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GREEN PAPER: WATER ALLOCATION PLAN FRAMEWORK- CHALLENGES FOR IMPLEMENTATION

VERSION 1: PRINCIPLES, PROCEDURES AND APPROACHES FOR RIVER BASIN WATER ALLOCATION PLANNING

USAID GOVERNING FOR GROWTH (G4G) IN GEORGIA

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ACRONYMS

ADB	Asian Development Bank
EIA	Environmental Impact Assessment
EU	European Union
G4G	Governing for Growth in Georgia
GDP	Gross Domestic Product
GIWP	General Institute for Water and Hydropower Planning and Design
GWP	Global Water Partnership
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
PPD	Public Private Dialogue
RBMP	River Basin Management Plan
REC Caucasus	Regional Environmental Center for Caucasus
SCOs	Civil Society Organization
UNESCO	United Nations Education, Scientific and Cultural Organization
USAID	United States Agency for International Development
WWF	World Wide Fund for Nature
WFD	Water Framework Directive
GEF	Global Environmental Facility

CONTENTS

EXECUTIVE SUMMARY

Water allocation and water sharing is a key aspect of water planning. It involves planning how surface and underground water resources will be managed and shared to achieve environmental, economic and social outcomes.

There is no one perfect way to undertake water planning. It is clear, however, that there are lessons being learned by individual states and territories that would benefit water planning in other jurisdictions if the experiences were shared.

The report is not a comprehensive analysis of all the aspects of water allocation planning but an overall review of significant processes, approaches, scope and content. It is a background paper for the Green Paper: Water Allocation Plan Framework – Challenges for Implementation to feed in.

The analysis has showed that there is no enabling environment for applying modern basin allocation approaches in Georgia, due to a number of barriers, including absence of regulations, tools (regulatory or market-based) and knowledge for efficient, fair and environmentally sustainable basin allocations as well as low government capacities for water quantity data collection and analysis, creating water balances and cadaster's. Currently, there are no evident conflicts among various water use sectors regarding water uses. However, the tensions may emerge in the light of rapid hydropower development, rehabilitation of potable and irrigation systems, which with negative impacts of climate change may become more evident and acute. Environmental considerations in water use allocations are also neglected due to the absence of methodological and legal basis as well as knowledge on Environmental Flow Assessments. The ongoing legal reform in the water resources management sector will address many challenges if the new water law is enacted and effectively implemented. Even with a new law there are some drawbacks in terms of supporting basin allocation planning.

INTRODUCTION

Governing for Growth (G4G) in Georgia is a five-year United States Agency for International development (USAID) funded project that is implemented by Deloitte Consulting LLP since 2014. G4G is designed to enhance governance in select business enabling areas and the water resource management is one of the main components of the project, as Georgian government still faces challenges and problems related to the sound water resource governance to be in line with directives of European Union (EU) Association Agreement.

To support Georgian government in initiated and planned legal and regulatory reforms within water resource governance and ensure its implementation fairly and transparently as well as providing a level playing field for small and medium size enterprise growth, G4G (under the project component “Improve water resource management across multiple competing interests”) awarded a grant to NGO Regional Environmental Center for the Caucasus (REC Caucasus) to develop a Green Paper Water Allocation Plan Framework – Challenges for Implementation. It is assumed that the Green Paper will introduce the key elements of water allocation process and propose a water allocation plan framework applicable for Georgia at a pilot river basin scale to demonstrate the aspects needed to rationally mange river basins.

The given report is an overall review of significant processes, approaches, scope and content of the basin water allocation planning frameworks based on desk analysis of available literature. Two guiding documents on water allocation planning have been used for drafting of the given report. The first is an Water Resource Allocation – sharing risks and opportunities developed by Organization for Economic Co-operation and Development (OECD) and the second – Principles, Procedures and Approaches for Water Allocation (joint publication by: World Wide Fund for Nature (WWF), General Institute for Water and Hydropower Planning and Design (GIWP), United Nations Education, Scientific and Cultural Organization (UNESCO) and the Asian Development Bank (ADB).

WATER ALLOCATION FRAMEWORK

NEED FOR WATER ALLOCATION

WHAT IS WATER ALLOCATION AND WATER ALLOCATION REGIME?

"Water Allocation" is a tool/mechanism for determining water users, water use purposes, allowable water abstraction levels, duration/timing and location, return water quantity and quality and conditions related to the water use. It is at the core of any water management system and in essence, is a means to address water shortage in short to long-run and arbitrate (adjudicate) between competing water uses. ***Simply saying, water allocation is a process of granting entitlements for the abstraction and use of water.***

The "Water Allocation Regime" is a combination of laws, public policies, institutional and economic mechanisms and informal conventional practices.

Historically, access to water has been regulated through water sharing rules and agreements to meet social and economic needs, including agriculture production, economic development (e.g. industrial water use) and health protection. Examples of water allocation schemes date back to the times of ancient Mesopotamian, Hellenistic, Rome and Chinese civilizations. A number of related challenges that developed towards the end of the twentieth century have led to a significant evolution in basin allocation planning. These challenges have included:

- Growth in water abstractions;
- Basin 'closure' and the lack of availability of more sites for water infrastructure;
- Growth and change in the economy, leading to a wider variety of water users with different water demands;
- The decline of freshwater ecosystems and the loss of river system functions;
- In recent times, climate change.

Under current increased risk of water scarcity and with water being a limiting factor for food production and economic growth, significant input to industrial production and power generation as well as being a basis for the integrity and healthiness of aquatic ecosystems, water allocation plans and agreements have been gaining a great significance in current days and becoming very significant and powerful means for resolving local and international conflicts over access to water.

MAJOR CHARACTERISTICS, PRINCIPLES AND OBJECTIVES OF WATER ALLOCATION REGIME

MAJOR CHARACTERISTICS OF THE WATER ALLOCATION REGIME

In order to manage the risk of water shortage, which is dynamic in time and space, well-designed Water Allocation Regime should have two features: (i) ***robustness (strength and reliability)*** – ability to perform well under average and extreme conditions (ii) ***adaptive efficiency*** – capacity to adapt to changing conditions with a least cost over time. These two stem from the notion that different water users have varying water shortage risk management (avoidance and/or reduction) capacities and preferences. For instance, it is critical to avoid water shortage for cooling the nuclear plant, since health and environmental risks associated with the failure of the system are unacceptably high. On the contrary, farmers growing low value crops may forego water uses during water shortage/scarcity periods through trading their water entitlements, given they may earn more revenues through water trading than through using water for harvesting. Furthermore, various water users have different capacities to reduce and/or avoid water shortage via improving water use efficiency, water conservation, recycling, diversifying water sources, pending on the knowledge level and available financial, human and technical resources of these water users. Thus, water uses should be flexible enough to address varying risk preferences and capacities.

MAJOR PRINCIPLES AND OBJECTIVES OF WATER ALLOCATION REGIME

In managing water shortage risks, the Water Allocation Regime should maximize economic, social and environmental benefits that individuals and the society receive out of the use of water resources. For this, it should follow 3 basic principles/ overarching goals: (i) economic efficiency; (ii) environmental sustainability and (iii) equity.

The economic efficiency consists of two dimensions. First is an ***allocative efficiency*** that determines the optimum (efficient) level of water supply balancing the marginal cost of increasing water use or its reliability with the marginal benefits of doing so and/or looks at how water resources are allocated among various purposes. Theoretically, water allocation regime is considered optimal/efficient (Pareto Optimum or Pareto Efficiency) when further allocation among users cannot make anyone better off without making at least one user worse off. The allocation is considered as ***relatively efficient*** when change in the allocation regime among water users/alternative re-allocation of the water among users, makes at least one person better off, without making anyone worse off. This regime is called ***"Potential Pareto Improvement"***. In practice, achieving optimal water allocation is problematic, since water is multi-dimensional resource hydrologically and legally. It is also difficult to estimate marginal benefits of water resources in various settings. Hence, achieving the relative efficiency or Potential Pareto Improvement of water allocation is the only feasible goal that can be attained in practice, e.g. through limiting the change in allocation to those who increase the value of water entitlements held, or through compensating those who become worse off as a result of change in the allocation regime.

The second dimension for economic efficiency is a ***technical efficiency*** of the resource use that looks at technologies, practices and mechanisms (economic and regulatory) encouraging efficient water use and promoting innovation to increase the value derived from water use. Such allocation regime provides incentives for efficient water uses and eliminates perverse incentives (e.g. subsidies) for inefficient water uses. Water abstraction charges, reflecting the full cost of providing access to water, are considered as one of the effective and widely applied tools/mechanisms for enhancing water use efficiency. In practice, they are more administrative fees rather than economic incentives, since they are not based on economic value of water abstracted. Historically, water prices have been always fallen short of efficient levels hence, increase in water abstraction fee levels can significantly contribute to the reduction of water shortage risks. At the minimum, water abstraction charges should discourage the most inefficient water uses.

In addition to allocative and technical efficiency of water resource uses, transaction costs of overall water allocation regime should be as low as feasible.

Environmental sustainability is the second major principle/goal that the allocation regime should follow. Growing anthropogenic pressures in on water from consumptive and non-consumptive uses, in a synergy with climate change diminish its environmental value. Therefore, allocation regimes should have hydrological integrity and allocate sufficient water for meeting environment needs defined as "Environmental Flows". The Brisbane Declaration, adopted at the 10th International River Symposium and International Environmental Flows Conference, held in Brisbane, Australia, on 3-6 September 2007 defines "Environmental Flows" as the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems. In other words, Environmental Flows are the quantity and timing of water flows required to maintain the components, functions, processes and resilience of aquatic ecosystems and the goods and services they provide to people. Unlike the natural flow regime, the environmental flow regime allows for some degree of hydrologic alteration though, it mimics intra and inter-annual flow patterns and ecological outcomes of the natural flow regime.[1]

Environmental flow assessments scientifically evaluate trade-offs between alteration of natural water flow patterns by humans and consequent changes in ecological health.

There are numerous methods for assessing environmental flows ranging from simple rule of thumb (e.g. Tenant or Montana method, Q_{90}) to sophisticated data-intensive robust methodologies. Overall, they can be classified by following general categories: (i) hydrologic (Tenant and Q_{90}); (ii) hydraulic rating (Wetted perimeter method); (iii) habitat simulation method; (iv) holistic method (building blocks)[2].

Hydrological method relies on the primary use of historic data (existing or simulated monthly or daily streamflow records) for making e-flow recommendations for maintaining river health at designated level. The method is not species specific, but rather generic.

Hydraulic rating uses changes in simple hydraulic variables (e.g. wetted perimeter) across single river cross-section as surrogate for habitat factors limiting to target biota; Habitat simulation assesses e-flows on the basis of modeling of quantity and suitability of physical habitat available to target species under different flow regimes (integrated hydrological, hydraulic and biological response data); Holistic methods identifies important

[1] Source: Conservation Getaway. The Nature Conservancy. Conservation Practices. Water. Environmental Flows. https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/Concepts/Pages/environmental-flows-conce.aspx

[2] Source: http://iwlearn.net/publications/ll/methods-and-tools-for-defining-environmental-flows-de-freitas

Methods and tools for defining of Environmental Flows. Glauco Kimura de Kimura de Freitas Freitas. The Nature Conservancy GEF: LEARN Regional Workshop on Application of Environmental Flows in River Basin Management February, 11, 2008.

flow events for all major components of river, model relationships between flow and ecological, geomorphological and social responses, and use in an interdisciplinary team approach to establish recommended e-flow regime/implications of flow scenarios (bottom-up to top-down).

The third overarching principle/goal for water allocation regime is the equity. This relates to the equity among water users, between existing water users and new entrants and, among varios social groups. This relates to both water allocation process (how and how much water is/has to be allocated) and the impact/outcome (who gains/wins, are benefits equally distributed among various social groups, etc.). Equity in the process ensures that all water users are/have to be treated equally and fairly. Equity in the outcome ensures that the positive distributional impacts are equally distributed among stakeholders. However, while dealing with income distribution, it is inefficient to directly interfere with achieving this objective. There are many proven ways to address access to water by all or to support livelihoods and food security.

Above goals are frequently conflicting or competing with each other and thus, efforts should be made to balanced and trade-offs made, based on the relative weight assigned to them by decision-makers, stipulating from local policy and economic context. Below is given a summary table of policy objectives for water allocation:

TABLE 1. INDICATIVE LIST OF POLICY OBJECTIVES OF WATER ALLOCATION REGIMES

Economic efficiency	Environmental sustainability	Equity
• Allocative efficiency (bias towards higher value users)	• Hydrological integrity of the system	• Equity among water users, including groups of users/equity between existing users and new entrants
• Water use efficiency	• Adequate environmental flows to support environmental services	• Equity in the process of allocation and reallocation
• Efficient allocation of risk of shortage	• Adequate environmental flows to support key freshwater species	• Fair distribution of costs and benefits
• Efficient level of water investments		• Equitable sharing of risk of shortage
• Incentives for innovation &investment		• Equity between generations (sustainable water use)/communities and community groups, including indigenous groups
• Administrative efficiency		• Perceived fairness of water allocation regime

OTHER IMPORTANT CONSIDERATIONS FOR THE DESIGN OF WATER ALLOCATION REGIME

Public and Private Good Characteristics of Water as Economic Good

So far, there is a heated debate across the globe whether or not water is an economic good or an essential, sacred resource. Certainly, water resources have economic features which are somewhat different from those of classical economic commodities. First of all, water resources display characteristics of both private and public goods. As a private good, water can be parcelled out among different individuals where the use by one may diminish the ability to consume by others. This creates a rivalry or competition over water use. Moreover, water as a private good can be utilized exclusively based the ownership status and entitlement over it. On the contrary, water as a public good can be enjoyed by all on a non-exclusive basis in a sense that individual consumption by one person does not diminish the ability of another person to consume it.

Unlike other economic goods and natural resources, water as an economic commodity exhibits specific features that have to be taken into consideration while designing water allocation regimes. More specifically:

- ***Water is a mobile good.*** It moves over space, evaporates or seeps into the ground. Therefore, it is very difficult and costly to track water flows and thus, almost impractical to enforce an exclusive water use regime;
- ***Water is an unsteady, variable good.*** Supply and demand for water varies over time, space and in terms of quality. Therefore, it is challenging task to match supply and demand unless there is adequate infrastructure for water storage or inter-basin water transfers;
- ***Water is almost always under-priced*** and reflects physical supply costs rather than scarcity cost of water. Even with supply costs, it is always priced at past supply costs and not at future replacement costs. Though under-pricing is not unique to water, it is yet its persistent and universal feature;
- ***Water is an essential good***, both as a final product (as no other good can replace it, nor any amount of other final good can compensate for having a zero level of consumption) and as an input for certain production processes (as no production is possible where water is absent or lacking);
- ***Water is a heterogeneous good***, since apart from water quantity, its quantity, location, timing and variability might be different. For a given user, one unit of water is not necessarily the same as another unit, if it is available in a different location, at a different timing, of a different quality and a different probability for its availability. Thus, due to its differentiated feature, there is no single demand curve for water;
- ***Benefits of water use are not directly proportional to increased access to water/increased water use.*** Sometimes water may be a necessary, but not sufficient condition for increased productivity and economic growth.

Private and public good characteristics of water are revealed pending on for what purpose or where water is used or in other words, how the water is valued (consumptive or non-consumptive uses). Water use displays different degrees of rivalry and exclusivity for consumptive and non-consumptive water uses. For instance, drinking water supply can be considered as a rivalry consumed in comparison with other water uses (irrigation, industrial, irrigation water use) in that area or one type of consumptive water use in upstream area can be considered as rivalry consumed in comparison with the same of other type of consumptive water use in downstream area. Furthermore, irrigation water use is thought rival relative to alternative water uses (evapo-transpiration, retention in crops), since it alters the run-off's quality and quantity and thus, subtracts available water to others. On the contrary, in-stream water uses (e. g. navigation, recreation, and maintaining environmental flows for ecosystem integrity) are thought as being non-rivalry and non-exclusively consumed within the same water use category, since they can be enjoyed by all. However, they still may stay rivalled with out-of-stream water uses in the same or downstream locality. Excludability of water use depends on policy-legal setting and the characteristics of the water. For instance, a surface water body on a private land in an area with strongly enforced property rights displays excludability, since any other potential user may be prevented from using that resource. On the contrary, groundwater aquifer which can be accessed by multiple users reveals public good and non-excludability features (so-called pooled resources) and is characterized with high excludability cost.

TABLE 2. DEGREE OF RIVALRY AD EXCLUDABILITY OF WATER WITH DIFFERENT TYPES OWNERSHIP

	Rivalry	
Excludability	**Low**	**High**
High	• Club good: recreation use of water bodies, where access to water is restricted to club members, e.g. in a private lake.	• Water body on a private land; • Drinking water consumed by households; • Irrigation system allowing for exclusion; • Rainwater collection on a private land.
Low	• Pure public good: instream water uses, e. g. navigation, recreation in public settings (bathing, boating), maintaining environmental flows for supporting ecosystem services, etc.	• Common pool resources, e. g. shared aquifer, water provided through distribution network in an irrigated area where no user can be excluded.

The distinction between public and private good characteristics of different water uses should be taken into consideration during water allocation due to two reasons. First, valuation of public and private goods is completely different: marginal value placed on a private good is that of individual user, while a marginal value of a public good is that of many users (e.g. general public) who can enjoy the good simultaneously. This distinction between evaluation of two goods is a reason for non-market benefits of instream uses and environmental protection overweighing economic benefits of various diverted (out-of-the-stream) water uses in majority of cases. For instance, in the US it was found that marginal values of fishing was higher than that of irrigation water use in 51 out of 67 river basins with intensive irrigation, but were highest in the South-West of country, where the water abstraction and change in stream flow had greatest negative impacts on fishing. Second, since public and private good characteristics of water uses are displayed in different legal-regulatory, policy and economic settings, nested allocation regimes can be arranged under the specific settings. For instance, if the government manages repartitioning between in-stream and diverted uses then it can use market-based allocation regimes for diverted uses (irrigation, industrial use, domestic use) among various users, e.g. irrigators. Allocation between instream (environmental flow requirements, recreation, fishing, etc.) and diverted uses almost always happen through regulations, while under market-based allocation regimes trade-offs on water uses can be made among one group of water users.

Legal Status of Water

The legal status of water as an economic good does not necessarily stem from its public or private good nature. Public ownership of water does not always mean that water is public good, or vice versa, common-pool resources are not always linked to public ownership regimes. Nonetheless, public good nature of instream water has almost always influenced the legal status of water. There are number of legal regimes for water property ownership, including but not limited to:

i) open access regime;
ii) common property regime;
iii) state ownership (property);
iv) private ownership (property).

Open access regime means that there no defined water users or owners. Moreover, there are no incentives to protect the water, unless all water users protect it by their own good will. Furthermore, under such legal regime there are no formal or informal mechanisms to control access to water.

Common property regime mean that some management group comprised of co-owners (group members) has exclusive rights and duties over the use of water resources. They also have the right to exclude non-members, while the latter have a duty to oblige to such regime. For instance, a community (management) group entitles individual community members to use community-owned ground or surface water resources (communal rights).

State property regime means that the state (relevant authority (ies)) has the right to set the rules/define entitlements for water use and the duty to monitor and control application of such rules for publicly-owned water resources. Individual society members under such circumstances have a duty to adhere to water use rules set by the controlling agency.

Private ownership regime means that the owner of a private land has the right to undertake "socially acceptable" water uses and the duty to refrain her/him from unacceptable uses. Others have the duty to respect private property rights.

Flowing waters are most widely considered as common heritage, not to be owned by anybody. Therefore, water is often subject to ***usurfructuary rights***, allowing using water and enjoying benefits out of its use under certain limited conditions. These conditions refer to the concept of "reasonable" or "beneficial" use within limited time.

There are several ways to define conditional water use rights or in other words, water entitlements. They depend on the geographic location, local environmental, political and historical context, type/method of water intake/abstraction and, on the purpose of water use. The most common types of entitlements are water shares, delivery shares, water-use licenses, take and use licenses, water allowances, supplies by agreement and works licenses. [3]

Common entitlements (water shares) refer to "Riparian Entitlements" under which all landowners with having properties adjoining the concrete water body have the rights for beneficial use of it, not interfering with other riparian uses of the same water body.

Appropriative entitlements are assigned for beneficial water uses in an order of submitted applications based on prior appropriation in accordance with seniority. Specifically, those applications submitted earlier will be treated more senior to those submitted later (first in line, first take). However, under certain specific conditions (e.g. under severe droughts) even senior entitlement holders may not receive their allocations. Under mild droughts only the most junior entitlement holders will not receive their full allocation. Thus, under prior appropriation entitlements junior right holders bear the higher risk of water shortage.

Under unbundled entitlement regimes, entitlements are untied from land ownership meaning that water users hold a right to abstract and use water from a specific resource pool, regardless of land ownership. The entitlement holder is given a concrete allocation to abstract and use water within a specified time under pre-set conditions.

Transboundary considerations

Under international water law, any riparian nation/state of a transboundary river basin is entitled for equitable and reasonable share of water uses and obliged to not cause significant harm. This guiding principle should be applied for water allocation as well as for the use and development of international river basins. In practice, there are no universal criteria for applying such principles. Each transboundary allocation regime should be tailor-made to the peculiarities of individual river basins and should be defined by bi- or multi-lateral agreements.

Entering into trans-boundary agreements is extremely challenging task, since water management practices and water use needs often differ between riparian countries for instance, concerning seasonal water demands and uses, as it is the case for agriculture and hydropower water uses. Understanding of water use benefits may lead to creative and mutually agreeable solutions. For instance, some international agreements recognize existing water uses, others set a minimum cross-border water flow or define an obligation for maintaining environmental flows (e. g. an agreement between Russian Federation and Republic of Mongolia).

[3] A right to take/use/extract/have water delivered that may be limited by conditions. http://waterregister.vic.gov.au/about/water-dictionary?start=20

POLICY INSTRUMENTS AND MECHANISMS FOR WATER ALLOCATION

As it was mentioned above, due to the complexity and distinctive features of water resources as well as due to the specific water legal status, water allocation regime is frequently a combination of laws, policies and mechanisms. Its composite elements can be divided into system and user level elements. System level elements include those issues that are the most efficiently and equitably dealt at larger geographic scales, e.g. at national or regional levels, or within river basins, catchments, river, stream or aquifers. They usually are expressed as specific conditions set out in water laws, water sharing plans or other policy documents and usually determine how system-level decisions have to be taken and by whom. They range from identifying the availability of water resources, to the legal status of the resource and to the mechanisms for monitoring and enforcement. Table below gives an indicative list and description of system-level elements/instruments:

TABLE 3. DESCRIPTION OF KEY SYSTEM LEVEL ELEMENTS OF A WATER ALLOCATION REGIME

System level elements of an allocation regime	Description
Legal status of the ownership of water resources	Legal definition of the ownership of water resource (public, private, communal, etc.)
Institutional arrangements for water allocation	Designating relevant authorities and organizations for water allocation and defining their duties and responsibilities
Identification of in-situ flow; determining available (allocable) resource pool	Explicit definition of instream (in-situ) flow requirements taking into consideration various factors, such as: base flow, environmental flow, non-consumptive uses, international commitments, inter-annual and intra-annual flow variability, climate change
Abstraction limits (cap)	Determining enforceable abstraction limits as volumetric values or a percentage of available water pool. A cap can be used to ensure meet environmental needs hence, it should reflect natural flow regimes
Determining permitted water uses not requiring water entitlements	Determining those water users and uses that may access and use water without any entitlement
Definition of exceptional circumstances	Clear definition of exceptional circumstances that require extraordinary measures with or without stakeholder participation
Prioritization of water uses	Setting out priorities on the access to and use of water for different water users and uses. Sequence of priority uses may be applied under exceptional circumstances or may guide the design of water allocation regimes
Determining conditions for new entrants or extended entitlements	Setting specific conditions for acquiring new entitlements or requesting expansions. This may include, but not limited to, requirements on third party or environmental impact assessments
Mechanisms for monitoring and enforcement	Designing and implementing water abstraction and use monitoring mechanisms such as metering, aerial surveillance or setting clear rules and procedures for infringements and conflict resolutions
Appropriate infrastructure	Water infrastructure for storing, transporting and treating the water, as needed

User level elements of water allocation regimes refer to those aspects, which are most efficiently and equitably dealt with by specifying the arrangements at the level of individual or collective water abstractors. This usually takes a form of arrangements specified in entitlements, permits or licenses. Table below summarizes the examples of user level elements.

TABLE 4: DESCRIPTION OF KEY USE LEVEL ELEMENTS OF A WATER ALLOCATION REGIME

User level elements of an allocation regime	Description
Water entitlements	Legal definition of water entitlements that award the right to use water under certain conditions as well as identification of types of users that are required to hold entitlements to abstract water
Abstraction charges	Charges set for water abstractions in order to recover the costs or internalize negative externalities associated with water abstraction. As a proxy, they are set administratively and are designed to recover the cost for water supply
Specific obligations related to return flows and discharges under water entitlements	Return flow obligation is a specific requirement to return some portion of water into the same or other water body after the use. Discharge obligations refer to quality requirements for effluent discharges
Duration for water entitlements with an expectation for a renewal	Term of validity (timeframe) of an entitlement. It may a number of years or forever (under certain limited conditions for beneficial uses)
Possibility to trade, lease or transfer under certain conditions	The ability and right of water users to trade (permanently or temporarily), lease or transfer their entitlements to others

Among the user level elements, addressing the issue of return flow is extremely difficult task. Under water scarcity, water entitlement holders tend to reduce return flows and save the water for themselves. This may undermine the allocation regime if reduction in effective water use is not accounted for. The issue can be addressed through two ways: (i) reducing water abstraction limits as the technical efficiency of water use increases, with an overall reduction averaged among all entitlement holders equally; (ii) specifying return flow requirements in water allocations. The first approach benefits more those right holders who move fast towards technological improvement. The second approach is more equitable, since the increase in technical efficiency for one entitled water user does not affect the water use by others. However, the latter is much more difficult and costly to administer, since each technology used by individuals should be tracked.

SUMMARY OF WATER ALLOCATION FRAMEWORK

Analytical framework for an allocation regime that links policy objectives to various elements of allocation regimes can be used as a basis to examine how the allocation regime currently functions in a range of countries (presented in the next section) and to identify opportunities for improvements.

Usually, the main driver for reforms of allocation regimes are: environmental improvement and protection, economic development, concerns about the equity in access to water, concerns about deteriorating water quality, climate change, concerns about water shortage or scarcity, etc. Below is given the logical framework for allocation regime.

TABLE 5. CONCEPTUAL FRAMEWORK FOR WATER ALLOCATION

Elements for allocation regime	Economic efficiency	Environmental sustainability	Social equity
System level elements			
Legal status of the ownership of water resources	Allows for clear assignment of water use entitlements	Grants legal authority to secure water for public good uses	Allows for clear assignment of water use entitlements
Institutional arrangements for water allocation	Ensures that the competent public authority can manage system and user level allocation with a clearly defined accountability lines	Ensures that the competent public authority can designate and enforce adequate environmental flows	Ensures equity in the process through stakeholder engagement
Identification of available resource	Allows for efficient augmentation of available resource	Ensures hydrological integrity and allows for managing system connectivity	May be used to ensure fair access to available resource
Identification of in-situ flow/ Determining available (allocable) resource pool	Balances use and non-use values of instream uses versus use values of diverted activities	Ensures adequate environmental flows	Balances the needs of instream and diverted water users
Abstraction limits (cap)	Balances the cost of closing system with risks of unsustainable use	Allows for closing the system for sustainable functioning	Balances current and future water users' needs
Determining permitted water uses not requiring water entitlements	Balances transaction costs related to managing small scale uses with costs (risks) of possibly undermining system integrity and foregoing abstraction charges	Ensures hydrological integrity	Balances small scale, customary and subsistence water uses with the need for system level integrity
Definition of exceptional circumstances/sequence of priority uses	Can be used to ensure that the sequence of priority uses to some extent reflects the marginal value of use	Can be used to avoid irreversible damage to vulnerable ecosystems and ensure that environmental flows are not simply adjustment factors in times of water scarcity	Can be used to ensure that human needs are a priority; Ensures equity by stakeholder engagement in defining exceptional circumstances or setting priorities for water uses
Determining conditions for new entrants or extended entitlements	Ensures that water can be allocated to higher value users	May require Environmental Impact Assessment (EIA) for maintaining system integrity	May require third party impact assessment; may ensure the fair access to water between existing water users and possible new entrants
Mechanisms for monitoring and enforcement	Balances monitoring and enforcement transaction costs with costs (risks) of unauthorized uses	Ensures hydrological integrity and ecosystem healthiness by monitoring and enforcing environmental flow requirements	Ensures that common pool resources are used equitably, use entitlements are followed and unauthorized used discouraged
Appropriate infrastructure	Ensures that water can be stored, treated or transported to water users, as needed	Ensures that water to serve environmental purposes can be stored, treated and/or transported	Ensures that water users have equal and adequate access to water

User level elements			
Water entitlements	Provides incentives for investment and innovation	When the entitlement is set as a percentage of available resource contributes to hydrological integrity	May ensure equity in the process of defining conditions for water entitlements
Abstraction charges	Promotes recovery of costs associated with the supply of fresh water to consumers together with environmental costs of water abstraction and possibly, the water scarcity value	May be used to reflect environmental cost of water use and possibly, its scarcity value in the charges related to water quantity	May be reviewed for potential affordability
Specific obligations related to return flows and discharges under water entitlements	Provides incentives for efficient water use	Contributes to hydrological integrity and the relevant quality of water through managing return water quality	Allows for positive externalities to be reaped by more efficient users
Duration for water entitlements with an expectation for a renewal	Provides incentives for investments	Contributed to hydrological integrity	Contributes to an equity in the process of entitlement renewal
Possibility to trade, lease or transfer under certain conditions	Ensures allocative efficiency, provides incentives for efficient water use and innovation	Allows for water “buy backs” that secures water from existing waters to be reallocated for environmental purposes hence, increasing flexibility of managing scarcity conditions	Allows for flexibility in sharing water shortage risks

BASIN WATER ALLOCATION PLANNING – PROCESS, STRUCTURAL ELEMENTS, PRINCIPLES AND APPROACHES

TERMS AND DEFINITIONS

Water allocation planning is the process of assessing the volume of water available for use within a geographic location (region or river basin) and determining how that water should be allocated amongst different administrative regions, sectors or users.

The result of water allocation process is a ***water allocation plan***, mostly a government policy instrument defining the water available for allocation. The plan may allocate water directly to regions, sectors and/or users, or alternatively it may define a process by which the available resources will be allocated.

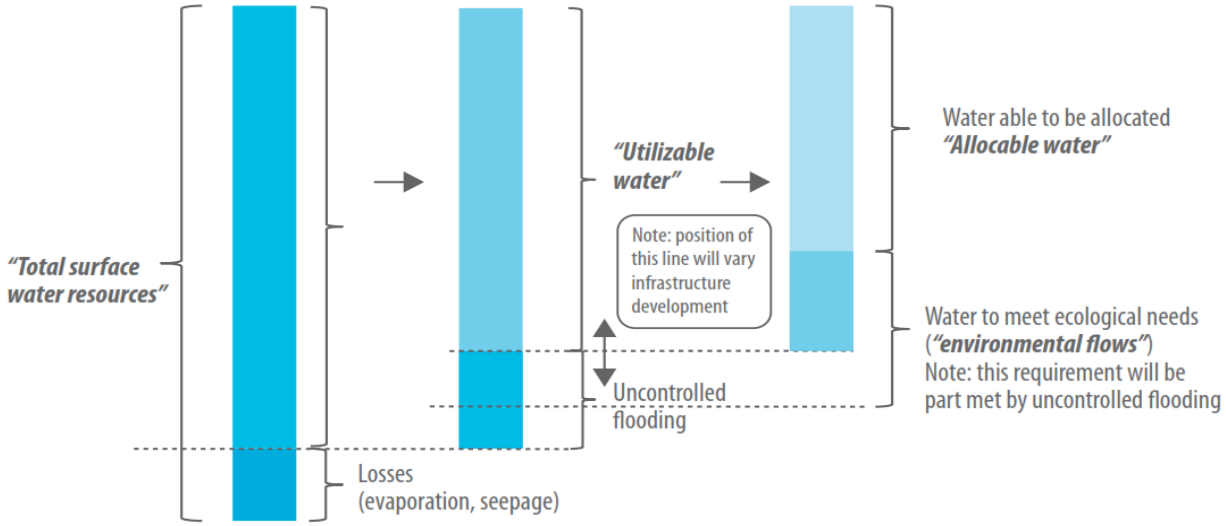
Basin water allocation planning is the water allocation planning at the basin level, while the ***basin water allocation plan,*** direct output of the allocation process is a policy document defining the water available for allocation within the same geographic scale.

Basin water allocation planning requires clear understanding of what water resources are available to be allocated within the concrete river basin. To this end, several key definitions are used to describe basin water resources:

- ***Total basin water resources:*** the total water resource volume within a basin. This may (depending on the context) include both groundwater and surface water resources.
- ***Utilizable water:*** the volume of water potentially available for abstraction based on hydrological features of the system and the water infrastructure in place. This in fact is a total water resource minus losses in the natural system (evaporation, seepage) and uncontrolled flooding.
- ***Allocable water:*** the volume of water that can be allocated (for subsequent use) to different regions, groups and sectors, pending on basin hydrology, available infrastructure and decisions on environmental requirements. It is determined as the utilizable water, less the water required to meet environmental objectives (environmental flows).

Below is given a schematic picture showing relationship between above categories of water resources for surface waters.

FIGURE 1: A CONCEPTUAL DIAGRAM SHOWING THE RELATIONSHIP BETWEEN TOTAL WATER RESOURCES, UTILIZABLE WATER AND ALLOCABLE WATER



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

BASIN WATER ALLOCATION

WATER ALLOCATION OVER DIFFERENT TIMESCALES

Water allocation planning can be a long-term and short-term process. Long-term process includes developing long-term water allocation plan with defined water entitlements, regional water shares[4] and abstractor rights.[5] Meanwhile, short-term process is annual water allocation, determining the water allocations for a year. An annual water allocation is the volume of water available under a water entitlement in any given year or season. This is the actual volume of water available for abstraction by the entitlement holder. It is determined based on the annual conditions and rules for prioritizing between different water entitlements.

Long-term water entitlements are typically expressed as mean annual volumes, or by reference to some other long-term flow statistic or requirement. These then need to be converted into the actual volume of water that will be available to the entitlement holder at any particular point in time, to allow for seasonal variability. This process is usually undertaken annually or seasonally, and is referred to as the annual allocation process. This is the mechanism for implementing the basin allocation plan (and other allocation decisions), and should be done in a way that gives effect to the basin allocation plan's objectives for both volume and assurance of water supply.

GEOGRAPHIC AND ADMINISTRATIVE CONTEXTS/DIMENSIONS OF WATER ALLOCATION PLANNING – MULTI-STEP APPROACH

The endpoint of the water allocation process is dividing water supplies between individual abstractors. In a smaller catchment that is located within one administrative district/unit and is without any trans-boundary context water allocation may take the form of single-step process and include allocation of water directly to individual abstractors. In larger river basins, basins with inter-basin transfers or in trans-boundary basins, water allocation is usually a multi-step process involving water allocation among different basins at the national level within the framework of national allocation planning, then water allocation among different regions/administrative districts at the basin level within the framework of basin allocation planning and finally to the individual abstractors within the context of regional allocation planning.

[4] Right for long-term share granted to administrative region or water users within specific region

[5] Same as water right and water license: the right of an entity or individual to abstract water from a watercourse or aquifer

FIGURE 2: MULTIPLE LEVELS OF WATER ALLOCATION

Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

NATIONAL WATER ALLOCATION PLANNING – PROCESS AND THE PLAN'S STRUCTURAL ELEMENTS

National water allocation planning is a process of identifying the water available to subordinate regions, basins and/or organizations thus, setting the water allocation bounds for subordinate allocation plans. Its composite elements are:

- National-wide objectives;
- Utilizable and allocable water resources, general allocation principles and procedures, or allocable amounts; and
- National infrastructure development priorities.

National objectives for allocation process may include priority regions or sectors for development or other priorities, as well as the broad approach to achieving those objectives. A plan may also identify either specific or general environmental goals and may set targets for water use efficiency.

A plan may identify the water resources, both surface and ground waters available in the country and within individual basins and define allocable amounts/portions for regions, river basins or sectors. It may also allocate any benefits or obligations related to inter-basin transfers or transboundary flows.

Infrastructure development priorities and programs outlined in the national allocation plan my include for instance water supply infrastructure development needs/plans and entitlements associated with water use for that purpose, current and future inter-basin transfer projects and associated volumes.

BASIN WATER ALLOCATION PLANNING – PROCESS AND THE PLAN'S STRUCTURAL ELEMENTS

WATER ALLOCATION PLANNING PROCESS

Basin water allocation is a process of defining environmental flows and allocable water, as well as the regional water shares for different administrative regions within the boundaries of a specific river basin.

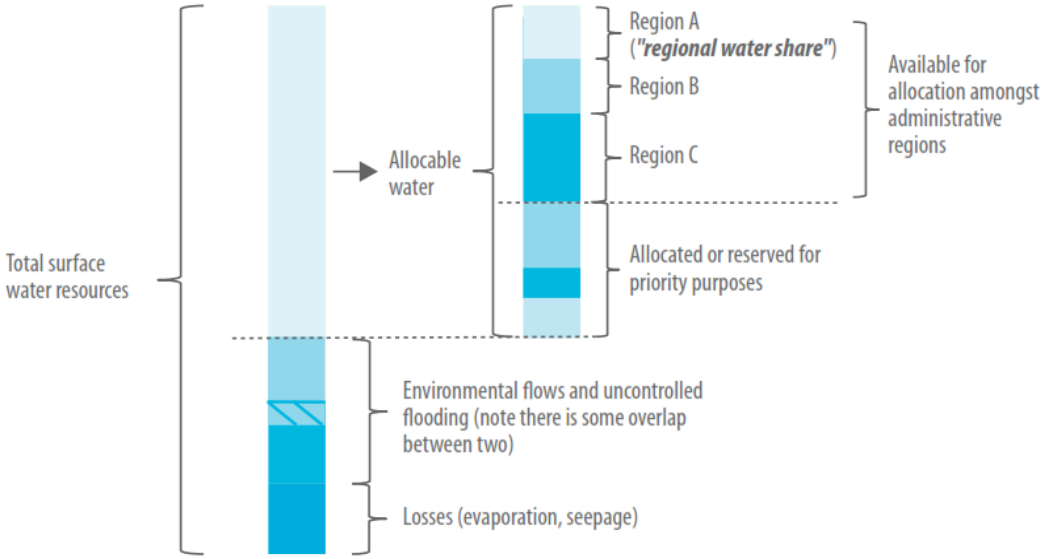
Total utilizable water within the given river basin is usually defined by the national water allocation plan or local assessment for water availability which may be a part of basin allocation planning.

The allocable water then is divided between:

- Priority purposes, for example, to meet inter-basin requirements, and strategic purposes, such as for major national projects, like hydropower schemes;
- Different regions, based on administrative boundaries, sub-catchment boundaries or some other division.

Below is given a flow diagram for basin water allocation process:

FIGURE 3: BASIN WATER ALLOCATION, DEFINING ENVIRONMENTAL FLOWS AND ALLOCABLE WATER, AS WELL AS THE REGIONAL WATER SHARES FOR DIFFERENT ADMINISTRATIVE REGIONS



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

Basin allocation plans may or may not contain details on available water and water allocations within regional shares at sub-regional, catchment or sectoral levels. Frequently, this is done through sub-catchment and/or sub-regional allocations planning process, where regional/district authorities set water objectives to allocated water between sub-regions/sub-catchments, water use purposes, sectoral groups and to meet additional environmental flow requirements stringent than outlined in overarching basin-wide or national-wide plans, if such.

FIGURE 4: ALLOCATION OF WATER BETWEEN ADMINISTRATIVE REGIONS

Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

Generic basin allocation planning cycle involves a set of processes, including:

- adopting an approach to suit the basin;
- steps for preparing the plan;
- consultation and coordination;
- approval process;
- revision;
- water re-allocation.

Adopting an approach to suit the basin implies selecting the most appropriate way to allocate water pending on the differing hydrological and economic conditions, as well as on different levels of water resources development of the basins. For instance, approaches for water allocation planning vary from each other significantly for basins, which are underdeveloped without any significant water stress and highly developed with significant water stress and competing water uses. Moreover, completely different approach should be applied for basins which are not yet experiencing water stress but have large storage of water for consumptive use and/or hydropower.

Water allocation approaches for various types/classes of basins in terms of hydrology, socio-economics and the level of development of water resources most widely differ in following aspects:

- The level of efforts to be devoted to various assessments and analysis, including environmental assessments and economic analysis and monitoring;
- Approaches in defining and managing water entitlements and annual allocations;
- Accompanying operational plans (e. G. Water efficiency plans, investment portfolios, etc.) And mechanisms (e. G. Market-based tools);
- Frequency and nature of reviews that may vary from extended periods of time to regular and frequent review and update.

Table below summarizes the hypothetical approaches to water allocation planning for various types/classes of basins.

TABLE 6: HYPOTHETICAL APPROACH TO ALLOCATION PLANNING IN DIFFERENT CLASSES OF BASIN

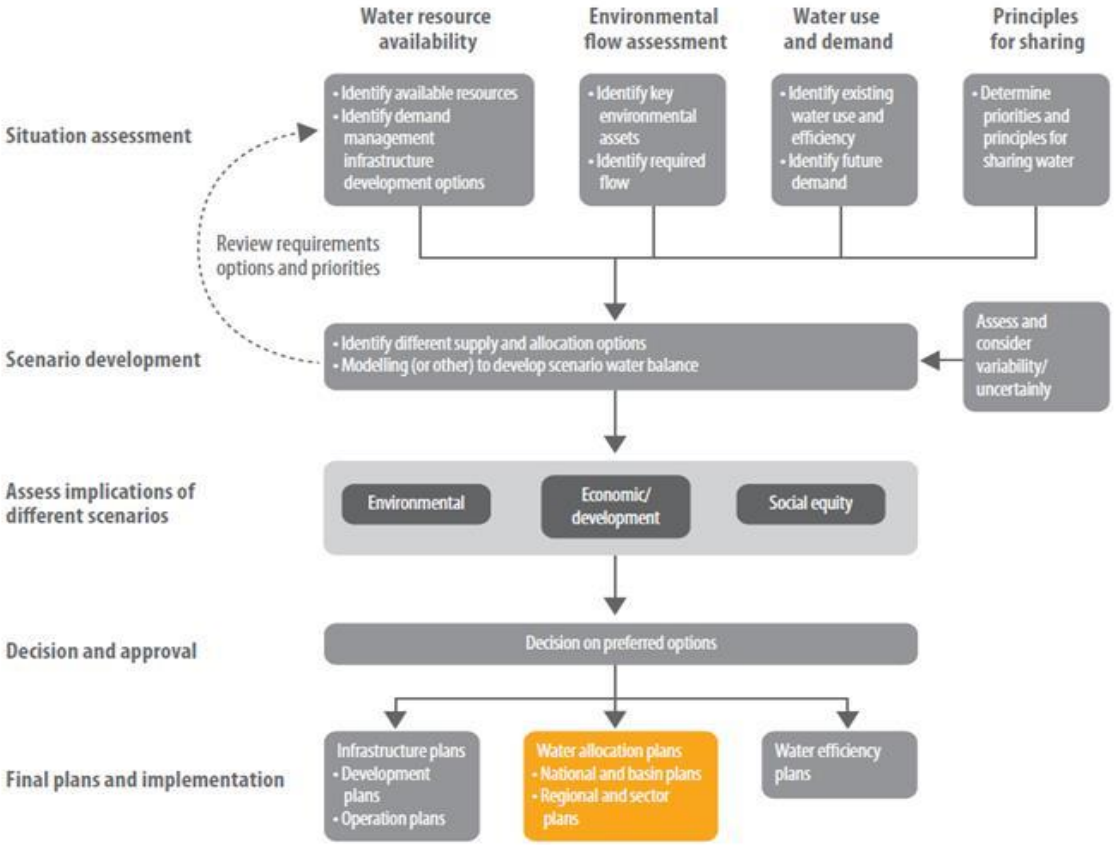
TYPES/CLASSES OF BASINS			
	Unregulated and low-utilization basin	**Hydropower and developing basins**	**Fully allocated and over-allocated basins**
Differing aspects			
Basin characterization	Low percentage of runoff utilized; water stress confined to dry season or drought periods	System not subject to significant water stress, but high percentage (>50% annual runoff) storage capacity; particularly applicable for heavily utilized hydropower basins	High percentage of runoff utilized
Key water allocation challenges	Drought planning; allocating low flows	Environmental challenges – base flow and removal of flood peaks; removal of variability. Reconciliation of infrastructure operation and construction with demands (multipurpose operation). Whether new storage should be built (financial considerations).	Trade-offs and economic prioritization, including conflicts during restriction periods, challenge of determining who to allocate water to in future/where to find water for future use, and challenge of reallocating water/curtailing water use
Assessment and analyses	Basic hydrological and water use assessments; system yield models	Basic hydrological and water use assessments; system yield and optimization models	Sophisticated hydrological and operational modelling; detailed water use assessment
Environmental flow assessment	Simple environmental flow assessment; may require particular assessment of dry period flows	Full environmental flow assessment	Full environmental flow assessment; social, economic and environmental assessment of river assets and values
Economic assessment	Not required	Some may be required	Full economic model; economic and social model of reallocation options
Type of allocation plan/approach to allocation	Focus on allocations for dry seasons and/or drought years; preliminary future cap on abstractions established	Detailed annual rules, including infrastructure rules; limitations to alterations in both low-flow and high-flow conditions	Full annual allocation agreement and plan, detailed sectoral allocations within areas may be specified; reallocation plan included
Accompanying plans	Not required	Infrastructure operation plans	Efficiency plans and institutional and market-based mechanism to be developed and implemented alongside allocations
Review	Less frequent, review initiated when abstractions reach a certain level	Frequent review of allocations and rules (5 years +/-)	Frequent review of allocations and rules (5 years +/-)

Steps/stages for water allocation planning involves the following:

- *Planning initiation* - formal inception phase: informing all stakeholders on the start-up of the process, its timeline, steps, approached as well as reaching an agreement on the scope, critical issues and overall approach (not always necessary).
- *Situation assessment* - assessments of: total water availability; supply options (including from existing or new infrastructure); projected water demands; socio-economic impacts of different options; water use efficiency and demand-management options; and environmental flows to identify key environmental assets and processes and their water needs.
- *Scenario development and analysis* - development of different allocation scenarios, which can be assessed based on their social, economic and environmental consequences.
- *Option selection and approval* - selection of an optimal/appropriate scenario and its approval pending on local legal-regulatory and policy setting.
- *Detailed (implementation) plan development* - After having reached a consensus on overall goals and objectives and strategies, development of: regional and sub-catchment allocation plans; infrastructure development (physical works) plans; annual allocation and management activities; new reservoir operational rules; environmental management, including environmental flow management requirements.

The generic flow chart of basin water allocation planning is shown on Figure below.

FIGURE 5: WATER ALLOCATION PLANNING PROCESS



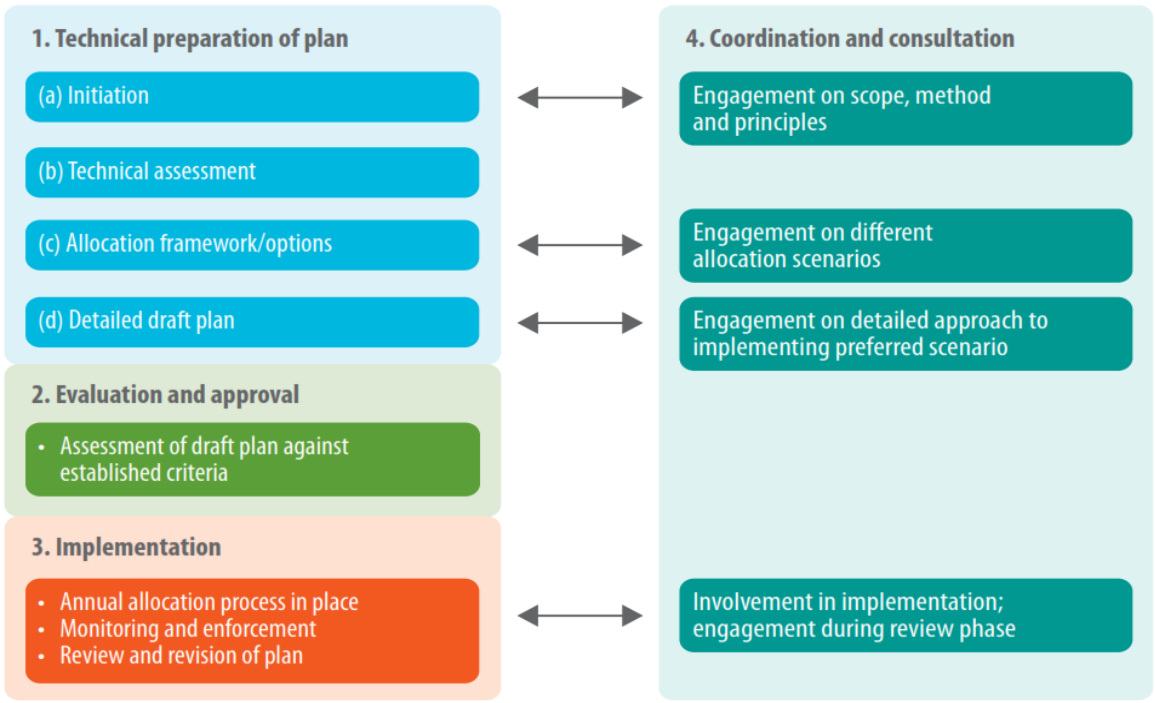
Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

Consultation and coordination stage involves engagement of a broad range of stakeholders, including decision-makers who are responsible for approval and implementation of a plan as well as others whose participation in the process might be beneficial in terms of their knowledge, political power, expertise and available resources. More specifically, stakeholder consultation and coordination are required to collect necessary information for the plan, align the plan with other sectoral policies, plans and programs and, to avoid potential conflicts/reduce extent of conflicts and create a trustful and mutually understanding environment in support of final decision-making.

While coordination refers to the process of aligning sectoral interests and reaching an agreement (formal or informal, pending on the local legal and policy context) amongst decision-makers (duty bearers), consultation refers more to the broader process of engaging with other stakeholders, including water users, SCOs, communities and private sectors (right holders/beneficiaries) to inform and receive a feedback from them on the process, issues, options and/or decisions. Stakeholder analysis should precede the engagement and consultation process in order to get a clear picture on the major interests and interested parties. There are a number of techniques for stakeholder engagement, including vis-à-vis meetings, public (or restricted) meetings and workshops, surveys, setting of key stakeholder consultative committees/groups/councils, on-line and written communication – requests for and submissions of written feedback.

Below is a schematic diagram of consultation and coordination process:

FIGURE 7: CONSULTATION AT DIFFERENT STAGES OF THE PLANNING PROCESS



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

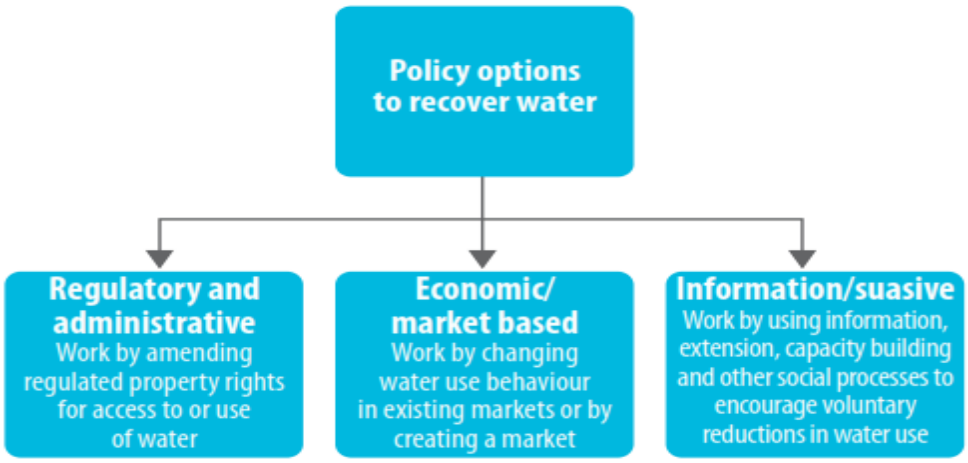
Approval process – the process of finalizing and approving the plan. Pending on the local legal and policy context, the approval might be done through statutory instruments (government endorsement, enactment of a law), administrative acts (issued by technical departments but not necessarily mandatory to other parties) or binding or non-binding agreements between regional or district authorities or riparian states.

Review and revision – re-assessment of objectives, approaches, data validity, baseline conditions and assumptions (e. g. sustainable yield) of a water allocation plan and its readjustment. The process may take place in case of new circumstances/triggers emerge, for instance, when new infrastructure is built/under the development, the government makes readjustments in its strategic development and environmental priorities or new information is needed on environmental requirements. Alternatively, it may be conducted cyclically on a regular basis (every 5, 10 or 15 years). Usually, regular review is more common practice across the globe. But, even within cyclical process the plan review and revision might be required if new triggers appear between two planning cycles. Regular/cyclical review usually covers re-assessment of the entire plan, while triggered review and revision may refer only to affected parts/elements. It is very important to leave existing water-sharing/allocation arrangements intact during the review process. However, in over-allocated basins, where there is no additional water available to allocate for a new development, the review process may ultimately lead to water re-allocation between different users, sectors and/or regions or the reduction of total abstraction cap.

Re-allocation – a process that can either involve the shift of water entitlements for consumptive use from one region, sector or user to another, or the process of reducing the total consumptive pool, such as to increase water for the environment. A pre-set mechanism to allow for sectoral and/or regional shift or reduction of a total consumptive pool of water is necessary to be embedded in the plan. There are a number of approaches to re-allocate water that can be united into three broader categories: i) regulatory and administrative; ii) economic and market-based and; iii) Information.

Below is given a summary chart of policy options for water re-allocation.

FIGURE 8: ALTERNATIVE APPROACHES TO RECOVERING WATER



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

KEY OPERATIONAL ELEMENTS OF BASIN WATER ALLOCATION PLAN

Key operational elements of a basin water allocation plan include the following:

- ***Objectives:*** The objectives should define the balance that the plan is trying to achieve in allocating water between different users, and for different parts of the basin. These can be of importance during implementation in interpreting the intention of the plan. They are also important when reviewing the plan, to allow for an assessment of whether the strategies adopted have achieved the plan's goal.

  Usually, basin water allocation plans are designed to meet several overarching objectives that stem from fundamental principles/goals of allocation regimes – equity, economic efficiency (balancing supply and demand; efficient water use) and environmental protection. These broad objectives are discussed in a previous chapter in the context of general water allocation framework. One additional general policy objective, not discussed in the preceding chapter is a support to social-economic development priorities. In the context of basin allocation planning, basin allocation objectives are interpreted in a following way:

  - *Equity:* allocating water fairly and equitably between different administrative regions/sub-catchments and between upstream and downstream users
  - *Environmental protection:* allocating water between different regions/sub-catchments and between users in a way that recognizes environmental water needs. This can include recognition of the needs of freshwater-dependent ecosystems, as well as the identification and protection of freshwater services such as sediment transport, groundwater recharge, waste assimilation and estuarine functioning, recreation and aesthetics, etc.
  - *Development priorities:* allocating water in a way that supports and promotes national and strategic economic and social development priorities. As part of this, recognition is often given to any existing dependencies of communities and industries.
  - *Balancing supply and demand:* balancing water supplies with demands to manage the natural variability of water availability and to avoid frequent or unexpected water shortfalls.
  - *Promoting the efficient use of water:* allocating water in a way that promotes the most efficient use of available water.

- ***Water resources subject to the planning:*** water resources within geographic limits (basin or administrative boundaries) of the plan as well as any or all water sources, including surface waters, ground water aquifers and interbasin transfers.

- ***Allocable water and regional water shares/water entitlements:*** the total volume and reliability of water available for abstraction in various parts of the river basin under existing and future entitlements as well as approaches/frameworks how that water is allocated between competing interests (administrative regions, sectors, priority purposes and so on). In some instances a plan may establish a process or framework for granting entitlements to the allocable water. However, in the case of regional water shares, these are normally specified in the allocation plan itself. A water allocation plan may define water entitlements at a regional, catchment or user level.

- ***Annual allocation rules:*** rules defining the process for calculating: (i) how much water is available in any given year or at a particular time. This is typically based on water already held in storage as well as estimates of future availability; (ii) how available water is to be shared between different regions, based on their regional water shares and seasonal conditions. This also includes prioritization of shares or entitlements.

- ***Environmental flows:*** assessment/identification of: (i) ecosystem assets, values and services that are a priority to maintain or restore; (ii) different flows needed to maintain the river's ecological values and objectives for those flows, that are required; (iii) the rules and strategies to achieve the environmental flow objectives. It is now recognized that the flow pattern (the size, timing, frequency, and duration of flows) is fundamental to ecosystem function. As such, allocation plans now seek to allocate more than just a minimum flow volume for the environment: they aim to protect those flows seen as important to maintaining ecological integrity and healthiness.

- ***Operating rules:*** minimum operational requirements on principles how water infrastructure needs to be operated to safeguard system yield (including the volume of water for allocation), reliable water supply and achieve environmental flows. Such rules are not mandatory to be a part of basin water allocation plans.

- ***Infrastructure needs:*** water allocation plan may also identify options for future infrastructure development. While the plan may not necessarily define what infrastructure will be built (that may be

addressed in a separate infrastructure plan), the plan may identify where there is the potential for new infrastructure, and how water entitlements associated with the infrastructure would be allocated should it be built.

- ***Monitoring and reporting:*** a framework defining outcome, output and performance indicators, measurable targets, means of verification including what data is to be collected, by whom, and how that will be reported.
- ***Review:*** timing or a trigger (specific circumstances) for expiration or review of the plan as well as procedures for the review.

ELEMENTS FOR ENTITLEMENTS, INCLUDING REGIONAL WATER SHARES

Elements of water entitlements, including regional shares consist of following elements:

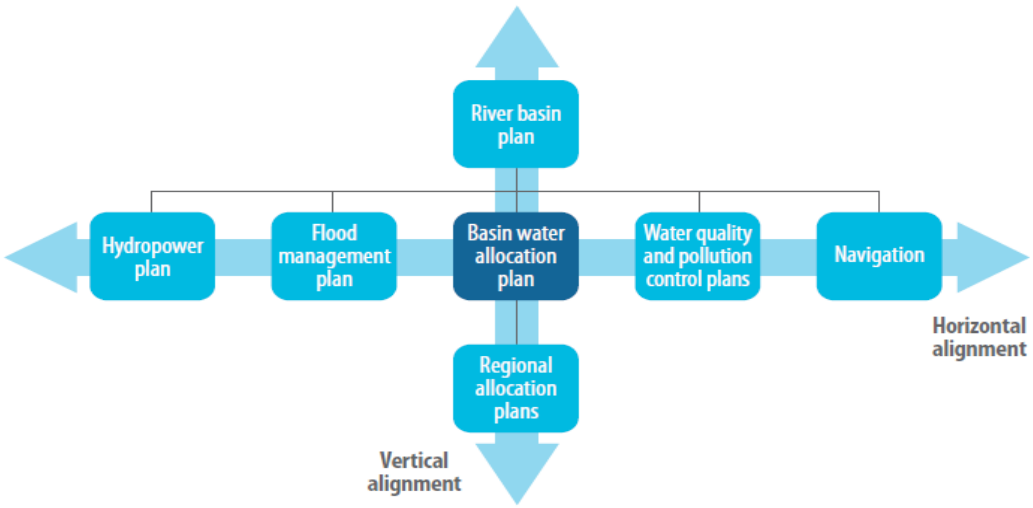
- ***Quantity of water***: most commonly specified as average volume of water per unit of time (year, month or other period). It may also be expressed as a guaranteed minimum volume, percentage share of available supplies (of flow or storage volume) or by specific access rules;
- ***Level of assurance or reliability***: defined in many ways, including by reference to a daily, monthly or annual performance. Reliability is very important element for the entitlement particularly, in case of rivers with little or no storage or rivers with highly unstable hydrology;
- ***Water quality:*** water entitlement may refer to the right to water of a certain minimum quality or standard, such as water suitable for drinking and/or bathing. This is challenging task when water allocation plan does not regulate water quantity;
- ***Location and source of water:*** indication of a location where the water can be taken from by reference to reservoir, river reach, catchment or aquifer;
- ***Purpose:*** a purpose for which the water is to be used. It may or may not be specified in the entitlement. In latter case, regional authority has a discretion to determine sectors or uses for given regional share.

ALIGNMENT WITH OTHER BASIN PLANNING ACTIVITIES

Water allocation planning is one of a set of planning activities within the river basin. The full scope of basin-wide plans may vary pending on local conditions. In general, the bundle of plans includes: (i) river basin management plan, a master plan defining overall basin vision and high-level objectives as well as criteria and guidance over prioritizing competing basin objective (ii) various thematic plans, addressing water quantity and quality issues, infrastructure development, etc.

Below diagram shows a linkage of a basin water allocation plan with other basin-wide plans.

FIGURE 9: ALIGNMENT OF THE BASIN WATER ALLOCATION PLAN WITH OTHER WATER PLANS



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

As figure above shows, the basin water allocation plan is one of the basin thematic plans and has important linkages to all other thematic plans. Management objectives and activities related to the following themes can all be of relevance to allocation decisions (and vice versa):

- **Water quality management**: to ensure that water allocated is fit for the purpose for which it is being allocated (for example, as a drinking water supply). In-stream water quality will be affected by the volume of water in the watercourse, which will vary with different water allocation decisions;
- **Flood risk management**: different approaches to managing flood risk will affect reservoir yield, and hence the water available for allocation for abstraction (and other) purposes. Flood releases can also (potentially) be managed to achieve other allocation objectives, including environmental flow objectives;
- **Water supply and other demand management measures**: these will affect levels of demand for water, as well as the scope for improved water use efficiency to reduce water requirements;
- **Conservation and restoration plans**: which depend on sufficient water (for instance, through environmental flows) to maintain important environmental assets and processes. There is little point in investing resources in protecting or restoring an ecosystem if it is not allocated the water required to maintain it;
- **Infrastructure and operation plans**: the operation of dams (for example, for hydropower or navigation), while non-consumptive, will affect system yield (which has implications for the amount of allocable water) and the flow pattern (which has implications for meeting environmental flow objectives).

As for the linkages of water allocation plan with river basin plan and particularly, with the River Basin Management Plan (RBMP) as prescribed by EU Water Framework Directive it, in essence is a structural component/operational mechanism of the RBMP to achieve or enhance a good ecological status of water bodies preconditioned among others, by hydrological and hydro-morphological quality parameters.

The relationship between the basin water allocation plan and the RBMP is presented on the figure below.

FIGURE 10: RELATIONSHIP OF THE BASIN WATER ALLOCATION PLAN WITH RBMP

Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

GENERAL CONSIDERATIONS - CRITERIA, PRINCIPLES AND METHODOLOGICAL APPROACHES FOR DETERMINIG WATER ENTITLEMENTS AND REGIONAL WATER SHARES

MAJOR WATER ALLOCATION PRINCIPLES AND CRITERIA

There are no universal rules/principles to determine how water should be allocated in the river basin. Approaches for allocation vary from basin to basin based on local natural and political conditions. Ultimately, all the decision made are of political nature. Regardless, some considerations – criteria and principles are the most widely accounted for worldwide in water allocation planning. They can create a good basis for political negotiations and making decisions on priorities and trade-offs.

The commonly applied criteria for water allocations can be divided into three major categories:

- proportionate division;
- allocation based on current (historic) water uses;
- allocation based on future water uses.

The simplest method of the proportionate division of water is equal allocation of water shares between basin regions or riparian states. It can be expressed in absolute (total volume) or normalized figures (per capita allocation). It also takes into consideration current and projected population size. Another way for proportionate division is to base water allocation on physical features of the basin, e.g. length of the river, basin area, contributions to the run-off by riparian states. Though this method is easy to design and implement, it does not take into consideration current and future water demands.

The allocation of water based on historic uses is the most pragmatic and politically correct approach, since it takes into consideration current supplies and demands and political realities. This approach, however, does not take into consideration future demands and water availability (shortage) uncertainties related to climate change impacts. Thus, it is unsustainable approach not encouraging technological innovations and investments in conservation and efficient use of water.

The allocation of water based on projections of future uses that can be derived/extrapolated from the analysis of economic growth (e.g. of GDP growth rate), more advanced sectoral forecasts or the analysis of social-economic and political development scenarios.

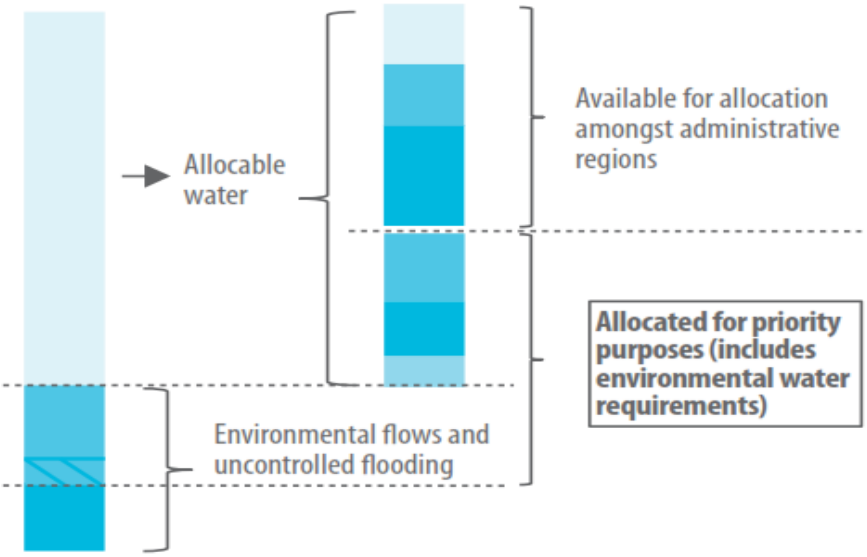
The table below summarizes the general criteria and principles for water allocation.

TABLE 6: PRINCIPLES AND CRITERIA FOR SHARING WATER

Consideration	Measure
Proportionate division	
1. Equal division	Equal shares for each riparian state/province
2. Physical characteristics of the basin	Area, rainfall, length of river
3. Population	Population numbers in, or dependent on, the basin
Existing use	
4. Historic or current use	Existing diversions or shares
5. Estimated demand	Water demand assessment, e.g. crop water needs
6. Efficiency of water use	Output per unit of water (physical or economic)
7. Social and economic dependency	Socio-economic reliance of the population on the waters of the basin
Future use	
8. Growth projections	Regional and sectoral gross domestic product (GDP) growth estimates
9. Alignment with development planning	Development space, future development priorities, value added per unit of water

Another fundamental principle/approach for sharing the water is allocation to high priority purposes which are: (i) water to meet priority human and political needs such as drinking and sanitation water and strategic and national importance projects; (ii) water to meet environmental flow requirements that is water and flow patterns required to support aquatic ecosystems processes.

FIGURE 10: ALLOCATING WATER FOR PRIORITY PURPOSES



Source: Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning (Asian development Bank, GWP, UNESCO and WWF-UK; 2013)

Priority purpose allocations are applicable for long-term and annual allocation planning and can be done at different administrative levels. For instance, river basin plans may reserve/allocate water for national strategic priorities. Regional authorities also may set up their own priority purpose allocations in the regional/sub-catchment allocation plans.

Allocating water to meet basic social needs (water necessary for domestic survival) is considered the top priority of most water allocation systems. In accordance with World Health Organization per capita survival norm varies from 20 to 100 liters a day. Large number of governments treat all types of domestic water uses as the highest priority.

Apart from allocations for domestic uses, allocations to support community livelihoods are frequently considered as priority allocations, especially in poor communities, and are recognized as permissible water uses without any authorization (licensing, permitting).

Strategic allocations are those treated as such by existing governments, e.g. water allocation/use for hydropower generation and/or cooling, strategic transport routes, defense. In addition to these, contingency allocations or reserves to meet future strategic needs are also counted as strategic allocations.

Interstate agreements or interbasin transfers should be accounted for prior to water being allocated between various users.

Water allocations to meet environmental flow requirements (instream ecological needs) in support of aquatic ecosystems and key ecosystem functions and services should be also made before allocations to various sectors/users.

Ground and surface water interactions in areas with high degree of connectivity should be also taken into consideration, by reserving some water for groundwater recharge decline in surface water availability before allocating water to different regions.

METHODOLOGIES FOR DECIDING BASIN ALLOCATION SHARES

There are various methodologies used to convert broad allocation principles into basin allocation plans. In general, four different families of methodological approaches exist for deciding on basin allocation shares:

- Hierarchy approach;
- Criteria (single or multiple) approaches;
- Strategic development approaches;
- Market-based approaches.

In practice, there can be significant overlaps between above methodologies. For example, many elements of more sophisticated multicriteria approaches are incorporated into the methodologies under strategic development approaches. Different methodologies may be used for deciding on shares at different levels in the water allocation framework (at national, basin or regional level). For example, single or multicriteria approaches are often used for deciding on shares between states or regions in a basin; those states or regions may then use a hierarchy approach for dividing water between sectors. Similarly, initial allocations of water may be based on a criteria or hierarchy-based approach, with any subsequent reallocation of water via market mechanisms.

Hierarchical approach divides basin water resources based on sectoral principle, with certain sectors having higher priority than others do. This method is usually used when allocation is made directly to sectors or users. However, it can also be applied for allocating water to regional shares through determining the volume of water demanded by priority sectors.

As it was discussed above there are a number of principles and criteria for allocating water. In most cases, multi-criteria approach is applied since it may lead to more unbiased and equitable outcome. This approach usually is adopted when allocation plans are based on stakeholder negotiations, expert judgments, etc. However, sophisticated approaches include using criteria and rules derived from economic growth scenarios.

Strategic development approaches usually are driven by efforts to maximize complex benefits and deal with uncertainties. This usually includes attempts to maximize benefits and balance them with environmental requirements and constraints through developing of a number of scenarios, assessing their impacts and selecting the most appropriate options.

Market-based approach implies water allocation through market-based mechanisms such as actions and trading's. In theory, initial entitlements at the basin level can be allocated through the auctioning particularly, in those basins where allocations are made straight to abstractors. However, there is no single example of allocating initial entitlements at the basin level. On the contrary, there are number of precedents of auctioning new entitlements within already allocated basins at the level of individual entitlements.

There are various approaches for defining regional shares. The most suitable approach will depend on factors including the local hydrology, the nature and extent of water infrastructure, capacity for monitoring and implementation, and the objectives for sharing water under different seasonal conditions. These approaches are as follows:

- ***Mean annual or monthly diversions***;
- ***Minimum guaranteed volume*****:** a volume of water that will be supplied in all conditions and ahead to other competing uses;
- ***Caps on abstractions:*** specified as a maximum level of abstraction. This may be by reference to a volume of water or certain operational rules. Whereas a mean annual entitlement defines the average amount that will be made available, a cap places an upper limit on abstractions, regardless of the water available in a particular year. A cap can operate in conjunction with other limits on mean annual diversions;
- ***Cross-border flow requirements:*** specified as a minimum daily, monthly or annual volume of water passing from one region into another. Such approaches are the easiest to monitor, but need to include a mechanism to address fluctuations between and within years. These approaches on their own may result in upstream regions benefiting the most during periods of above-average flow, or downstream regions benefiting during drier periods;
- ***Percentage of available flow:*** water shares defined based on shares of what is physically available in the river at a given time. This may be particularly relevant for sharing seasonal flow events;
- ***Sharing of tributaries:*** where there are multiple shared tributaries, water may be allocated based on entitlement to the water in different tributaries. For example, a region may be entitled to all (or a fixed percentage of) the water from one tributary;
- ***No further development approach*****:** water shares are defined based on infrastructure, entitlements and sharing rules in place at a particular point in time, with no changes to existing operations permitted that would increase total water abstractions. Such an approach requires a high level of trust between the parties, and requires complicated accounting and monitoring to ensure enforcement.

ENABLING ENVIRONMENT AND IMPLEMENTATION

Making and implementing effective water allocation plans is a challenging task. Experience shows that it can take years, even decades, to finalize a plan. It is important then that the preconditions for successfully preparing and implementing a plan, as well as the common barriers to success, are well understood from the outset. Number of the key requirements necessary to support the development and implementation of a water allocation plan, as well as some of the common challenges are listed below:

BARRIERS TO IMPLEMENTATION

International experience shows a number of common barriers to the successful development and implementation of water allocation plans. These include the following: lack of capacity to develop or enforce allocation plans; lack of political will; the challenges of over-allocated basins; lack of data or lack of confidence in the data.

POLICY AND LEGISLATION

As for any major government initiative, basin water allocation planning depends on high-level support within government. This support should ideally be reflected in policies and legislation that provide guidance (and some certainty) to policy-makers, water managers and stakeholders on the government's agenda, and the agreed mechanism for its implementation. This should:

- Establish the overarching objectives and framework for basin water allocation planning – describing the different plans or instruments to be prepared, their legal effect, and the purpose of making the plan(s).
- Define the process for preparing a plan. This should strike a balance between providing flexibility, while ensuring that there are concrete milestones and timeframes for action.
- Establish or designate the institutions tasked with developing and implementing water allocation plans. The role of other relevant government agencies should also be specified.
- Create the legal mandate for those institutions to undertake their work. This is particularly important to help resolve interdepartmental disputes on priorities for how water or rivers should be used or managed. The designated planning agency should be granted the powers it requires to collect the information it requires and generally to undertake the planning process.
- Provide guidance on high-level priorities and objectives for allocation planning.
- Set out environmental protection requirements and how these should be incorporated into allocation planning.
- Establish formal mechanisms for community engagement, the airing of grievances, and dispute resolution. These requirements can be set out through a series of mechanisms, including laws, regulations, policies and strategies. The appropriate combination will depend on the political and legal contexts.

OPERATIONAL REQUIREMENTS

The way reservoirs and other water resources infrastructure are operated is central to the implementation of a water allocation plan. Reservoir operation rules will determine what water level will be maintained under different circumstances, when water is to be released from a reservoir, and the volumes, timing and rates of release. These operational rules will affect the overall system yield, and thus determine what water will be available to satisfy the needs of water entitlement holders and the overall reliability of water supply.

Reservoirs are often operated to achieve a range of objectives: to reduce flooding, to maintain water levels to aid navigation, to generate hydro-electric power, to provide flows for environmental purposes, and of course to provide for water abstraction and use by households, industry and agriculture.

Reservoir operating arrangements must be designed to give effect to decisions about managing these competing interests. This includes giving effect to the requirements of a water allocation plan. Reservoir operating rules may then need to be amended as a result of the making of a water allocation plan, to ensure that water is stored and released in a way that is consistent with, and gives effect to, the water allocation plan. This may involve a requirement to release water at certain times, to ensure minimum cross-boundary flows for supply or environmental purposes, or requirements to not release water to ensure there is adequate water to meet water supply obligations.

Similarly, water allocation plans depend on allocation decisions being given effect at the user level – there must be confidence that regional limits on abstraction are given effect on the ground in the way that individual abstractors are regulated. This is typically via water entitlement or licensing systems. These usually define the rights of individual water abstractors to take a volume of water, subject to certain conditions. These licensing systems need to align with the water allocation plan and any regional water shares, and be mindful of the plan's objectives and requirements.

Finally, implementation of a water allocation plan will usually involve an annual allocation process, through which the water available that year is assessed and allocated between different regions in accordance with their regional water shares and the water allocation plan (see Figure 9). At the operational level, this then requires that there are systems and processes in place for measuring (for example, reservoir or river levels, or the amount of snow in the catchment), predicting (such as through weather forecasting) and ultimately assessing the water available for allocation that year. This volume then needs to be divided between the regions (and at the abstractor level, between the individual abstractors), and decisions on that communicated to relevant stakeholders, including water entitlement holders, reservoir operators and water resource managers.

INSTITUTIONAL CAPACITY AND MANAGEMENT SYSTEMS

As modern approaches to water allocation planning have become more sophisticated, so too have the demands on the relevant government agencies and their staff and systems. Internationally, a key challenge to the development and implementation of allocation plans has been the need for sufficient institutional capacity. Without this, policies cannot be converted to action.

Some of the key institutional and system requirements are: human capacity and resources, funding, hydrology and hydrologic modelling, data collection and management, environmental science, water licensing systems, monitoring, compliance and enforcement.

MONITORING, REPORTING AND COMPLIANCE

Monitoring, and reporting the results of monitoring, is a critical part of the implementation of a water allocation plan, and water resources management in general. Monitoring has several roles: to assist water management and the implementation of the plan, to ensure compliance, to provide relevant information to stakeholders, to inform future allocation and management decisions.

What to monitor

What to monitor will depend on the particular objectives and requirements of the allocation plan. Typically, a monitoring program will gather information on some or all of the following: water resources, water abstraction and use, dependent ecosystems.

Consideration is building a monitoring program

The following are some of the key issues to consider in building a monitoring program to support a water allocation plan: The purpose of the monitoring program, costs and benefits, responsibilities for monitoring, quality assurance, accuracy and frequency of monitoring.

Accounting and reporting

Reporting information on water resources, their allocation and management achieves several functions. Broadly, it provides a degree of transparency, promoting accountability in the allocation process. Reports can provide confidence to interested parties that allocation plans are being implemented as required. Reporting can also be important for providing information required by stakeholders to inform their decisions, such as allowing water users to know current or predicted water availability. Reporting requirements need to be tailored to suit the situation, based on the audience, the type and depth of information required, and the best method(s) for communication.

Compliance and enforcement

Clearly, the success of an allocation plan in achieving its broader social, economic and environmental objectives will depend on the level of compliance. This extends to compliance by water abstractors, different levels of government and government agencies, and water infrastructure operators. As with other aspects of the water allocation process, responsibilities for and approaches to assessing and ensuring compliance vary significantly.

CHALLENGES TO WATER ALLOCATION

DEALING WITH VARIABILITY

Dealing with variability in inter-annual and seasonal availability of water is one of the defining challenges of water allocation planning. The most suitable approach will depend on how water entitlements have been defined in the first instance. Often some form of annual allocation process is required to convert long-term entitlements to a defined volume of water, based on the prevailing seasonal conditions. This process may recognize the relative priority of different water users, and can thus ensure that, particularly where less than the full water entitlement is available, different regions and user groups are affected in different ways. Such approaches recognize the differing capacities of water users to adjust to changes in the volume of water that is available to them, as well as the different social and economic consequences from changes (especially reductions) to water supply.

DEALING WITH UNCERTAINTY

Current and future changes associated with socio-economic development and climate is characterized by high levels of uncertainty. Uncertainty can relate to changes in average water availability, greater climatic variability, and limited information on the nature and impact of possible changes. These and other factors are contributing to profound uncertainty about the future. Generally, planning in the context of an uncertain future should:

- Ensure that decisions do not foreclose future options;
- Allow responses to unforeseen events, including events that lie outside the historic record;
- Establish monitoring systems to observe change.

GOLDEN RULES OF ALLOCATION PLANNING

Based on international experience, this report identifies ten ‘golden rules’ of basin water allocation planning. They are:

1. In basins where water is becoming stressed, it is important to link allocation planning to broader social, environmental and economic development planning. Where inter-basin transfers are proposed, allocation planning also needs to link to plans related to that development.
2. Successful basin allocation processes depend on the existence of adequate institutional capacity.
3. The degree of complexity in an allocation plan should reflect the complexity and challenges in the basin.
4. Considerable care is required in defining the amount of water available for allocation. Once water has been (over) allocated, it is economically, financially, socially and politically difficult to reduce allocations.
5. Environmental water needs provide a foundation on which basin allocation planning should be built.
6. The water needs of certain priority purposes should be met before water is allocated among other users. This can include social, environmental and strategic priorities.
7. In stressed basins, water efficiency assessments and objectives should be developed within or alongside the allocation plan. In water-scarce situations, allocations should be based on an understanding of the relative efficiency of different water users.
8. Allocation plans need to have a clear and equitable approach for addressing variability between years and seasons.

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