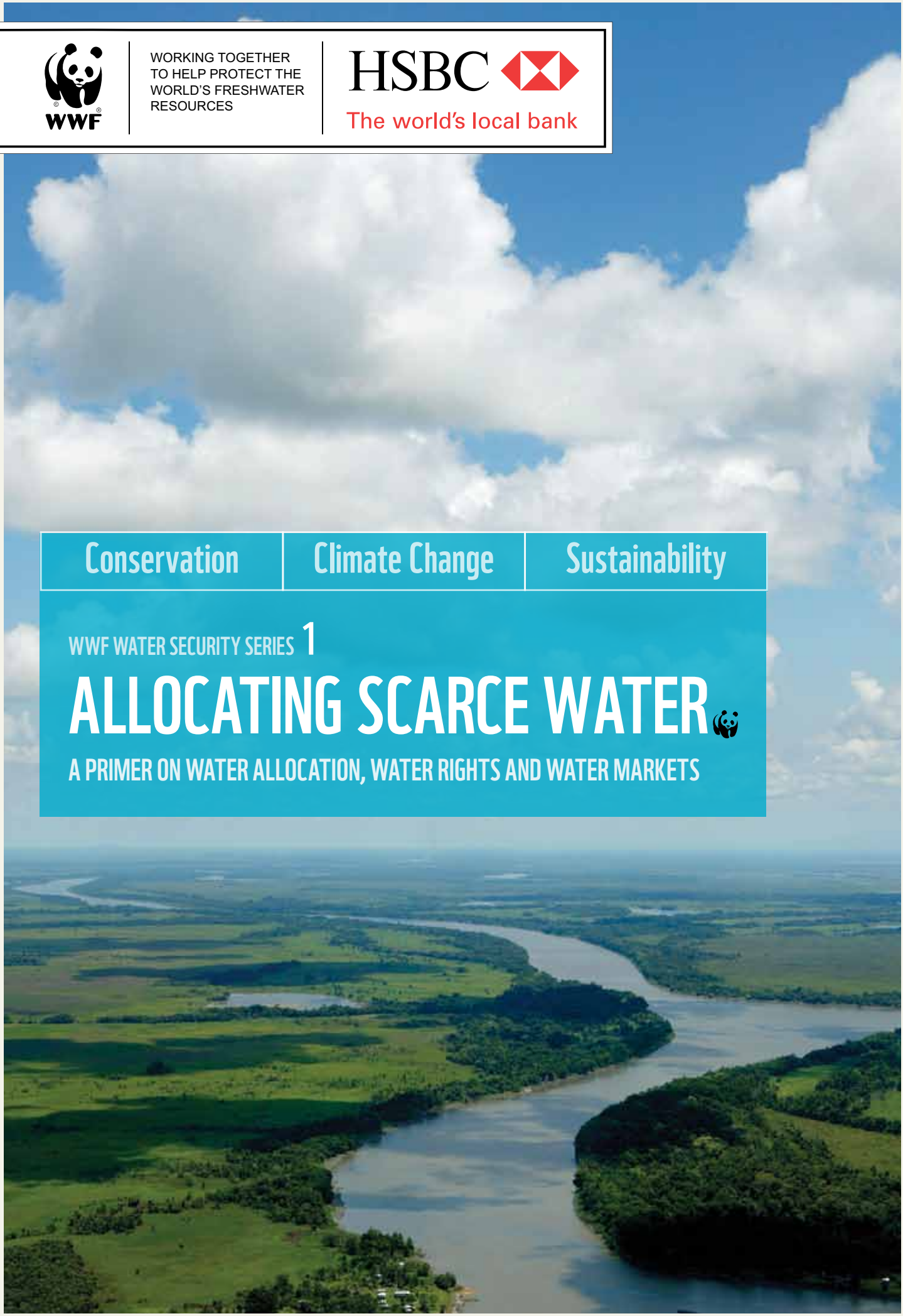


Conservation | Climate Change | Sustainability

WWF WATER SECURITY SERIES 1

ALLOCATING SCARCE WATER

A PRIMER ON WATER ALLOCATION, WATER RIGHTS AND WATER MARKETS

WWF's Water Security Series sets out key concepts in water management in the context of the need for environmental sustainability. The series builds on lessons from WWF's work around the globe, and on state-of-the-art thinking from external experts. Each primer in the Water Security Series will address specific aspects of water management, with an initial focus on the inter-related issues of water scarcity, climate change, infrastructure and risk.

Understanding Water Security

As an international network, WWF addresses global threats to people and nature such as climate change, the peril to endangered species and habitats, and the unsustainable consumption of the world's natural resources. We do this by influencing how governments, businesses and people think, learn and act in relation to the world around us, and by working with local communities to improve their livelihoods and the environment upon which we all depend.

Alongside climate change, the existing and projected scarcity of clean water is likely to be one of the key challenges facing the world in the 21st Century. This is not just WWF's view: many world leaders, including successive UN Secretaries General, have said as much in recent years. Influential voices in the global economy are increasingly talking about water-related risk as an emerging threat to businesses.

If we manage water badly, nature also suffers from a lack of water security. Indeed, the evidence is that freshwater biodiversity is already suffering acutely from over-abstraction of water, from pollution of rivers, lakes and groundwater and from poorly-planned water infrastructure. WWF's Living Planet Report shows that declines in freshwater biodiversity are probably the steepest amongst all habitat types.

As the global population grows and demand for food and energy increases, the pressure on freshwater ecosystems will intensify. To add to this, the main effects of climate change are likely to be felt through changes to the hydrological cycle.

WWF has been working for many years in many parts of the world to improve water management. Ensuring water security remains one of our key priorities.

Acknowledgements

This report is based on a technical review of the issues conducted by Pegasys Consulting, and discussions held over a two-day workshop at WWF-UK in May 2006. The authors would like to thank Hector Garduno for reviewing an early version of the paper, and Bryan Bruns for detailed comments on a later draft.

The authors would like to acknowledge the series editors: Dave Tickner, Tom Le Quesne and Mica Ruiz.

April 2007

Tom Le Quesne, Guy Pegram
and Constantin Von Der Heyden

CONTENTS

Summary: Key propositions in water allocation

This primer is intended to review the key approaches to water allocation and some of the principal issues associated with these alternatives. While there are very important contextual differences in considering how best to allocate water, the authors believe that a number of basic propositions can be advanced that can help to guide and underpin WWF's engagement with these issues. These are summarised here.

1 In the context of increasing pressure on freshwater resources accompanied by complete ecosystem collapse in many cases, engagement with issues of water allocation and water rights will be necessary for many of WWF's freshwater programmes to achieve their conservation goals.

2 There is a clear role for WWF in helping to define environmental flows and advocating for social and environmental needs to be recognised in water allocation policy and processes. However, achievement of WWF's objectives will require more than legal or policy recognition alone, but is also fundamentally dependant on the existence of effective allocation and management systems.

3 Depending upon the local context, WWF should engage in one or more of the three spheres necessary for the achievement of effective water allocation that recognises environmental and social needs:

a. Policy and legislative formulation;
b. Management strategy development; and
c. Institutional capacity building.

4 WWF should be clear that it is evaluating water allocation arrangements based on their ability to ensure that water is available in the following order of priority:

a. Basic human needs and key social purposes;[1]
b. Ecosystem integrity; and
c. Economic development.

Water requirements for ecological functioning and social purposes should be advocated as a priority automatic allocation through legal and strategic processes.

1 There are currently debates as to whether basic human needs should be confined to water required for domestic use, or should also include use of water for subsistence purposes such as small scale agriculture.

Summary

Key propositions in water allocation

5 The most effective means of allocating water will always be determined by local circumstances: there is no "correct" approach that can simply be replicated globally. It is impossible, therefore, to be prescriptive in identifying the solutions to the water allocation challenge. The mix of allocation mechanisms (such as user-based cooperative, market-based and/or central-authorisation) should reflect local conditions and capacity. Yet, despite this uncertainty, there remain some broad approaches over which some consensus is beginning to evolve.

6 Any effective allocation mechanism is entirely dependant upon the development of significant institutional capacity from the national to the catchment level. This is required to assess available resources and any necessary ecological requirements, and administer, monitor and enforce the water allocation process.

7 The definition of water rights systems that allocate usufruct rights for economic purposes with periodic review should be promoted, linked to the concept of priority allocations for social and environmental maintenance purposes.

8 It is critical to recognise that a plurality of water rights systems (e.g. state administration, traditional law, international treaties) may be relevant within a particular situation. Conflicts between different systems need to be reconciled to enable consistent application at a catchment level.

9 Water trading may provide an efficient water allocation mechanism, but, as with any other mechanism, only under particular conditions. There is a potentially important role for localised spot trading, and the one-off purchase of rights to facilitate strategic reallocation between sectors (e.g. to meet environmental needs or growing urban demands).

10 Water banks offer significant opportunities for securing or restoring environmental flows while increasing the efficiency of water use and safeguarding social concerns.

11 Phased and adaptive implementation of water rights reform is necessary.

Introduction

Globally, many freshwater ecosystems are suffering from massive over abstraction. Some of the world's major rivers are now completely dry for stretches and periods of time. This poses major social, economic and environmental challenges. These will only be addressed when effective ways can be found to allocate water between competing needs within a catchment, while sufficient water is retained to ensure the continuation of ecosystem functions.

WWF freshwater programmes are increasingly engaged with issues around the protection of basic ecosystem functioning through the maintenance of minimum environmental flows. Any consideration of the implementation of environmental flows inevitably requires understanding of and engagement with core issues of water allocation and water rights. This 'primer' is intended to provide preliminary guidance, in particular to WWF staff, on the approaches to water allocation around the world, the current thinking on key issues, and provide pointers to further reading.[2] The primer aims to offer a review of central concepts, rather than innovative thinking or state-of-the-art analysis.

In addition to reviewing key concepts, a number of basic propositions are set out that could be used to guide WWF's freshwater programmes in engaging with water allocation. These are provided in summary form at the start of the text. A number of recommendations are also made through the paper where there appears to be a clear basic position that WWF would anticipate taking on key issues.

2 This report is based on a technical review of the issues conducted by Pegasys Consulting, and discussions held over a two-day workshop at WWF-UK in May 2006. The authors would like to thank Hector Garduno for reviewing an early version of the paper, and Bryan Bruns for detailed comments on a later draft.

PART ONE:
Keeping rivers flowing: the importance of water allocation and water rights

PART ONE:

Why do water allocation and water rights matter?

Conservation organisations such as WWF have historically focused on local freshwater biodiversity issues, for example the protection and restoration of important wetland areas or riparian sites. Where issues of over abstraction have arisen, these have typically been in the context of localised impacts on particular wetland sites, with local solutions pursued through dialogue with the industrial and agricultural sectors involved, for example a group of farmers.

Despite the important benefits of these initiatives, ever increasing withdrawals of water from the world's freshwater ecosystems are creating new threats as water stress leads to pervasive, catchment scale reductions in ecosystem functions. Put simply, rivers across the world are being sucked dry. Catchment scale challenges such as these, with widespread social, economic and environmental consequences, can no longer be addressed by local engagement at a limited number of sites, but require broader solutions: effective water allocation mechanisms are required that match the scale of the problem.

The need for allocation processes typically arises from a familiar pattern in the development of water use. Initially, sufficient water is available to meet the needs of all water users within a catchment without jeopardising ecosystems. As a consequence, little management is required. However, increases in agricultural and industrial activity coupled with population growth lead to ever increasing water withdrawals. Some augmentation of supply through engineering approaches is usually possible to meet increased demand, notably the construction of increased storage capacity, but also inter-basin transfer.

There typically comes a point, however, at which engineering solutions will no longer suffice to meet increased demand, or are considered to be economically, socially or environmentally undesirable. When this happens, over-abstraction from the ecosystem leads to water stress, with serious negative impacts on social and economic development and the deteriorating health of aquatic ecosystems. Where there is no further water available for use, catchments are referred to as "closed".

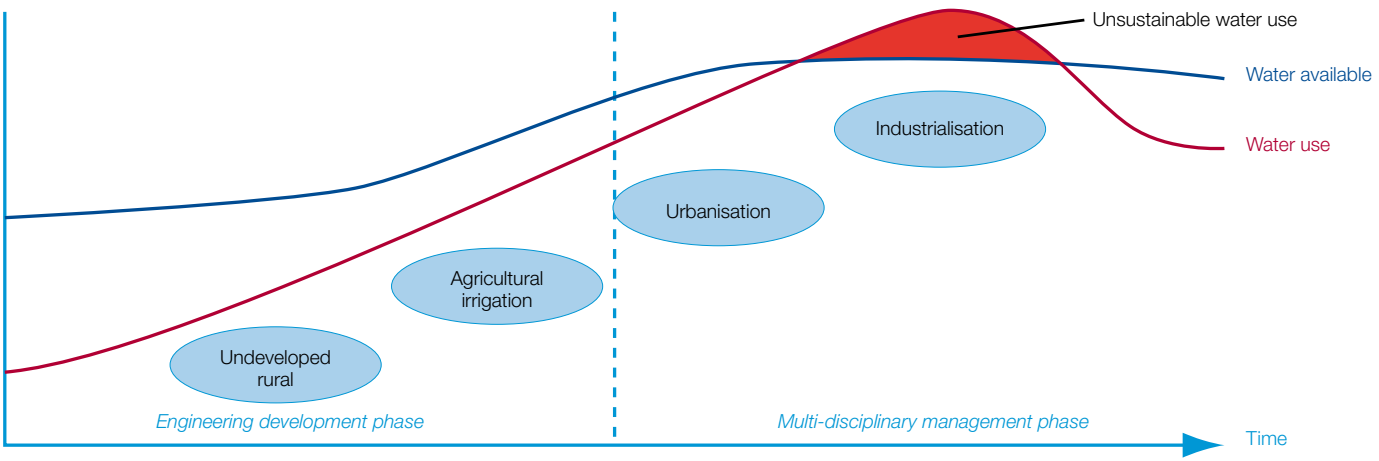
When such water stress is reached, a new and more sophisticated approach to water management is required. Rather than an engineering approach, these approaches seek to restore river flow through a multi-disciplinary and multi-stakeholder process of managing water withdrawal. Effective water allocation mechanisms need to be developed that manage the use of the scarce resource. In more prudent cases, such allocation systems may be introduced before catchments experience major water stress, but often a crisis is required to inspire reform.

PART ONE:
Why do water allocation and water rights matter?

Water allocation, waste discharge and IWRM

Discussions of water allocation commonly consider only the allocation of rights to abstract water for productive or subsistence needs. A further form of water rights exists, namely the right to access and utilise the resource to discharge waste. This paper largely focuses on the way in which the rights to abstract water are allocated. However, the impact of waste discharge on downstream water abstractors means that there should be close coordination between the allocation of abstraction rights and the administration of waste discharge, either through the establishment of a single agency, or cooperation between separate agencies. This need for co-ordination is a good practical example of the principles of Integrated Water Resources Management (IWRM).

Figure 1 **Changing risk and management requirements with use**



PART ONE:

Introducing water allocation and water rights

At the core of the issue of managing water within a catchment is a key question: how do we decide and control who can abstract water? This process is accomplished through a system of rules that is typically described in terms of the two key concepts of water allocation and water rights:

- A **water right** is the formal or informal *entitlement* which confers on the holder the right to withdraw water.
- **Water allocation** describes a *process* whereby an available water resource is distributed to legitimate claimants and the resulting water rights are granted, transferred, reviewed, and adapted. Hence, water allocation processes generate a series of water rights governing the use of water within a catchment.[3]

A range of different possible water allocation processes and water rights exist around the world. Appropriate water allocation results in more socially and economically beneficial use of the resource while protecting the environment. Unsuitable or ineffective approaches drive water stress. Understanding water rights and water allocation is therefore key to understanding the solutions to global water stress.

Water allocation

In some cases, water is sufficiently abundant compared to use that there is no need for an allocation process. Alternatively, formal and informal control over water abstraction may have broken down. Under these circumstances, a situation of open access to water occurs. In all other cases, however, a process of water allocation of some form exists that sets out how, by whom, and on what basis decisions are made over who will be entitled to abstract water. There are a number of key alternative systems of water allocation:

1 **Automatic entitlement.** Some water allocation processes recognise an automatic minimum entitlement to water for basic social purposes, or the maintenance of minimum environmental requirements.

2 **Administrative or bureaucratic process.** The right to abstract water is given by some authority, either a state agency or a user group (e.g. an irrigation board). This is the most widespread formal type of allocation process.

3 **Communal or traditional processes.** An enormous range of allocation process exist that are based on traditional, non-state law or custom.

4 **Market allocation.** In some parts of the world, water rights are reallocated on the basis of trade rather than by administrative allocation. Both formal and informal water markets exist.

5 **With land.** Water rights may be attached to the ownership of land. Transfer of the land through sale or inheritance implies transfer of the water right. In some cases, landowners abutting a surface water resource are entitled to water rights. Similarly, groundwater below private property is often regarded as an entitlement of that property.

3 The phrases water rights and water allocation are used in different ways in differing contexts, and this can lead to ambiguity and confusion. For example, the concept of 'water rights' can sometimes be used to refer to the entire water allocation process. On other occasions, a 'water allocation' can be used to refer to a particular entitlement or right, rather than the process. Note also that the increasingly high-profile 'human right to water' refers to a different concept again.

PART ONE:
Introducing water allocation and water rights

Often, more than one method of allocation will be in operation within a catchment. Some of the key issues associated with these different allocation processes are discussed later.

Water rights

Water allocation processes generate a series of water rights. The nature of the water rights themselves vary greatly, and are referred to in different jurisdictions as licenses, concessions, permits, access entitlements, or allocations. In spite of this variability, a number of basic attributes of a water right can be identified, and together these describe the extent of the use and control rights conferred on the holder of the water right. These attributes can be grouped into attributes describing the water (quantity and quality of the water, the source and location), the holder (use, location and duration) and the administration of the right (ownership and transfer, security and enforcement).

Within the range of different types and attributes of water rights, it is useful to identify one particular category of water rights, private property rights. Private property water rights, as the name implies, confer on the holder the full set of property rights. Such rights are the closest approximation of "ownership" of the water. As a result, private property rights are usually absolute in terms of quantity and quality, have no or limited conditionality, are without restrictions on use, are fully transferable and are granted in perpetuity. The implications of this particular type of property right are discussed later.

Table 1: Attributes of a water right

Attribute	Description
Quantity	The amount of water the holder of the right may abstract.
Quality	The quality of the water to be abstracted or disposed of.
Source	The specific resource and location from which the right is awarded.
Timing	Restrictions on the time that the right applies, i.e. times that the volume may be abstracted.
Assurance	Some rights are absolute – 100% of supply guarantee of a certain quantity and quality, while other rights have variable assurance of supply and quality depending on the available resource. This can be based, for example, on principles of priority or proportionality.
Use	The specific use for which the water is abstracted (e.g. irrigation, mining, etc.)
Duration and ownership	The duration for which the holder is entitled to the rights conferred. Some rights are permanent while other rights are authorised for a specified period of time.
Transfer	Whether the right can be sold, transferred to another person or location, or inherited.
Security and enforcement	Details of the administrative body that has the legal mandate to award the right, including the extent of that mandate.

PART ONE:

A framework for effective water allocation: WWF's Water Diagnostic

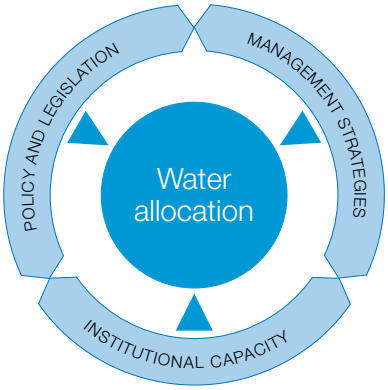
Effective water allocation requires that correct approaches be applied in three key areas of focus (as illustrated in Figure 2), namely:

- Policy and legislation: creating the legal framework for water allocation, including possible plural rights systems;
- Management strategies: the methodologies, processes and approaches for implementing the legal and policy framework; and
- Institutional capacity: the ability of organisations and stakeholders to give effect to the policy and strategies.

Together these determine the functioning of a water allocation system and the associated protection of resources at a catchment level. Where any one of these three is inadequate or not consistent with the other two, the successful implementation of the system is jeopardised. Without the policy level, there is not clear understanding of the "rules" for water use. Without good management strategies, the translation of these rules into sustainable allocations is limited. Without institutional capacity, the ability to ensure that these allocations are made and enforced is poor.

This simple framework provides a useful tool to indicate possible WWF involvement in water rights and allocation processes. Achieving environmental flows may require intervention in one or more of these domains, depending on the particular context.

Figure 2 **Where is change needed? WWF's diagnostic tool**



For example:

- Where **policy reform processes** are ongoing, WWF should attempt to articulate the importance of approaches that enable protection of the environmental resource.
- There is considerable scope for intervention in the development and revision of **management strategies** to secure environmental flows, for example through the development of improved system operation rules, or new strategies for the reallocation of water licenses.
- In other contexts, the development of **institutional capacity** may be a key area of focus, for example the achievement of improved allocation through catchment forums, improved management of groundwater, or improved monitoring and enforcement of rights.

This list is far from comprehensive, but illustrates that the protection of the environmental resource can and often does require interventions in each area of focus.

PART TWO:
Key issues in water allocation and water rights

PART TWO:

Environmental flows and priority allocations

Increasingly, environmental water needs are recognised and environmental water allocations have been introduced in policy and management around the world (e.g. Postel and Richter, 2002). These environmental allocations are not only intended to maintain biodiversity and aquatic ecology, but are recognised as vital to ensuring the continuing provision of environmental goods and services upon which peoples' lives and livelihoods depend. For example, rivers that do not flood adequately do not produce the fish biomass upon which communities may be reliant; wetlands that are drained do not attenuate flood waters that result in significant downstream flood damage; and lakes that are polluted do not provide the recreational services that people seek.

Defining acceptable environmental flows is not solely a question of specifying a minimum flow below which water levels should be allowed to fall. It is also necessary to account for important flow variations within a system, for example to include flood events which may be vital for supporting wetland, delta or flood-plain ecosystems, or flows for migrating fish species. There is a growing technical literature on methods for establishing these flow requirements (see 'Keeping Rivers Alive – a primer on environmental flows and their assessment; WWF, 2009), and this paper is not the place for an extended discussion of these approaches.

A variety of different legal and policy approaches exist for recognising environmental flows within water allocation systems. While in some jurisdictions the environment is regarded as a legitimate user of water and, therefore, is pooled with other users in accessing allocations (e.g. SADC 2003),[4] certain jurisdictions recognise the environment as an automatic (priority) allocation as the resource base upon which other users depend, and therefore separated from other water users (e.g. RSA, 1998).[5]

Importantly, the identification in policy or law of the environmental requirement may often not be sufficient to ensure environmental flows. There is also a need for the data, monitoring, enforcement and management capacity to ensure that these requirements are realised in practice. Furthermore, many basins are already over-allocated, and mechanisms will be required to allow for re-allocation of water from existing uses to the environment. In short, whatever the legal position, environmental flows are very unlikely to be secured in basins under pressure without an effective overall water allocation system.

4 SADC. 2003. "SADC Regional Water Policy", Southern African Development Community, Gabarone.

5 RSA. 1998. "The National Water Act: Act 102 of 1998", Government of the Republic of South Africa, Pretoria.

The Rietvlei River, Kwazulu Natal. South Africa's 1998 Water Act provides a priority allocation for the environment.

Automatic entitlement and the environmental Reserve: South Africa

The South African National Water Act recognises the requirement for sustainable utilisation of the water resource through the definition of an environmental Reserve, which is the quantity and quality of water required to protect the aquatic ecosystems of the water resource. Once determined by the Minister, the Reserve is binding on any institution involved in water resources management. A basic human needs Reserve is also recognised, which provides for the essential needs of individuals served by the water resource.

Before any water use license can be issued, a Reserve must be determined. The methodologies to do this have been developed and refined over the past 15 years, but still require scarce human resource capacity. The back log of ad hoc licensing Reserves, together with the significant time and resource requirements for comprehensive catchment Reserve determination, places a huge burden on water resources managers. The challenge remains the balance between technical rigour of analysis and the management imperatives at a catchment level in a developing country.

Even where Reserves have been determined, the implications for water use have not always been understood in the absence of catchment allocations plans and strategies. The Reserve reflects resource objectives that need to be coherently translated into conditions on water use abstraction and discharge for each user. Finally, while the legislation enables expropriation of water allocation without compensation to meet the requirements of the Reserve, this poses a significant political and legal challenge to its implementation.

Despite these teething problems, the legislation and implementation of the Reserve in South Africa has contributed towards sustainable utilisation of the country's water resources and presents an extremely important instrument for resource protection.

PART TWO:
Environmental flows and priority allocations

Priority allocations

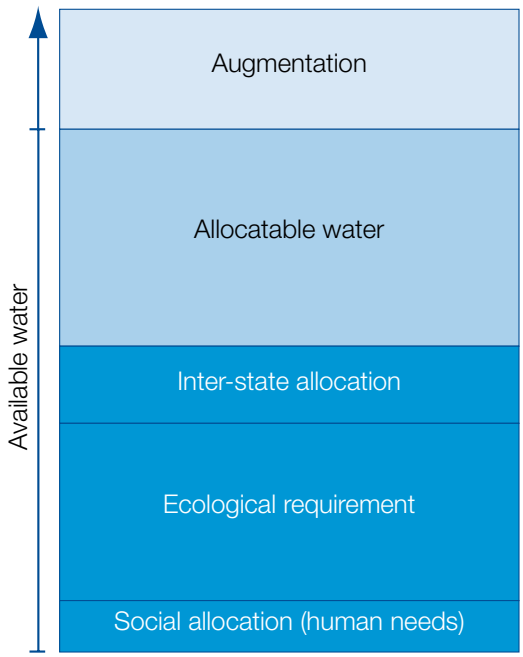
Within any system of water allocation, certain categories of use can be identified as having priority (or an automatic entitlement). Figure 3 schematically indicates the reliably available water resource in a catchment. This may be augmented through infrastructure development (e.g. dams, transfers, etc.) or other means.

From the available water, it is possible to allocate by right water for basic human needs, ecosystem maintenance (instream flow requirement) and/or inter-state and international obligations. Other priority water allocations can include strategic industries such as power or defence. These priority users would be allocated water before the "economic" users of water. As a corollary, in periods of reduced availability, water supplied to economic users should be the first to be constrained, before water supply to strategic, ecological, or social uses.

More recently, there has been a growing debate as to what should be included within the 'social' allocation of water. Should this be confined to domestic uses, or should a certain quantity of water for household livelihoods and subsistence agriculture also be included? Where basic subsistence needs are considered as part of a social entitlement, this would need to be reflected in the priority allocations.[6]

Priority water allocations for social and environmental purposes are increasingly recognised in water law around the world. Where reform processes are being undertaken, WWF should advocate for the inclusion of these in the allocation process.

Figure 3 **The elements of water allocation**



Note: The quantities of the allocations in figure 3 should not be taken as in any way indicative of the different requirements in any given location. The ecological requirement, for example, can be equal to or greater than 90% in some catchments under certain conditions.

6 Water rights are distinct from the internationally growing concept of a "human right to water" as a basic human right, as articulated in the United Nations General Comment 15 in 2002. The recognition of a 'human right to water' may be incorporated in the definition of water rights, by defining the water required for basic human needs as a priority right in law. It would also confer additional responsibilities on governments.

Extreme water stress: a dry creek in New South Wales, Australia

The environment as driver for water law reform: Australia

In Australia, the introduction of cotton in the 1960s and the advent of large-scale irrigation, coupled with the flawed assumption of a permanent under-use of licenses, led to a dramatic over-allocation of water resources. This brought a range of dramatic natural resource impacts into focus, including irrigation-induced salinity, growing evidence of decline in native fish populations, loss of vegetation, degradation of soils, and water quality decline resulting in algal blooms.

In the light of this, water policy began to reflect environmental studies showing a decline in river health. In 1994, the Council of Australian Governments (COAG) acknowledged the need for a national water reform programme and issued a comprehensive statement of principles and processes. Significantly, the COAG recognised the need for environmental flows, through a review of water allocation and reallocation mechanisms including the trade in water rights.

Dramatic water resource impacts were particular evident in the Murray-Darling Basin. Consequently, New South Wales has incorporated environment flows in its water policy and water resource management planning for the MDB. Such planning has formed a flexible means of attaining environmental goals, through a number of key elements:

- Minimum flow rules for releases from storages and for pumping from unregulated rivers;
- Reservation of water within storage to meet environmental contingencies;
- Unregulated flow management to preserve important elements of high flows; and
- Specific entitlements for environmental or instream use.

Despite these reforms, environmental flows have not yet been fully restored, and remain in many cases largely rhetorical.

PART TWO:

Capacity and institutional issues

Inherent to any effective allocation process is not only an appropriate policy and legal framework. At least as important is the institutional capacity to implement and monitor the process. In many – perhaps the majority – of contexts, shortfalls in capacity are a greater challenge to effective allocation than inappropriately defined legal or policy systems. It is simply not possible to construct any effective allocation process in the absence of basic institutional capacity.

Garduno-Valesco (2001)[7] identifies some key challenges evident from the implementation of water allocations and water rights systems in Mexico, Uganda, South Africa and Sri Lanka, and the following list of key capacity issues is drawn from this:

- Adequate data collection and monitoring is to be regarded as the most difficult, yet critical, task of water allocation. This includes monitoring of the system in response to use, to ensure that the resource base is protected and that water rights are secured through adequate resource quality and quantity. It is also necessary to monitor compliance with use conditions. Data can be problematic or disputed even in areas with long records of measurement and relatively high levels of human and technical resources and institutional capacity in water management, such as Australia and the Western USA;
- Capacity is a key institutional constraint. Given the complex nature of a water rights and allocation system, institutional capacity must be diverse (technical, stakeholder engagement, financial, etc), and must be supported and strengthened throughout the implementation;
- Adequate resources (financial and human) should be available and budgeted. Although transferring these costs to water users is appropriate in the long run (user pays and polluter pays principle), it may be prudent to introduce these costs in a phased manner in the short-term, to ensure that stakeholders do not incur high costs before the benefits of any new system are evident;
- Institutional structures and arrangements must be clearly defined. Where mandates, roles and responsibilities are not clarified, the process of water allocation from resource assessment to application, to monitoring and enforcement, and review is disjointed and may be undermined. At best, the bureaucratic process may be excessively time consuming and costly (inefficient) while at worst allocations may be flawed. While functional integration should be pursued, clear distinctions between institutions enable efficient execution of functions;

7 Garduño Velasco H. 2001. "Water Rights Administration – Experience, Issues and Guidelines", FAO Legislative Study 70, Development Law Service FAO Legal Office, Food and Agriculture Organisation of the United Nations, Rome.

PART TWO:
Capacity and institutional issues

- Water balance analyses and water resources planning studies can play a crucial role in helping to arrange water allocations to sub-catchments, administrative units (provinces, cities, counties, townships and villages), sectors (irrigation, municipal water supply, industry) and to the environment;
- Widespread stakeholder engagement in the allocation process and clear communication around the issues of water rights must be undertaken well in advance of implementation of any new system, for example registration. Stakeholders should be involved in the governance of the institutions implementing the water allocation system;
- Allocation and water rights systems are time-consuming processes. Accordingly, time frames for implementation (and for the demonstration of benefits arising from the reformed allocation system) should be realistic to ensure that false expectations are not created and that consensus is not undermined. Experience from Mexico suggests at least 15 years are required for full implementation of a new system; and
- The water allocation system should be flexible, and should be reviewed and adapted as the iterative nature of the process identifies requisite improvements or additions. Adjustment to the system as a result of trial and error is a legitimate feature and the legal obstacles borne out by practice and experience should be removed through a process of reform.

PART TWO:

Private property rights and use rights

A key distinction exists between two principal approaches to water rights – private property rights and use rights. Each approach has particular characteristics, strengths and drawbacks. Understanding the distinction between these approaches is key to understanding how water is used in different contexts.

Private property rights

Private property water rights confer on the holder the full set of property rights and are the closest approximation of "ownership" of the water. Private property rights are usually absolute in terms of quantity of water that may be abstracted, have no or limited conditionality, and are granted in perpetuity. As a result, private property rights are very secure. Private property rights to water can exist in themselves, but can also be tied to the ownership of land.

Private property rights have some advantages from an economic perspective. Many water-based infrastructure investments (e.g. impoundment infrastructure, abstraction and transfer infrastructure, irrigation infrastructure) have relatively long investment horizons, and private property rights provide significant security to these investments.

Nevertheless, private property water rights have a number of important disadvantages, in particular from an environmental perspective. Chief amongst these is that private property rights do not enable much control over the allocation to be exercised, most importantly where water in a catchment is being over-abstracted. It may be necessary to change water management and allocation within a particular catchment owing to changing demands and use patterns, new scientific understanding, pollution related problems, environmental allocations, political shifts or changing economies.

Should an adjustment of the allocations in a catchment be required to enable, for example, environmental allocations, this can only be achieved through expropriation of the right with full compensation or purchasing of water rights on the open market (where markets exist). Expropriation of any private property right, even with full compensation, is a hotly contested and politically fraught process.

As a consequence, "adaptive management" is difficult to achieve with private property water rights, and private property rights typically do not support sustainable water allocation and the achievement of environmental flows.

Use or usufruct rights

The alternative to the ownership of water as a property right is where use or 'usufruct' rights exist. Under these circumstances, water is regarded as a public good and the control remains with the state or a user association. The right to abstract a certain volume of water is granted through an allocation process. Owing to their nature, usufruct rights are relative in terms of quantity, quality and timing, are conditional, and are of limited duration.

The strength of usufruct rights is that they enable improved management and control of the resource. Where changing circumstance requires reform of water

River Ganga, India. Abstraction for irrigation has resulted in low flows in some reaches of the Upper Ganga; it is at times possible to walk across the river.

allocations, for example to allow for environmental allocations, usufruct rights enable such reform through re-allocation or cancellation of the right following completion of the term, or through the imposition of improved conditionality, for example 'hands-off' flow requirements. Adaptive management not only provides for sustainable environmental management, but can allow for more socially equitable management.

The key disadvantage of usufruct rights is the inherent uncertainty that the relative nature, the limited duration and the conditionality of the right introduces. As such, uncertainty and insecurity may lead to the distortion of water-based investment. However, this disadvantage of usufruct rights can be overcome by extending the duration of the right and/or requiring that prior investment be considered during review of a right.

Accordingly, a fine balance must be struck between rapid adaptive management on the one hand and security of investment on the other when considering conditionality and duration of a usufruct right. Following an extensive review of the literature, the Australian Productivity Commission (2003)[8] suggested that the approach that found the best middle ground was a fixed, medium term (e.g. 5–10 years) and a clear process by which rights are reviewed following completion of the term.

8 Productivity Commission. 2003. "Water rights arrangements in Australia and overseas", Commission Research Paper, Productivity Commission, Melbourne, pp 331.

The Rio Grande, southern USA: **for much of its length, the river suffers from chronic over-abstraction. The system of private property rights to water creates immense difficulties to addressing these problems.**

Private property rights and the environment: South West USA

Water rights in the south-western USA date back to the mid nineteenth century, when agricultural development of the South West was supported by the state in an attempt to extend economic development and control into the region. Water rights in the South West USA are conferred through ownership of land and are private property rights. As such, the rights to water are granted in perpetuity and in entirety, such that conditions on that right cannot be imposed and the right cannot be removed (expropriated) without significant political and legal challenge (and compensation). The water rights system follows the "prior appropriation" principle, which gives priority in right to the older rights – "first in time, first in right". Accordingly, under conditions of water stress, those rights holders most recently granted are the first to lose access to the decreasing resource, while the older rights are the last to be affected by decreasing availability.

The environmental implications of the South West USA system of water rights and allocation are profound and have been widely recognised as an important demonstration of the negative environmental impacts associated with water rights systems based on private property rights and the principles of prior appropriation.

Two key implication can be demonstrated:

1. Environmental allocations: When the South West was being developed and water rights were being issued, little consideration was given to environmental allocations or environmental sustainability. Accordingly, the environment was not granted an allocation under the water rights system. Moreover, information on the available resources was not highly developed, and water resources have, in time, been over allocated. By the time that recognition of the environmental water needs was developed, all available water had been allocated as private property rights.
2. Priority: where some environmental flows have been secured through transfer or purchase of rights, these rights are often the "more recently" acquired rights. As a result of the prior appropriation principle, these environmental allocations are therefore amongst the first to be curtailed under conditions of water stress, while the older (usually irrigation) rights are retained.

PART TWO:

Communal rights and legal pluralism

Traditional and communal water allocation systems, as their name implies, are based on typically long standing non-state law, custom and tradition. They can be very sophisticated, well enforced and flexible. Traditional water rights vary greatly in characteristics – some approximating private property rights while others are usufruct rights. Perhaps the traditional rights best described are the communal rights, in which water is allocated by a community and administered by community leaders (elders, priests, healers), with use rights allocated to individual users (Ostrom 1992).[9] In line with this distinction, rights to individual users are usually relative in terms of quantity, quality and timing, are conditional, are of limited duration and can only be transferred in very specific ways, for example through inheritance or together with transfer of land.

The merit of such systems is often a strong local decision-making, monitoring and enforcement base, and this can be particularly important in the context of weak state management institutions. Bruce and Migot-Adholla (1994)[10] found that for rural land rights in Africa, customary land tenure arrangements provided as much, or more, tenure security than government-issued title deeds. These findings are probably transferable to water, the enforcement of which is more costly than land rights and requires greater institutional and legal capacity. Accordingly, in many areas with limited government agency capacity and tight financial resources, especially in most rural areas in developing countries, one would expect that customary law, backed by local norms and community sanctions, would be as effective as state law as a basis for claiming water rights.

However, customary systems also face challenges. They can often be defined relative to a particular "community", with little recognition of the impact on other downstream communities or the ability to adapt to wider changes in the catchment. Equally, some communal allocation systems are highly equitable. Others, however, particularly those based on individual private property ownership, are commonly not equitable – access to and control of water can be an important measure of status and a means of control (e.g. the water rights systems of the Qanats in the Middle East).

Legal pluralism

In many places, dual or plural water allocation processes or laws may be at work and, accordingly, dual or plural water rights may be in place. For example, in a remote rural area, statutory law may exist in concept by virtue of the inclusion of that area in some administrative jurisdiction. This statutory water law may regard water as a public good with administration of the resource vested in the state. However, on the ground, customary law may prevail and the interaction of members of society around access to and control of the resource may be based in custom and social norms. Accordingly, the resource may be managed as a collective good by the community, with little or no regard for the legal requirements of the statutory law. Under such circumstances, conflict can arise where the two systems confront each other as part of water registration, reallocation or charging processes.

9 e.g. Ostrom, E. 1992. Crafting institutions for self-governing irrigation systems. San Francisco: ICS Press.

10 Bruce JW and Migot-Adholla S. 1994. "Searching for land tenure security in Africa", World Bank, Washington.

PART TWO:
Communal rights and legal pluralism

The pluralism of water law is further increased because each of type of law – especially state, customary, and religious – may be plural in itself. Government land laws may contradict water acts. Many communities have different ethnic groups living side by side and using the same water, but having different traditions regarding its use. In particular, many rural areas have farmers and pastoral groups, with different ways of life and ideas on water. The mix of religions adds to this plurality. All of these types of 'law' will be interpreted differently in different places, generating a plethora of local law. These different types of water law are not neatly separated; rather, they overlap and influence each other.

Unclear and competing water law systems in any given context can lead to obvious management problems. However, attempts to establish a uniform water system – typically a system of formal, state law – may be ineffective where institutional capacity is weak, and lead to unanticipated, negative social or environmental consequences. A plurality of legal systems may be relevant within a particular situation. These systems should not be in conflict, should recognise one another, and enable consistent application at a catchment level.

PART TWO:

Water markets

A number of key alternative mechanisms exist through which decisions can be made about who should be granted access to water. Often, these decisions are made by administrative authorities or according to communal water management rules. However, an important alternative approach is to allocate water on the basis of market mechanisms, particular in the case of re-allocation of water.

The introduction of water markets has been part of a shift in paradigm in water policy in many countries over the last two to three decades. This has seen a move away from 'command-and-control' to more decentralised and market driven policies. Full cost recovery, water markets, and the devolution of water management issues to local levels have been key components of this process. Globally this process has been promoted by major international organisations such as the UN, the World Bank and the OECD.

In addition to the introduction of an increasing range of water markets in formal national water policy making, informal and local water markets are widespread. Indeed, there are few water management contexts globally in which no water trading of any kind takes place. In considering water markets, therefore, the appropriate question is not whether trading per se should take place, but what form of trading can facilitate the desired social and environmental objectives.

Types of water market

There are a range of different types of water market that can be introduced.

- **Open water markets.** Full water markets exist where water rights can be traded on a free market, largely without administrative control and interference. Such an approach most closely approximates the sale of other goods and services in a market economy, for example land. Full, open water markets can be most easily introduced where water rights are privately held, implying that there is a property right that can be traded.
- **Spot markets.** Spot water markets are temporary exchanges of water, whereby the holder of the water right retains the right but trades the usage of the water on a temporary basis. Such temporary transfers of water use are significantly more common than the full trade in water rights. Spot markets are particularly important in allowing flexibility in systems in response to periods of reduced supply. Although spot trading can be used to purchase water for environmental allocations, the medium to long-term uncertainty undermines its usefulness in securing long-term allocations. For similar reasons, spot trading in water may not facilitate investment, as the security of supply is unsure.

PART TWO:
Water markets

- **Administrative water trading.** Where open water markets fail, or lead to socially or environmentally unacceptable consequences, regulation of water markets can be introduced. Regulation of water markets often exerts some control over:

  1 **Spatial elements of trading:** where water is traded between catchments or over a significant river reach, the implications of the trade are considered by the regulator before the transaction is authorised.

  2 **Social/equity elements of trading:** particularly where social and political prerogatives require redress or access to the resource by the poor and marginalised, water transactions are scrutinised by the regulator to determine whether these objectives are achieved and to prevent that existing inequities are further entrenched.

  3 **Sectoral water trading:** trade between sectors is limited/regulated, to prevent perverse economic or social impacts and to counter the impacts on the resource by shifting water resource sectors discussed above.

  4 **Price:** particularly where social/redress objectives are relevant, the regulator may regulate the sale price or provide subsidies to encourage redress transactions.

- **Informal water markets.** In a very widespread range of conditions, informal water markets exist even where these are not sanctioned by official national policy or law. Semi-formal water markets also often exist within irrigation districts, governed by the administrative provisions for the relevant district.

In addition to these different categories of market, trading can also take place over different scales and ranges. Hence, trading may be confined to very local transactions under some circumstances, whereas under others it may be permitted between catchments. Equally, under some conditions, trading is permitted between any parties, whereas under others trading is confined within particular sectors.

The advantages and disadvantages of water markets

Such is the range of different types of water market, caution is required in generalising about the advantages and disadvantages of markets. The issues pertaining to formal markets in private property rights, for example, may differ markedly to those relevant to informal trading between members of an irrigation district.

Nevertheless, a number of typical issues can be highlighted from both a socio-economic and an environmental perspective. Hence, a number of general advantages are typically cited from the use of water markets:

Upper Biobío River, Biobío Region, Chile. **Insufficiently regulated water markets in Chile have had adverse environmental impacts.**

Water trading, free markets and the environment: Chile

Before 1981, ownership of Chilean water resources was vested in the state. Concessions were required for water use to be considered lawful. These concessions were linked to land and were granted for specific uses. With the enactment of the Chilean Water Code of 1981 by the Pinochet junta, the water rights system was reviewed and liberalised. The concessions were transformed into full-fledged private property rights, with rights generally granted in perpetuity and fully tradable. The Code also stipulated that all water resources not committed through the registration of existing use be allocated through an auction process. No allocation was retained for the environment. Apart from the requirement to apply and register for a concession, there are very few other obligations tied to the new concessions (e.g. use, timing, return flows).

In line with the neo-liberal ideology of the Pinochet government, the private property rights regime was intended to facilitate allocation and re-allocation through market processes. Through trade, use of the scarce good goes to the water user who pays the highest price for water, thereby achieving the highest productivity.

While some authors demonstrate that the reformed water rights system in Chile resulted in substantial economic gains, it is now widely recognised that the system did not take adequate cognisance of the social and environmental objectives of sustainable development. Many marginal social groups, particularly the poor and politically disenfranchised, lost access to water which had been protected under a range of historical and traditional rights. Limited access to information and prohibitive transaction costs largely excluded some groups from registering water use or engaging in trade.

Similarly, the system failed to protect the environment, as market-based allocation encouraged over-registration, speculation and the transfer of water rights across hydrological boundaries, whilst administrative control of the resource was significantly undermined. In addition, inter-sectoral trade in water rights reduced return-flows and had water quality impacts through increased waste discharge. This resulted in spatial and temporal environmental impacts, and a resource that was systematically overexploited through abstraction and waste discharge.

PART TWO:
Water markets

- Net benefit from water use is increased. By allowing trade, water can be transferred from less productive economic activities to more productive ones;
- Incentives are provided for water conservation. If any water used has to be purchased, or water saved can be sold, strong reasons to maximise the efficiency with which water is used are introduced; and
- Allocation and re-allocation can be achieved without political involvement. Where water is allocated by administrative bodies or local communal authorities, control can be exercised by social and political elites. Water markets can provide a transparent means of allocation.

The environment may also benefit from water markets:

- Where a catchment has been over-allocated, the purchase of water rights may be the most efficient and politically acceptable method of securing water for environmental needs. The water efficiency measures stimulated by the market may make additional water available for environmental allocations without reducing overall economic activity; and
- Increased efficiency in use may reduce environmental pollution (e.g. irrigation return-flow laden with fertilisers and agrochemicals).

For all their potential advantages, experience suggests that water markets face very significant challenges. A number of significant general problems have been identified:

- Discrepancies in income levels and access to capital result in markedly varying transaction costs and access to information. As a result, markets can lead to adverse impacts for poorer and marginalised communities. Monopolistic acquisition of water rights has been demonstrated in Chile, which is held by some as a success in water markets, but where other researchers demonstrate significant inequities and inefficiencies;[11]
- While transactions on spot water markets may occur frequently, water markets for water rights are often not as active;
- Third party effects experienced by individuals not involved in the transaction can be significant. For example, decreases in agricultural activity following the sale of water rights by some farmers may make it unviable for any remaining agricultural businesses to afford to maintain local irrigation, processing or distribution infrastructure; and
- In poorer communities, the short-term windfall of trading water rights may result in the sale of means of production and livelihood. While this may be an economically rational action, it is not a socially justifiable one (in terms of equity and social development considerations).

11 e.g. Hearne, R. R. and K. W. Easter. 1995. “Water Allocation and Water Markets: An Analysis of Gains-From-Trade in Chile.” World Bank Technical Paper Series Number 315, Washington, USA; Hearne RR and Easter KW. 1995. “Water allocation and water markets: an analysis of gains-from-trade in Chile”, World Bank Technical Paper Series Number 315, Washington. Bauer CJ. (1997) “Bringing water markets down to earth: the political economy of water rights in Chile, 1976-95”, World Development 25(5) 639-656.

Fields along Murray river near Tocumwal, Australia. Market forces have driven up the cost of securing water for environmental flows.

Spot trading in Australia: out-pricing the environment

The first genuine economic response in the Australian Murray-Darling Basin (MDB) to modern IWRM was in 1983–84, when New South Wales was in the grip of a severe drought. Available water to individual licensees was very low, at about 10–20% of licensed water entitlements. In recognition that these volumes were too low for any individual to invest in planting a crop, the government announced that irrigators could trade their available water temporarily on an annual basis. Since then, spot water trading is considered an integral part of irrigation farm business planning.

The need for environmental flows in the MDB and for the reallocation of water from consumptive use to instream uses was widely recognised. However, market forces drove up the price of water in response to high demand and limited supply. While private enterprises can purchase sufficient water to support economic activity, the volumes of water required to safeguard river health is orders of magnitude more than that used by individual enterprises. Accordingly, purchasing sufficient quantities of water to achieve desirable improvements in river health implies a major imposition on the public purse, and is well out of the reach of almost all private institutions and conservation organisations.

PART TWO:
Water markets

In addition to general challenges with water markets, there are a number of specific environmental concerns:

- Water trading moves water around in a catchment, or even between catchments. Sale of a water right by a downstream holder to an upstream holder can result in significant ecological impacts. Similar effects are seen for sale of water rights between catchments, where the receiving catchment may not be able to support the water right;[12]
- Water trading may result in significant temporal effects on water use. Some water users require a relatively constant volume of water while for others water demand is more variable, often reflecting seasonal variability. Trading between users may affect the amount of water user at different time of the year (and day), which may have significant effects on natural flow variation, flood and low flows; and
- Where water is traded between sectors, the amount and quality of water that returns to the resource (return-flow) may change. Similarly, the expected assurance of supply between sectors may differ considerably, resulting in over-allocation of a catchment as a result of trade.

The problems with water markets identified here clearly point to the need for WWF to argue for careful regulation and control of any water markets. The conditions under which the use of markets forms the primary basis for the allocation or reallocation of water are therefore likely to be limited, and this implies careful consideration of the situations under which water trading is likely to be appropriate.[13]

Despite these cautions about the widespread use of open markets for the reallocation of water, there is an important role for markets of some form in many contexts. In particular, localised spot trading within a sector (for example within an irrigation district) can play an important role in allowing flexibility within local agricultural systems. Equally, the purchase of water rights may often be the only feasible way of securing long-term policy objectives of transferring water use from one sector to another, for example from agriculture to growing urban needs or to achieve environmental or other objectives.

In each of these cases, trading or the purchase of water rights has an important role to play within clearly defined parameters. Moreover, while there are clear challenges to the widespread use of water trading, it is important to recall that all methods of allocating water have their imperfections. In particular, the primary alternative of allocation through administrative process is always susceptible to the danger of elite capture and corruption.

12 This problem is countered in Australia by introducing an “exchange rate” calculation to water traded between catchments. However, such calculations are complex, and administration and resource intensive, and have met with variable success.

13 In Australia and the USA, water markets appear to have been successful in capturing economic, social and environmental benefits (e.g. Bjornlund 2002). From these and other country experiences, it appears that suitable market conditions require that: • Catchments as units of trade are relatively small (i.e. to facilitate the physical transfer of water). • Numerous rights exist (i.e. to facilitate frequent transactions). • Rights are held individually (i.e. to facilitate decision-making).• Adequate water is available to meet all existing allocated rights; i.e. the resource is not over-allocated. • Middle income to higher economic levels prevail (i.e. to ensure the availability of capital in the market). • Strong water resource management institutions exist to provide security to rights, to enforce conditionality and manage the resource, and to support transactions. Clearly, these conditions are likely to exist in only a number of cases.

PART TWO:

Water banking

The challenge of water markets lies in the identification of ways of mitigating the potentially damaging impacts of trade while unlocking the very considerable economic and environmental benefits that are on offer. One particularly promising option for designing markets which achieve WWF's goals is through the introduction of water banks.

A water bank is an institution that offers to buy and sell water under some set of rules regarding prices and quantities. It typically acquires a 'stock' of available water licenses, which are available for purchase. Water banks therefore provide an intermediary in the water market between buyers and sellers, thereby lowering transaction costs and encouraging market activity. Equally importantly, a water bank can regulate undesirable social and environmental impacts. From an environmental perspective, water banking is attractive as it can allow for water to be set aside to ensure ecological flows as part of the trading process. There are several examples of efficient and equitable water transfers by water banks (Howe and Goodman 1995).[14]

However, such institutions require strong oversight to ensure that the public trust is maintained, and to this end governance and accountability arrangements must be clearly defined. Moreover, state involvement must be retained to ensure that a balance between the profit motive and the public good is maintained. As with water markets, water banking requires clearly defined and secure water rights, and strong water resource management institutions that can monitor water use and enforce the water rights system.

14 Coppock, R. H. and Kreith, M. (eds.). 1992. California Water Transfers: Gainers and Losers in Two Northern Countries. University of California, Agricultural Issues Center and Water Resources Center, Davis, California.

15 An acre-foot is equivalent to 1.235 mega-litres.

16 Howe CW and Goodman DJ. 1995. Resolving water transfer conflicts through changes in water market process, in: A. Dinar and E. T. Loehman (eds.) "Water quantity/quality management and conflict resolution, institutions, processes, and economic analyses", Preager, Westport, pp. 119-129.

Los Angeles, USA. An environmental water bank has helped to secure water for the environment and the cities of Southern California during periods of shortage.

Environmental water banking: California

After five years of continuous drought, a drought water bank (DWB) was legislated and established in California. The aim of the DWB was to enable transfer of water from agriculture in northern California to urban, municipal, and agricultural sectors in southern California.

The DWB set differential prices for purchase and sale of water rights, to cover the transaction costs of the bank and to enable allocation to the environment and groundwater recharge through cross-subsidisation. In 1991, the purchase price was set to $125/acre-foot[15] and the sale price was $175/acre-foot. Over 300 transactions were recorded, and over 1,000,000 Ml of water were bought by the DWB, while circa 480,000 Ml were sold. The difference (i.e. water not sold) was released to the environment (circa 200,000 Ml) and used for recharge of the groundwater (circa 320,000 Ml).

Assessment of the benefits and impacts of the DWB[16] show increased income in receiving areas (Sothern California) and significant social and environmental economic value generated. Some third party effects, such as decreased employment opportunities, and some environmental impacts associated with spatial and temporal effects of trade were noted in the selling areas (i.e. Nortern California). The Californian DWB demonstrates the potential environmental benefits of water banking, as the introduction of an administrated trade environment (i.e. through the water bank) allows the third party effects, and the spatial and temporal environmental impacts of trade to be monitored and minimised.

PART TWO:

Water pricing

Closely related to the question of water trading is the issue of the appropriate price for water. Pricing of water is typically imposed for one (or both) of two reasons: the generation of revenue to support water management activities; and as a means of controlling water use. Of these, WWF should strongly support the use of the former under the right circumstances: well resourced management is vital for securing socially and environmentally sustainable water use. The latter, the use of price to control use, is more complex.

User charges to recover the costs of water resources management

With the establishment of river basin organisations for the management of water resources, there has been a move to charging and collecting revenue from water users to at least partially cover the costs of developing and/or managing water resources. Provided the impacts on vulnerable communities is taken into account, this can provide vital resources for water management.

It is important to distinguish between the issue of appropriate prices for raw water abstraction, and the pricing of domestic water supply tariffs. In the latter case, the charge is typically not for the water itself, but the cost of the construction and maintenance of the necessary water supply (and sanitation) infrastructure. A whole set of different – and controversial – issues are associated with tariff schemes and cost recovery for domestic water supply, and these are not relevant here. It is important to note, however, that a charge can be applied to bulk use of water for agricultural or industrial purposes, without requiring that the price of water for domestic purposes increase.

An increase in the price of water to finance water management functions will often be resisted by politically powerful vested interests. Nevertheless, water cannot be well managed nor environmental allocations secured in the absence of well resourced institutions. Generating revenue through pricing of water is one of the most attractive approaches, and can simultaneously be used to encourage efficiency of water use and provide signals over water scarcity even though these are not the principal intentions of the increased price.

PART TWO:
Water pricing

Price as a mechanism of allocation

The second possible function of pricing is where it is used to control water use. Hence, instead of basing water allocation on an administrative process of issuing water rights or through water trading, an appropriate price is set for water. Theoretically, a price for water can be set that is equal to the cost of the provision of that water – including any environmental costs associated with water use.[17] Under conditions of scarcity, excessive water use is obviously undesirable and comes at a high social cost. An appropriate pricing system could avert overuse because prices would rise to reflect the relative scarcity of water supplied leading to a fall in use.

The most commonly proposed advantage of this approach is that it is theoretically efficient as the costs and benefits of water use are equalised, and water is consumed only by the most productive users under conditions of scarcity. However, there are a number of significant disadvantages:

- One of the principle limitations relates to difficulties in defining an appropriate cost itself (Saunders et al. 1977).[18] These difficulties are in part a result of problems in collecting sufficient information to correctly estimate and subsequently monitor benefits and costs (Dinar et al. 1997).[19] Information is expensive and mistakes made may be costly: if prices are set too low, demand for water would be excessive, and if prices are set too high, water would be wasted to drainage.
- A price-based approach to allocation is also disadvantageous because it tends to neglect equity issues. In periods of shortage or scarcity, if prices increase to the necessary level, lower income groups may be negatively affected.
- At a more practical level, a price-based approach is difficult to implement because it requires extensive monitoring, which is very costly and difficult to administer. While theoretically efficient, there are very significant practical and methodological problems with the use of pricing as the principal means of allocation water. The limitations of price as the principal basis for water allocation does not imply, however, that there is no scope for WWF to advocate for the use of price as a signal to encourage efficient use as part of a broader strategy of allocation.

17 Such an approach is known as Marginal Cost Pricing.

18 Saunders R, Warford JJ and Mann PC. 1977. “Alternative concepts of marginal cost of public utility pricing: problems of application in the water supply sector”, World Bank Staff Working Paper No. 259, World Bank, Washington.

19 Ibid.

PART TWO:

Water law reform

In recent decades there has been a trend towards wholesale reform of water management and rights in many countries. Under these water reforms, long-standing approaches have been replaced with approaches based on a formalisation of water rights, a switch to time-limited administrative rights, the introduction of decentralised multi-stakeholder management platforms, and a move towards cost-recovery of management costs. Typically, an implicit or explicit reallocation of water between sectors has been implied by the reform process. Examples of such water reform processes include South Africa, Mexico, and a number of East African countries.

Most of these water reform programmes have their limitations and imperfections. However, in unreformed countries, outdated policies, legislation and institutional arrangements are often incapable of responding to modern demands. As a consequence, unreformed systems can often pose very significant challenges to the achievement of social and environmental objectives.

However, despite the benefits of water reform, they are typically very difficult to achieve. Political opposition to reform can easily arise and may be strong enough to counter, or at least delay, enactment of the new water law. Sri Lanka is a good example, where considerable effort has been invested for over 10 years on reform of the water law, still without success.[20] Resistance to reform can also occur where governments own or operate water utilities that will be impacted by reform.

Experiences from South Africa, Kenya and Zimbabwe demonstrate that significant shifts in political power and changing political ideologies (i.e. radical political reform) enabled a widespread legislative reform process, including water law reform.

While opposition to reform is likely to be significant, scope also exists for the formation of progressive alliances in favour of reform. Most notably, these can include social and developmental interests who will seek reform of processes that are often inequitable and biased in favour of entrenched elites. The lessons from water law reform processes around the world suggest five key elements to a water law reform strategy (Bruns et al., 2005):[21]

1 High-level political support for reform must be ensured and must be publicised.
2 Policies of reform must be well explained, widely publicised and extensively consulted well in advance of the formal introduction of changes.
3 Benefits of reform should be clearly identified, particularly for the poor and for the agricultural sector, and should be communicated and demonstrated to stakeholders.
4 Existing rights and traditional systems of water rights should be incorporated and integrated into the new water allocation system, where appropriate.
5 In some settings it may be appropriate to implement reform in a phased manner, for example payments may be phased in over time, allowing stakeholders to adapt to the changes.

20 For more details, see Gunatilake HM and Gopalakrishnan C. 2002. Proposed water policy for Sri Lanka: the policy versus the policy process. "Water Resources Development" 18 (4) 545 – 562.

21 Bruns BR, Ringler C and Meinzen-Dick RS. (eds). 2005. "Water rights reform: lessons for institutional design", International Food Policy Research Institute, Washington, pp 328.

The source of the Nile in Lake Victoria, Uganda.

Phased implementation in Uganda: matching design with capacity

In 1995, three major policies and laws relating to water were adopted: the Constitution, the National Water Action Plan and the Water Statute. These formed the foundation of the Ugandan water rights administration system. Although the Constitution and National Water Action Plan speak of comprehensive water rights and a detailed water rights system, the water rights administration system recognised that financial, regulatory and managerial capacity was very limited and was a significant obstacle to the implementation of a complex water rights system. For example, only one person was available for water rights administration in the relevant Government Ministry. Accordingly, it was emphasised that plans should not exceed capacity and regulatory tools should be adopted in a phased manner.

In order to use scarce human and other resources in a targeted and realistic way, it was decided that initially only water users that have an impact on the water resources would be regulated and require a permit. Thus, an estimated 200 water abstractors and 200 polluters (some overlap with abstractors) were identified, primarily supplying the 60 to 70 major towns.

These abstractors/dischargers would require a water abstraction or wastewater discharge permit, with the related fees. Rather than develop a detailed, complex information system, it was recommended that an informal inventory of water users and polluters be kept initially.

For this handful of water users, a realistic ‘grace period’ for registration was proposed. It was envisaged that, in a later stage, the power to levy taxes would be devolved to districts, once appropriate administration and information systems were in place and adequate governance structures had been developed and tested.

In this way the Ugandan permit system effectively supports the state’s regulatory role by prioritising water resources management issues through identification of water users that need to be and can be regulated, given the very limited implementation capacity and the numerous other pressing concerns for government. These priorities are broadened as capacity is built, to achieve the lofty principles of the Constitution and the National Water Action Plan over a realistic time horizon.

PART TWO:

Assurance of supply

One of the defining characteristics of the management of water is the variability in the supply of the resource. In some years, abundant rainfall can mean that there is sufficient supply to meet the demands of all users and any environmental needs. In other periods, reduced rainfall places pressure on the system, leading to drought in the most extreme cases. How water allocation systems respond to this variability is an important factor in determining how successful they are in protecting ecosystems.

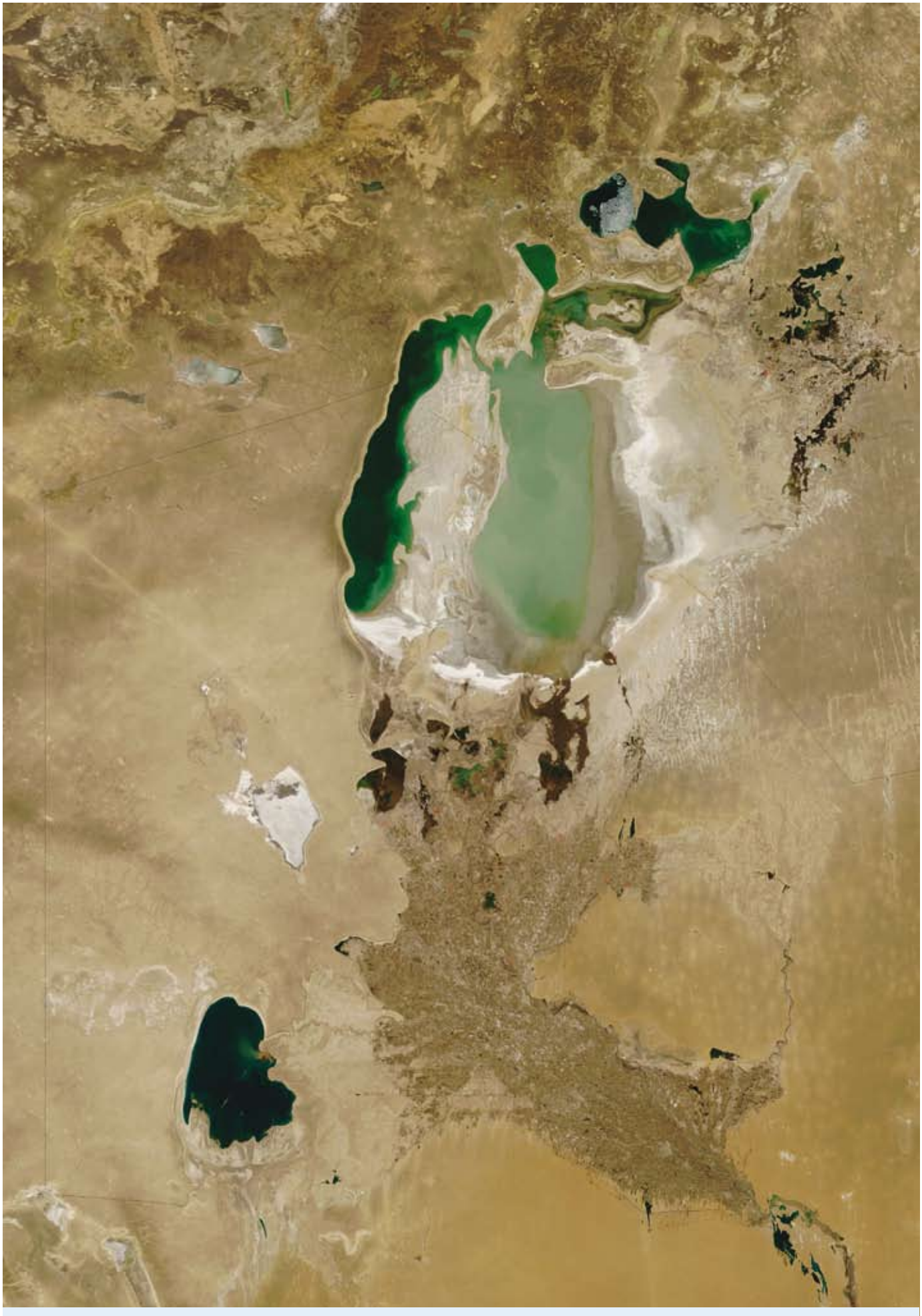
In line with the principles of priority allocation, WWF's objectives suggest that as water availability in any given year or season declines, the amount of water available to different sectors should be reduced in line with their priority. Hence, social and environmental uses should be protected before the economic use of water. Where this prioritisation is not the case and economic users continue to receive their full water right, the costs of reduced supply are transferred to ecosystems or more marginalised groups in society, for example tail-end irrigators.

Accounting for differing volumes of supply under differing conditions of availability is a key part of a successful water allocation system. Under formal rights systems, differing uses of water can be afforded differing assurances of supply. Hence, rights for the provision of domestic drinking water should be guaranteed 100% assurance of supply, while water for irrigation may be more conditional on availability (in regulated systems) or flow levels. An alternative approach occurs where a water right is defined not volumetrically but as a proportional of available flows. Hence, as the total amount of water available in the resource falls, so each individual water use receives – in theory – proportionately less.

Assurance of supply is an important issue to account for when water is traded or re-allocated between sectors. Water rights for agricultural use typically anticipate variability of supply depending on available resources. However, the same does not apply for domestic or industrial use, where reliability of supply is essential. Significant problems can therefore arise if rights are simply transferred from agricultural to urban use. These can be accounted for by the introduction of an 'exchange rate', in the transfer of water between sectors.

For example, in parts of the USA, two agricultural rights when transferred become only one urban right. The absence of such an 'exchange rate', when agricultural water rights are purchased for urban use has been identified as a problem under the current Mexican water law.

Image: Poza Azul in Cuatrocienegas, Mexico. Failure to account for differing assurance of supply requirements when water is transferred between sectors has led to further over-abstraction pressures in Mexico, and has been identified as a problem with the current policy arrangements.



The Aral Sea. The areaof this freshwater lake has reduced by 90% in the last 50 years due to use of water to irigate cotton in areas such as those visible in the bottom half of this image.

PART TWO:

Well-defined water rights

One of the principle characteristics of usufruct rights is that they typically include a number of conditions. The correct specification of these conditions is vital in ensuring that water use is socially beneficial and environmentally sustainable. Where water rights policy is being defined, WWF should advocate for the inclusion of the following conditions.

Quantity. A water right should clearly specify not only the amount of water that may be abstracted, but also the quantity of any return flow to the river where applicable.

Duration. Use rights are best issued for 5–10 years, with a clear review process. See the discussion above.

Quality. The quality of in particular the return flow of water to the system should be specified.

Source. The resource and location from which the right is awarded.

Timing. Restrictions on the time of year at which the water may be abstracted can be important in ensuring environmental flows.

Conditionality and assurance of supply. Conditions on the state of the resource from which the water is drawn can be important in protecting environmental flows. Most simply, a 'Hands Off Flow' condition can require that abstraction ceases when the resource falls to a certain level.

Price or fee. Where formal water rights systems exist, fees should be paid to water management authorities to cover the costs of management, for example the costs of monitoring water levels and compliance with conditions. Fees can also be used to control demand. (See the discussion in section G).

Use. It may be important to place conditions on the use to which abstracted water can be put, in particular if this affects the quality or quantity of any return flow to surface or ground water.

Ownership and transfer. Any ability to trade should include environmental safeguards.

The River Test, Southern England: a nationally important biodiversity resource threatened by overabstraction.

A partial reform of England's water licenses

Following a partial reform of England's water law, new abstraction licenses can include conditions such as hands-off flow requirements that protect ecosystems at times of water shortage.

However, there are thousands of historic water licenses in England that do not have the same conditions and checks on them, and these have not been reformed. As a result of the absence of the necessary conditions on these historic rights, many are responsible for significant damage to rivers, lakes and wetlands.

Further reading

Some key references that serve as a useful guide on water allocations, water rights systems and water markets are listed:

Bauer CJ. (1997)
"Bringing water markets down to earth: the political economy of water rights in Chile, 1976-95",
World Development 25(5) 639-656 More recent references: Against the current: privatization, water markets and the state in Chile, 2002, www.wkap.nl and Siren Song, 2004, www.rffpress.org

Bruns BR, Ringler C and Meinzen-Dick RS. (eds). 2005.
"Water rights reform: lessons for institutional design",
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Dinar A, Rosegrant MW and Meinzen-Dick RS. 1997.
"Water allocation mechanisms – principles and examples", World Bank Policy Research Working Paper 1779, World Bank and International Food Production Research Institute, Washington, pp 43.

Easter KW, Rosegrant MW and Dinar A. 1999.
"Formal and informal markets for water: institutions, performance and constraints",
The World Bank Research Observer 14(1) 99-116.

Garduño Velasco H. 2001.
"Water rights administration – experience, issues and guidelines",
FAO Legislative Study 70, Development Law Service FAO Legal Office, Food and Agriculture Organisation of the United Nations, Rome, pp 122.

Garduno Velasco H. 2005.
"Making water rights administration work",
paper given to an International workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', 26-28 January 2005, Johannesburg, South Africa.

Productivity Commission. 2003.
"Water rights arrangements in Australia and overseas",
Commission Research Paper, Productivity Commission, Melbourne, pp 331.

Rosegrant MW and Binswanger HP. 1994.
"Markets in tradable water rights: potential for efficiency gains in developing country resource allocation",
World Development 22(11) 1613-1625.

Environmental flow resources

Global Environmental Flows Network:
http://www.eflownet.org

The Instream Flow Council:
http://www.instreamflowcouncil.org/

FLOW – The Essentials of Environmental Flows, IUCN:
http://tinyurl.com/b47ozk

DIVERSITAS, an international programme for biodiversity science, including the freshwaterBIODIVERSITY Cross-Cutting Network:
http://www.diversitas-international.org/?page=cross_freshwater

WWF's Freshwater Programme in numbers

100% RECYCLED

10

WWF is one of 10 organisations which has established the Alliance for Water Stewardship to establish an international certification programme for water managers and users

35%

the Freshwater Living Planet Index (a global measure of more than 700 vertebrate animals) declined by 35% between 1970 and 2007

12

our global freshwater priorities are the rivers and lakes in 12 critical places across 5 continents

100 MILLION

WWF has helped establish over 100 million hectares of freshwater protected areas in the last 10 years

WWF

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

wwf.org.uk

HSBC
The world's local bank

The HSBC Climate Partnership is a 5 year global partnership between HSBC, The Climate Group, Earthwatch Institute, The Smithsonian Tropical Research Institute and WWF to reduce the impacts of climate change for people, forests, water and cities. For more information visit **hsbc.com/climatepartnership**

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