



Public Utilities Commission of Sri Lanka



Study on Sustainable Water Resource Management for Drinking Purposes

Final Report

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University of Moratuwa, Sri Lanka



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Executive Summary

Introduction

The present study of “Sustainable Water Resource Management for Drinking Purposes” is to strengthen the water service delivery by the Public Utilities Commission of Sri Lanka (PUCSL) which has been empowered by the parliamentary Act No. 35 of 2002. The need and outline of the present study was determined by the outcome of a “Regional Public Consultation Series” carried out by PUCSL which covered the nine provinces of the country. The message that had come out of these sessions had been the inadequacy in the existing water supply in terms of either quantity, quality and/or duration. As such the present study objectives were to, i) review the current situation of natural and man-made issues and constraints met by local water service providers; ii) review the existing legal provisions and institutional perspectives on ownership of water resources, access to the same and water allocation; iii) review international Best Practices of water allocation; iv) evolve and recommend an appropriate water allocation system for Sri Lanka; v) carryout stakeholder consultations and evaluate the proposed water system; and vi) propose a final solution with required amendments to the existing systems.

Current Status of Water Sector

Sri Lanka receives about 120 BCM of annual rainfall of which about 43 BCM is available for use. Approximately 21.6 BCM of available water can be attributed to the Wet Zone covering about 25% of the total land area of the country while the dry zone which occupies 75% of the land area receives the balance 21.4 BCM. In terms of current usage of the available water, 12.04 BCM is used for agriculture and 3.01 BCM for household consumption and industrial use, which altogether accounts to about 35% of the available water, showing a substantial quantity (65%) of the available water is not harnessed for productive use. Though there is a large number of hydro-power plants, in terms of water usage it is considered as non-consumptive. In the year 2017, the ‘safe’ drinking water coverage in the country was around 86%, and population served with pipe borne water stands at 46%, which constitute 35.2% provided through the national distribution network of NWS&DB and 10.8% served by small scale schemes operated by CBOs. The water used for agriculture is provided almost free of charge while the tariffs levied on domestic water supply are substantially subsidized. Since its independence in 1948, Sri Lanka has spent a colossal amount of money in water resource infrastructure development particularly related to irrigated agriculture for the benefit of rural masses and hydro-power generation to boost industrial development in the country. Despite repeated attempts of the last several decades Sri Lanka is yet to have a comprehensive national water policy which is considered as an important requirement for sustainable use of water resources ensuring rational allocation among competing users and for a variety of uses. The most important recent policy formulation attempt in the country is the “Draft National Policy, Strategies and Institutional Framework for Water Resource Development, Conservation and Management” circulated in 2019.

Review of Regional and International Water Governance

Countries all over the world have recognized the importance of integrated water resources management to ensure rational water management and water security in an environment where there are significant challenges arising from less and sporadic patterns of rainfall, global warming, increasing levels of water pollution and ever-increasing competition between uses. The present study carried out a selected review of international and regional methods and practices adopted by, other countries taking India, Thailand, Philippines, Indonesia, Turkey and South Africa as a sufficient sample. The review highlighted that these countries have adopted a comprehensive national water resource management policy with a sound legal basis; and that there are recommendations for an institutional mechanism with adequate powers for implementation, monitoring and evaluation of water resource management policy.

Water related Legislations in Sri Lanka

In Sri Lanka there are quite a few water related legislations currently in force starting from the Land Development Ordinance No. 19 of 1935. State Lands Ordinance (SLO) No. 8 of 1947 to more recent Sri Lanka Sustainable Energy Authority Act No. 35 of 2007 and Sri Lanka Electricity Act No. 20 of 2009. Out of these, State Land Ordinance is the main statute which defines water as either private or public property.

Most of these legislations are there to deal with matters related to water related subsectors like Irrigation, groundwater utilization, agrarian development, conservation of forestry resource etc. Some of these legislations are outdated due to their inconsistency with the prevailing circumstances while some are superseded by new legislations. For example, Mahaweli Authority of Sri Lanka (MASL) Act No. 23 of 1979 stand above the provisions in most other water related legislations like Irrigation Ordinance etc.

Review of International Best Legal Practices of Water Allocation

Internationally while, there are documentations indicating the objectives of a water allocation system highlighting the need to provide for equitable apportioning of water resources among the various users, protect existing water users from diminished supply due to new users, govern sharing of limited water supplies during shortage and facilitate efficient water use, it has been emphasized that from the perspective of water law, groundwater and surface water is usually considered distinct. Governments have historically exercised control over water resources.

Some of the common elements in water resources legislation are the a) statement of the objects and purposes of the water policy in the legislation. b) maintenance of water quality and prevention of the deterioration of quality, c) application of the public trust doctrine in limiting prior appropriation rights to water where a full exercise of such appropriation rights would adversely affect the environmental function of a water body, d) planned approach to water management, e) comprehensive assessment of water related programs and policies, f) environmental impact assessment for major activities significantly affecting the human environment and other actions that can affect water resources, g) Strategies to manage water related differences and to coordinate activities, h) timely information on quality and quantity of water availability to stakeholders as a prelude to participatory planning, i) approaches that

do not permit private ownership of water and keeps the water resource in the public domain, j) recognition by the courts about the need to change from riparian rights to a permit-based system as circumstances warrant and the need for justification for the preservation of riparian rights, k) need to take into account changing circumstances in regulating water rights, l) water rights subject to forfeiture or may extinguish due to non-use in the best utilization of the resource, and m) that water rights are conditional and vested rights are secondary to public interest.

The United Nations General Assembly by its resolution adopted on 28th July 2010, recognized the “right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights”. The resolution accordingly calls upon “States and international organizations to provide financial resources, capacity-building and technology transfer, through international assistance and cooperation, in particular to developing countries, in order to scale up efforts to provide safe, clean, accessible and affordable drinking water and sanitation for all.”

Stakeholder Participation in Water Allocation Decisions in Sri Lanka

Stakeholders in both water sector and also in the water allocation process in Sri Lanka can broadly be divided into several subsectors depending on the purpose of the water usage. These users compete with each other for their share. They include, Agriculture/Irrigation for food production, Domestic Water Supply for drinking and sanitation, Industries, Hydroelectric Power Generation, and the Environment. The stakeholders can be further divided by considering the level of interest. One is the institutional level stakeholders representing water institutions and the other is the end-user or consumer level stakeholders.

As at present, the only mechanism for multi-stakeholder participation in water allocation at national level in Sri Lanka is the Water Panel of Mahaweli Authority which coordinates the Ceylon Electricity Board (CEB), National Water Supply and Drainage Board (NWSDB), Department of Irrigation(ID), and Meteorology Departments[50] together with officers working in the field and the representatives of Farmer Organizations. Other Stakeholder platforms operating in the country are the Project Management Committees in operation at Irrigation Scheme levels.

Review of Landmark Water Allocation Cases in Sri Lanka

Several conflicting water allocation/sharing cases in Sri Lanka, examined for this study include the Iranamadu reservoir in Northern province, the Muruthawela reservoir in Southern province, Rajangana, Mahakandarawa and Thuruwila reservoirs in North Central province. All these conflicts have arisen when the public authorities attempt to extract water from the respective reservoirs to supply to some other community for their domestic use. In most of these disputes the noticeable factor is that the farmers are of the opinion that the water resources are inadequate while the public authorities are confident that the resources are adequate to serve the intended purposes. So, the main cause for farmer protests is the failure of the authorities to create adequate and correct awareness among the main stakeholder, the farmers. Therefore, it would appear that to be successful, the water sharing decision-making needs to be moved to an

independent professional entity to which representations can be made and where the decision making takes place in a transparent and accountable manner preferably with the consensus of all stakeholders. Future projects in the water sector too need to be multi-sectoral and clearly identify and provide for the needs of the relevant sectors. The approach in arriving at decisions should also be a simplified process not encumbered by extraneous considerations.

Review of Regional and International Cases

In almost all parts of the world, with the increasing levels of water scarcity, water allocation plans and strategies have received increasing significance in resolving conflicts over the right to access water by countries, regions and users. Several reported water allocation cases in Philippines, Thailand, Malaysia, Indonesia, India, Myanmar and Western USA were selected and studied for the purpose of this exercise. What is observed is strikingly the same everywhere on earth the same type of issues and responses can be observed with little variation. Resolution of water sharing problems has one fundamental requirement. That is the need to introduce a new water sharing mechanism If the present issues cannot be resolved with available legislative and administrative provisions. Almost all cases highlight the need to carefully handle the stakeholders starting from the planning stage and continuing up to the stages of implementation and operations. In both developed and developing countries, an effective administrative mechanism could be seen as the key factor for the success of water allocation plans and strategies.

Stakeholder Responses Regarding Existing Situation

For the purposes of the current study on “Sustainable Water Resource Management for Drinking Purposes” a Stakeholder Consultation Session was held with the participation of representatives from various water sector institutions in the country. The objective of the session was to get the stakeholder views with regard to current operational aspects of the Water Sector in the country, particularly about the (i) Current Water Allocation Processes, (ii) Objectives and Practices of Water Allocations, (iii) Sharing Water Among Competing Users, (iv) Defining Water Entitlements and (v) Dealing with Variability and Uncertainty. The bold answer for all the above questions is that the existing policies, practices and procedures are not based on any national policy thus most are fragmented and they are not transparent so, their reliability is in question.

Water Allocation and Modelling

Water allocation is generally considered to be the process of allocating or sharing water between different users or consumers based on a set of principles defined in a water allocation policy statement. Water allocation between users’ needs to be based on various priorities or supply principles that are normally set out by the government policy. There are several methods of water allocation. In early literature, water allocation methods had been recognized as, marginal cost pricing, public allocation, water markets and user-based allocation. The selection of a suitable water allocation policy and a practice must be sufficiently supported with other tools to ensure rational water management. This is simply because, the principles or guidelines of reasonable and equitable use etc., are difficult to

apply directly in practice. Measurable criteria and models need to be designed and used to achieve fair apportionment of water in the light of water shortages.

The choice of water allocation options including the models, parameters, prioritization etc., must be embedded in codes of practice to ensure good water management practices. The strength of a water code is partly highlighted by the presidential decree of the Philippines. The Water Code passed in 1976 had authorized the to grant water rights, levy the appropriate fees for these rights, and collect charges for water development. The Code also recognizes seniority of rights such that the earliest approved rights have priority over others to the use of a limited supply of water. In times of drought or any emergency, however, the use of water for domestic and municipal purposes takes precedence over agriculture or related uses. In this regard, the Code also provides that such a reallocation requires payment of due compensation to the affected sector. It likewise allows the transfer or lease of water rights in whole or in part to other parties subject to approval.

Water Allocation Models Currently Used in Sri Lanka

The only water allocation model in Sri Lanka is the simulation model that is used by the Water Management Secretariat of the Mahaweli Authority. Water allocation based on this model had taken place for over three decades. Though the present coverage of this system is limited to 9 river basins in the island covering an approximate land area of 41%, the model in practice provides a good foundation to develop a structured water allocation framework by building on the present water allocation system. The process describes an impressive stakeholder consultation process but some information points to an allocation system providing water through a top-down, government driven allocation system. It appears that the feedback mechanisms require a strong system which enables finer resolution interventions. The provided details do not indicate methods available to overcome uncertain situations such as climate change. Hence, there is a high probability to create conflict situations when the stakeholder numbers increase with time and also if the resource gets depleted because of uncertain events. Documentation points to the limited attention given to ensure a display of transparency with regards to the methods and parameters used in this water allocation mechanism.

Devising a Water Allocation Framework for Sri Lanka

A water allocation framework to be practical and successful, it must lead to a systems approach, a logical sequence, a method of validation and successful stakeholder participation. In essence a water allocation framework must embed an initiation phase, development phase, implementation phase, and an evaluation phase to develop a rational water allocation system.

- The **Initiation Phase:** involves a detailed scoping carried out to identify stakeholders and a situation analysis that would reveal the relevant resources and allocation issues.
- The **Development Phase:** is the core of a water allocation framework. In this the target is to determine how much of water resources can be allocated for water uses or water

users and then how this allocation system can be managed. Assessment of information is one of the tasks to be undertaken in this phase is targeted to capture (i) water resource availability and trends, (ii) water resource uses and their current trends, and (iii) requirement for environment, social and cultural activities. Objectives of water allocation, allocation limits, management approach with respect to entire allocation plan and the final water allocation framework are also to be determined under this phase.

- The **Implementation and Evaluation Phase**: once the necessary approvals are obtained the newly devised Water Allocation Framework can be implemented. The Institution/s responsible for implementation of the allocation framework must be provided with adequate resources for its success. In parallel, stakeholder awareness programs have to be carried out to ensure successful implementation of the proposed framework.

The Water Allocation Framework

The water allocation framework for Sri Lanka has been presented as the final recommended solution. In this connection, the present work carried out two important key stakeholder consultations. One on the 26th February 2020 for the identification and confirmation of the method that had been used to arrive at the framework and then the other on the 17th September 2020 to present and incorporate the comments received on the given recommendation. The recommended solution by the present work which is the establishment of a sound water allocation framework must adapt a systems approach which is based on a, Clear logical sequence, giving priority to transparency, ensuring a method of validation, and devising a comprehensive stakeholder evaluation at each step of decision making. The key is for the framework to include four important phases as, an initiation phase, a development phase, an implementation phase, and an evaluation phase.

Way Forward

Immediate Next Step

This report is the outcome of the situation analysis that has been completed and the outline of the suggested Water Allocation Framework which has been carefully developed after a systematic study. The situation analysis and the developed water allocation framework was presented, and favorably discussed at the verification meeting with key stakeholders. There was a clear agreement about the present situation, analysis, assessment and the need of a systematic approach as proposed in the developed framework to ensure a sustainable water allocation system ensuring a satisfaction of all water uses and the purpose of drinking water use. However, there were expressions that indicated concerns with regards to the institution that would gain control. This has already been addressed in the report by indicating the need for impartiality and transparency during the system development and implementation of the proposed framework for Sri Lanka. The immediate next step is to get involved with initial activities of the Framework development phase namely; the assessment of current water resource availability and trends, water resource uses and trends, and water requirement for environment, social and cultural needs.

Study on Sustainable Water Resource Management for Drinking Purposes

Public Utilities Commission of Sri Lanka

1 Introduction

1.1 Background to the Study

Public Utilities Commission of Sri Lanka (PUCSL) was established under the “Public Utilities Commission of Sri Lanka Act, No.35 of 2002”. The PUCSL Act., is applicable to the public utilities industries set out in the schedule to this act which are Electricity Industry and Water Service Industry. Sri Lanka Electricity Act has been enacted in the year 2009 and electricity sector regulation is fully functioning at present. Water and Petroleum industry legislations are still in the pipeline. In order to prepare and propose the draft legislation for the water service industry, it is necessary to execute several tasks to support a rational decision making process.

In dealing with the required matters, Section 17 of the PUCSL Act of 2002 requires the Commission to appropriately consult, any person or group whom may be affected or likely to be affected by the decisions of the Commission. Accordingly, the PUCSL commenced island wide consultation pertaining to the drinking water services industry and during the consultation, representations had been made by affected parties. The representations had mainly focused on drinking water supply services provided by National Water Supply and Drainage Board (NWS&DB), water schemes managed by the Community Based Organisations (CBOs) and Local Authorities. Topics deliberated included topics such as, access to water sources, ownership of water, water allocation, catchment protection, mapping source areas, pollution control, and related matters. According to the PUCSL, the clear and loud message that had come out from the consultations had been that ‘water services available for drinking purposes is inadequate’.

The water service providers i.e. NWS&DB and CBOs expressed that one of the main constraints they encounter in expanding their services is lack of sufficient quantities of water available at the water sources. Further water pollution at source is another problem for the supply of water at the minimum quality. It is the common understanding that drinking water supply takes the top priority among other water uses.

Though the representations had pointed to various alternatives as solutions to the water resources crisis, PUCSL, has decided to perform investigations on the available options to resolve this issue of unavailability of adequate quantity of good quality water at the available drinking water sources and the limitations in accessing such sources where available.

1.2 The Objective of the Study

1.2.1 Introduction

Freshwater is a scarce resource. Competition for the limited supply of freshwater has increased due to various demands of the exponentially increasing population and because of the increased pollution owing to anthropogenic activities. Competing water uses include human consumption for survival and economic development along with the use for survival of environment as a demand from a silent consumer. Though a majority of the public would claim water for human consumption as the top priority, there are power groups who claim otherwise.

Accordingly, the recognition of the current situation concerning the surface and groundwater availability prior to resorting to solutions proposed by stakeholder agencies is a major step to reach a solution to the issue of non-sufficiency of drinking water. Hence the study initiated by the PUCSL to explore the solutions available to resolve this issue of unavailability of adequate quantity of good quality water at the sources for supplying as drinking water is very timely.

1.2.2 The problem and importance

Need for rational allocation of water resources has been rising in the policy agenda. Demand for high quality, unrestricted supplies of water for human consumption due to population growth, high population densities in urban clusters, sparsely distributed rural populations has increased the competition to access water resources. This is further intensified by the increasing water needs of agricultural and industrial sectors which are the backbones of economic development. Rapid degradation of water quality, uncertainty of water availability due to climate change, need to look after the non-consumptive uses such as aesthetics, recreation, while undertaking the immense responsibility to safeguard the environment for future generations, are the other factors that need to be considered when allocating the scarce water resources.

Sri Lanka is blessed with most parts having relatively high water availability. It has been felt that the common belief is the availability of sufficient amounts of water to share but the unwillingness and lack of mechanisms appear as the hindrance. The assessment of water resources in the country has been going on for many years for watershed management, irrigated agriculture, river diversions, multipurpose investments. Already many major projects in the country are in the

process of strengthening the knowledge on water resources availability for economic development and other similar purposes. Community water supply projects and the National Water supply and Drainage Board also has carried out compartmentalized water assessments for drinking water extraction. There is no doubt that quantification of water resource is the priority for sustainable water utilization. However, the present problem faced by the PUCSL is beyond the knowledge of the availability. Stakeholder consultations of PUCSL have clearly pointed out that the problem is the lack of sufficient quantities of water. The key is that lack of water and lack of sufficient amount of water are two aspects that require a very clear distinction. Lack of sufficient amount of water has to be evaluated conjunctively by considering the availability, allocation and competition. Lack of water can be assessed merely by carrying out an assessment of water resources that reaches a particular location because of the rainfall received, the soil, land cover and the upstream topography. In an environment where water resources quantifications have been done to acceptable level, the most important aspect is to look at the prevailing setting with regards to the water sharing.

This brings forth the need for the PUCSL to carefully look at the prevailing situation, legislation and methods of water allocation. Water allocation is not a straightforward activity. Water availability in quantity, quality, space and time are critical factors. Historical use, riparian rights both linked to quantity and pattern are also key concerns with regards to water allocation and sharing. There are strengths and weaknesses associated with water use policies, laws, regulations, operation rules, availability of institutions, infrastructure etc. Water allocation issues are location specific but there are lessons that can be effectively used by carefully evaluating the system. There is only a very limited work that had been done with regards to water allocation. Hence it is very important to carry out a systematic study of the present water allocation setting, to carry out an evaluation and recommend options for water sharing that includes water for drinking purposes.

1.2.3 Objectives and Scope

The objective of the present work is to review the stakeholder concerns, existing legal provisions and institutional perspectives on ownership of water, access and allocation, with regards to the Sri Lankan setting. Then results of evaluation will then be compared with the international best practices to capture and propose suitable solutions for stakeholder acceptance and suggestions. Stakeholder preferences would then be subjected to a rational re-evaluation by the experts to propose appropriate solutions for the pressing issue that would eventually lead to a sustainable use of water resources ensuring adequate quantities for drinking water purposes.

Accordingly, the scope of the present consultancy is to propose a solution to the prevailing water resources allocation system in Sri Lanka. Keeping in line, the specific tasks that have been deliberated by the PUCSL under the overall scope are as follows,

Technically review the natural and man-made issues and constraints met by local water service providers

Review the existing legal provisions and institutional perspectives on ownership of water resources, access to the same and water allocation.

Review international Best Practices of water allocation

Evolve and recommend a suitable water allocation system for Sri Lanka, considering our cultural, historical and societal needs and current laws/Acts/rules/right etc. It is required to adhere to prevailing customs if any, i.e. reparation right of users at present.

Carryout stakeholder consultations and develop pros and cons of proposed water allocation system

Propose a final solution with required amendments to the existing laws/policies/institutions

1.3 Methodology

The scope of the study was carefully evaluated to clearly identify the main and sub tasks that would be carried out under each ToR item.

1. Technically review the natural and man-made issues and constraints met by local water service providers
 - Under this task, initially, the local water service providers and key stakeholders are to be identified in consultation with the PUCSL. Already conducted stakeholder consultations will be supplemented with additional consultations required for filling remaining gaps if any.
 - Stakeholder consultations would focus on the ownership of water resources, access to available water, water quality concerns, allocations of water to users and uses.
 - Identified issues and constraints will be grouped under institutions, sectors, and geographic regions to identify trends and priorities.
 - A district and national level stakeholder consultation workshop/s as necessary is/are proposed to capture acceptance and oppositions.

Review the existing legal provisions and institutional perspectives on ownership of water resources, access to the same and water allocation

- Identify Sri Lankan and international water legislations and associated regulations and respective spatial coverage of each document

- Identify the same specifically for the assurance of riparian water rights
- Identify existing institutional arrangements and associated responsibilities for successful service delivery
- Verify each identification with stakeholder consultations
- Review collected documentation and identification of strengths and weaknesses in the existing legal and institutional provisions for sustainable water allocation

Review international Best Practices of water allocation

- Identification of both international and regional examples of water allocation legislation and regulations
- Identify methods practiced internationally and regionally to capture water quantity allocation with respect to time and space
- Identify international and regional best practices with respect to water rights and prioritization
- Review of best water allocation practices for rational application in the Sri Lankan water supply services

Analyse the prevailing situation in comparison with best practices elsewhere to develop a suitable water allocation system for Sri Lanka

- Determine the national level policy environment, legal tools, stakeholder involvement and associated frameworks for identification of options
- Determine the sub national level assessments, plans, management tools and techniques, and mechanisms for monitoring
- Determine the technical, administrative, political and social concerns and boundaries with respect to water allocation, adaptive operation and management
- Propose alternatives for rational water allocation system considering cultural, historical and societal needs to comply with current laws/Acts/rules/rights

Evaluation of proposed alternatives to identify the merits and demerits through Stakeholder Consultation

- Development of a criteria to evaluate the proposed alternatives by considering the technical, administrative, political and social factors associated with water allocation and verification through stakeholder consultations

- Development of sub criteria associated with primary factors and verification through stakeholder consultations
- Development of a multi criteria assessment methodology for the evaluation of alternatives and verification through stakeholder consultations
- Perform an objective evaluation to identify the suitability of identified alternatives and capture stakeholder concerns and recommendations with respect to the technical, legal and institutional framework for sustainable water allocation.

Recommend a final solution with required amendments to the existing laws/policies/institutions

- Preparation of Main Report of the final solution for the water allocation to provide sustainable water services
- Preparation of addendums to the Main Report indicating requisite policy/legal/institutional considerations and amendments

1.4 Structure of the Study

The study was structured to commence work by visiting the PUCSL office to commence and perform available data collection and study. The stakeholders identified with the concurrence of PUCSL were requested to submit relevant details for the study. A structured letter (annex) was used to collect the information available at stakeholder institutions (Annex stakeholder institutions). This was followed by a stakeholder workshop to verify the status of collected data.

Subsequent to the workshop a situation analysis was carried out with the use of available literature and verified information collected from stakeholder consultations. Based on the situation analysis, a lists of options on the way forward was prepared for stakeholder consultation.

Next is the verification phase that includes a stakeholder workshop to discuss the options and to finalise the study recommendations.

2 Status of Water Sector in Sri Lanka

2.1 Background

Sri Lanka has a long history of water resources development. Ancient rulers of the country focused on the main functions of governance, protection of the territory and its people, their religion and ensuring food security through water security. Water and environmental sustainability were considered as the key for food security and the main focus at that time was to provide for the storage of water within reach of the people for cultivation and drinking purposes.

It has been recorded that King Parakramabahu the first (1153-1186) had been responsible for the construction, restoration and enlargement of 163 Major reservoirs, 2,376 minor reservoirs, 165 anicuts together with 3,910 Channels from tanks and anicuts[1]. During the Dutch and British occupations, each period lasting approximately 150 years each, continued to develop and manage water resources and brought a new focus on urban water supplies and sewerage treatment for public hygiene, primarily in the Capital City and key urban centres.

The ancient water managers used a community based “Rajakariya” (royal duties) system for the cost-sharing of operation and maintenance (O&M) works for water supply the reservoirs and tanks. The British who commanded the entire island since 1815, abolished this community based maintenance practice in 1832 without offering a substitute. The roles for O&M fell on the government as part of the civil service, which essentially meant serving the basic needs of the city dwellers.

Subsequent interests of British governors who chose to revive the water resources and irrigation systems enacted the Irrigation Ordinance of 1856. The central irrigation board with the Governor as President was formed in 1887 for irrigation management, that focused attention on rural people, essentially as a means of production, rather than meeting environmental and social needs. The Irrigation Department, as an organisation which is distinct from the traditional Public Works Department (PWD) was formed in 1900 to expedite the construction of irrigation systems for agricultural expansion.[1], [2]

Following the announcement of an Irrigation Policy in 1932, the Irrigation Department had been the main agency undertaking water resources development, flood protection and irrigation works in the island.

In the very early days, the Development of water resources for domestic water supply was confined to the city of Colombo. The Labugama reservoir constructed across a tributary of Kelani river in the year 1886 had yielded approximately 57 million litres per day for the city. This supply was augmented by another 90 million litres per day with the construction of Kalatuwawa reservoir in 1960. Water supply service delivery during this time was administered by a sub department under the Public Works Department. In 1961, a Department of Water

Supply was created for provision of water supply that targeted approximately 225 lpcd for the municipal area, 136 lpd for other urban area and 45 lpd for rural areas [1]. In 1965, the Department of Water Supply became a division under the Ministry of Local Government and from 1970, this division functioned as a separate department under the Ministry of Irrigation, Power & Highways.

From 1993, water supply activities that engage in groundwater extraction exceeding $\frac{1}{2}$ million cubic meters per day and/or in the construction of water treatment plants of capacity exceeding $\frac{1}{2}$ million cubic meters are required to carry out Environmental Impact Assessment (EIA) under the amended National Environmental Act No. 56 of 1988 and the Gazette Extra Ordinary number 772/22 of 1993. This Act brought about a significant change in the manner in which development projects are implemented; where a prescribed list of projects had to undergo an EIA process prior to implementation.

In case of development projects demands such as those for domestic, environmental, industrial and cultural are generally accounted for at the feasibility stage. Even though it is not specifically mentioned in the Irrigation Department Guidelines[3], personal communications revealed that as a practice, irrigation projects utilise only 2/3 of the yield leaving the balance for future requirements.

Devolution of administrative powers of central Government to Provincial Councils through the 13th amendment to the Constitution in 1987, created a new impact pathway in the management of irrigation systems. Provincial Councils were vested with planning, design, implementation, supervision and maintenance of all irrigation works other than schemes relating to rivers running through more than one province (to account for cross-jurisdictional issues). However, according to irrigation department sources, in 1991 the inter-provincial schemes were handed back to the irrigation mainly due to lack of technical competency and the realisation that water resources are connected across boundaries and the vexed issues of externalities and public costs were too complicated to handle at a provincial level. However a formal document could not be accessed to find specific details pertaining to this. During this phase, Irrigation Ordinance was amended in 1994 to establish new project management committees which were given legislative powers to make decisions on water management, planning and operation within projects. Change of political regime in 2004, reversed a major water management organisational arrangement, which proposed to merge the then Irrigation Department and Mahaweli Authority [2].

The government after 1977 accelerated the water sector development completed six reservoirs, five hydroelectric plants and provision of irrigation infrastructure for 112,000 ha.

Right throughout the last two centuries, all the successive governments have been investing on water resource development. However, there has been no permanent body for policy formulation and coordination of matters related specifically to water resources. During this time, the Water Supply and Drainage services under the Ministry of Irrigation Power & Highway became a statutory board for the development of water supply service facilities after a new act of parliament in 1974[4] led to the creation of the National Water Supply and Drainage Board (NWSDB).

Sri Lanka's water & sanitation sector development is based on expansion of pipe-borne water supply, sewerage facilities for densely populated cities and septic and sewer management facilities for peri-urban areas. These development activities are coordinated by the National Water Supply and Drainage Board, which is the lead agency for water supply and sanitation service delivery in the country. So far, all plans developed are based on the mandate of the above institution.

The NWSDB has identified over 60 major development projects to be financed in the next 7 years (10 Year (2016-2025) Development plan for NWSDB [5]) The Water Supply and Sanitations Improvement Project assisted by the World Bank has engaged national and international experts to develop a comprehensive development and investment plan, with a Draft Report being finalized as at present.

The financing plan prepared by the National Water Supply and Drainage Board with assistance from the Ministry of City Planning Water Supply & Higher Education is based on the following investment strategies.

1. Expansion of pipe water supply on priority basis
2. Expansion of sewerage networks and treatments for densely populated urban centres
3. Rehabilitation of existing schemes to maintain service levels
4. Improve service levels to reliability and 24 hour supply
5. Reduction of Non-Revenue Water
6. Implementation of septage treatment for urban centres
7. Provision of water for CKDu (Chronic Kidney Disease of unknown aetiology) affected areas

The hydropower, inland fisheries and tourism are sectors that fall into the category of non-consumptive users. The Ceylon Electricity Board is the controlling body for hydropower which has a significant influence on the water releases from major hydro reservoirs. Inland fisheries is not a thriving sector in the country. However, there is a recent trend to cultivate fish in small irrigation reservoirs in the dry zone. In the tourism sector, though water plays a major role, there is no mechanism to recognise the role in a quantitative manner.

2.2 Water Resource

Sri Lanka receives about 120 billion cubic meters of annual rainfall[6]–[8]. Accordingly, the volume of available water is approximately 43 Billion Cubic Metres (BCM). The Dry zone and wet zone of Sri Lanka covers approximately 4.85 and 1.8 million ha respectively. Using runoff ratios computed by Arumugum [1], the available streamflow for the entire dry zone is 21.4 billion cubic meters while in the wet zone the estimated streamflow is around 21.6 billion cubic meters [8].

Assuming 2017 mid-year population of 21.4 million [9], the annual average per capita surface water availability in Sri Lanka is 2009 cubic meters, or approximately 5000 litres per day. Though this appears as a significant number, there is a very wide spatial variability. According to PIP (2017-2025), about 12.04 billion cubic meters of surface water is extracted for irrigation and about 3.01 billion cubic meters for household water supply and industry uses. This represents around 35% commitment, which is substantial as much of the water is either inaccessible or lie away from where it is most needed.

Sri Lanka's prevailing water storage capability has been estimated at approximately 8 BCM in 2017[8] while the irrigation capacity has been estimated at 15 billion cubic meters with plans to increase this to 21.5 billion cubic meters by 2020 [7]. Estimated water quantity for 2014 had been 16 billion cubic meters with approximately 80% used for agriculture. The estimated water requirements for 2018 had been 20 billion cubic meters because of enhanced agricultural, irrigation and water supply requirements [7]. Economic and social progress, coupled with government plans to become self-sufficient in paddy production, would increase water for agriculture, drinking water, and industries which in turn would push the state to develop catchment storage capabilities, maintenance of existing storage, and rehabilitation of irrigation infrastructure for better water use efficiency. The main challenges with respect to water resources would be the spatial variability of water availability and the increasing pollution of freshwater bodies due to domestic and industrial waste [10], including salinity intrusions.

2.3 Water quality

Major causes of water pollution in Sri Lanka include, sewage, industrial waste, agricultural pollutants and physical pollutants. As a result of natural and mostly human activities, nutrients, pesticides, industrial effluent, faecal contaminants, other microorganisms, and waste sediments could contribute to the pollution pathways affecting surface and groundwater resources.

The estate plantation sector has a significant influence on the water resources, drinking water supply and sanitation outcomes in Sri Lanka. Sri Lankan rivers originating from the central highlands flow through a very a high concentration of tea plantations which use large quantities of agricultural pollutants. Much of the

drainage from agricultural land finds its way to island's major rivers and streams. Hence, production decisions in agriculture have a high potential to create excessive surface water pollution. When compared to rural and urban sectors, the estate sector of Sri Lanka is the largest community group consuming surface water for drinking purposes. Also, the estate sector has the largest percentage of population without proper toilet facilities.

A number of agencies such as the Central Environmental Authority (CEA), National Aquatic Resources Agency (NARA), NWSDB, MASL, National Building Research Organisation (NBRO) and some State universities, undertake water quality monitoring of surface waters for different purposes. However, there is a lack of reliable water quality data, a recognized water quality index, or a coordinated water quality monitoring programme in the country. In Sri Lanka, there is also a lack of accredited water quality measuring laboratories. There had been research pointing to the dangers of increased faecal coliforms in several catchments relating to inadequate toilet facilities and open defecation in some areas [11]. The same author recommends the appointment of a coordinating committee for action and developing national guidelines for a water quality index for monitoring the water bodies of Sri Lanka.

Groundwater quality has been reported as poor especially in the agricultural areas and in urban areas. Groundwater in agricultural areas has been affected by the excessive use of fertilizer. It has been estimated that about 40% of tube wells in the recent past had been abandoned due to contamination and about 18% of these wells have had pollutant concentrations greater than the World Health Organisation allowable limits for safe water [12].

2.4 Water Users

In the very early days, no significant conflicts prevailed among different water users. The major water user had been the Irrigation sector. Irrigation Department (ID) responsible for all water resources related work such as irrigation, flood protection, drainage & reclamation and coast conservation, was the major water resource planning and management agency till the beginning of the 1970 's.

Gradually new agencies were formed and water resources development function was devolved to Provincial Councils too for development of within the respective provincial authorities. Currently the Irrigation Department(ID), Mahaweli Authority of Sri Lanka (MASL) and Agrarian Development Department are the major national water agencies operating in the Irrigation sector. The Water Resources Board is responsible for Ground Water management. Hydropower reservoirs are operated by the Ceylon Electricity Board. Supply of domestic water and industrial water comes within the purview of the National Water Supply and Drainage Board(NWSDB), Municipal Councils, Pradeshiya Sabha and CBOs.

Main water uses in Sri Lanka are categorised as, water for basic needs such as household water supply, sewerage and sanitation, water for Food, Water for Health, Water for the Environment and Water for Industries [6]. Quoting data from the FAO aqua stat database[13], the draft “Overarching Agricultural Policy of Sri Lanka” [14] indicate that 87% of freshwater withdrawals are used for agricultural purposes and the balance represents industrial and municipal water withdrawals.

The Sri Lanka water development report[6] indicates that in the wet zone and dry zone, the domestic per capita water withdrawals are 35 and 26 litres per day respectively. The respective industrial water withdrawals indicated as 49 and 8 litres per day, point to a high density of industry use in the wet zone of Sri Lanka. The same report quotes the NWSDB, to indicate that average monthly household consumption in 2007 was 19 and 14 cubic meters per house connection for Colombo and other regions respectively. A study on Water Sector and Wastewater Sector carried out in 2015[15] reports that NWSDB annual production is equivalent to 25 litres per day per person in each household with pipe borne water (3.8 persons per household in 2016). Out of annual drinking water production, the industrial consumption had remained 1% over the years from 2014-2017[9]. A study reported in 2010[16], notes that urban share of population would rise to 45% by 2015, and it had remained between 14.6% and 17.3% between 2002 to 2016[9], [17]. Hence estimates of water requirements by user category can vary widely. Lack of reliable data is a key impediment to planning and priority setting.

2.5 Safe Water, Health and Sanitation

At present, the ‘safe’ drinking water coverage in the country is around 86 percent of the population while the population having pipe borne water supply facilities is around 46 percent. Base on published information pertaining to 2017, Currently, around 35.2 percent of the population has been connected to the national pipe borne water distribution network of the National Water Supply & Drainage Board (NWSDB) and 10.8 percent of the population is served pipe borne water facilities through Community Based Organisations (CBOs)[8]. Not all water sources are monitored for adequacy in terms of health and environmental criteria and the notion of ‘safe’ water is only a nominal guide.

According to the Central Bank statistics, in 2018 [9] all island percentage of ‘not safe’ water sources increased due to the poor performance mainly in the North Central and Sabaragamuwa provinces. It may be critical to capture the reason for the rather stagnant or declining progress towards better water services visible from data belonging to the two political regimes. The comparison of sector wise performance in 2002 and 2016 corresponding to access to drinking water reflects a deterioration of pipe borne water coverage in the estate sector.

The performance in the sanitation statistics in 2002 and 2016 shows that, there is a gain in the sector with increased percentages of toilet facilities with septic tanks

and decreased number of unimproved toilets and open defecation category. Considering the low lying, high density urban environments susceptible to floods, an emphasis must be made to significantly increase the percentage connected to reticulated sewer systems. The potential to inadvertently link septic systems with adjacent dug wells for drinking water is very high in urban and peri-urban areas where the allotments are becoming smaller due to supply and demand pressures. To avoid the emergence of crisis situations, proper standards for water and sanitation installations and capacity building of trades personnel, must be developed and appropriate codes of conduct for building industry must be developed.

The claims that by the first half of 2018, Sri Lanka has progressed to a status with access to safe drinking water covering 90.6% of its population showing an improvement from the 88.8% in 2016, thus needs to be viewed against these deficiencies in standards and variations in the quality of service. This also applies to the claims regarding access to pipe-borne water, which has been reported to have progressed to 50.5% in the first half of 2018, from 47.7% in 2016[18]. The effectiveness of these achievements are to be realised in the quality of life outcomes in time to come.

The state of the environment report of 2001 had revealed that only 19% of the population in Colombo Metropolitan Region (CMR) was served by piped sewers and 59% by onsite facilities. The total quantity of excreta disposed in this area is estimated at 726 metric tonnes/day, 59% of which is released into earth through septic tanks and pit latrines. Around 138 MT of sewage are released daily into waterways owing to grossly inadequate sewerage systems. As stated earlier, on-site systems such as pit latrines also contaminate groundwater [19].

The current water supply service delivery in Sri Lanka is at a satisfactory level when compared with the other countries in the region. However, there is an urgent need to support island wide improvements and improve standards of sanitation systems. Approximately 15% of the population (3 million people) have been identified as the unserved population [20], [21]. Though the comparison of piped water supply coverage in rural and estate sectors show the same order of magnitude, the surface water use in the two sectors differ drastically. The quality of drinking water sources in the central province from where most water courses originate, the percentage coverage has remained unchanged between 2012 and 2016. There are seven national planning targets(**Table 1**) expected to achieve successful service delivery in the water supply and sanitation sector by the year 2020[8].

Table 1: National Planning Targets for the Water Supply and Sanitation Sector

National Targets for the Water Supply and Sanitation Sector
Increase Safe Drinking Water Coverage up to 100% from the present level of 86%
Increase pipe borne water coverage up to 60% from 46%
Reduce NRW in Colombo City up to 20% from 47%
Reduce NRW Island wide up to 25% from 28%
Increase sanitation coverage up to 100% from 87% (exclusively for HHs)
Increase pipe sewerage facilities up to 7% from 2% of urban population
Improvement of water quality and water availability: Increase water availability during dry season by 50%

3 Water Charges, Levies, and Tariffs

3.1 Water (Resources) Sector

The legal basis for the obligation for any consumer or user of water to pay water rates though contained in some laws, is not comprehensive nor implemented with rigour. The procedures for assessment, collection and payment of such water charges may be found in the various legal enactments relating to different uses of water for domestic municipal, town, urban purposes, for irrigation purposes, for hydro-power production, for navigation, etc. Water Sector main service delivery subsectors are Irrigation, Water Supply & Sewerage and Hydropower Generation.

- Irrigation

For irrigation, the Irrigation Ordinance No. 32 of 1946, Section 34(2) has provisions to charge various amounts for water and land i.e. irrigation rate in respect of lands benefitted or to be benefitted under any scheme, special irrigation rates in respect of water derived by seepage, mechanical appliances or other special means. Under the Irrigation Ordinance, detailed rules are laid down for the assessment and collection of irrigation rates. There is no evidence of imposing these rates and charges in the post-independence era as successive governments gave high priority to paddy cultivation. Since Sri Lanka is predominantly an agricultural economy, it appears that imposing charges on farmers is treated as a politically sensitive issue. This limits the possibility of using rates and charges as a means of securing irrigation water and regulating and managing such use.

All multipurpose development projects of the government have included infrastructure for maximizing water for irrigation and farmers have been receiving free water. The government and the people receive various benefits from access to free water. Key attribute that needs consideration is that with the current policy the country has moved towards ensuring national food security with the production of 80%^[9] of its total annual rice requirement.

- Electricity

There is no tariff differentiation between electricity generated using water and other sources, Direct electricity charges are levied by the Ceylon Electricity Board and the Lanka Electricity Company Private Limited, under the provisions of the Sri Lanka Electricity Act No 17 of 1969. Appraisal of all major water resources development projects for irrigation and hydropower are based on the revenue generated from electricity and the savings to the country due to non-import of rice. However, these opportunity cost principles are not used in setting user tariffs for both electricity and water, although electricity charges are moving closer to full-cost recovery than that for water.

3.2 Water Supply and Sewerage Sector

Prior to enactment of the National Water Supply and Drainage Board Act No. 2 of 1974, which created the NWSDB, no direct water charge was imposed on domestic water consumers. Water supply operation and maintenance (O&M) costs were partially recovered through property taxes collected by local government authorities in terms of the provisions in the MC/UC Ordinances (e.g. Municipal Councils Ordinance No. 29 of 1947, Section 272 (28)).

- Domestic Water Tariff

In case of the water supply sub sector, the NWSDB in terms of the NWSDB Act No. 2 of 1974 is mandated to implement a system of water tariff with the approval of the subject Minister. The first water tariffs were imposed by NWSDB in the early 1980s when a programme of metering domestic water connections was started. The NWSDB is allowed to increase tariff periodically, in every three years as per agreement with the government, to maintain a healthy balance sheet. However, the last tariff increase was in 2012 (Gazette No 1776/13 – Tuesday, September 18, 2012). There is only one tariff for all the schemes operated by NWSDB and it is called national tariff. The national tariff is formulated to charge cost in incremental steps per progressive increase of tariff and subsidize poor households whose consumption falls within the first 10 cubic meters.

The urban schemes operated by NWSDB use the same national tariff across all regions. It allows for the cross subsidisation, and hence many water supply schemes do not generate adequate funds to recover the total operating cost. NWSDB has been able to progressively increase tariff until 2012 and was able to recover the total operation and maintenance cost and partial debt repayment[22].

Although there are a few other urban water supply schemes operated by Kandy and Nuwara-Eliya MCs, the tariffs systems are similar to the national tariff imposed by the NWSDB. This practice of non-full cost recovery may be socially equitable at the outset, it also encourages excessive use, inefficient technology choice and impart social costs. Directly it creates gaps in meeting O&M expenditure for water utilities, which needs to be met through public budgets and hampers the ability of the NWSDB to fund new investment in system improvements. Users in turn are exposed to poor service delivery, resulting in unmet demand for potential new customers.

For instance, the current water sales revenue for NWSDB is barely sufficient to cover O&M expenditure and debt service obligations for the NWSDB. The NWSDB is not generating surpluses for the rehabilitation of existing schemes. The worst impact is on sewerage schemes where only 17% of its O&M[23] expenses are recovered through existing tariffs. The cost of new investments and rehabilitation is being financed through either foreign assistance or Government sources. Donor funds rarely come as grants while loans increase the debt service obligations of

the already cash-constrained national treasury. It is therefore appropriate for the NWSDB to plan for generating surpluses to meet the cost of operations and minor rehabilitation with the adjustment of tariff to cover inflation, debt service and depreciation.

- Community Water Supply Tariff

In the rural sector, small community managed water supply facilities implement scheme specific tariff to cover O&M costs of water supply. These small RWS, with less than 100 household in some cases, are struggling to generate adequate funds even for essential maintenance works[24]. RWS main aim is to collect adequate funds for day to day operations, and the government, through the Department of National Community Water Supplies. Projects such as “Jala Abhimani programme in Ministry of CPWS&HE”, New Tap Programme, and Second Community Water Supply Project etc., often intervenes in rescuing some of the schemes managed by the community[25], [26]. Water tariffs in Sri Lanka are some of the lowest in the region. Given the growing gaps between supply and demand for water infrastructure rehabilitation and expansion of services, the lack of financial sustainability implied by these low tariffs further undermines the scale and sustainability of service delivery.

- Industry – Discharge

The National Environmental Act provides for the issuance of environmental protection license that are subject to discharge standards. These licenses are issued subject to generic license fees. Water sources are used as discharge points for industrial effluent. Load-based licensing is a market-based instrument to regulate effluent discharge. While load-based licensing establishes limited for pollutant loads being discharged by license holders it also links licence fees to pollutant load. The higher the load, the higher the license fee. Attempts at ‘load-based licensing’ has received attention in the past but not implemented.

4 Institutional Setting

4.1 Overview

Since independence Sri Lanka has maintained a democratic style of governance, though with substantial modification made within the structure from time to time. Throughout this period, the norm was that, it is the responsibility of the government to deliver essential services and civil administrative functions to its citizens. Presently, Sri Lanka has a system of governance with three democratic institutions operating at three levels viz. National, Provincial and Local governments.

Institutional and administrative complexities in Sri Lanka is in part due to the promotion of various devolution models and decentralization models by successive governments that captured the political superiority after the independence. Although there may be a claim that primary objective for the motivation to change had been because of the desire to unite communities for the national development effort, the ultimate result has promoted varying styles of devolution and decentralization models. The politically motivated changes that had taken place over time had placed layers of administrative legislation on the prevailing ones, often without the necessary adjustments to avoid overlap and duplication.

4.1.1 Levels of Government

The general political structure of government has three implementation layers of democratic institutions as National Parliament, nine Provincial Governments and a large number of Local Government entities. Hence, at the subnational level there are two levels of elected representations; the Provincial Council (Palath Sabha) and Local Government Authorities (Municipal Councils, Urban Councils and Pradeshiya Sabha).

The Thirteenth Amendment to the Constitution of 1987[27] led to the most recent important change to the framework of government in Sri Lanka. The Provincial Councils Act No. 42 of 1987[28] established nine Provincial Councils covering entire Sri Lanka and provided for sharing of powers, functions and finance between the center and the regions. The Ninth Schedule to the Thirteenth Amendment sets out three lists, Devolved List (functions devolved and carried out by the Provincial Councils), Reserved List (non-devolved) functions to be carried out by the central Government) and the Concurrent List (which defines matters upon which both Parliament and Provincial Councils have jurisdiction). Although intended to clarify which functions are and are not to be devolved, due to a variety of reasons ranging from lack of political will of the central government, to insufficient capacity of provincial and local governments, still there are ambiguities regarding the operation of certain functions. It is important to note that all national, provincial and local authorities and agencies remain financially

accountable to the national government and the Parliament. All public entities corresponding to all levels are subject to supervision of the Auditor[28]–[30].

- Top Level

While the President remains the Chief Executive, executive powers are devolved through a Cabinet of Ministries, for the purpose of financial and administrative control. A set of Project or State Ministers, who report through the Cabinet Ministers, or directly to the President oversees the execution of service delivery in certain areas. Departments, statutory boards and public corporations are entities which assist the service delivery tasks of those ministries. In Sri Lanka, the ministries are not classified according to economic sectors or social efficiency grounds. The Head of State, The President, assisted by the Prime Minister determines the tasks to be executed by each ministry. Historical evidence indicates that as a practice, successive Sri Lankan governments had regularly changed the names of ministries and the number of supporting institutions during their terms in office.

- Second Level

The second level of government is the provincial councils established at each of the nine provinces in the country. As detailed earlier, this is empowered by the 13th Amendment to the Constitution [28]–[30]. A Governor is appointed by the executive president to administer each province. The Governor appoints five provincial ministers from the elected provincial council members to carry out various service delivery tasks, the Governor designates one out of these five ministers as the Chief Minister. The Chief Minister is the political head of the province and is also the Chief Executive. The five provincial ministers are accountable to the provincial council, which receives bulk of financial resources from the relevant line ministries of the National Government. A chief secretary is appointed to each provincial council by the executive president with the concurrence of the chief minister. Organisation of various officer levels within the provincial public service closely resembles that found at National Level.

- Third Level

The third level of government is the local government. Local governments consist of three kinds of administrations classified according to the level of urban development. These three types consist of the Municipal councils and Urban councils in the urbanized regions, and the Pradeshiya Sabha in the regions with rural character.

4.1.2 Administrative Structure

Sri Lanka' has an administrative structure which geographically divide the entire country to 9 provinces, 25 districts, 335 Divisional Secretary Divisions (DSD), and 14,022 Grama Niladhari Divisions (GND) [31], [32]. Each of these institutions, except GNDs are headed by officers belonging to the Sri Lanka Administrative Service (SLAS); Provinces by the Chief Secretary, Districts by District Secretary; and the Divisions by Divisional Secretary. These are officials reporting to the Central Government under Ministry of Public Administration and Local Government. The Grama Niladhari Divisions served by Grama Niladhari and reported to a Divisional Secretary, are the lowest level of government administration and public liaison.

4.1.3 Multiplicity of Governance

Sri Lanka has multiple systems of government segregated vertically and horizontally. The most pronounced is the central government administration by the parliament i.e. the cabinet of ministers and assigned ministries providing subject based functions at a national level. The Provincial and Local Government bodies govern through provincial ministries and local departments providing devolved subject based functions at provincial and local level. The central government's decentralised administration, at the District, Divisional and Grama Niladhari offices provides administrative and social infrastructure development functions at the District, Divisional and Grama Niladhari Division Levels.

Given the multiplicity of the governance system the coordination mechanism established through the Executive President, National Parliament and District Coordinating Committee (DCC) can be convoluted and complex. The DCC is set up to administer service delivery efforts of the national government. These committees link the devolved and non-devolved functions and develop and maintain the connection between the local governments and central agencies. The DCC membership comprises all members of national parliament representing the designated District, provincial council members, provincial secretaries, the functional heads of line ministries in the district, and the district secretary.

4.2 National Government and Institutional Setup for Service Delivery

4.2.1 National Government Setting and Features

As described earlier, the present framework of the Government of Sri Lanka, constitutes three layers of democratic institutions named as,. National, Provincial and Local governments.

The “National Government” (in some instances referred to as the “Central Government”) is headed by an Executive President, elected through majority vote and supported by a Prime Minister and a Cabinet of Ministers selected from the elected representatives of the National Parliament. In Sri Lanka, national level service delivery functions are carried out along a fairly conventional channel of command through a series of ministries.

There is a distinctly visible inconsistency in the composition of each ministry and this depends on the politicians, their strength and the political inclination. Very often, the act of mixing and clustering of ministerial entities which is not transparent to the general public, and this leads to a single development sector getting spread over a number of ministries and then undergoing supervision by a number of ministers. Hence there are negative impacts due to duplication of functional responsibilities and because of human resource overloading.

The institutional structure of central government follows a traditional hierarchical framework established under colonial rule, particularly the British, with some minor changes made in response to prevailed socio-economic and political needs. This framework is common to all ministries, with a minister who is a democratically elected political representative, at the top. The minister of a ministry who is generally called the subject minister is expected to deal with policy matters supported by a Secretary to the ministry. A set of Deputy and State Ministers, who report through the Cabinet Ministers, or directly to the President, overseas the execution of service delivery in certain portfolios. Departments, statutory boards and public corporations with specific statutory functions assist the service delivery tasks of those ministries [33].

The secretary to a ministry is usually a senior member belonging to either the Sri Lanka Administrative Service, Engineering Service, Planning Service or Scientific Service. In the absence of a rule for the appointment of a ministry secretary, there are many exceptions that can be looked at from a positive or negative point of view. This appointment is made by the Executive President. The secretary of a particular ministry is the chief executive and the chief accounting officer responsible for all institutions under that ministry. A secretary’s tasks are assisted by a group of additional secretaries and assistant secretaries sharing responsibilities, heads of departments, statutory bodies, corporations and other

public entities under each ministry. Some of these institutions branch off to sub-national level for easy provision of services to the community.

In the National Government setting, in addition to the above mentioned conventional ministerial institutional setup, there is a parallel institutional setup to represent and execute central government's service delivery wishes at district and divisional level. These service delivery administrative tasks are carried out by the District Secretaries at district level and the Divisional Secretaries at divisional level. District and Divisional Secretaries are appointed by the Central Government's Ministry which oversees the Public Administration and Home Affairs portfolio. The District Secretaries deal with the non-devolved functions at a district level. The Divisional Secretaries manage both non-devolved functions sanctioned by the district authority of the national government, and as the district representative of Provincial Councils to carry out the devolved functions[34].

4.2.2 Provincial Government Institutions and Features

The Thirteenth Amendment to the Constitution of 1987[27] led to the most recent important change to the framework of government in Sri Lanka. The Provincial Councils Act No. 42 of 1987[28] established nine Provincial Councils covering entire Sri Lanka and provided for sharing of powers, functions and finance between the center and the regions. The Ninth Schedule to the Thirteenth Amendment sets out three lists, Devolved List (functions devolved and carried out by the Provincial Councils), Reserved List (non-devolved functions to be carried out by the central Government) and the Concurrent List (which defines matters upon which Parliament may make laws in consultation with all Provincial Councils). These three lists were extracted from the schedule and are presented in the Annex 4.

Although the lists intended to clarify which functions are devolved and are not to be devolved, due to a variety of reasons ranging from the lack of political will of central government to the capacity constraints of provincial and local governments. As at present, there are ambiguities regarding the operation of certain functions. It is important to note that all national, provincial and local authorities and agencies remain financially accountable to the national government and the Parliament. All public entities corresponding to all levels are subject to supervision of the Auditor General of the National Government[28]–[30].

Provincial councils are democratic institutions elected for 5-year terms. The leader of the political party that has the majority in the council serves as the province's Chief Minister. The Chief Minister is the political head of the province and thus its Chief Executive. Chief Minister is supported by not more than five provincial ministers and are answerable to the provincial council. The provincial councils have full statute-making powers with respect to the functions of the Provincial

Council List[35]. In each of the nine provinces a Governor [36] is appointed by the President. He fulfils two primary roles: (1) representative of the President and (2) head of the provincial executive. A third role, that of constitutional and legislative guardian, is often stressed by constitutional writers.

Constitution of the democratic socialist republic of Sri Lanka limits the number of ministries for each provincial council to a maximum of five[27]. Five provincial ministers are appointed by the Governor from among the provincial council members, and one is designated as Chief Minister who is the Chief Executive. The five provincial ministers are responsible to the provincial council[36]. Each provincial council has a Chief Secretary appointed by the President with the concurrence of the Chief Minister, The Chief Secretary is the chief Accounting Officer of the provincial council and the head of the provincial secretariat. Provincial secretariat houses the provincial service delivery institutions and departments under provincial ministries. The organization of the various officer levels within the provincial public service closely resembles the organizational structure at national level.

4.2.3 Local Government, Institutions and Features

Service delivery at the third and last level of government is through Local Governments. They constitute three types of democratic institutions classified according to the population density and the level of physical development in their constituencies. These three types are the Municipal Councils, Urban councils and Pradeshiya Sabhas. According to a recent census (2017), there are 23 Municipal Councils, 41 Urban Councils and 271 Pradeshiya Sabhas in the country[37].

Municipal councils for the densely populated urban agglomerations are headed by a Mayor. Urban Councils headed by a Chairman are for relatively small cities. Pradeshiya Sabhas too headed by a Chairman, are for sparsely populated rural areas. The mayors and chairmen are selected from the elected people's representatives to serve a stipulated time period.

The institutional setup of Municipalities is slightly different from other two types of local authorities due to their higher level and large size of service delivery functions. The administrative head of the municipality is the Municipal Commissioner who is a public servant and is responsible for all service delivery activities carried out by its departments.

The administrative and service delivery functions of Urban councils or Pradeshiya Sabha are handled by a Secretary who is a public servant. In Municipalities, Urban Councils and Pradeshiya Sabhas there are departments to perform functions such as administration, accounts, public health, capital and maintenance works. The institutional arrangement of Municipalities, Urban Councils and Pradeshiya Sabhas have a close resemblance to each other. In the

case of larger municipalities, the works department is normally split in to several departments to distribute the volume of work associated with service delivery activities such as, maintenance, solid waste management, street lighting etc.

4.2.4 Coordination between different Levels of Government

To ensure successful execution of service delivery activities by the three levels of governments, there are two coordinating committees. Their purpose is to i) secure consistency in the provision of public services, ii) provide a link between devolved and non-devolved functions, and to iii) link agencies responsible for the administration of devolved and non-devolved service delivery functions.

The two formal committees setup by the state for the purpose of coordination[38] are, the District Coordination Committee (DCC) at District level and the Divisional Coordination Committee (Div.CC) at Divisional Secretariat level. Both political leadership and all regional level officers are represented at DCC where any district level issues allowed to discuss. The composition, conduct and the responsibilities of each committee is clearly spelled out in the Circular-4/2019 dated 13.02.2019 of the Ministry of Internal and Home Affairs, Provincial Councils and Local Government (Annex 5)

4.2.5 Political Representatives and Service Delivery

In Sri Lanka the political representatives are provided with decentralised budgets for service delivery[39]–[42]. Though there is no legislative evidence on the internet, activities performed with these funding are generally classified as service delivery actions for crisis management. Political representatives also provide the feedback to the government through the parliamentary and provincial councils. It is noteworthy that other than a subject minister no political representative is formally in the chain of command for service delivery.

4.2.6 Administration Authority for Water Related Functions

The administration of water sector service delivery has no difference to the general setting described in the earlier sections. The water sector ministries and institutions follow the same general channels but with water specific rules, regulations and guidelines.

At national level, various government entities existing or appointed from time to time such as National Planning Department, Committee of Development Secretaries and Inter-Ministerial Coordinating Committees etc., perform the coordination function.

In the 1990's under the Ministry of Irrigation, a national level Central Coordinating Committee on Irrigation Management(CCIM) representing major water agencies functioned to resolve issues related to water allocation.

The next level of coordinating bodies at regional level are the Provincial Coordinating Committees (PCC) and District Coordinating Committees (DCC) formed by the participation of political leadership and regional officers from all institutions.

District level agricultural and water issue activities are coordinated by the District Agricultural Committee (DAC) which have the representation of Farmer organisations and related state agencies. These committees at each district were formed to resolve problems associated with irrigation water issues, agricultural practices and services. However due to increasing demand for water, the subject of water sharing among different users has become an ongoing discussion.

The administration authorities for water related functions and their lines of command starting from the executive president and ending at the service recipients who is the community are broadly divided in to four sections representing the National, Provincial, District and Divisional setting (Annex 8). Horizontally from left to right the system cuts across four channels representing the formal administrative setup; the service delivery channel through subject ministries, the local governments and lastly the channel of the parliamentarians. The channels representing the formal administrative setup, the subject ministry setup and the local government setup are the lines of authority for the implementation of service delivery activities. The political representative channel which is the crisis management channel functions both ways by providing *ad hoc* service delivery support and also opening a feedback channel upto the governing hierarchy.

4.2.7 Water Sector Service Delivery Institutions

The water sector institutions are almost wholly owned and managed by either national level or sub national level government entities. The principal organizations and committees active in the sector are concisely described in the report titled, Sri Lanka's Water Supply and Sanitation Sector: Achievements and a Way Forward[21]. The water sector institutional setting has been briefed in many other publications. Supplementary document on water sector for the National Climate Change Adaptation Strategy for Sri Lanka[43], that had been prepared with assistance from ADB provides a summary which is most likely the situation in 2011. This document points to the existence of 6 key ministries, 6 key agencies and 14 other agencies/groups with impact. A diagram of roles and responsibilities of the water sector institutions reflecting the connection between ministries, respective boards and authorities placed as implementing agencies, and local government authorities is in a water sector assessment of Sri Lanka published in 2014[7].

The administrative and financial authority and feedback related to water sector service delivery points to a prevailing horizontal, vertical and institutional

functionality incoherence. The cross sectoral and geographical complexities mixed with the multitude of agencies, and a visibly weak feedback-loop shows the need to carefully evaluate the water sector service delivery chain for effective resource utilisation.

Institutional and administrative complexities in Sri Lanka is in part due to the promotion of various devolution models and decentralisation models by successive governments that captured the political superiority after the independence.

Although there may be a claim that primary objective for the motivation to change had been because of the desire to unite communities for the national development effort, the ultimate result has promoted varying styles of devolution and decentralization models. The politically motivated changes that had taken place over time had placed layers of administrative legislation on the prevailing ones, often without the necessary adjustments to avoid overlap and duplication.

In the water sector service delivery, there are 28 agencies with technical capacity for service delivery and 04 types of service facilitators. These 32 entities belong to 17 ministries out of the total of 34 ministries (including three non-cabinet ministries) [44] [45] as of December 2018. The list of these entities is given in Annex 6. Among those 17 ministries, 13 ministries were related to water resource sector, 17 ministries were in water supply subsector and 14 ministries were in the sanitation subsector (some of those ministries were involved in more than one subsector). This list is given in Annex 7. The functions carried out by some of the agencies contributing to water sector service delivery are briefly presented in the Table 2.

Table 2: Objectives and Functions of Water Sector Service Delivery Agencies

Water Sector Service Delivery Agency	Objectives/Functions
Meteorology Department	Collection and dissemination of weather and climatic data and information
Irrigation Department (ID)	Provision of irrigation infrastructure, flood control systems and salt water exclusion schemes. Promoting participatory management of irrigation schemes of major and medium irrigation schemes except schemes under purview of IMD. River Basin Planning, Riverine management
National Water Supply and Drainage Board(NWSDB)	Provision of piped water and safe drinking water schemes using surface and groundwater resources, development, and management of sewerage systems
Ceylon Electricity Board(CEB)	Provision of hydropower and thermal power for electricity

Water Sector Service Delivery Agency	Objectives/Functions
Water Resources Board(WRB)	Conducting scientific investigations on groundwater resources and commercial drilling of tube wells; Regulate ground water exploration in terms of the gazette notification No. 2010/23 – Thursday March 16, 2017
Mahaweli Authority of Sri Lanka (MASL)	Water resources development in the Mahaweli River basin and transfer to adjacent basins construction and management of irrigation and hydropower infrastructure and settlements, promoting irrigated agriculture, upper watershed management water allocation between competing users
Irrigation Management Division (IMD) of the Ministry of Irrigation	Promoting participatory management of irrigation schemes of selected number (37) of major irrigation settlement schemes; institutional support to setup farmer companies and pilot testing
Natural Resources Management Centre of the Department of Agriculture	Promoting agricultural production through conservation measures for soil erosion and watershed management
Agrarian Development Department	Provision of agricultural inputs and enforcement of agrarian laws on farmer organizations, and administration of irrigation management procedures. Water management of small irrigation systems
National Planning Department	Planning of projects and programs at national level and advise on resource allocations among the projects; monitor projects and programme implementation. Development adviser and facilitator
Central Environmental Authority	Implementation of environmental laws relating to environmental impact assessment regulations while conducting environmental awareness programs and enforcement of the provisions in the National Environmental Act of 1983
National Aquatic Resources Agency	Conducting research and development work in aquatic resources, such as inland and marine fish resources, limnological studies in water bodies, and water quality measurements
Natural Resources Energy & Science Authority	Administration of research grants for science and energy, publication and dissemination of research results carried out by independent researchers
National Building Research Organization	Measuring water quality for state agencies
Industrial Technology Institute	Conducts research and Development and provide internationally competitive technical to accelerate industrial has one of the accredited laboratories for water and waste water quality testing
Health Department Ministry of Health	Regulate of quality of water supply and sanitation programs, including prevention of water-borne diseases; DG health Services with derive powers from the Food Act to control water quality and regulate bottle water manufacturing
Coast Conservation Department	Administers the Coast Conservation Act covering environmental impact assessment regulations in coastal development projects and implementation of the master plan on coastal zone management

Water Sector Service Delivery Agency	Objectives/Functions
Sri Lanka Land Reclamation and Development	Corporation development of low-lying marshlands, drainage improvement projects, and canal maintenance; Recently in 2015 the mandate of the SLRRDC expanded to include wetland management
Land Commissioner's Department	Administration of land ordinances, where most of the water-related legislation has been incorporated
Department of National Community Water Supply	The Department of National Community Water was established with effect from 19.09.2014 by the Gazette Notification dated 22.09.2014. The objective of the establishment of this department is to provide drinking water and sanitation facilities for the people, especially including the rural people. This department mainly focus its attention for the areas which are not been covered by the National Water Supply and Drainage Board

5 Governance, Policy and Legislation Influencing Water Sector in Sri Lanka

5.1 General

A comprehensive national water policy is a key factor for satisfactory service delivery in the water sector. In Sri Lanka it is visible that there is very poor coordination between the agencies dealing with water or dealing with activities affecting water. In a country paper of Sri Lanka, it is stated that “Water resources policies although clear in terms of subsectors, are not consistent in relation to national development policies, while some of the sub sectoral policies do not follow a national water policy. Hence there are many instances of conflict between sectors and between sub sectors. These may have to be resolved through development of a coherent national level policy statement for the water sector supported by a modified/revised legal framework that would take into consideration the enforceability of the agency capacities and thorough involvement of the public”[46].

However, Sri Lanka being a country with an agricultural background has a long history that is closely associated with water and irrigation. Water policies of Sri Lanka since ancient times, can be broadly divided in to four distinct periods. They are, 1) Ancient (pre-colonial) Era, 2) Colonial Era, 3) Immediate Post-independence Period; and 4) Period of Modern Sri Lanka.

5.2 Water Governance in the Past

5.2.1 Ancient Sri Lanka

There is evidence that in ancient Sri Lanka, kings and their subjects had considered irrigation and water related assets with a sacred value and avoided destruction of such infrastructure even during their internal political conflicts. The “Rajakariya” system that had been the official duties in the era of the kings, defined the responsibility of beneficiaries towards maintenance of irrigation infrastructure. “Rajakariya” was a compulsory contribution the farming community had to make in return of the benefits they reaped from the state-owned lands and the state sponsored irrigation systems. There is evidence of a system of legislative enactments, executive powers vested with the King (responsibilities) and monitoring system at village and regional levels, operationalized with the community and the monasteries”[2]. Apart from the reservoirs built for multiple purposes such as irrigation, community use and inland fishery, there is evidence about the existence of reservoirs like “Baswakkulama (which was) supposed to be an urban water supply reservoir to fulfil the requirements of the then capital city Anuradhapura”[2].

5.2.2 Colonial Era

The colonial interference with the country starts with Dutch followed by Portuguese and British and came to an end with the country's independence in 1948. The Dutch intervention with water was mainly confined to development of a system of canals mainly for the transportation of commodities of peripheral areas to the Colombo harbour for export. The historical evidence does not point to a significant intervention by the Portuguese to develop water infrastructure. Instead, they had made use of the available facilities to their advantage.

The British who ruled Sri Lanka for a much longer period than their predecessors, had varying degrees of interventions over water resources depending on a variety of circumstances. During the initial period of their rule, the British have not shown much interest in water or water infrastructure because their primary focus was on the cash crops such as coffee, tea, rubber, coconut and spices. Since these crops mainly depend on rain water, the water infrastructure during this era had been for , drinking and domestic water supply.

However, during the latter part of the British rule, there had been social uprising associated with negligence of irrigation infrastructure because these facilities were the backbone of the livelihood of a majority. This prompted the rulers to focus a renewed development policy towards irrigation infrastructure. In this era, the British have made several key legislations and institutions for the sustainability of irrigation infrastructure. The Irrigation Ordinance enacted in 1856 was later replaced by a much-improved version of the Irrigation Ordinance of 1961. This ordinance is cited as “an ordinance for improvement and extension of paddy cultivation in the land” in the Book on Irrigation Development in Sri Lanka[2]. The other major step of the British, taken for the strengthening of irrigation sector is the establishment of Irrigation Department in 1900. The legislation which subsequently underwent minor amendments is still the main governance tool for water in the irrigation sector. The irrigation department with similar changes remains as the major governing body in the irrigation sector. This era also marked the enactment of the Flood Protection Ordinance No. 4 of 1924, the Soil Conservation Act No. 25 of 1951 & subsequent amendments, and the Fauna and Flora Protection Ordinance No. 2 of 1937[47].

5.2.3 The immediate Post-Independence Period

This post-independence period (1948 –1980) is between Sri Lanka's independence and the wake of modern Sri Lanka. At the time of independence, the country was heavily dependent on the imports of its essential food items, particularly the staple food rice. This situation was in place because the priority of rulers was on the cash crop plantations. Hence the paddy cultivation and its associated irrigation networks were neglected. This intern adversely affected the other water resources development works.

In this backdrop, the policy direction of the new national governments after the independence was to reduce food imports, particularly rice. Since rice heavily depended on water, the water sector infrastructure development was given a high priority in the governments development policy. The state policy on water focused on new water infrastructure construction and rehabilitation of ancient networks[2].

With the economic development, the hydro power sector emerged as the other major user of the water resources. The hydropower sector became a powerful user who governed water allocation because hydro-electricity was an essential commodity. Even in this period apart from the irrigation ordinance which was the major legislation that reflected the water policy of the state.

Water Resources Board Act No.29 of 1964 and subsequent Act No. 42 of 1999, Mahaweli Authority of Sri Lanka Act No. 23 of 1979 and subsequent amendments, Fauna and Flora Protection Act No. 49 of 1993 as amended by Act No. 53 of 2000, and the National Water Supply and Drainage Board Act No. 2 of 1974 and subsequent amendments were the other major legislation were the other legislation that catered for sub sectors related to the water sector. An explicit policy document for water or a related sector was a major absence during this period.

5.3 Water Policies of Modern Sri Lanka (1980 –to date)

5.3.1 Consensus and Failures

During this period, water became a crucial factor due to its competing demand between various uses such as, agriculture, power generation, human consumption and environmental protection. The economic importance and political sensitivity of each water use sector, spatial variability of the resource, undesirable climate change impacts and human interventions causing water pollution, created a situation where trade-off between water uses became difficult. The country paper on Sri Lanka[46] points to five major constraints which were critical for sustainable utilisation of water as a resource.

They were i) inadequate measures for watershed management, ii) Degradation of water quality due to industrial pollution and excessive use of fertiliser and agro chemicals, iii) lack of management measures for groundwater extraction, iv) poor operation and maintenance of water infrastructure, and v) lack of clear policy directions and the weakness in the coordination mechanisms for the management of water resources for multiple users. During the early 1970s, there was a common consensus among the stakeholders regarding the need of a comprehensive water policy for the country. During this period there had been a few standing committees for policy formulation and review. They have been reported [46] as, the Central Coordinating Committee on Irrigation Management, the National Water

Supply Sector Coordinating Committee, the National Environmental Steering Committee, the National Development Council, the Cabinet Sub Committee on Economic Development, and the Committee of Secretaries. There have been several attempts since 1970s to formulate a comprehensive set of policies encompassing all aspects such as ownership, uses, supply and protection with primary focus on rational allocation while ensuring its future sustainability. Many of these attempts, despite international support and persuasion has not been able to arrive at expected outcomes[48].

The apparent reasons for these failures are complex in nature, some of which are explicit while some are hidden and not easy to comprehend.

Work of Samad and others describes many failed attempts to establish a water policy for Sri Lanka[49]. The reason behind many failures are mentioned as political resistance to the proposed water policies. The failed policy attempt in 2002 was a regime change from a liberal to a socialist political setting. A water resources management master plan had to be discarded in 2001 due to an adverse campaign by the opposition party in the parliament. Failure of the water resources management project of ADB in 2004, has been attributed to poor awareness programs and limitations in the policy formulation process. The resistance of the institutional and inter institutional bureaucracy has been mentioned as another reason for the failure to get government approval for an overarching water policy. There are many such evaluations on the process of water policy development. A detailed listing of policies and legislation until the point of Rain Water Harvesting Policy is given in the sector vulnerability profile-water prepared for the National Climate Change Adaptation Strategy for Sri Lanka[47]. A detailed outlook in relation to the international situation, current water related policies, and various policy options for water and watershed management is given in the Sri Lanka Water Development Report of 2010[6]. This work while pointing to the policy options for water research, irrigation management and pricing policies, drinking water supply, water demand management, water loss due to leakages, water pricing, watershed management, and wastewater discharge fees also mention that future policies on water resource planning must also be guided by the National Physical Planning policy. A compilation of various policies and directives in circulation in the water supply & sanitation Sector prepared for this political economy assessment is in **Table 3**. As for water rights, there is no formal or adequate water allocation system in the country. At the local level, water allocation is carried out by the public water service agencies like ID, NWS&DB, and in rural areas, through a system of traditional allocation procedures and rights.[50]

5.3.2 Current Policy Formulation Attempts

The following are the most recent and relevant policy formulations by the state organisation related to water sector service delivery.

- Policy on Water Resources

There are three recent policy attempts that address the water sector of Sri Lanka. The first and the most important one for the water sector is the draft “National Policy, Strategies and Institutional Framework for Water Resource Development, Conservation and Management”[51] initiated in March 2019, by the Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries and Aquatic Resources Development and presently undergoing public scrutiny is the most recent water policy document.

This activity has attempted to cover many areas such as, Water rights and responsibility, role of state, water resource planning, development conservation and management, water allocation by needs and priorities, sharing the conservation and management cost of water resources infrastructure, data and information management, research and development, training and capacity building and institutional arrangements.

One important feature that has been addressed is the sharing of conservation and management costs which means that, the conservation, operation and management costs of infrastructure developed by the state shall be shared by the state and proportionately by the bulk users (irrigation, urban water supply, inland fishing, hydropower etc). Methodology of sharing the cost will be decided by the resource allocating authority”.

- Policy on Drinking Water

The second is the already approved National Drinking Water Policy of the Ministry of City Planning and Water Supply, which is intended to provide a framework for the water supply sector to provide safe water supply to the people of Sri Lanka. This was approved by the Cabinet of Ministers in the year 2010[52]. This act which considers water for drinking purposes, is primarily to improve national service coverage in safe water through mobilization of efforts and resources of all stakeholders of the sector.

- Policy on Agricultural Water

The third is the Draft Overarching Agricultural Policy for Sri Lanka dated August 2019, and prepared by the Ministry of Agriculture, Rural Economic Affairs, Irrigation, and Fisheries, and Aquatic Resources Development and, Ministry of National Policies, Economic Affairs, Resettlement and Rehabilitation, Northern Province Development and Youth Affairs[53]. In this draft which is primarily on agriculture, there is a section which addresses agricultural water management.

- Policy on Other water uses

Up to date there are no explicit water policy on the water uses such as industrial, recreational, environmental or hydro-power.

5.3.3 Policy Formulation Requirements

Water policy is critical for the development of water as a resource and utilisation of same for economic development and environmental sustenance. However, it could be noted that there is no documentation to reflect the adequacy of policy drafting process. Noting the historical failures, the importance to follow a structured logical sequence which is adequate and transparent can be highlighted. Performing a rationalisation with economic justifications that consider sustainability would be a key factor. Since there are many literatures that could be used as guidance material to determine the contents and the depth of detailing, it may be prudent to perform a comparative evaluation including an assessment of merits and demerits associated with such inclusions. Summarising the comprehensiveness of water and related policy documentation, the Sri Lanka Water Development Report of 2010[6] mentions that, i) both water related policies and legislation are fragmented and not holistic, ii) there is a need for the policy efforts to accompany appropriate tools for implementation, and iii) the present laws and guidelines on water pollution policy must be improved from the present unsatisfactory to moderately unsatisfactory status.

Many parts of the world have water policies in place with different levels of details about with the same core principles. They are the adequate consideration of water management across all sectors, consideration of all water users, ownership of water management resources and assets[54]. Some of the emerging problems in water policy today stem from insufficient recognition of and adaption to the relationships between the institutional setting, technology growth, and the hydrology of water systems[55].

Sound water policies need to carefully evaluate whether the key principles are embedded in to such documentation. Regarding water policy principles the DFID Occasional Paper mention the need to consider water as a basic need, holistic resource, a scarce commodity, an environmental asset, which involves many stakeholders, participation, delegation, subsidiarity and financial self-sufficiency for effective governance[56]. Discussing the reforming of water resources policy, the Paper 52 of Food and Agriculture Organisation(FAO) provides a comprehensive guidance on the contents that must be included in the water resources policy[57]. The major principles for a water policy consideration discussed in this FAO document are, the economically efficient use of water, criteria efficacy, distributional impact, environmental impact, fiscal implications, acceptability, sustainability and feasibility. Administrative feasibility, political

and public acceptability are some of the key features that are also discussed as considerations for a strong water policy.

Table 3: List of various policies and directives in the water supply & sanitation Sector

Policy /Directives	Formulated by	Process followed	Status and Impact
National Water Resources Policy	Water Resources Council/ Water Resources Secretariat	Inclusive approach to engage all stakeholders in subsectors and water user groups	Approved in 2000/ Priority for drinking water over other uses. All water resources development to include all aspects of water
National Policy for Rural Water Supply & Sanitation Sector	Ministry of Urban Development, Construction & Public Utilities	Drafted by Rural Water Supply & Sanitation Division (RWSSD)	Approved in 2001 Adopted by Community WS&S project (CWSSP)
National Policy for Rural Sanitation	Ministry of Urban Development & Water Supply	Drafted by RWSSD of Ministry of UD&WS	Approved 2006 Adopted by CWSSP
National Drinking Water Policy www.nwsdb.lk	Ministry of Water Supply & Drainage	Invited Public views Consulted interagency working group	Approved by the Cabinet in 2010
National Sanitation Policy www.rscsacosan.lk	Ministry of City Planning and Water Supply	Invited public views and consulted interagency working group and Water Sanitation Coordination Forum members	Approved in August 2017
Directive on establishing National Water Quality Surveillance Institutional Framework (2009) www.health.gov.lk	Ministry of Health and then My of Water Supply & Drainage	Joint Cabinet paper submitted by water and health ministries	Approved in 2009 to Established a regulatory institutional framework and introduced. All water service delivery agencies to adopt Water Safety Plans National Water Quality Steering Committee established and regular meetings were held chaired by the Director General of Health services

Policy /Directives	Formulated by	Process followed	Status and Impact
Directive for locating of industries in Kelani River Basin www.cea.lk	Ministry of Water Supply & Drainage, NWSDB and CEA	High Level Technical Committee High & Medium Polluting Industries Siting Committee: Chaired by CEA	Approved in 2010 Protection of drinking water sources By a Cabinet Memorandum Guidelines have been prepared for the siting of Industries in the vicinity of Kelani River.
Circular on Water Quality Surveillance www.health.gov.lk	Ministry of Health & Nutrition	Expert working group of water and health sectors conducted regular meetings and extended to District Level	Implemented a national and district level institutional arrangement for water quality monitoring
Circular on Ecological Sanitation (Health circulars Ministry of Health Sri Lanka www.health.gov.lk	Ministry of Health & Nutrition	Expert group in water and health sectors collaborated to promote eco sanitation systems	Adoption eco-san options in the sanitation sector during Tsunami recovery period and beyond
National Water Sanitation Coordination Meeting	The emergency water and sanitation coordination established by UNICEF during Tsunami recovery period from 2005-2008.	Mainstreamed by transferring the chairman ship to the secretary then Ministry of Water Supply & Drainage in 2007	Formalized with the approval of the cabinet in 2019 based on the cabinet paper submitted by the Ministry of City Planning Water Supply and Higher Education

5.4 Regional and International Water Governance

5.4.1 Overview

According to the COMSET sub-commission on ‘the ethics of fresh water’, appointed by UNESCO, “Water, as a common symbol for humanity, valued and respected in all religions and cultures, has also become a symbol for social equity. Hence ethical principles in usage, sharing and conservation seems to be consistent throughout the world. However, when a crisis occurs in water sector, apart from the common ethical principles applicable in all geographies there will be different strategies and methods which will be appropriate for different situations”[58].

It is observed in many countries, water resources development for irrigation has been the first strategy in development activities. As a result, the farming community became the first water user. However, water sharing conflicts commenced to surface because of the change of development priorities from food security to industrial and services. Hence apart from water for irrigation, water for aquaculture, health and sanitation, cities, industries, hydropower and ecology had to be considered. In this transition, it is very important to avoid negative consequences on existing users in reallocation to new users. Hence, systematic assessments, sound forecasting is essential. Since 1990s, there had been quite a number of efforts by international financing institutions and NGO towards local, small-scale collective water provisioning for poor communities.

In water allocation and management there had been different approaches adopted by different countries based on its traditions, practices and ethics. In addition, role of women in water, water history, challenges of technology, standards of professionalism, and issues and traditions related to alternative sources too play a vital role.

Over the years, either food security or water for food had been the priority. The 1943 food conference had agreed on the concept of food security as a human right[59]. The 1948 Universal Declaration of Human Rights[60] stated the right to food. The 1966 International Covenant on Economic, Social and Cultural Rights[61] declares the importance of production, conservation and distribution of food by making full use of technical and scientific knowledge. The World Food Summit in 1974 had shown the importance by vowing to eradicate world hunger in a decade by considering water for food as a priority[62].

When United Nations declared 1980-1990 period as the “International Drinking Water Supply and Sanitation Decade” [63] where it was acknowledged that, “Many countries in the world have already reached, or are rapidly approaching the potential of maximum economic explorations of conventional water resources and ambitious and complex programs are being carried out to prevent water resources (quantity as well as quality) from becoming a constraint upon economic and social development “

Over the following two decades, several important international conferences, studies and forums discussed the basic water needs: Mardel Plata in 1977, the Dublin Conference on Water and the Environment and the Rio Earth Summit in 1992, the UN sponsored comprehensive assessment of the world’s freshwater resources in 1997 are some of them. World Water forum started in 1997 opened up wide discussion over almost all the related subjects and it became a continuing dialogue among all the nations once in three years. The UN declaration of a decade for water for life in 2005[64] also demonstrated the importance of water for drinking, sanitation and food security.

Subsequent to the identification of the complexities associated with allocation of water among competitive users, many countries committed to adopt a coordinated integrated water resources management framework.

A careful study of policy reforms in many countries reveal a similar path to achieve national goals in water security and rational water allocation. In this connection, a comparative study of policy development processes associated with water management in India, Indonesia, Philippines, Thailand, South Africa and Turkey was performed to draw learning points to Sri Lankan policy process.

These countries were selected to study their water environment and historical developments of water sharing mechanism for this assignment. Selection of these countries is merely based on having some similarities with Sri Lankan water sector or because of the international acceptance of a country’s approach in water management mechanism. However provisions made in national policies and legal enactments for sharing water specifically for drinking purposes could not be traced, but a holistic approach on integration of all uses was observed in existing or new policies and enactments that were lately introduced.

It is common to notice conflicts that occur whenever a new user enters the sector to share existing water resources. General approach taken by governments is to initially make attempts to solve each case that surfaces. After a series of attempts such governments had understood the necessity to develop an overarching policy with integrated management and the ability to respond accordingly.

5.4.2 India

i. Overview

As the neighboring countries India and Sri Lanka share a similarity not only in water resources development, but also in the political environment and social issues. However India is well ahead of Sri Lanka in introducing water policies and legislations covering wider subject areas.

India is the second most populated country in the world with over 1.2 billion people (www.censusindia.gov.in). Water in India is intricately intertwined with the cultural fabric of the country, and has both economic and social connotations. Official estimates of the total utilisable water is 1,123 BCM as against the current use of 634 BCM, reflecting a surplus scenario[65]. A considerable temporal and spatial variation exists within the country with respect to water availability[66]. Apart from the precipitation pattern variations, unplanned urban expansion in cities has exacerbated the pressure on water resources. Seasonal water scarcity is also a matter of grave concern.

India is the largest consumer of groundwater in the world with an estimated usage of 230 km³ per year [67]. Approximately 60 per cent of the demand from agriculture and irrigation, and about 80 per cent of the domestic water demand, is met through groundwater. As per the Department of Drinking Water and Sanitation (DDWS) nearly 90 per cent of the rural water supply is from groundwater sources. The groundwater contamination rate in India is extremely high. Over exploitation and unsustainable water use practices has made most industrially and agriculturally productive regions suffer from water shortages [68].

Water quality is a major concern in many cities in India. Many metros have resorted to the practice of water rationing to manage erratic water supply. Many metropolitans that have run out of water supply options are attempting to tap water sources of surrounding peri-urban areas or even nearby cities. New Delhi the national capital has been cited as an example that is plagued with water conflicts. By 2025, the urban population that is expected to reach 45% would create a very high demand for domestic water and also in the industrial sector water use [66]. The potential for water transfers between river basins is an option being pursued in India to alleviate water scarcity in some basins. The move to link major rivers in the north with river basins to transfer water from water-abundant rivers such as the Ganga, Brahmaputra and Godavari to water-scarce central, western and southern basins. Water transfers had raised controversies between the government and civil society groups due to concerns such as ecological sustainability and affordability[69].

ii. Existing Institutional Set-up in water sector

The current arrangement to manage water in India exists at two administrative levels; central and state governments. The designated apex body for water resource management Union Ministry of Water Resources[70], controlled by the central government is responsible for the overall development, conservation and management of water, treating it as a national resource. This includes formulating general policies on water resource development and providing technical assistance to all states in irrigation, multipurpose projects, groundwater exploration and exploitation, command area development, drainage, flood control, water logging, coastal and riverbank erosion problems, dam safety, and hydraulic structures for navigation and hydropower. MoWR also oversees the regulation and development of inter-state rivers. Various other central ministries also carry out different functions in the water sector [65]. Various other central ministries also carry out different functions in the water sector. Some of the prominent Ministries are, i) Urban Water Supply and Sewage Disposal – Ministry of Urban Development (MoUD), ii) Rural Water Supply and Rural Sanitation – Ministry of Drinking Water and Sanitation (MoDWS), iii) Hydro-electric and Thermal Power – Ministry of Power (MoP) and iv) Pollution and Environment Control – Ministry of Environment and Forests (MoEF). The legal provisions related to inter-governmental responsibility in the water sector are derived from the overall constitutional division of power between the central and state governments as effected by the Indian Constitution of 1952.

The States have jurisdiction over water resources within their borders. But, the powers of the states are subject to regulate and develop inter-state rivers and river valleys by central government. The parliament has enacted the Inter-state Water Disputes Act of 1956 and it is under this act that a number of tribunals were set up to resolve water disputes among the states.

Although the central government is responsible for overall planning and coordination, the states are responsible for the actual management of the water sector. The water administrations are differently named in different states and the names as examples are, the Irrigation Department, the Public Works Department, and the Water Resources Department. These entities are responsible for the construction, maintenance, and management of water projects. Regarding water pricing and cost recovery, the administrative systems differ in different states partly due to historical reasons. The spatial structure of water administration in most states is based on administrative boundaries and projects rather than on any well-defined hydro-geological boundaries[71].

iii. Regulatory Mechanisms

While India has a relatively sound technical information base and expertise in water-related aspects, their utility at the practical level of regulation is extremely

limited due to the lack of organizational arrangements for enforcement and monitoring. The top-down approach inevitably found in any centralized administrative setting and the inability to tap locally available informal institutional potential such as, water related local customs, water sharing conventions, and associated monitoring and enforcement mechanisms are said to constrain effective enforcement of even well-conceived policies[71]. The issue of water rights as a mechanism for allocation and accountability assumes importance with increasing scarcity and conflicts both at the macro level of regions and sectors as well as at the micro level of distributaries, communities, and individual users. Unfortunately, India does not have any explicit legal framework specifying water rights, even though various acts have a basis for defining some form of such rights.

iv. Independent Regulatory Authorities

Independent Regulatory Authorities or IRAs at the state level introduced in the last decade are new mechanisms which are expected to usher in sweeping fundamental and comprehensive changes in governance. The first state to have this new regulatory entity was Andhra Pradesh, which formulated the Andhra Pradesh Water Resources Development Corporation (APWRDC) 1997. However other states are in the process of preparing drafts for legislations and establishments of administrative setups. Effectiveness of these regulatory authorities are yet to be proved.

v. Conflicts and Resolution Mechanisms

Conflicts

The case study from Maharashtra pertaining to sharing water and farmer rights to water[68] is a typical example with regards to water sharing conflicts. In this, three farmers, who were among those protesting the transfer of irrigation water to municipal supply in Maval of Pune district, Maharashtra were killed by police in 2011. This left many questions on strategies used for sharing of water among different uses. The farmer protests were because the Government was reportedly planning to divert more water from Pavna dam situated close to Pune city to Pimpri Chinchwad Municipal Corporation, which is one of the richest municipal corporations in India.

A need to enact a proper water acquisition (diversion) policy to protect the farmers as well as municipal users, on the lines of the land acquisition policy was advocated by many scholars after this incident. Need for proper 'water accounting' was also emphasised at all river basins to find out actual water use by different sectors. Rapid urbanisation, along with changing lifestyle of the masses, puts enormous pressure on the government to augment water supply for urban use. In the absence of reliable water sources for non-irrigation purposes, states are compelled to extract water from the storage reservoirs which are originally constructed for the irrigation purposes.

In the Indian context, the property rights over water is still with the government. The farmers, despite their property rights over land, could gain such right for water only if water reaches either the sub-canal or the field. The government can take away water from the main source whenever it is required. Moreover, farmers are also asked to pay for water even if they don't get water, since their land is demarcated under command area of the reservoir. Given the fast decline of unutilised irrigation water potential and increased competition for irrigation water from non-agricultural sectors, there is every possibility that farmers' agitations and their conflicts with the governments to aggravate.

Inefficient use of water in municipal areas is another reason for farmers agitation. In Pune, the purified water supplied by the municipal corporation has used water for cleaning cars, irrigating parks, home garden, etc. This happens because of low price that had been fixed for municipal water. Since the ability to pay among the city dwellers is high, water price needs to be increased substantially to improve efficiency and also to compensate the farmers who have lost their livelihood opportunities because of diversion of irrigation water.

Conflicts Resolution

Various arrangements exist for resolving conflicts at different levels. Water use prioritization specified in the National Water Policy[72] and implied in the constitution provide a general framework for resolving inter-sectoral water allocation conflicts[73]. But, for a more effective solution, quantification of entitlements has to accompany prioritization and both should be defined within appropriate hydro-geological and organizational contexts when necessary. It is observed that the issue of quantification of entitlements is often left to administrative or political authorities.

The most preferred arrangement should be based on physical boundaries of river basins and involving stakeholder networks. In the case of inter-state (or inter-regional) water conflicts, the frequently relied arrangement in the past involves negotiated agreements for developing/sharing water among the concerned states/regions. But, when there is difficulty in reaching a negotiated settlement, the concerned parties can rely on the tribunal established by the central government under the provisions of the Inter-state Water Disputes Act of 1956.

Although the tribunal settles disputes by quantifying water claims, it involves a lengthy process to reach a final settlement. There are cases such as the Krishna water transfer for Chennai (Madras) city where Tamil Nadu has paid for the entire project cost which is interpreted as an implicitly made payment for water. In India there are a few traditional and informal village level institutions such as tank level organisations in Tamil Nadu, that can be quoted as mechanisms for resolving water-related conflicts at the micro level. Middle level conflicts across communities within a river basin or canal system such as the case of upstream

users vs. downstream users or head-end users vs. tail-end users, and also conflict cases between irrigation and water supply agencies are still rampant for want of proper forums for resolving differences.

vi. Policies and Regulation

The National Water Policy (NWP) for India was adopted in 1987 and revised in 2012. The policy focuses on planning and development of water-based resources in the country in both river-basin and national perspectives. Drinking water is the main priority. All the states in India are required to formulate their own state water policies within the ambit of the NWP and subsequently set up a blueprint for water resources development[74].

The National Water Policy has been given priority to drinking water [72], [75] as depicted in Basic Principle iv, which states that; Safe water for drinking and sanitation should be considered as pre-emptive needs, followed by high priority allocation for other basic domestic needs (including needs of animals), achieving food security, supporting sustenance agriculture and minimum eco-system needs. Available water, after meeting the above needs, should be allocated in a manner to promote its conservation and efficient use.

Further under Section 3, where uses of water is defined as indicated below.

3.1 Water is required for domestic, agricultural, hydro-power, thermal power, navigation, recreation, etc. Utilisation in all these diverse uses of water should be optimized and an awareness of water as a scarce resource should be fostered.

3.2 The Centre, the States and the local bodies (governance institutions) must ensure access to a minimum quantity of potable water for essential health and hygiene to all its citizens, available within easy reach of the household

A dedicated section for “water supply and sanitation” has been outlined to emphasise the effective and efficient use of water especially in urban water supply systems.

Industrial demand tends to be a de facto higher priority than irrigation because of the ability of industries to pay more for water access. These two sectors, especially in water scarce regions and during water-scarce periods, compete for water resources available for irrigation. Thus, the share of present irrigation water withdrawals that will be allocated to meet additional domestic and industrial demands is a key factor in deciding the future irrigation withdrawals of a basin[65].

In the last decade, India had witnessed a progress in the area of water sector regulatory reforms. The advent of the Independent Regulatory Authorities (IRAs) at the state level as described above are new mechanisms which are established to usher in sweeping fundamental and comprehensive changes in governance in this sector.

5.4.3 Indonesia

i. Overview

In its entirety, Indonesia is a water resources rich country. A study conducted by ADB shows seasonal variability that creates water stress in the dry season[76]. As in many other developing countries, water resources management in Indonesia has become a critical issue because of the need to fulfill the increasing water demand for various uses. Floods, droughts, water pollution, and conflicts over water uses are becoming routine problems that need to be resolved. Responding to the situation, the Indonesian government has taken an initiative to reform its water sector by bringing the elements of integrated water resources management (IWRM). Accordingly, in the last 5 decades, there had been a paradigm shift in the policies and legal frameworks, resulting in a change in the structure of water governance. Indonesia has implemented bold reforms since 1998, leading to new laws and regulations and an enabling environment for IWRM. However, application of IWRM in Indonesia is still difficult, because water resources management is neither a national priority nor a leading sector for national and regional development[77].

ii. Evolution of Water Governance

The primary need to provide water for increasing demand has been identified as increasing the sources of supply and conservation of the watersheds[76]. The main elements of water governance in the early period had been through the construction of water related infrastructure and conservation of watershed. This approach was reviewed in 1990s when integrated water resources management was incorporated. In the third stage the emphasis was to fulfil the water demand by considering the need to manage water and other related resources in an integrated manner. The main elements of water governance had been identified as efficiency, equity, and sustainability.

iii. Water Sector Adjustment Policy

In order to overcome the problems and constraints and to improve water resources management, Indonesia initiated Water Resources and Irrigation Reform Programs[77]. One of the important aspects of this program is the shift in water

governance by adopting a river basin approach. This was followed by a legal reform and the formation of fifteen “newly set-up” river basin organizations[78]. Out of the 90-river basins, 73 are managed by provincial government, 15 are under national management, and 2 are under the management of public corporation. It is with the WATSAP, the framework for river basin management[77] planned to be developed and implemented.

iv. Responsible organisations

In Indonesia, the development and management of water resources is spread over many different sectors. The management of surface water resources is mostly carried out by the Ministry of Public Works. Groundwater is managed by the Ministry of Mining. Conservation of land and water is described as the main responsibility of the Ministry of Forestry. Conservation of water quality is dealt by the Ministry of Environment. Supply of water as piped water is mainly carried out by the Directorate of Human Settlement under the Ministry of Public Works. Utilization of water for agriculture is the joint responsibility of Ministry of Agriculture, Horticulture, Fisheries, etc. Each of these ministries are assisted by either relevant provincial or district/city agencies[76].

v. Development of legal enactments

This water resources management approach produced a number of legal products that provide the bases for the reform process. At the initial period, 1999, two legal products enacted. One was on the formation of coordination team for river basin and water use management, and the other was on irrigation management policy reform. In 2001, more legal products were enacted ranging from government regulation on irrigation, and on water quality management and water pollution control.

In the year of 2003, a draft of water resources law has finally submitted to People Representative Assembly for approval. From the process of legal reforms carried out in Indonesia one thing need to be noted is that lower level of legal products are enacted prior to the adoption of national water resources law.

vii. River Basin Management and Water Allocation

When compared with many other countries, Indonesia is a leading nation in the implementation of IWRM principals specially with the selection of river basin as the unit of water management.

The Government of Indonesia started to recognize river basin as the unit of water management in 1982 through the enactment of Government Regulation (GR) No. 22/1982. As the follow-up of this newly introduced government regulation, the

Public Works Ministerial Regulation No. 39/PRT/1989 was issued in 1989 to specify the 90 river basins in Indonesia[76].

The objective of this ministerial regulation is to ensure that conservation and use of water in the basins are conducted in a holistic and an integrated manner. As described earlier, the management of these river basins are distributed among the national government, provincial government and a public corporation. The objective of this regulation is to ensure that conservation and use of water in the basins are conducted in a holistic and an integrated manner.

A water allocation plan is prepared every year for each river basin by the River Basin Organization (RBO) with reference to the guidelines established by the Minister of Public Works and with the involvement of the community through the basin council. The prepared annual water allocation plan must be approved by the minister of public works/governor/regent/mayor in accordance with their respective authority.

viii. **Water Governance Issues**

As mentioned earlier, the use of IWRM concept in Indonesia is well established because of the strong legal and institutional framework that had been placed to support the implementation. Indonesia is subdivided into 131 comprehensive water resources management(WRM) units. There is a responsible river basin organisation (RBO) that has been established or appointed for all of these river basin territories, In case of most river basin territories, a WRM plan has been prepared, or is in the advanced stage of preparation and this is in accordance with the “one basin, one plan, and one management” principle[76].

Most of these river basin territories have a stakeholder platform, which regularly convenes and deals with WRM conflicts and is involved in the formulation of the basin plan or regular reviews. Spatial planning and water resources planning recognize their mutual relationships and the strong need for coordination. Irrigation management is also carried out jointly by the central, provincial, and district governments. River basin water distribution is carried out by Large River Basin Organisation/River Basin Organisation (central government), Indonesian Central Management of Water Resources (provincial government), Indonesia Public Works Department (district government), and several state-owned enterprises. Public Works Ministerial Guideline are available for bulk and retail sharing of water resources in Indonesia[79].

5.4.4 Philippines

i. Overview

Philippines could be accepted as one of best example case study to demonstrate successfulness of farmer organisations for their active participation in the joint

management of irrigation systems. In the 1980 and 1990 era, many Sri Lankan water managers were sent to get trained about these systems in Philippines. Hence Philippines was selected for this study to highlight the practical issues on water sharing.

Philippines is a country is endowed with rich water resources that include inland freshwater sources such as, rivers, lakes, and groundwater together with marine waters in and around many islands. In an overall sense, there is sufficient water but has been identified as insufficient in highly populated areas and especially during dry season[80], [81]. Just over a third or to be exact, a 36 percent of the country's river systems are classified as sources of public water supply[82].

The rapid increase in population, urbanization, and industrialization has reduced the quality of water, especially in densely populated areas and in the regions dominated by industrial and agricultural activities. Access to clean and adequate water remains an acute seasonal problem in urban and coastal areas specially in the national capital which is the Metro Manila[82].

However, awareness on the need for improved sanitation and water pollution control is very low. This is clearly reflected by the demonstrated reluctance to pay for a sewerage connection even when accessibility to such systems are available. Only seven percent of the country's total population is connected to sewer systems and only a few households have acceptable effluent disposal through on-site sanitation facilities.

ii. Water conflicts

In Philippines, conflicts occur among water use sectors and there are numerous Legal provisions and administrative mechanisms to intervene and settle these disputes[82]. Some of them are as briefed below.

- **Conflict between formal and customary water rules**

The formal system of water management used by the government is based on a system where water is priced and consumers having assigned rights. This system exists especially for domestic water which is supplied by a water district and for irrigation water which is governed by the national agency. However, perception of customary systems associated with indigenous communities is that water is a natural and a communal resource and hence should be treated as an integral part of their everyday life, culture and traditions. There are conflicts frequently between these two community segments with regards to new developments and water use.

- **Conflicts between rural (agricultural) and urban water uses**

The state law has prescribed for sectoral priorities in the case of water scarcity, such as during a drought. Philippines' Water Code further states that the water user who is favoured in allocation decisions should compensate the water user whose allocation was foregone. As impacts of climate change intensify, drought events will likely be more frequent, and as a result rural–urban conflicts are expected to worsen.

- **Conflicts of upstream and downstream water users in a river**

Upstream verses downstream water use conflicts are evident in the country, mainly due to absence of trans-village agreements and unclear property rights. For instance, irrigation water has become a problem with downstream farmers suffering from irrigation water scarcity due to the diversion of water upstream by plantation companies or by domestic water providers to supply the urban areas downstream.

Trans-village conflict across the watershed is commonly observed. This is evident in remote areas, occurring between villages fighting over a single spring or forest area to provide for their needs which can no longer be provided within the village's territory. There are also cases of water being extracted for sale by commercial water enterprises to the residential areas, but resulting in an impending water scarcity situation downstream.

Conflicts had arisen because of un-harmonized and fragmented plans of different institutions involved in the management within the watershed, as well as with a lack of transparent water cooperation agreements among parties. There are no appropriate data at the watershed level that can facilitate water planning which accounts for future demand within the watershed.

iii. Water Governance

Philippines's water governance consists of both formal and informal structures. It is informal where self-supply predominates, especially in rural areas. There are vast numbers of tiny, primary water diverters from nature and water institutions and they can be categorized as local, fragmented and informal. In the urban centres water economy is formal, characterized by the presence of predominant service providers. Even though water institutions are a few, formal legal bodies exist. Some outcomes of the governance reforms in the contemporary times are the conflicts between formal and informal rules; rural–urban water conflicts; downstream–upstream conflicts; and contestations in the privatization mechanisms of the Manila domestic water supply[82]. The literature describes a southern Phillipines example where a rural water supply had found a remedy by a local government–community partnership.

The Philippines has a relatively strong water management framework backed by several government enactments and some of them are, the Presidential Decree 1067 Water Code (1976), the Republic Act 7586 National Integrated Protected Area System Act (1992); the Republic Act 8041 National Water Crisis Act (1995), the Republic Act 8371, the Indigenous Peoples Rights Act (1997), and the Republic Act 9275 Clean Water Act (2004).

Out of the above, the Water Code of the Philippines (declared in 1976)[83], [84] is the overarching law that governs the access, allocation and use of water and it assigns the National Water Resources Board (NWRB) a key regulatory role. It stipulates rules on the appropriation and utilization of all waters including, the control, conservation and protection of waters, the watershed and related land resources, and the administrative and enforcement of these rules[85].

The underlying principles of the code are, i) All waters belong to the State, ii) The State may allow the use or development of waters by administrative concession, iii) The utilization, exploitation, development, conservation and protection of water resources shall be subject to the control and regulation of the government through the National Water Resources Council, iv) Preference in the use and development of waters shall consider current usages and be responsive to the changing needs of the country. It is noteworthy that the code also defines, The Code defines following, i) Basic principles and framework relating to the appropriation, control and conservation of water resources to achieve the optimum development and rational utilization of these resources, ii) Extent of the rights and obligations of water users and owners including the protection and regulation of such rights, iii) A basic law governing the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources and rights to land related thereto, and iv) The administrative agencies that shall enforce the Code.

The water code and its strengths and weaknesses are discussed at length in a book[86] which provides an in-depth analysis of the water governance by the water code. It says that, the Philippine water laws provide the framework for allowing the scarcity value of water to be paid by its users. In particular, the 1987 Constitution declares that all water resources belong to the State. The Water Code (Presidential Decree 1067) passed in 1976 authorized the National Water Resources Board (NWRB) to grant water rights, levy the appropriate fees for these rights, and collect charges for water development. The Code also recognizes seniority of rights such that the earliest approved rights have priority over others to the use of a limited supply of water. In times of drought or any emergency, however, the use of water for domestic and municipal purposes takes precedence over agriculture or related uses. In this regard, the Code also provides that such a reallocation requires payment of due compensation to the affected sector. It likewise allows the transfer or lease of water rights in whole or in part to other

parties subject to approval by the NWRB. The major weaknesses cited are in relation to the institutional structure and the lack of recommendations for assessments.

ii. Existing Institutional Set-up in water sector

The institutional arrangements for managing water in the Philippines, like in many developing countries, are embedded within shifting political and economic contexts that closely follow international trends. Pre-colonial customary rules on water and land ownership continue to shape collective management arrangements among indigenous communities[82]. In towns and cities, water supply and provisioning follow the understanding that water is a public good and on this basis, the government takes a lead role in the water supply and distribution.

Through the local government code of 1991 after the change of government in 1986, the management of water was decentralized. This empowered the local governments in the financing and operating of their own water supply systems while addressing watershed degradation and water quality. Operating within the Philippines, there are global organisations which had acquired legal authority through treaty ratifications such as Ramsar Convention. These entities also affect water decisions and actions in the country[82].

In case of irrigation, the national irrigation administration had slowly divested agency responsibility to the “Irrigator Associations” and had introduced participatory management practices. Since 1995, a notable shift had occurred with the admittance of private sector participation in the water provisioning as concessionaires, bulk suppliers or even competitor to water districts. In terms of hierarchy, the water institutions in the Philippines are broadly classified as national, subnational and local. According to their mandates, the institutions are grouped as Statutory (prescribed by law) and Customary (Creations of tradition or local social arrangements). The water institutions based on their representations can also be divided as, State agencies, Community or civil society groups, and Research and academic institutions.

5.4.5 Thailand

i. Overview

Thailand and Sri Lanka share many similarities in the water environment. Due to rapid economic development in the past few decades, water demand had continued to grow in Thailand. Two of the four regions, namely the Northeast and the Central Plain, experience frequent droughts and flooding. The water resources development budget has increased steadily over the years and represents a large portion of the national budget for development[87].

Agriculture remains the main user of available water and accounts for 71 percent of total water demand; the industrial sector accounts for two percent, the domestic sector for five percent and the remaining 22 percent are for ecological balance. The trend, however, is for a reduction in the share of agriculture with a corresponding increase in both industrial and domestic water use. Thailand is an agriculture-based country. In the past water resources had been the main factor supporting the rapid expansion of agricultural activities and increase in productivity emphasizing the supply-side management. However, rapid population increase and an accelerated economic growth due to the rise in manufacturing and services, had caused a steep increase in water demand. Moreover, in recent years, Thailand has faced serious water problems such as pollution, shortages, droughts and floods. Therefore, water resources development and management had become increasingly important because the emphasis on water requirements had shifted from agriculture to other sectors as well.

Challenges in water sector

In Thailand most of the irrigation projects are designed to serve the local needs of paddy farmers with little regard for the overall basin or sub-basin requirements. Large-scale and medium-sized irrigation systems do not adequately meet the current requirements of other competitive users. Unsuitable soil and hydrology conditions in various regions have resulted in inefficiencies in water distribution systems for irrigation. The irrigated areas are not fully utilized, especially in the dry season. It is estimated that the cropping intensity of irrigation projects is around 70 percent in the wet season and 30 percent in the dry season.

At the same time, the problem of unrealistic water allocation exists, especially in the dry season when the water supply is limited. Current process of water resources development through projects had proven unacceptable to stakeholders and especially to local people. It had been recognised that there is a need for more information and increased participation for rational decision-making. There had been problems with regards to water resources management at the river basin level. The issues such as, unclear policy, legal and institutional framework governing basin areas had made it difficult to effectively implement water management at basin level. In Thailand there are numerous agencies involved in basin management, and it had been mentioned that none possess a clear responsibility for basin management and development. The implementing agencies follow their own procedures in planning without consulting the community. Many large-scale projects do not go through a public consultation process and therefore get stalled midway. It is important to seek the opinion of all concerned parties or stakeholders, to get them involved from the early stage of project formulation and to keep consulting them throughout the development process.

In Thailand, there is open access with regards to the right to use. This facilitates water use without payment. Such users are the farmers and industries who use water directly from public water courses or from the irrigation channels that belong to the Royal Irrigation Department (RID). This creates problems in the management of costs due to water supply. The free access and the state sponsorship provided for water projects has created a lack of ownership and the absence in the need for a responsibility when water sharing. This creates water conflicts between agriculture and industry sectors. It has been indicated that the unclear water rights and lack of prioritization in water use, raises an issue of system sustainability [87].

Farmers who use water for agriculture insist that they have a priority because of their existence well before the industries. However, the industries served by the private water supply companies, claim a priority granted by the Provincial Water Works Authority (PWA). Moreover, the existence of unclear rights had led to inequality with regards to access to clean water.

Development phases of the country and the role of water

Water management in Thailand has evolved with time. Three periods can be distinguished, each having their own focus which can be described as below [88]. Period from 1283 to 1857 where the focus had been managing people to suit water conditions. Then the period from 1857 to 2000 with a focus on the supply-side management. The period after 2000 up to the present, where the emphasis is on the demand-side management. There is evidence that Thailand had followed a very structured development activity by having twelve national development plans since 1962. In each of these plans there had been various efforts for water resources management. 12 Development Plans implemented by Thailand government starting from 1966 have accommodated water resources development [89]. The Twelfth National Economic and Social Development Plan (2017-2021) has focused on enhancing international regulatory and institutional linkages at the implementation level. It emphasizes the use of physical infrastructure linkages as a basis for the development of areas, economies and communities along trans-border economic corridors.

Water governance

Water resources are administered and managed by eight ministries with different priorities and programs that sometimes overlap or are in conflict. Water management policy in Thailand is the responsibility of the National Water Commission, while government agencies providing water are the Royal Irrigation Department, the Metropolitan Waterworks Authority, the Provincial Waterworks Authority, and local administrative authorities [90]. Vast authority has been given to National Water Resources Committee (NWRC) established in 1996 under a Prime Minister's Office Regulation of 1989. However, NWRC lacks full authority

and an operating mechanism to oversee the implementation of the resolutions adopted by the Cabinet[87].

Royal Irrigation Department is responsible for planning, development and management of water resources projects. Besides, there are many agencies implementing small-scale water development projects. The Department of Energy Development and Promotion manages the pumping schemes and the Department of Mineral Resources manages and controls the use of groundwater.

Having the above background, the Thailand Government has laid out a new water management mechanism which comprises three pillars covering the legal aspects, national level organization on water resource management, and a water resource management strategic plan[91].

The strategic plan approved by the cabinet provides a guidance on areas that need to be comprehensively covered in a similar document. The 6 important strategy areas are, management of water for consumption, water security for production sector, flood and inundation management, water quality management, rehabilitation of forest watersheds and degraded areas and management and administration[92].

5.4.6 South Africa (SA)

i. Over view

Water is a scarce resource of highly variable availability in South Africa. According to 2004 statistics, about 11 million black Africans have no access to running water, and about 20 million without adequate sanitation. Considerable progress has been made in water and sanitation service delivery in South Africa, where legislative and policy frameworks for water services are some of the most progressive in the world. South Africa's post-apartheid policy reform include significant efforts to ensure access to water for all. Hence many countries while preparing strategies for water policy reforms, study the background situation and the process of policy formulation in South Africa to draw relevant lessons[93]. In South Africa, although it is assumed that the user should pay for basic water and sanitation services, and while many are willing to pay, the poor are unable to do so. South Africa is a country that has shown the possibility to provide the poor with basic services, and to improve the delivery of water services and sanitation[94].

ii. Water governance

The first democratic elections held in 1994 allowed South Africa to reform its water law[95]. Water use in South Africa is regulated primarily at the national

level through the National Water Act and the Water Services Act. The former dictates how water from a specific source can be accessed and used, while the latter focuses on what water-related services should be provided to citizens, and by what authority. The Water Act states that water is a national resource, owned by the people of South Africa and held in custodianship by the State. This legal framework ensures a holistic approach of the entire water cycle. The National Water Act includes an innovative component called the Human Rights Reserve, which is aimed at implementing the distribution of water in adequate quantity and quality to all the citizens of South Africa[96]. The country's water sources are managed at catchment level. The national Department of Water Affairs and Forestry (changed to Department of Water and Sanitation, DWS, in 2014) is designated as the main regulating body, the Water Boards (operating at catchment level) are responsible for providing bulk water, and municipalities are in charge of delivering services to end users[96].

In January 2018, after 3 years of drought, Cape Town city found its storage dams dangerously low and heading toward “Day Zero”. During this crisis it is reported not only the water authorities but the Disaster Management Centre too had joined to manage the situation, making use of Disaster management legislations[95].in addition to water related legislations.

The complete system of governance for water in South Africa is a three-dimensional system of elements, which includes, (i) Principles and mandate, policies and legislation, regulatory framework, institutional arrangements and practice, (ii) Levels from the international, national, regional, local to neighborhood levels; and (iii) Responsibilities of government, non-government organizations, and civil society[95].

Water is considered a social good, fundamental to transformation and development in the country. The Constitution of South Africa (1996) provides everyone with the right to sufficient water within available resources and this is reflected in the country's Free Basic Water Policy of 2001. However, according to a case study in eThekweni Municipality done in 2014 [93], free basic water and sanitation are not provided equally or evenly. The rights-based discourse adopted for water and sanitation services provision is tempered by the neo-liberal cost approach to service delivery. The commodification of services implies that everyone cannot afford to pay for the right to have sufficient access to water and sanitation. This raises a concern as to whether the focus of service delivery should be on cost-recovery or on social and environmental justice.

iii. Institutional mechanisms

Water Management Institutions in South Africa had been discussed by a research examining drought management with reference to institutional preparedness and responses to drought in South Africa using a case study[95]. This work

schematically indicates the links between various stakeholder institutions involved in water resources management. It states that efforts by all stakeholders must be well coordinated for effective intervention. Even though coordination is evident in water governance institutions in South Africa, the prevalent top-down approach in lines of command is the major challenge between local-level and district-level water actors. Thus, the success of the national water governance endeavours depends on effective institutional interaction and relationships between and among water institutions.

In the above work the author is critical about the implementation deficiencies and process to state the grievances of agriculture sector irrespective of the constitutional provision. In this the author writes “ *The South Africa constitution grants a right of access to sufficient water for domestic uses and not a right to adequate water (i.e. sufficient amounts but not abundant or overflowing) and excluding water for other uses besides not abundant or overflowing) and excluding water for other uses besides domestic uses. This means that water users cannot compel the government to provide them with enough water for their other water needs outside of domestic needs during drought times. In this instance, communal farmers suffer as they should procure water from private water suppliers during drought times, the cost of which is beyond the means of many. Thus, the national constitution is noble in its intentions but has been less successful in its execution*”.

5.4.7 Turkey

i. Overview

Turkey owns ancient hydraulic systems that dates back to many centuries and some such water supply systems are still in operation. At the same time, it faces trans-boundary water issues as Euphrates and the Tigris rise from the high mountains of Anatolia and flow down through Turkey, Syria, and Iraq and join to form Sharr-al-Arab before they flow into the Persian Gulf. Historical analysis reveals that Turkish water management has been shaped not only by domestic priorities and national politics, but also by lessons learnt from international experience and external pressures[90]. Hence the current water management practices has an influence in Sri Lanka because of the similarities especially with respect to the traditions. Turkish recent experience in modifying water legislations and global level interventions in water sector reforms are worthwhile to review for this study, as some novel concepts can be observed.

ii. Water Policy

Turkey's water policy and management is a subject for a range of national ministries and executive administrations. Some of the legislations of the republic which governs water management dates back to early years in the 1920's. Due to numerous amendments and additions to the existing legislation in the course of

time, water management in Turkey ceased to be simple. The primary sources of Turkish law are the constitution, laws, law amending ordinances (decree-laws), international treaties, regulations and by-laws. Water resource development and management is affected by several key elements of Turkish legislation. One can find provisions related to water use, management and allocation in almost 100 different enactments, by-laws, decrees etc. As indicated by There are practical difficulties and contradictions in the implementation and enforcement of water-related legislation. Manifold challenges had emerged in the 1980s, forcing the public authorities to reform water management policy. Industrialization and sizeable and steady migration from rural areas to urban centres increased the demand for water and electricity, which was to be met by hydraulic works. When public spending proved insufficient to overcome the undersupply of electricity and water, either as a result of domestic economic crises or because other national needs were given precedence, Turkey had no alternative but to secure external funding for its water projects, and new methods/approaches were considered[97].

From the 1920s to the 1950s, Turkey was engaged in state consolidation efforts, which included the investigation and exploitation of water and land resources. New government institutions were mandated to conduct hydrological surveys of the country's water resources and hydropower potential and to carry out related civil works. The first phase also saw the enactment of framework laws and the implementation of various water projects. Yet, even in this phase, preliminary thinking on how to develop water resources systematically had begun. However public investment in infrastructure was decided centrally on an ad hoc basis and thus in response to pressing needs. The constitution of 1982 had established the basic principles which governs water resources. In Turkey, water is a public good under the state's trusteeship. The authority to explore and manage water resources is vested in the state. The Turkish Civil Code (2001) considers water in two distinct categories; public water resources and water resources in the domain of private law and private proprietorship. There is no system for allocating water rights for surface water users. Various provisions are present in the different codes of practice, which brings about some complications regarding authority, organizational malfunctions, and legal gaps. These gaps are being filled by means of judiciary decrees.

Assigned water rights ensure the rights of prior use, and can neither be sold nor transferred. User-rights to water resources in the domain of private law and ownership are subject to title deed registration. Until 1960 this included ground water resources which were then transferred from the private to the public domain.

Water is allocated, in practice, by a variety of agencies operating independently of each other. The current national system of recording and harmonizing user rights to water dates back to early years of the Republic and is not well adapted to water

short environments. It does not provide security for present users, does not allow for or adequately protect environmental uses of water and does not provide incentives for and economic use or for orderly transfers among sectors.

Lack of a comprehensive water law has been identified as a major challenge in Turkey. Hence there is a clear need for a framework law which assembles the guiding principles, norms, rules, procedures in water resources management and allocation[98].

One major concern is that 35 % of Turkey's water resources are generated in its transboundary river basins. Turkey's policy regarding the use of its transboundary rivers has always been consistent and is based on the following four principles; i) Water is treated as a source of cooperation among riparian countries ii) Transboundary river basins have their own characteristics and peculiarities and each case of transboundary waters, iii) Transboundary water issues should be addressed only among the riparian countries without interventions by the third parties, iv) Each riparian state of a transboundary river system has the sovereign right to make use of the water in its territory without giving "significant harm" to other riparian countries, v) Transboundary waters should be used in an equitable, reasonable and optimum manner[99].

iii. Administrative set up

The Turkish administrative system, including the water-related institutions, has three administrative levels as the national, provincial and local level. Similar to Sri Lanka the local level consist of municipalities and villages. Being modelled on the French system, it is highly centralized and linked to strong central government organizations.

State Hydraulic Works which is call the DSI is empowered to coordinate water use at the national level. In this respect, any agency, which embarks on a water development project or engaged with a water-sector related activity has to cooperate with DSI and must obtain prior approval concerning the source and volume of water to be used for each purpose. The Act No. 5393 on Municipalities (2005) assigns numerous powers and duties to municipalities which are, for example, the construction of urban water supply and sewerage systems and wastewater treatment plants. Municipalities usually prefer to combine water and urban transport services as a means of obtaining revenue and cross-subsidizing public services. Villages, i.e. the lowest administrative units, are self-governing autonomous local administrations. Village mayors and village councils may decide on, for example, the construction of drinking water wells[97].

From the 1950s onward, Turkey adopted a river basin planning approach based on exploratory hydrological studies. The understanding of river basin planning was not quick to change into a holistic understanding of water resources

management as defined by the concept of integrated water resources management (IWRM).

When a dispute arises between a user and State Hydraulic Works about public surface and groundwater resources and their utilization, the cases are dealt by the administrative courts rather than courts of justice. There are numerous administrative courts' and the Council of State (highest administrative court decisions, which confirm that the DSI is the ultimate authority to allocate public water resources. Allocations from the national budget is the main financial source of the municipalities to provide water services. In this respect, the municipalities resort to either state to state soft loans or credit from international financial agencies under the guarantee of Turkish Treasury.

iv. Water Policy and Law

As stated earlier, a clear need is identified for a framework law which assembles all components that form water resources management and allocation. Conferring this legal authority and establishing individual water rights will force a fundamental change in the manner in which water resources are developed, managed and used.

Effective greening of water policy is hampered by a command and control policy approach which Turkey's government is not able to enforce. The state apparatus has yet to consider how to create incentives for users to protect water resources based on dialogues including societal groups. Institutional reform aimed at strengthening institutions mandated with environment / nature protection and streamlining ecological concerns into sector policies (particularly agriculture) has yet to be undertaken. Similarly, inclusive forms of decision-making have not yet been introduced. In this respect, the draft national framework water law looks promising. However, it has not yet completed the necessary parliamentary procedures which may lead to a parliamentary debate and possible adoption.

The Draft Water Law emphasizes that in due consideration of national security, the economic and social development needs of the country, multipurpose development of surface and groundwater resources are carried out to provide adequate and good quality water for citizens. It refers to the utilization, allocation, protection, safeguarding, monitoring of surface and groundwater resources of the country in responding to drinking, domestic water needs of each citizen as well as providing water for industry, irrigation, hydropower and nature

On the whole, Turkey's water policy has been transformed from being an entirely centralized public policy to one with decentralized elements, with strong private sector participation and a still rather weak integration of environmental issues into its water policies and management [100].

5.5 Review

The regional and international country practices associated with water governance draw attention to many factors that need to be considered when attempting to arrive at a sound water allocation practice.

The examples highlight that it is very important for governments to explicitly recognise water resources and its management as a national priority. The examples also point to the following as important considerations for regional water governance.

Water governance is a multifaceted entity that requires a sound connection and an appropriate balance of adequacy associated with policy, legislation, regulation, standards, guidelines and institutions. The governments must layout water management mechanisms that are founded on sound legal aspects, national level water management organisations and a water resource management strategic plan.

There is a need of an overarching water policy backed by legislation that covers guiding principles, norms, rules, procedures in water resources management and allocation. Water policy and legislation must be explicit with regards to the ownership and custodianship of water. Water policy must be balanced to ensure adequate central control while providing sufficient delegation probably with decentralised elements.

It could be identified that a country's water law must be placed according to a plan that can work within a national framework which assembles all components that form water resources management and allocation, establishing individual water rights to influence the manner in which water resources are developed, managed and used. In addition, water legislation must explicitly cover the aspect of transboundary management of water resources that states the rights covering water use within the borders of accepted spatial units. Water law also must be clear about the issue of water rights as a mechanism for allocation and accountability.

The need of an apex institution with adequate powers to manage water in a holistic manner has been highlighted while indicating the requirement of proper organisational arrangements for enforcement, monitoring and expression of feedback. The other institutions must be knitted together under an umbrella organisation and with clear mandates and without duplication. The case studies pointed to the need of active and complete stakeholder consultation forums with sufficient legislative backing to evaluate and participate in water allocation, conflict reporting and resolution. There had been instances where transfer of authority and participatory management practice had been a success.

The need of independent regulatory authorities covering both central and decentralised systems but that would have the capability to work in coherence had been recognised. Regulatory authorities must be empowered to monitor Water allocation systems by using transparent methods while taking adequate steps to monitor the consideration of both water quantity and quality during implementation of allocating water for sharing.

Example cases show that there must be codes of practice that considers public and private proprietorship with a system for allocating water rights for users and to practice water allocation by a variety of agencies while considering the social, economic and environmental objectives. Such systems must establish mechanisms to incorporate the perception of customary systems associated with indigenous communities. Water allocation systems and associated codes of practice must embed transparent methods to consider both water quantity and quality when water allocation is carried out. It is also important to ensure an appropriate mechanism for the establishment of guidelines for water resources assessment and sharing.

It can be observed that over time, water managers had realised the importance and strength of practicing water management by treating either watersheds or river basins as the bounding spatial entity. In this connection the governments have realised and established river basin authorities having adequate legislative power for water allocation between competing users.

Such establishments must have designated authority with adequate legal backing to accept and publish references and guidelines for water resources management, stakeholder involvement and user prioritisation. Accordingly, it is necessary to establish appropriate coordination teams for each river basin and sub basins. .

The case studies show that water resources policy must be supported by providing adequate mandate to state institutions. Such mandate must to assess, investigate and exploit water and land resources to systematically manage the water resources and thereby fulfill the objective of water sharing. Water resources management systems must be capable of assessing water use efficiency in relation to its intended use and display such assessments to all stakeholders by using transparent systems.

The case studies have clearly shown the importance of assessments, methods and data collection systems. Temporal resolution adequate for the assessments must be evaluated and data collection programs must be aligned to a temporal resolution which supports rational management of water for water sharing. These water data collection programs and analysis of data for outputs must also be aligned to collect and process data based on identified watershed boundaries.

6 Water Allocation and Legislation

6.1 Outline

The legal system in Sri Lanka is multifaceted. It has been influenced by the Common Law and Civil Law systems and special laws. Roman Dutch Law introduced by the Dutch to Sri Lanka is considered the residuary law of the country and during the British rule came to be applied to situations where no statute was applicable and if the special laws were applicable, where these laws were silent. However, presently the Roman Dutch law has been modified considerably by Statute Law or law made by the legislature.

The main statute that defines access to water resources in Sri Lanka is the State Lands Ordinance (SLO). This Ordinance recognises private and public lakes and streams. A private lake is one situated entirely within the boundaries of a private land. Any lake other than a private lake is a public lake. Similarly, a private stream is any stream the source and entire course of which is situated within private land. A public stream is any stream other than a private stream. The Minister may, by a notification, declare any tank or reservoir as a lake for the purposes of this law. The right to the use and flow and to the management and control of water in any public lake or public stream vests in the State.

This situation is rendered complex by the 13th Amendment to the Constitution enacted in 1987. The 9th Schedule to the 13th Amendment sets out three lists viz., the Provincial Council List, the Reserved List and the Concurrent List. Water resources are referred to in some form or the other in all three lists thus requiring clear understanding. The Water Resources Board Act relates to groundwater. Irrigation water sources may come under the Irrigation Ordinance or the Agrarian Development Act.

The National Environmental Act enacted in 1980 and containing major amendments in 1988 provides for the quality of inland water resources and for the regulation of pollution of water sources.

As for water rights, the literature does not point to a formal or adequate water allocation system in the country. It has been noted that at the local level, water allocation is carried out by the public water service agencies like ID, NWS&DB, and in rural areas, through a system of traditional allocation procedures and rights. According to the available documentation associated with the national water resources policy, these allocation mechanisms have failed to ensure water allocation, recognizing the rights of the existing users with a flexibility to meet the needs of the new users [101].

6.2 Rights relating to access to water

6.2.1 Water and Residuary Law

Cooray (1974) in the Reception of Roman-Dutch law in Sri Lanka[102] states that the “Roman-Dutch law is the residuary law of Sri Lanka. The Roman Dutch law in British times came to be applied in all situations in which there was no relevant statute and with regard to those subject to the special laws, where those laws were inapplicable or silent. A statute is the primary source of law. Where there is no applicable statutory principle, the courts would first look to see whether the parties are governed by one of the exceptional systems of law, and, if not, they would apply Roman Dutch law. However, Roman-Dutch Law has been affected by judicial decisions, which departed from and modified the Roman-Dutch principles, or introduced English principles instead, or apply and gave effect to local customs and practices.”

Water is different to many other resources. Getches (1990) in “Water Law in a Nutshell” [103] indicates that the very mobility of water “necessarily limits the appropriateness of traditional concepts of ownership”.

The Roman-Dutch law distinguishes between public and private streams. If a stream rises in a person’s land, it is private in its inception and may be dealt with as a private stream. However, if it has continued to flow in a defined channel for a considerable period over adjoining land, the stream becomes a public stream. An owner of a private stream may stop it on his own land and diminish its volume but not so in respect of a public stream[104]

In *Appuhamy et, Al v. Singho et Al* , a case that pre-dates the State Lands Ordinance, the parties sought adjudication relating to the rights of riparian proprietors as between themselves. The Courts cited an Indian authority in this regard as, “*The riparian proprietor may deal with the stream as freely as with any other portion of his land, provided only that he must not, by so doing, sensibly disturb the natural conditions of the stream as it exists within the limits of other proprietors, whether above or below, or on the other side.*”

Res communis under Roman Dutch law recognizes that running water is incapable of being owned or appropriated and that the use and enjoyment is common to all. *Res Publicae* recognizes that lakes and public rivers fall within the class of things that are public. They belong to the people (Corpus Juris, Balasingham, 1937). Peiris [105]. This *The Law of property in Sri Lanka. Vol. I.*, states that the common law principle in respect of the use of water resources is that, the owner of land has the right to exploit water resources existing in his property, including the groundwater. At this point, it is important to note that the above principles have

been considerably modified and even extinguished through ‘statute law’. The law deals with the right to access and use water rather than ‘own’ water.

6.2.2 Water and Statute Law -Surface Water

Surface waters consist of stagnant or ‘still fresh water’ contained in lakes, tanks reservoirs etc., and running water or ‘moving fresh water’ in rivers, streams etc.

- State Lands Ordinance

The *State Lands Ordinance No. 8 of 1947* (SLO) seeks to vest the right to regulate water in public surface water bodies in the State. At the time of enactment of the SLO (1947); the Forest Ordinance (1907), the Land Development Ordinance (1935) and the Irrigation Ordinance (1946), were already in existence and so the SLO had to take into account the provisions of these pre-existing laws.

The State Lands Ordinance (SLO) defines public lakes and streams as follows:

- Lake

“lake” includes a lagoon, swamp or other collection of still water, whether permanent or temporary, not being water contained in an artificial work. “private lake” means a lake which is situated entirely within the boundaries of any private land. “public lake” means any lake other than a private lake

- Stream

“stream” includes any river, creek or ela, whether perennial or intermittent, flowing in a natural channel, and any affluent, confluent or branch into or from which the stream flows. “private stream” means any stream the source and entire course of which is within private land. “public stream” means any stream other than a private stream

Accordingly, a lake or a stream falling within the above definitions become private only if situated entirely within or flowing entirely within ‘private land’. Any other lake or stream is public. The definition of ‘lake’ as mentioned above, excludes water contained in an ‘artificial work’. In this connection, the Ordinance defines a ‘work’ as: *“work” includes any dam, lock, tank, reservoir, weir, flume, race, channel (whether an artificial channel or a natural channel artificially improved), and any cutting, tunnel, pipe, sewer and any machinery and appliances.* However, in terms of the Ordinance, the Minister has the power to declare any tank or reservoir as a lake even if it is an ‘artificial work’. The Ordinance makes no mention of the waters contained in an artificial work that has not been so declared, the management of which presumably falls within other respective laws. As far as ownership is concerned, section 76 of the Ordinance declares that “the bed” of any public lake or public stream is the property of the State.

The *State Lands Ordinance* exempts water in private lakes and private streams by definition. However, these are water sources that are entirely located within private land. The *Report of the Land Commission* (1987) indicates that more than 80% of the land in Sri Lanka comes under State control in some manner. In these circumstances it may be assumed that there are no significant private surface water sources in the country.

As far as “the water” contained in a public lake or public stream is concerned, Section 72 of the Ordinance states that the “right to the use and flow and to the management and control “of water” in any public lake or public stream shall, ... vest in the State.”

Due to the importance of Section 72, the same is extracted and shown below.

72. The right to the use and flow and to the management and control of the water in any public lake or public stream shall, subject to the restrictions hereinafter mentioned, vest in the State. And in the exercise of that right, the State, by its officers and servants, may enter any land and take such measures as may be thought fit or as may be prescribed for the conservation and supply of such water as aforesaid and its more equal distribution and beneficial use and its protection from pollution, and for preventing the unauthorized obstruction of public streams.

Therefore, the State has in terms of the above provision, the “right” to the use and flow, and management and control, of the water found in a public lake or public stream. In carrying out this “right”, the officers and servants of the State may enter a land and take such measures as they think fit or take such measures that may be prescribed in order to “conserve” and to “supply such water” and for its “more equal distribution” and “beneficial use”.

The measures may also be measures intended to “protect from pollution” and to “prevent unauthorized obstruction of public streams”. The basis of the State control over such water is “linked to the infrastructure” coming within the public realm viz., public lake or public stream.

Section 73 of the SLO contains restrictions on the rights of the State. Section 73 (1) provides as follows: The right vested in the State by section 72 shall be subject to the following restrictions: -

- a) It shall not be exercised in contravention of any right conferred on and lawfully exercisable by any person, company, corporation, board, or local authority by or under any written law other than this Ordinance or of any license granted by the State*
- b) it shall be subject to the rights of the occupiers of land on the banks of public lakes and public streams as hereinafter defined;*
- c) it shall be subject to the rights of the holders of permits issued under this Part of this Ordinance.*

Therefore, the law firstly provides that the rights of the State shall not be exercised in contravention of any right conferred on and lawfully exercisable by any person, company, corporation, board, or local authority by or under any written law other than this Ordinance or of any license granted by the State. The Ordinance, however, does not identify such rights and only makes a general exemption.

The rights of the State are subject to the rights of the occupiers of land on the banks of public lakes and public streams defined in the Ordinance as rights of riparian proprietors. Section 75 of the Ordinance provides that the occupier of land on the bank of any public lake or public stream has the right to use the water in that lake or stream for;

- a) domestic purposes,
- b) the purpose of watering cattle or other stock, and
- c) agricultural purposes.

subject to the condition that the water to be used for any of the above purposes not be diverted through a channel, drain or pipe or by means of a pump or other mechanical contrivance, but be removed in a bucket or other receptacle. In addition, it is noted that under section 53 of the *Irrigation Ordinance* (IO), a land deriving substantial benefit from seepage resulting from a major irrigation work is liable to the payment of a seepage rate.

The rights of the State are also subject to the rights of the holder of a permit issued under the Ordinance. Section 77 of the SLO provides that:

77. (1) *Subject as hereinafter provided, no person shall—*
- a) divert any water from a public lake or public stream; or*
 - b) construct or maintain any work in, or upon the bank of, any public lake or public stream; or*
 - c) construct or maintain any bridge or causeway in or over a public lake or public stream,*
- except under authority of a permit issued, on behalf of the State, by the Government Agent¹ or other prescribed officer:*

¹ Section 4 (1) of the *Transfer of powers (Divisional Secretaries) Act No. 58 of 1992* states that: *Save as provided for in subsection (2), wherever in any other written law or in any notice, permit, communication, form or any other instrument or document issued, made, required, executed or authorized, by or under any such written law, any of the expressions “the Government Agent”, “the Government Agent of the District”, “the Government Agent of the Administrative District”, “the Government Agent or Assistant Government Agent of the Administrative District”, “the Government Agent, any Additional Government Agent, any Assistant Government Agent, or any Additional Assistant Government Agent”, “the Government Agent of any Administrative District”, or “the Government Agent of a Province” occurs, there shall be substituted therefor, the expression “the Divisional Secretary of the Divisional Secretary’s Division. ...*

Provided that no permit shall be required to authorize any person to divert any water from a public lake or a public stream in any case where such person is entitled so to divert such water under the Irrigation Ordinance or the provisions of any other written law.

(2) Every such permit shall be in such form and contain such conditions and provide for such payments as may be approved by the Land Commissioner either generally or in the circumstances of any particular case.

In terms of the law, the permit to divert water from a public lake or stream should conform to the conditions that may be approved by the Land Commissioner generally or in the circumstances of any particular case. In considering an application, the Government Agent is required to take the following matters into consideration:

- a) The rights of riparian proprietors who are likely to be affected by the issue of the permit.*
- b) The interest and requirements of the State and of any local authority concerned.*
- c) The probability that the grant of the permit may adversely affect any work or proposal contemplated or undertaken by the State or any local authority.*
- d) Any other prescribed matter.*

In considering applications for permits, the Government Agent may be assisted by an Advisory Board appointed under the Ordinance.

The Ordinance also contains exemptions. Therefore, no permit is required to divert water from a public lake or public stream where a person is entitled to so divert water under the *Irrigation Ordinance* or other provisions of any other written law. The section on 'savings' in the Ordinance [section 111] states that the SLO does not affect the provisions of the Forest Ordinance, the Irrigation Ordinance and the Land Development Ordinance.

The Ordinance also preserves any right claimed by way of an instrument of disposition executed before the Ordinance, namely prior to 01st September 1949. Although the Ordinance provides for compensation for the extinction of prescriptive rights to use water in a public stream or lake, such claims for compensation are to be entertained only if made within one year after the commencement of the Ordinance.

Accordingly, the *State Lands Ordinance* recognizes the right of the State to water in public lakes and public streams and sets out a permit scheme in order to access such water. However, the Ordinance itself provides several restrictions, exemptions and exceptions to such right of the State; a summary of which is set out in (Table 4). Therefore, the exercise of the rights vested in the State to the use

and flow and management and control of the water found in a public lake or public stream may not provide for the establishment and implementation of a comprehensive allocation framework relating to all sectors.

Table 4: Restrictions, exemptions and exceptions in the State Lands Ordinance

#	Restrictions, exemptions and exceptions
1.	Not applicable to private lakes and private streams.
2.	Not applicable to water contained in an ‘artificial work’ unless the work has been declared by the Minister as being a lake.
3.	Right vested in State not be exercised in contravention of any right conferred on and lawfully exercisable by any person, company, corporation, board, or local authority by or under any written law other than this Ordinance or of any license granted by the State.
4.	Right vested in State subject to rights of riparian proprietors.
5.	Rights vested in State subject to rights of holders of permits issued under this Part of this Ordinance.
6.	No permit required where person entitled to divert water under the <i>Irrigation Ordinance</i> or other provisions of any other written law.
7.	Savings vis-à-vis <i>Forest Ordinance</i> , the <i>Irrigation Ordinance</i> and the <i>Land Development Ordinance</i> .

- Forest Ordinance

The *Forest Ordinance No. 16 of 1907* has limited provisions relevant to the allocation of water. Section 5 of the Ordinance provides for a duly empowered forest officer to stop a public or private watercourse in a reserved forest provided that in the opinion of the Government Agent an equally convenient watercourse already exists or has been provided or constructed by such forest officer.

- Land Development Ordinance

The *Land Development Ordinance No. 19 of 1935* too contains limited provision in relation to the allocation of water resources. The definition of ‘land’ includes the bed of any waterway or of any collection of water; natural or artificial. Land in terms of the Ordinance may be mapped out for a variety of purposes including for the protection of springs.

- Irrigation Ordinance

The *Irrigation Ordinance No. 32 of 1946* (IO) was enacted to amend and to consolidate the law relating to irrigation. Even though the SLO provides for a situation where a person is “entitled” to divert water under the Irrigation Ordinance, the Ordinance itself does not make it immediately apparent as to how such an entitlement arises. Section 66 (A) of the Ordinance, introduced by the

Irrigation (Amendment) Act No. 23 of 1983 refers to “obtaining water from any irrigation work in contravention of the law and thereby causing any loss to any cultivator who is entitled to obtain such water.”

Section 2 (1) of the Irrigation Ordinance makes reference to an ‘irrigation rate’ in respect of water supplied or to be supplied. A FAO publication entitled, Land and Water Sector Development in Sri Lanka, by Gamage (Undated) [106] points out that this introduction of an irrigation rate in the Irrigation Ordinance No. 21 of 1867 is to recover the cost of improving irrigation facilities.

The said section provides as follows:

An irrigation rate under this Ordinance, with reference to any land to which it relates, is a charge in favour of the State imposed upon the land in respect of water supplied, or to be supplied to such land or in respect of the cost of or incidental to, the construction or maintenance of any major irrigation work benefiting or intending to benefit such land, or of all or any of such matters in combination.

Therefore, an ‘irrigation rate’ herein is in respect of the “water” or in respect of the “irrigation work” i.e. transmission cost. It is noted that the Ordinance defines a major irrigation work as follows: *“major irrigation work” means an irrigation work constructed and maintained by or under the authority of the Director of Irrigation out of moneys provided by Parliament;*

The Ordinance also defines a minor irrigation work as follows: *“minor irrigation work” means an irrigation work other than a major irrigation work”.*

Section 55 of the IO refers to a special supply of water subject to the payment of a special irrigation rate in ‘any area not ordinarily entitled to a supply of water from any major irrigation work’. The IO also provides for the imposition of a consolidated irrigation rate where, after the 1st November 1946, any major irrigation work is constructed wholly for the purpose of benefiting lands held on grant, permit, lease or otherwise from the State.

Part V of the Ordinance relates to the construction and maintenance of irrigation works. Section 64 of the Ordinance sets out the regulation making power under the Ordinance. The said section provides that: *Regulations may be made in respect of any irrigation work for all or any of the following matters: -*

- a) the prevention of the obstruction, diversion, or cutting of any ela, channel, or other watercourse comprised in the irrigation work, or of any other damage thereto,*
- b) the prevention of any encroachment upon any such ela, channel, or watercourse,*
- c) the prevention of any interference with any sluice, dam, or regulating machinery or device in or upon any such ela, channel, or watercourse,*

- d) the prevention of the obstruction of or interference with any road or path comprised in the irrigation work,*
- e) the construction of field channels and dams in approved places and in accordance with approved alignments,*
- f) the prevention of the waste of any water supplied from the irrigation work,*
- g) the prevention of the obtaining of water from any such ela, channel, or other watercourse in any manner not authorized,*
- h) the prevention of the diversion by any act or omission, of such water from any of the purposes for which it is intended,*
- i) the limitation of the extent of land for which water will be supplied in each season for cultivation under the irrigation work and the fixing of dates for the commencement and completion of the supply of such water in each season,*
- j) the conditions on which water will be supplied from the irrigation work and the charges to be paid for the supply of such water after the date fixed for the completion of cultivation,*
- k) the maintenance of the irrigation work,*
- l) any other matters necessary for the protection of the irrigation work, or for the conservation of water supplied therefrom.*

Section 75 (1) of the Ordinance amongst other things provides for the protection of the water in an irrigation work. The said section states as follows:

Where water from any ela, channel, watercourse or other irrigation work is obtained in any manner not authorized or is allowed to run to waste, and the person who obtained such water or allowed such water to run to waste cannot be identified, then, if land has derived any benefit from such water, the allottee or tenant cultivator, or where there is no allottee or tenant cultivator of any land the proprietor, of such land shall be liable to pay for such water at such rate as the Government Agent² may determine.

These and the other provisions in the Irrigation Ordinance indicate that the management and control of the water in the ‘irrigation work’ comes under the Irrigation Ordinance.

Once the water enters the various ‘irrigation works’ the mechanism for the management and allocation are specified in the IO. For example, section 5A (1) of the IO provides as follows:

In respect of every major irrigation work being a part of a inter-provincial irrigation and land development scheme which is specified by the Secretary to the Ministry of the Minister in charge of the subject of Irrigation, there shall be a Project Management Committee consisting of,

² Section 4 (2) of the Transfer of powers (Divisional Secretaries) Act No. 58 of 1992 states that:
 ... Wherever in Part II of the Irrigation Ordinance, the expression “Government Agent” occurs, there shall be substituted therefor, the expression “the District Secretary”.

- a) *such number of representatives of the Farmer's Organizations in that area as may be necessary to make the number of farmer representatives in the Committee not less than fifty per centum of the total membership of the Committee,*
- b) *a Project Manager appointed by the Secretary to the Ministry of the Minister in charge of the subject of Irrigation who shall function as the Chairman or Secretary of the Committee,*
- c) *a representative appointed by each of the following officers: -*
 - 1. *the Director of Irrigation,*
 - 2. *the Land Commissioner,*
 - 3. *the Commissioner of Agrarian Services,*
 - 4. *the Director of Agriculture, and*
 - 5. *the Commissioner of Co-operative Development,*
- d) *representatives from any other related agencies as may be determined by the Secretary to the Ministry of the Minister in charge of the subject of Irrigation,*
- e) *the Divisional Secretary or Secretaries of the Divisional Secretary's division or divisions within which that irrigation work is situated.*

- Agrarian Development Act

Irrigation works are also defined in the Agrarian Development Act. The Agrarian Development Act No. 46 of 2000 defines 'irrigation works' as an irrigation work serving up to two hundred acres of agricultural land. In terms of the Act, the Farmer's Organisations are required to assist Agrarian Development Councils by encouraging efficient water use. Within their area of authority, the Farmers Organizations are responsible for ensuring the efficient management of water. Every tank, dam, canal, watercourse, embankment, reservation or other irrigation work within the area of authority of a Farmer's Organization is subject to the supervision of such organization. The Commissioner General may order remedial action where it appears to him that any person has willfully or maliciously caused the waste of water conserved in an irrigation work. No person may dig any well or construct any well for the purposes of cultivation, or maintain any well, for the purposes of cultivation except with the written permission of the Commissioner-General and subject to such conditions that he may impose.

- Mahaweli Authority of Sri Lanka Act

The *Mahaweli Authority of Sri Lanka Act* (MASL Act) No. 23 of 1979 establishes the Mahaweli Authority of Sri Lanka as the responsible agency for the implementation of the Act. The Act applies within 'special areas' as declared in terms of the Act. Within a special area, the Authority plans and implements the Mahaweli

Ganga Development Scheme including the construction and operation of reservoirs, irrigation distribution system and installations for the generation and supply of

electrical energy. Although the Act does not explicitly set out the right of the Authority to access and to manage the water resources in the area, it does provide for the construction of irrigation works and for the levy of a charge or fee for the supply of water by the Authority.

Section 22 (1) of the Act provides as follows:

22. (1) The written laws for the time being specified in Schedule B hereto shall have effect in every Special Area subject to the modification that it shall be lawful for the Authority to exercise and discharge in such area any of the powers or functions vested by any such written law in any authority, officer or person in like manner as though the reference in any such written law to the authority, officer or person empowered to exercise or discharge such powers or functions included a reference to the Authority.

Schedule B includes the following laws:

*Agricultural Development Authority Incorporation Order
Agrarian Services Act
Fauna and Flora Protection Ordinance *
*Flood Protection Ordinance
Forest Ordinance
Irrigation Ordinance
Land Development Ordinance
Mines and Minerals Law
National Water Supply and Drainage Board Law
State Lands Ordinance
Water Resources Board Act
Wells and Pits Ordinance
Written law enacted under any of the aforesaid enactments.*

The inclusion of the State Lands Ordinance in particular recognises that within its area, the Authority may regulate/manage access to water resources.

- State Lands (Recovery of Possession) Act

State Lands (Recovery of Possession) Act No. 7 of 1979 provides for the recovery of possession of 'State land'. In terms of the Land Orders, land considered State land includes public rivers, river sources, springs, elas, water ways and their reservations.

සියලුම පොදු ගංගා, ගංගා මුලාශ්‍ර, ගංගා පන්ද, දිය උල්පත්, ඇලදොළ, දිය පාරවල් හා ඒවායේ රක්ෂිත.

Therefore, in terms of the Act, the State may protect public rivers etc., against unauthorised possession.

- Sri Lanka Electricity Act

The *Sri Lanka Electricity Act* No. 20 of 2009 provides for the issuance of licenses for generation, transmission or distribution of electricity. Section 31 of the Act provides that the provisions contained in the respective schedules to the Act apply in respect of the respective licenses. Schedule IV of the Act relates to ‘preservation’. Clause 3 of the schedule provides as follows:

- i. A generation license shall, in circumstances specified by the Commission, be entitled to construct, subject to conditions prescribed by the commission in consultation with the relevant water authority, water ways and pipelines and to use water for its licensed activities and the relevant water authority shall not unreasonably deny such right.*
- f) For the purpose of this item the “relevant water authority means such authority” as the commission shall prescribe.*

Therefore, the Act provides that the generation license carries with it an “entitlement to use water for the licensed activities”. Thus, the holder of such a generation license would enjoy such entitlement. What considerations would go into deciding such entitlement is unclear.

The Act also provides that the “relevant water authority” shall not unreasonably interfere with same. The relevant water authority is as prescribed by the Commission (PUCSL). It appears that this exercise has not yet taken place. However, it must be noted that even if such a recognition of relevant water authorities was to be carried out, this would still be for the purposes of the Sri Lanka Electricity Act only.

- Sri Lanka Sustainable Energy Authority Act

The *Sri Lanka Sustainable Energy Authority Act*, No. 35 of 2007 seeks to provide for the development of renewable energy resources and for this purpose to declare energy development areas. The Act recognizes ‘hydro energy’ or the energy derived from a moving body of water, through processes such as reaction and impulse. The Act provides that the Republic has the absolute ownership of all renewable energy resources notwithstanding any right of ownership a person may have to such renewable energy resources within the Area. This is subject to rights granted to any person by a permit issued under the Act. The Authority is responsible for conserving and managing all renewable energy resources within a Development Area.

- National Water Supply and Drainage Board Law

The *National Water Supply and Drainage Board Law* No. 2 of 1974, establishes the National Water Supply and Drainage Board (NWSDB). The law gives the NWSDB the exclusive right to undertake the supply of water within its area of authority unless the Board gives written permission with the approval of the

Minister. However, water supply by a local authority within its administrative limits remain unaffected unless such undertaking has been transferred to the Board. Section 16 (1) (a) of the Law provides as follows:

16. (1) It shall be the duty of the Board in each area of its authority: (a) to develop, provide, operate and control an efficient, coordinated water supply and to distribute water for public, domestic or industrial purposes;

This provision makes it the duty of the NWSDB to provide water for public, domestic and for industrial purposes though this does not impose on the Board a duty or liability enforceable by proceedings before court or tribunal to which the Board

will not otherwise be subject. This does not prevent the Board from carrying out works necessary in any part of Sri Lanka for the discharge of its functions.

In order to meet its obligations towards water supply, the NWSDB may purchase water in bulk. Other than empowering purchase, the Law needs to chart a clear course by which the water requirement of the Board can be met. The law authorizes the NWSDB to construct intakes, filters, tanks, aqueducts or other works to bring water to the area or areas of authority of the Board. The NWSDB may enter into joint schemes with any Government Department or any other body approved by the Minister for the supply of water and sewerage services. The law appears to provide for the NWSDB to have its own reservoirs, water courses etc. Section 33 of the Law reads as follows:

Every person who wrongfully takes or uses any water from any reservoir, watercourse, conduit, or pipe belonging to the Board, or from any pipe leading to or from any such reservoir, watercourse, conduit, or pipe, or from any cistern or other like place containing water belonging to or supplied from the Board, or for the use of any consumer of the water of the Board, other than such as may have been provided for the gratuitous use of the public, shall be guilty of an offence.

Therefore, the Law references works belonging to the Board as well as water belonging to or supplied by the Board. A Government water supply undertaking or a local authority water supply undertaking may be transferred to the Board.

- Local Authority Laws

The *Municipal Council's Ordinance*, the *Urban Councils Ordinance* and the *Pradeshiya Sabha Act* provide for the respective local authorities to provide public utility services including water supply. The relevant laws do not immediately make it clear as to how the water sources are to be accessed.

- Water Resources Board Act

The *Water Resources Board Act No. 29 of 1964* provides for the Water Resources Board (WRB) to advise the Minister on matters related to water resources of the country. Section 12 (1) of the Act provides as follows:

It shall be the duty of the Board to advise the Minister on the following matters, and on any other matter that is referred to the Board for advice by the Minister: -

- a) *the control, regulation and development (including the conservation and utilization), of the water resources of the country,*
- b) *[provisions in this section b have been quoted and hence not reproduced]*
- c) *the formulation of national policies relating to the control and use of the water resources of the country with the following objectives in view: -*
 - i. *the multi-purpose development and use of water resources,*
 - ii. *the short-term and long-term provision of water resources for domestic supplies and industrial supplies,*
 - iii. *[provisions in this section iii have been quoted and hence not reproduced]*
 - iv. *any other like objective.*

However, “implementation of such policies and advice” is unclear from a reading of the Act. Section 16 of the Act provides for the making of rules for the purpose of carrying out and giving effect to the principles and provisions of the Act and for matters connected with the functions and duties of the Board.

It is significant to note that in terms of section 12 of the Act, the WRB has a duty to advise the Minister in relation to the formulation of national policy relating to the control and use of water resources for the purpose of short-term and long-term provision of water resources for domestic supplies and industrial supplies.

Functionally the Water Resources Board pays more attention to groundwater extraction.

- National Environmental Act

The powers and functions of the Environmental Authority under the Act include the prevention of the discharge of untreated sewage or substandard industrial effluent or toxic chemicals into soil, canals or water ways. It also provides provisions regulating the pollution of inland waters.

The National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 in terms of the National Environmental Act establishes ambient water quality standards for categories A - water that requires simple treatment for drinking; B - bathing and contact recreational water; C - water suitable for aquatic life; D - water source that require to undergo general treatment process, for drinking; E - water suitable for irrigation and agricultural activities; and F - water with

minimum quality but not falling into categories A to E. The regulations provide that no person can discharge, deposit or emit any pollutant into the inland surface waters to exceed the Ambient Water Quality Standards in relation to the categories specified. Regulations have also been formulated in terms of the National Environmental Act setting tolerance limits for the discharge of industrial waste into inland surface waters. In light of the scarcity of water sources for drinking and agriculture, the allowing of effluent discharge into inland water bodies needs review and strict monitoring.

The National Environmental Act provides for the carrying out of environmental assessment in relation to certain projects that are prescribed in terms of the law. Regulations made under the Act published in Gazette Extraordinary No. 772/22 provides that environmental assessment is required in relation to the construction of water treatment plants of capacity exceeding ½ million cubic meters.

- The Penal Code

The Penal Code makes it an offence to voluntarily corrupt or foul the water of any public spring or reservoir, so as to render it less fit for the purpose for which it is ordinarily used.

6.2.3 Review of Surface Water Functionality

The provisions contained in the State Lands Ordinance provides the State, the “right” to the use and flow, and management and control, of the water found in a public lake or public stream. However, as set out above these provisions are curtailed by several exemptions and restrictions in the law.

In terms of the Water Resources Board Act, the Board has a duty to “advise the Minister” on the control, regulation and development (including conservation and utilization), of the water resources of the country, and the formulation of national policies relating to the control and use of the water resources in relation to multi-purpose development and use of water resources. It is noted however that the law mandates the Board to advise the Minister.

The Board also has a duty to advise the Minister in relation to the formulation of national policy relating to the control and use of water resources for the purpose of short-term and long-term provision of water resources for domestic supplies and industrial supplies. In this, it is noted that the duty of the WRB in advising the formulation of national policy and that of the NWSDB in providing water supply for domestic and industrial purposes converge.

The summary in the **Table 5** shows that the Sri Lanka’s statute law with respect to surface water does not provide a clear picture of the empowerments for surface water allocation.

Table 5: Summary of Surface water functionality Empowered by Each Legislation

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
1	State Lands Ordinance	Any use of water in a Public Lake or Public Stream (Conditional) The right to the use and flow and to the management and control of water in any public lake or public stream is vested in the State. Requires a permit for the diversion of any water from a public lake or public stream.	Exemptions and exclusions: <ul style="list-style-type: none">• Rights under written law• License from State• Riparian Proprietor• Irrigation Ord. / Forest Ord. / Land Development Ord.• Entitlement under written law
2	Forest Ordinance	No explicit provision regarding environmental use of water	Use of Water for ‘forests’ could be implied.
3	Land Development Ordinance	Definition of ‘land’ includes the bed of any waterway or of any collection of water whether natural or artificial. Land in terms of the Ordinance may be mapped out for the protection of springs.	The responsibility of the State in protecting spring water sources is implied.

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
4	Irrigation Ordinance	Regulates management of irrigation water in any irrigation work. Provides for the construction and maintenance of irrigation works and for the levying of irrigation rates.	Clear provision required as to entitlement.
5	Agrarian Development Act	In respect of irrigation works serving up to 200 acres of agricultural land. Farmers Organisations to ensure efficient management of water.	Clear provision required as to entitlement.
	Mahaweli Authority Act	Construction of irrigation works Levy of charges or fees for supply of water by Authority. Authority to implement the State Lands Ordinance and the Water Resources Board Act within its area of Authority.	Implies that the Authority has access to and/or may regulate access to water sources within its area.
	Water Resources Board Act	Advise the Minister on; <ul style="list-style-type: none"> • Control, regulation and development of water resources, • Formulation of national policies on controlling and use of water resources in relation to multi-purpose development and use of water resources and short and long term provision of water resources for domestic and industrial supplies. 	Provides the framework for the emergence of a comprehensive policy framework for water resource development including allocation. Clear provision required for implementation of the policy framework.

The above review indicates that the legal framework in respect of managing and allocation of surface water resources remains fractured and fragmented. The *State Lands Ordinance* creates the framework for a comprehensive framework for water allocation by vesting in the State the right to the use and flow and to the management and control of water in a public lake or public stream and requires a permit for the diversion of water from such a water body. However, certain limitations to the comprehensive application of the Ordinance can be found within the Ordinance itself and several other laws as set out above. In the absence of a comprehensive overall allocation framework, each sectoral law seeks to ensure that its immediate water needs are secured through entitlements, exemptions etc. Although the Water Resources Board Act refers to the formulation of overall national policy, the role of the WRB in this regard appears to be largely advisory. A review of the legal framework in relation to surface water does not provide evidence of an allocation strategy and approach that takes into account the needs of all sectors through a transparent equitable mechanism. The closest to an overall framework in law is provided by the provisions in the Water Resources Board Act.

6.2.4 Water and Statute Law -Groundwater

Groundwater is considered as the water found below the earth's surface. Groundwater is natural water that flows within aquifers below the water table. Groundwater is replenished from surface water and eventually flows to the surface naturally. Groundwater may be discharged at springs and can form oases or swamps. Groundwater law involves many issues, including the distinction between percolating groundwater and surface water, the definition of basin boundaries, the interrelated concepts of safe yield and overdraft, and the different categories of groundwater rights. Groundwater laws vary by location.[107]

- Water Resources Board Act

In addition to 'water resources' in general, referred to in the section on surface water, the *Water Resources Board Act No. 29 of 1964* also contains provisions specifically relating to groundwater. Section 12 (1) of the Act further provides as follows:

It shall be the duty of the Board to advise the Minister on the following matters, and on any other matter that is referred to the Board for advice by the Minister:
... ..”,

... ..

- a) *the preparation of comprehensive and integrated plans for the conservation, utilization, control and development of the groundwater resources of the country,*
- b) *the co-ordination of the activities of government departments, local authorities and public corporations, in regard to surveys of basic data and other investigations, relating to hydrogeology,*
- c) *the analysis of reports based on investigations, statistical surveys, plans and proposals relating to the groundwater resources of the country made by government departments, local authorities and public corporations,*
- d) *the co-ordination of projects undertaken by government departments, local authorities and public corporations, relating to the conservation, utilization and development of the subterranean water resources of the country, and the assessment of the possibilities, benefits and economic feasibility of such projects,*
- e) *any other suitable measures to be taken by the Government for the proper control and economic use of groundwater.*

The Act therefore makes reference to groundwater resources and subterranean water resources. These powers are advisory, and the Water Resources Board may advise the Minister on such matters.

In terms of section 12 (3) of the Act the Board may also carry out the following:

(3) The Board may carry out such other activities, for payment or otherwise, as would enable it to effectually perform its duties under subsection (1) of this section. The activities which the Board may carry out shall include the following: -

(a) carrying out of feasibility studies on the availability of ground water resources;

(b) carrying out of hydrogeological investigations to identify ground water sites for deep tube wells and agro wells;

(c) the construction of tube wells in a scientific manner to enable the extraction of groundwater for domestic, agricultural and industrial purposes;

(d) the drilling of bore holes to investigate the sub surface strata.

As stated above in the previous chapter on surface water, section 16 (1) of the Act empowers the Board to make rules for the purpose of carrying out and giving effect to the principles and provisions of this Act and for all matters connected with the functions and duties of the Board.

The Water Resources Board has published an 'Order' under section 16 of the Water Resources Board Act seeking to supervise the exploration of groundwater. The said 'Order' is published in Gazette Extraordinary No. 2010/23 of 16.03.2017. The Gazette seeks to regulate the following groundwater-based industries in the use of natural water springs or groundwater:

- a) Bottle water industry*
- b) Beverage industry*
- c) Laundries*
- d) Vehicle service stations*
- e) Hotels*
- f) Plant nurseries*
- g) Agriculture farms*
- h) Livestock farms*
- i) Private groundwater selling points*
- j) Coir and rubber industry*
- k) Ice factories*
- l) Any other industry as per the decision of the Water Resources Board.*

The Gazette also seeks to regulate any government or local government institution, non-government organizations, any institute or an individual engaging in water bottling, industry, beverage industry. Where there is extraction

of more than 30,000 liters per month for commercial agriculture or industry, a perimeter protection report should be obtained from the Water Resources Board. The Gazette also requires those engaged in construction of tube wells to register themselves with the Water Resources Board.

- Mines and Minerals Act

The *Mines and Minerals Act* No. 33 of 1992 empowers any owner or occupier of any land or a licensee authorized under the Act to explore for or mine for minerals in such land, to search and mine for, develop, produce and consume mineral water in or from such land for his personal use. The Act defines mineral waters as waters from which minerals may be extracted on a commercial basis.

- National Environmental Act

The National Environmental Act provides for the carrying out of environmental assessment in relation to certain projects that are prescribed in terms of the law. Regulations made under the Act published in Gazette Extraordinary No. 772/22 provides that environmental assessment is required in relation to ground water extraction projects of capacity exceeding ½ million cubic meters per day.

6.2.5 Review of Groundwater Functionality

Provision in the law relation to groundwater is limited. The provisions in the Water Resources Board Act include *the duty of the Board to advise the Minister on* the preparation of plans for the conservation, utilization, control and development of groundwater resources, and other suitable measures to be taken by the Government for the proper control and economic use of groundwater. In addition, the provisions in the Water Resources Board Act relating to National policy on water resources could apply to groundwater resources too. ‘Order’ under section 16 of the Water Resources Board Act published in Gazette Extraordinary No. 2010/23 of 16.03.2017 seeks to regulate certain groundwater-based industries in the use of natural water springs or groundwater:

Table 6: Summary of Ground water functionality Empowered by Each Legislation

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
1	Water Resources Board Act	<p>Advice Minister on;</p> <ul style="list-style-type: none"> • preparation of plans for conservation, utilization, control and development of groundwater resources • analysis of reports based on investigations, statistical surveys, plans and proposals relating to groundwater resources made by 	<p>Provides the framework for the emergence of a comprehensive policy framework for water resource development including allocation.</p> <p>Clear provision required for implementation of the policy framework.</p>

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
		government departments, local authorities and public corporations <ul style="list-style-type: none"> other suitable measures to be taken by the Government in the proper control and economic use of groundwater 	
2	National Environmental Act	Provision for the regulation and control of the pollution of ground water Environmental assessment relating to groundwater extraction in excess of a specified daily rate.	
3	Mines and Minerals Act	Provision relating to consuming mineral water for personal use	

The provisions in the Water Resources Board Act provide the framework for the emergence of a national policy and plans for the proper use of groundwater. It is noted that the Water Resources Board Act which was enacted in 1964 provided for the development and management of water resources in general which included surface and ground water. The 1999 amendments to the Act, while retaining the overall functionality of the Board in respect of water resources in general also emphasized its role vis-à-vis groundwater resources. The Figure 1 summarizes the legal framework pertaining to groundwater and surface water.

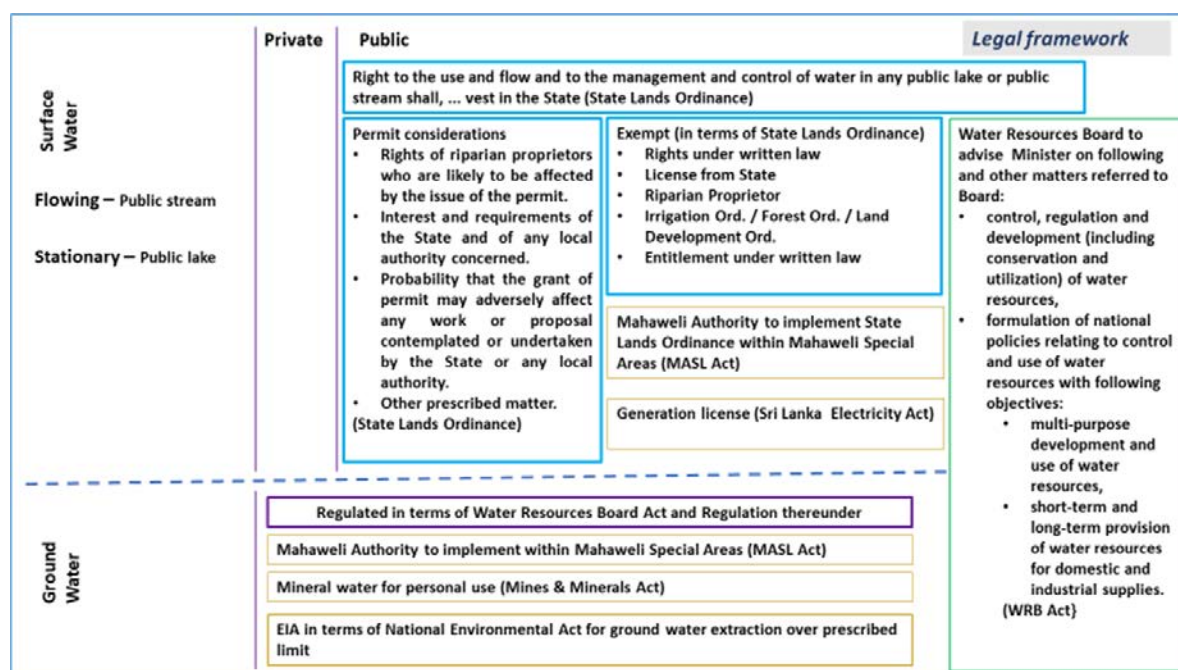


Figure 1: Summary of Legal Framework associated with Surface water and Groundwater

6.2.6 Water and Statute Law -Water Supply

This discussion on water supply deals with the public, domestic and industrial water supply.

- National Water Supply and Drainage Board Law

The National Water Supply and Drainage Board Law No. 2 of 1974 empowers the National Water Supply and Drainage Board (NWSDB) to engage in water supply and drainage within its areas of authority.

The duties of the Board include the following:

- i. develop, provide, operate and control an efficient, coordinated water supply;*
- ii. distribute water for,*
 - a. public,*
 - b. domestic or*
 - c. industrial purposes;*
- iii. take over and carry on any water supply undertaking of a local authority that has been transferred to the NWSDB;*
- iv. provide a supply of water and to distribute it or sell water in bulk or otherwise, to any local authority, Government department, other institution or organization, or individual*

In order to carry out its duties the NWSDB may:

- i. purchase water in bulk;*
- ii. enter into contracts necessary for the performance of the duties and the exercise of the powers of the Board;*
- iii. enter into joint schemes with any Government department or body approved by the Minister, for the provision, development and maintenance of water supply services;*
- iv. construct intakes, filters, tanks, aqueducts or other works for the purpose of bringing water to the area or areas of authority of the Board for the use of the inhabitants.*

A person who wrongfully takes or uses water from any reservoir, watercourse, conduit, or pipe belonging to the Board, or from any pipe leading to or from any such reservoir, watercourse, conduit, or pipe, or from any cistern or other like place containing water belonging to or supplied from the Board, or for the use of any consumer of the water of the Board, other than such as may have been provided for the gratuitous use of the public, is guilty of an offence.

The provision in the Law relating to penalties further makes reference to 'reservoirs or other works belonging to the Board', 'stream, reservoir, aqueduct, or other waterworks belonging to the Board', 'land belonging to the waterworks', and

‘channel, tank, reservoir, cistern, well, fountain, stand-pipe or other work connected with the water supply’.

The Law further provides for the transfer to the NWSDB of the undertakings of the Department of Water Supply and Drainage including the vesting in the Board of any movable and immovable property of the Department. The NWSDB is, in terms of the provisions of the Law, the successor to the Department of Water Supply and Drainage. Therefore, any works of the Department too could have been transferred to the NWSDB. The Law also contains provision to the effect that a person who, unlawfully and maliciously, does any act which causes or is likely to cause a failure of any water service supplied by the NWSDB is guilty of an offence.

The local authorities too, have the power to engage in water supply activities in terms of their respective laws. The National Water Supply and Drainage Board Law provides that any person engaged in the supply of water is subject to an approval other than a supply being carried out by a local authority. The above provision make reference to the following in respect of the NWSDB:

- a) *intakes,*
- b) *filters,*
- c) *tanks,*
- d) *aqueducts,*
- e) *reservoirs,*
- f) *watercourses,*
- g) *channels,*
- h) *tanks,*
- i) *cisterns,*
- j) *wells,*
- k) *fountains or*
- l) *other work.*

- Municipal Councils Ordinance

The *Municipal Councils Ordinance No. 29 of 1947* provides that one of the public utility services that a Municipal Council may maintain is that of ‘water supply’. The immovable property that may be vested in a Municipal Council includes the lakes, ponds, reservoirs, tanks, aqueducts and other waterworks within the Municipality that may be or have been made over, with the sanction of the President or the Governor-General, as the case may be, to the Municipal Council in terms of the Municipal Councils Ordinance or under any repealed enactment.

- Urban Councils Ordinance

The *Urban Councils Ordinance No. 61 of 1939* provides that an Urban Council may establish and maintain certain public utility services including water supply.

The Ordinance provides that a person who pollutes or contaminates any reservoir used for the purposes of the waterworks belonging to any Urban Council, or any stream or watercourse where the water flows into or feeds any such reservoir, is guilty of an offence.

- Pradeshiya Sabhas Act

In terms of the *Pradeshiya Sabha Act No. 15 of 1987*, a public utility service that a Pradeshiya Sabha may have includes 'water supply'. The Act provides that a person who pollutes or contaminates any reservoir used for the purposes of the waterworks belonging to any Urban Council, or any stream or watercourse where the water flows into or feeds any such reservoir, is guilty of an offence.

- Urban Development Authority Law

The *Urban Development Authority Law* provides for the preparation of a development plan for a development area or part thereof with a view to promoting and regulating the integrated planning and physical development of lands and buildings in a development area of the Authority having regard to the amenities and services to be provided to the community. A 'development plan' may make provision in respect of water supply, sewerage and drainage.

- Community Based Organization water supply

In addition, there are a number of community based organisations (CBOs) that maintain water supply. These come within the purview of the Department of National Community Water Supply (DNCWS). There is at present no law at the National level that specifically empowers the functioning of the water supply CBOs.

- Statute of the North Western Province

The North Western Province has enacted the *Establishing and Regularizing of Community Based Organizations (Water Supply and Environmental Sanitations) Statute No. 01 of 2013 of Provincial Council of North Western Province*. This statute is contained in Gazette Extraordinary No. 1,808 of 26.04.2013. The objectives of the Statute are as follows:

The North Western Province has enacted the *Establishing and Regularizing of Community Based Organizations (Water Supply and Environmental Sanitations) Statute No. 01 of 2013 of Provincial Council of North Western Province*. This

statute is contained in Gazette Extraordinary No. 1,808 of 26.04.2013. The objectives of the Statute are,

- a) ensuring the sustainability of CBOs established to provide Water Supply and Environmental Sanitation to the people of the region, and regulating, guiding and the administration of same.*
- b) Implementing projects in order to promote Water Supply and Environmental Sanitation.*
- c) Inclusion of all regional water supply and environmental sanitation projects that are being carried out within the Province into a common management procedure.*
- d) Establishment of the North Western Provincial Water Supply and Environmental Unit.*

6.2.7 Review of Water Supply Functionality

The water supply functions is presently with the National Water Supply and Drainage Board and the local authorities. Provision for water supply may be made in the development plan formulated in terms of the Urban Development Authority Law.

While the law provides a duty on certain Authorities to carry out water supply functions, there is little recognition of the right to an adequate, quality supply of water.

The duties of the National Water Supply and Drainage Board vis-à-vis water supply for public, domestic and industrial use as set out in sub-section 16(1) of the Act is given above. It is noted that sub-section 16(2) provides that 'nothing in this section shall be construed as imposing on the Board, either directly or indirectly, any form of duty or liability enforceable by proceedings before any court or tribunal to which the Board will not otherwise be subject'.

Table 7: Summary of Water Supply functionality Empowered by Each Legislation

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
1	National Water Supply and Drainage Board Law	<p>Develop, provide, operate and control an efficient, coordinated water supply.</p> <p>Distribute water for, public, domestic or industrial purposes.</p> <p>Take over water supply undertaking of a local authority transferred to NWSDB.</p> <p>Provide supply of water and distribute or sell water in bulk or otherwise, to any local authority, Government department, other institution or organization, or individual.</p> <p>Board may:</p> <p>purchase water in bulk;</p> <p>construct intakes, filters, tanks, aqueducts, other works for the purpose of bringing water to the area or areas of authority of the Board for use of inhabitants.</p> <p>The law refers to reservoirs or other works belonging to the Board, and streams, reservoirs, aqueducts, or other waterworks belonging to the Board.</p>	<p>Recognizes waterworks and other works owned by the Board.</p> <p>Clearer provisions required for the identification and management of such works.</p>
2	Local authority laws viz., Municipal Councils Ordinance, Urban Councils Ordinance and Pradeshiya Sabhas Act	Public utility services of 'water supply'.	Clear provision required relating to access to water sources for the purpose of obtaining water.
3	Urban Development Authority Law	A development plan in terms of the law may provide for water supply.	
4	Establishing and Regularizing of Community Based Organizations (Water Supply and Environmental Sanitations) Statute No. 01 of 2013 of Provincial Council of North Western Province	Establishment of the North Western Provincial Water Supply and Environmental Unit	Provincial statute pertaining to CBOs engaged in water supply.
5	Water Resources Board Act	Formulation of national policies on controlling and use of water resources in relation to multi-purpose	These provisions may be further strengthened to provide a framework for

#	Legislation	Explicit functionality	Remark (Such as what has been implied)
		development and use of water resources and short and long term provision of water resources for domestic and industrial supplies.	the purpose of effectively managing water resources.

6.3 Devolution of Power and Water Allocation

6.3.1 Devolution

The Constitution of the Democratic Socialist Republic of Sri Lanka was amended in 1987 in order to establish Provinces and to devolve power to the Provinces. The 13th Amendment to the Constitution which paved way for devolution was certified on 14th November 1987. It provides for devolution and for the establishment of Provincial Councils. The Ninth Schedule to the Constitution contained in the 13th Amendment sets out three lists containing subjects falling within the Provincial Council List (List I), the Reserved List (List II) and the Concurrent List (List III) (Annex 4). Article 154G (1) provides for each Provincial Council to make statutes applicable within the respective Province with reference to the relevant lists in the Ninth Schedule. It is noted that National policy on all subjects and functions is a reserved subject and so are all subjects and functions not specified in the Provincial List or the Concurrent List. As described previously, the statute laws before and after the 13th amendment, and the 13th amendment play an important role in water allocation.

6.3.2 Surface Water

Item 18 of the Provincial Council List refers to rights in or over land, land tenure, transfer and alienation of land, land use, land settlement and land improvement, to the extent set out in Appendix II (Annex 4). Appendix II provides that a Provincial Council may initiate irrigation and land development schemes within its Province utilizing water from rivers flowing through more than one Province.

Agriculture and agrarian services, other than in inter-provincial irrigation and land settlement schemes are provincial and so is the rehabilitation and maintenance of minor irrigation works. Planning, designing, implementation, supervision and maintenance of irrigation works, other than irrigation schemes relating to rivers running through more than one Province or inter provincial irrigation and land development schemes is also provincial. Appendix II under the Provincial Council List provides that irrigation schemes within the Province initiated by the State utilizing water from rivers flowing through more than one Province, within the Province utilizing water through diversions from water systems from outside the Province, and schemes where the command area falls within two or more Provinces will be the responsibility of the Government.

The Reserved List includes the regulation and development of inter province rivers and river valleys to the extent to which such regulation and development under the Government is declared by Parliament by law to be expedient in the public interest.

Water storage and management, drainage and embankment, flood protection and planning of water resources are contained in the concurrent list. However, it is noted that they are placed under the heading 'irrigation' and so might be limited to the irrigation context.

6.3.3 Groundwater

Groundwater has not been directly considered in terms of the 13th Amendment to the Constitution. Therefore, groundwater policy may perhaps be considered under the Reserved List which provides for National policy on all subjects and functions or subjects and functions not specified in the Provincial List or the Concurrent List.

6.3.4 Water Supply

The National Water Supply and Drainage Board is an agency coming under the Government operating under and in terms of the National Water Supply and Drainage Board Law. Hence water supply by the NWSDB is a function of the Government.

Water supply is also a function that is contained in the Municipal Councils Ordinance, the Urban Councils Ordinance and the Pradeshiya Sabhas Act. Notwithstanding the enactment of the National Water Supply and Drainage Board Law, the water supply provisions in the local authority laws still remain.

In 2003 a Bill titled *Water Services Reform Bill* was presented to Parliament which sought to introduce the Public Utilities Commission as the economic and technical regulator for the water services industry. In a challenge to the bill before the Supreme Court the Courts finding includes the following:

The National Water Supply and Drainage Board Law of 1974, enacted under the provisions of the previous Constitution provides inter alia for the supply of water. However, as correctly submitted by Counsel for the Petitioners, the law did not remove the role of local authorities in this regard. The provisions in the respective Local Authorities Ordinances and the Pradeshiya Sabha Act being a later enactment under the present Constitution, that empower these authorities to supply pipe borne water, remain in force.

Item 4 in the Provincial Council List I, in the 9th Schedule, specifies Local Government as a Subject coming within that List. Item 4:3 provides as follows:

Local Authorities shall have the powers vested in them under existing law. Municipal Councils and Urban Councils will have powers vested in them under the Municipal Councils Ordinance, and Urban Councils Ordinance, Pradeshiya Sabhas will have the power vested in them under existing law. It will be open to Provincial Councils to confer additional power on Local Authorities but not to take away their power.

It is seen from the preceding analysis that under the existing law the supply of pipe borne water is a function vested in the respective of local authorities. Therefore it is a subject in List I within the legislative competence of Provincial Councils. However, even Provincial Councils cannot take away these powers from the respective local authorities. The Bill under review does not take into account the preceding provisions of the Constitution and the applicable law which vests the supply of water services in local authorities.

Therefore, the supply of pipe borne water was considered as coming within the legislative competence of Provincial Councils.

Community Based Organisations in general are supported by the Department of National Community Water Supply. There is no National law that enables this function. The North Western Province has enacted the Establishing and Regularizing of Community Based Organizations (Water Supply and Environmental Sanitations) Statute No. 01 of 2013 of Provincial Council of North Western Province in respect of the provincial level institutions.

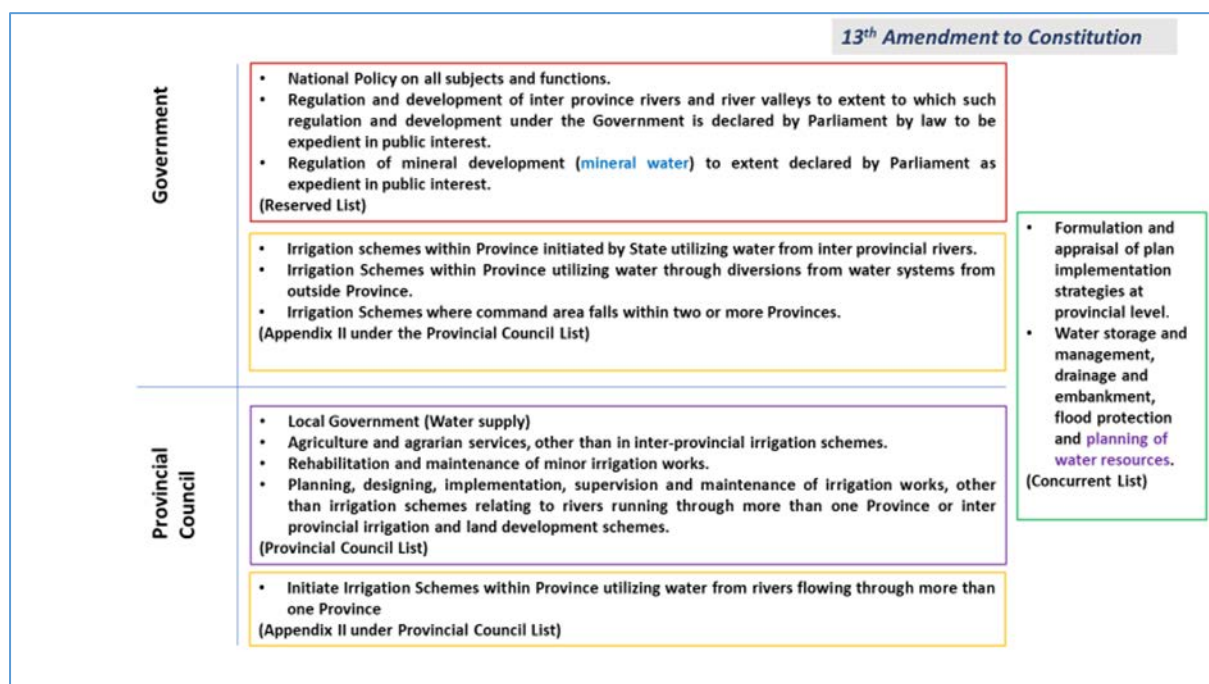


Figure 2: Devolution of Power and Water Governance by Central Government and Provincial Councils

7 Review international Best Legal Practices of water allocation

7.1 Common Elements

Wurbs (2013)[108] sets out some of the objects of a water allocation system i.e. provide for equitable apportioning of water resources among the various users; protect existing water users from diminished supply due to new users; govern sharing of limited water supplies during shortage and facilitate efficient water use. He indicates that from the perspective of water law, ground water and surface water is usually considered distinct.

Solanes, (2009) [109] indicates that Governments have historically exercised control over water resources. He identifies some of the common elements in water resources legislation as follows:

- a. Statement of the objects and purposes of the water policy in the legislation. (e.g. optimum use of water resources for the benefit of all – Canada; management of surface and ground water to serve the common interest, benefiting individual users –Germany; integrated water resources management – Netherlands)
- b. Maintenance of water quality and prevention of the deterioration of quality. (e.g. designated areas for the management of water quality³ and putting into effect programs and plans to manage, restore, enhance water quality – Canada; maximum loads for discharges, strict liability that is joint and several, use of best available technology to treat hazardous waste – Germany; Licensing discharges, pollution charges, five year action plans to prevent pollution, bans and restrictions on identified pesticides – Netherlands; minimum acceptable river flows, protection zones for water, codes of good practices for agriculture in order to protect water resources – England; duty of the State in protecting water resources – China)
- c. Application of the public trust doctrine in limiting prior appropriation rights to water where a full exercise of such appropriation rights would adversely affect the environmental function of a water body (e.g. USA)⁴
- d. Planned approach to water management. (e.g. prior planning approval where there could be substantial modification to water bodies or banks,

³ In this regard it is noted that the National Environmental Act in Sri Lanka provides for the declaration of environmental protection areas where the Central Environmental Authority is empowered to exercise, perform and discharge any powers, duties and functions relating to any planning and development within such protection area and to be responsible for the physical planning of such area. Where such area of declared, the Minister may declare that any planning scheme or project in the protection area under the provisions of any law which is in conflict with any provisions of the National Environmental Act, shall cease to operate in that area so long as the Order is in force.

⁴ The public trust doctrine has been cited in a number of Sri Lanka cases including the Water's Edge case.

protection of quality of life and water availability reflected in water plans for river basins and for economic regions, disaster concerns, integration of water planning and regional planning – Germany; utilization of water resources following a systematic and comprehensive approach taking into account all related aspects and consonant with land-based plans – China)

- e. Comprehensive assessment of water related programs and policies. (e.g. assessment taking into account environmental impacts and other National concerns, and based on principles such as the precautionary principle, intergenerational equity, conservation of biodiversity and ecological integrity – Australia; multidisciplinary assessment of plans relating to water resources – USA)⁵
- f. Environmental impact assessment for major activities significantly affecting the human environment and other actions that can affect water resources (USA; Netherlands).
- g. Strategies to manage water related differences and to coordinate activities. (e.g. during times of scarcity of water of required quality reconciliation of rights subject to compensation – Germany; consultative dispute resolution – China; agreements between Government and sub National governance bodies – Australia / Canada)
- h. Timely information on quality and quantity of water availability to stakeholders as a prelude to participatory planning. (e.g. registers with pertinent information available for public inspection, strict record keeping of water usage and information publicly available – England; programs on public information – Canada)
- i. Approaches that do not permit private ownership of water and keeps the water resource in the public domain.
- j. Courts have recognised the need to change from riparian rights to a permit-based system as circumstances warrant and the need for justification for the preservation of riparian rights. The need to take into account changing circumstances⁶ in regulating water rights has also been similarly recognised. (USA).
- k. Water rights subject to forfeiture or may extinguish due to non-use in the best utilization of the resource. (e.g. Germany, Spain, Mexico, USA etc.) This is based on the concept of 'beneficial use' i.e. water not to be misused, water to be used for generally recognised and socially acceptable use, water rights cannot be obtained speculatively,[110].
- l. Water rights are conditional and vested rights are secondary to public interest.[110]

⁵ In this regard it is noted that the proposed amendments to the National Environmental Act in Sri Lanka include strategic environmental assessments (SEA).

⁶ In this regard it is noted that the State Lands Ordinance of Sri Lanka in deciding upon a permit for the diverting of water the Government Agent is required to take into consideration the interests and requirements of the State and of any local authority and the probability that the grant of the permit may prejudicially effect any work or proposal contemplated or undertaken by the State or by any local authority.

7.2 United Nations Recognition of Right to Water

The right to water for drinking and sanitation has received recognition as a human right. The United Nations General Assembly by resolution adopted on 28th July 2010, recognized the “right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights”. The resolution accordingly calls upon “States and international organizations to provide financial resources, capacity-building and technology transfer, through international assistance and cooperation, in particular to developing countries, in order to scale up efforts to provide safe, clean, accessible and affordable drinking water and sanitation for all.”

The 2003 Supreme Court Special Determination in relation to the Water Services Reform Bill in setting out the grounds relied upon by Petitioners and Intervenor to that application states that one of the grounds relied upon is that “in terms of the General Comment No. 15 (2002) of the Economic and Social Council of the United Nations, the right to water comes within Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights” and that the “General Comment specifically states that the right to water is to be considered a human right and since Sri Lanka has acceded to the International Covenant, the provisions our law should be interpreted in the light of the obligations under the Covenant and in terms of the General Comment made thereon by the Council”. On that basis it had been “contended that the right to water would come within the purview of fundamental rights as referred to in Article 3 of the Constitution and form part of the sovereignty of the People”.

In November 2015, the General Assembly having recalled its previous resolutions affirmed “that the human rights to safe drinking water and sanitation as components of the right to an adequate standard of living are essential for the full enjoyment of the right to life and all human rights” and recognized “that the human right to safe drinking water entitles everyone, without discrimination, to have access to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use, and that the human right to sanitation entitles everyone, without discrimination, to have physical and affordable access to sanitation, in all spheres of life, that is safe, hygienic, secure, socially and culturally acceptable and that provides privacy and ensures dignity, while reaffirming that both rights are components of the right to an adequate standard of living”.

7.2.1 Case Law

In the case of Delhi Water Supply & Sewage Disposal Undertaking and another vs State Of Haryana & others decided in 1996, the Supreme Court of India in

determining rights between the irrigation and drinking water needs stated that a “river has to flow through some territory; and it would be travesty of justice if the upper-riparian States were to use its water for purposes like irrigation, denying the lower riparian States the benefit of using the water even for quenching the thirst of its residents”. Therefore, the Court directed the Haryana State to make available certain quantity of water to Delhi throughout the year.

8 Stakeholder Participation in Water Allocation Decisions

8.1 Overview

“A stakeholder is a person (or a group) who is responsible for making or implementing a management action, who will be significantly affected by the action, or who can aid or prevent its implementation”[111].

In the contemporary social and economic setting, “Water is everybody’s business and it is important to make sure that this vital resource is managed in an integrated fashion bringing together and addressing the needs of all stakeholders. The Sri Lankan authorities have been making a sincere effort to put this idea to practice effective water management and related activities in the water sector [112].

The Sri Lanka National Water Development Report of 2006 [112] also describing the ancient village tank management for domestic water supply, irrigation, water for livestock and the recharge of groundwater mentions about a system of compulsory labour for stakeholders that had been in existence under the patronage of the King to ensure proper maintenance of the irrigation system and its water.

In the subsequent period, public participation, farmer organisations, community water associations are some of the methods used for stakeholder participation in water sector decision making[113]–[116].

The recent water managers have identified that the natural increase of population coupled with its improved living standard and expansion of the economy have made a substantial increase in demand for water over and above the existing levels of available supply, which require some rational negotiated settlement approaches to solve water allocation issues that arise between competing uses/users[117]. Mahaweli water security program in ADB project document is one example of a case incorporating a variety of stakeholder consultation approaches in the water sector[118]. A demonstrated example of forming water stakeholder committees in India water policy implementation shows its importance, practicality, success of mobilising a wide range of stakeholders[119]. In relation to outside Sri Lanka cases, a comparative study of stakeholder participation in a multitude of water sectors using 5 regional river basins had revealed that the stakeholder interests

grow with the state of development of the river basin[120]. This shows that the stakeholder interests grow when there is a greater need to share the limited water resources.

8.2 Water Use Sectors and Stakeholder Organisations

8.2.1 Water and Stakeholders

In case of water, everyone and every living organism becomes a stakeholder. The key stakeholders for a particular expanse of water are those who become part of the decision making process associated with the utilization of that water. A country's water management within government structures is distributed across many agencies and tends to be dominated by sectoral interests.

The main water users in a country includes, agriculture, water supply & wastewater, mining, industry, environment, fisheries, tourism, energy, and transport. The priority assigned for each sector is based on the development and economic goals according to environmental, social and political realities [121].

In Sri Lanka, the best available application of water management among many stakeholders can be identified as the one practiced at the Water Management Secretariat (WMS) of the Mahaweli Authority of Sri Lanka. The WMS ensures the appropriate utilization of the water resources of Mahaweli reservoirs while coordinating with Ceylon Electricity Board(CEB), NWSDB, Department of Irrigation, and Metrology Department to meet the countries' agriculture, hydro-energy, drinking and irrigation water requirements. WMS also provide information and recommendations to the Water Management Panel(WMP) to assist reaching its operational policy decisions[50]. The WMP assembles weekly to decide weekly water allocations. There is no published information about the WMP responsibilities and the key stakeholders who perform the associated decision making. A panel meeting minute corresponding to 15th October 2013 indicates the participated stakeholders as, the Ministry of Irrigation and Water Resources Management, Mahaweli Authority, Resident Project Managers of Mahaweli Systems, Irrigation Department, CEB, Agriculture Department, Paddy Marketing Board, Rice Research and Development Institute, Farmer Representations from Districts and Divisions[122], A panel meeting minutes in April 2020, mentions that, the participated stakeholders were, the Mahaweli Authority, Irrigation Department, Water Management Secretariat, NWSDB, CEB, and Resident Project Managers of Mahaweli Systems[123]. In this backdrop, it is important to capture the details of the key water uses and stakeholder organisations.

8.2.2 Water Use and Competition

In the early days, domestic water was the responsibility of individual households where most of them used shallow wells to extract water for domestic purposes. Shallow groundwater was of acceptable quality and hence there was no significant demand for NWSDB involvement. Hence, Irrigation Department was the major user of water resources and this was especially so in the dry zone. Later with subsequent institutional changes, the Mahaweli Authority, Irrigation Department and the Department of Agrarian Services shared most of the water resources in the country. As time passed, the social migration into urban clusters, deterioration of surface water quality and the need to for pipe borne water became a concern of the community in urban area. These factors included NWSDB as another competing user of water resources. The national energy requirement commenced harnessing of hydro power in the country. Though hydropower was a non-consumptive water user, the hydropower systems created a change in the timing of available water resources causing problems in the synchronization of non-consumptive and consumptive requirements. As a result of the associated infrastructure development, the Ceylon Electricity Board (CEB) also became a competing water user.

CEB claimed that hydropower generation with available water resources provides more benefits than allocating water for traditional farming operations. Considering the opportunity cost of water, CEB even offered very high compensation for farmers of Kalthota Scheme, a scheme downstream of Samanala wewa reservoir, to forego cultivation. Though farmers initially accepted the arrangement, they subsequently withdrew from the arrangement quoting higher social costs when compared with the economic benefits. The change of national priority from agriculture to industries surfaced the industry sector as a new competitor for the available water resources.

Water use need to be carefully evaluated by considering both consumptive uses such as irrigation, domestic use, industrial and non-consumptive uses such as hydropower, inland fishery, tourism recreation and environmental sustainability, On the other hand, water sources must consider both, sources like reservoirs that store water and the sources such as rivers, which provide use without storage that provide opportunities for extraction and diversion. Water allocation models must consider all water use categories and they have to be treated on their merits.

As at present Sri Lanka's water sector pays most of its attention towards surface water. Groundwater is an option that has been tried mostly by the industries and the NWSDB to establish own water sources. Extracting groundwater to meet the increasing demand is another solution to reduce the tension between water users competing for surface water. However, such exploitations need to consider the deterioration of the quantity and quality of the resource due to possible over extraction.

8.2.3 Water Use Sectors

Stakeholders in the water sector in Sri Lanka can broadly be divided into several subsectors depending on the purpose of the water usage. These users compete with each other for their share. They include, Agriculture/Irrigation for food production, Domestic Water Supply for drinking and sanitation, Industries, Hydroelectric Power Generation, and the Environment. The stakeholders can be further divided by considering the level of interest. One is the institutional level stakeholders representing water institutions and the other is the end-user or consumer level stakeholders.

i. Agriculture/Irrigation

Sri Lanka's annual water withdrawal is approximately 13 billion cubic meters (BCM). As the major user, the current share of water withdrawal for agriculture is 87% of the total[51]. Paddy cultivation takes up around 90% of water allocated for irrigation[7]. Key players in the sector at national level are the Mahaweli Authority of Sri Lanka (MASL) and Irrigation Department (ID), who deal with major irrigation schemes. These two agencies cater to approximately half of the irrigated land in the country[112]. Minor irrigation schemes with an extent less than 80 ha are managed by farmer communities under the supervision of Department of Agrarian Development (DAD) and Provincial Councils (PCs).

At institutional level the involved stakeholders are, the Mahaweli Authority of Sri Lanka, the Department of Irrigation, the Department of Agrarian Services and the Provincial councils. At end-user and consumer level the farmer organisations play the role of stakeholders.

ii. Domestic Water Supply and Sanitation

Around 7% of the fresh water available to use in the country is consumed by domestic water supply and sanitation subsector, Hence, next to Irrigation, these subsectors in combination become the second major user of available water. Currently 90.6% of the population have access to safe drinking water and 50.5% (2015) have access to piped water supply[124]. According to recent statistics corresponding to year 2017 as the key stakeholders NWSDB and Community Based Organisations(CBOs) account for 37.9% and 14.0% respectively. This means the combined coverage However, according to more recent statistics (2017), in the case of pipe borne water supply, key players are the NWSDB and CBOs which account for 37.9% and 14.0% respectively. (both together 51.9%) of the total households in the country[125],

Stakeholders at institutional level are, the National Water Supply and Drainage Board, the Department of National Community Water Supply, the Mahaweli Authority of Sri Lanka and Some of the Local Authorities, In the case of water

supply schemes operated as the community based organisations, such organisations participate as the end user level stakeholders.

iii. Industry

Industry Sector uses around 7% of the fresh water available in the country[51]. The source of water for industries vary depending on the purpose of usage, required quantity and desired quality. This use could be from pipe borne water supply of NWSDB or a local authority, extraction from private dug wells and deep wells, or from rivers[112]. The common knowledge is that most of the industries, particularly those located outside the urbanized areas use water from their own dug wells, deep wells or by tapping surface runoff from nearby streams and rivers. The volume of water used by commercial and industrial establishments in urban areas is available with NWSDB and usually it accounts for around 10% of their total supply[126].

Stakeholders involved in this subsector at institutional level are, National Water Supply and Drainage Board, Water Resource Board, Board of Investment. Individual Industries are the stakeholders at at End User/Consumer Level.

iv. Power Generation

In the power sector on one hand there is the hydro-power sector which diverts a large percentage of surface water over a short distance and then return to the same stream without a significant change to the quality of water. On the other hand the thermal power plants also extract water for cooling purposes and often returns to the same surface water body. These power plants are of different magnitudes varying from run of river to storage types. The power sector which extracts water to support energy generation, is usually considered as a non-consumptive user of water, however, its impact on downstream flow regime is a matter of concern, particularly during water scarce situations. In the Sri Lankan context, The Ceylon Electricity Board (CEB) and MASL are the key stakeholders. There are also a few small-scale private investors engaged in this particular sector.

Stakeholders involved in this subsector at institutional level are, Ceylon Electricity Board, Mahaweli Authority of Sri Lanka, Irrigation Department and Private Sector Investors in mini hydropower generation. The stakeholders at the end user/consumer level are the individual consumers and Public Utilities Commission of Sri Lanka.

v. Environmental Flow

Being a silent user, this aspect has not received due recognition in the past. However, according to the publication entitled Basin Water Allocation Planning, “There is now wide recognition of the importance of maintaining an appropriate flow regime to maintain the ecological health of river basins, and thus for preserving the ecological services provided by rivers. As a result, water allocation plans are increasingly allocating water to meet instream ecological requirements, commonly referred to as environmental flows. In recognition of the fundamental importance of protecting a river’s ecological services and values, water is often allocated to meet environmental flow requirements prior to water being allocated to other users”[127]. In the Sri Lankan context, the major representation of the silent water user environment is carried out by the Central Environmental Authority(CEA). CEA the *defacto* representation empowered by a parliamentary act, is the agency that ensures water allocation requirements for the country’s fauna and flora.

As at present Sri Lanka’s water sector pays most of its attention on surface water. Groundwater is an option that has been tried to a lesser degree and mostly by the industries and NWSDB to establish their own water sources. Extracting groundwater to meet the increasing demand is another solution to reduce the tension between the water users competing for surface water with limited supply. However, such exploitations need to consider the deterioration of the quantity and quality of the resource and its effect on the environment due to possible over extraction.

8.3 Water Allocation and Stakeholders in Sri Lanka

8.3.1 General

Water allocation is the process in which an available water resource is distributed (or redistributed) to legitimate claimants, and the resulting authorization for use is granted, transferred, reviewed, and adapted as a water use right. Priorities for allocating water may be defined in law or through strategy development or planning processes[128]. Water allocation is made necessary when the natural distribution and availability of water fails to meet the needs of all water users – in terms of quantity, quality, timing of availability, or reliability. In simple terms, it is the mechanism for determining who can take water, how much they can take, from which locations, when, and for what purpose[127].

Water allocation comprises of both water allocation planning and water allocation implementation. At the planning stage, the water availability, requirement and priorities are assessed and then allocations are made by incorporating various concepts and assumptions. During implementation at the Operational stage, the allocations have to be reviewed by evaluating the planning assumptions based on the ground realities during applications.

On one hand it is quite evident that deficiencies at the planning stage complicate the water allocation operations. On the other hand, poor transfer of operational experiences to the water allocation planners would hamper efficient planning. This vicious cycle highlights that a sound water allocation system needs to intelligently manage both supply and demand for water.

Water managers and the politicians often claim, and the community always accept, that water allocation is complicated and difficult because of the unpredictability of weather and uncertainties of climate change. This is where the engineers, planners, and the socio-economists have to accept the challenge to facilitate educated decision making. Once a water allocation plan is prepared; it is important to express the plan with the assumed uncertainties and then justify such uncertainties with policy decisions. In other words, uncertainties associated with the supply and demand have to be accounted for and water allocation systems must be created to deliver outputs which are rational, explicit and flexible. Such a water allocation system must explicitly evaluate any failures and explicitly indicate the margin of failures, the specific reasons and the proposed corrective measures, in a manner transparent to the public. Therefore, water allocation systems need to capture the tolerable variations associated with each supply and demand element. The same approach must be applied to find solutions for water allocation problems arising out of unexpected water quality variations as well. There are also lesser known areas such as the dynamics in the interaction of

shallow groundwater and deep aquifers that need to be addressed in the water allocation conceptualisations.

In the case of decision-making process associated with water allocation, the major element that contribute to its success is the engagement of all relevant stakeholders. They include decision makers, the stakeholders affected by such decisions and the stakeholder elements that has power to disrupt the process in case of disagreement.

It is noted that water allocation of an existing system becomes always complicated as the present users may have used water liberally without any competitors. It is usually the irrigation sector who is the first user and hence farming community becomes a stakeholder in water allocation cases in an existing system. In the water resources development schemes under planning or construction stage, the farming community is not yet a stakeholder and hence decision on water allocation can be taken easily by the planning team by considering the current and future demand of all the current and anticipated future users.

The Thuruwila-Auradhapura water allocation case can be cited as a lesson for need of a successful stakeholder engagement. A solution acceptable to all stakeholders was ordered by the courts when the current users presented their case in the courts, stating that they were not consulted prior to finalising of water allocated for each use.

The failure of Rajangana-Thamuttegama water allocation case can be cited as a good example where the poor stakeholder engagement has been demonstrated through an inability to engage all relevant stakeholders in the decision-making process.

8.3.2 Stakeholders and the Government Administrative Setting

The existing political government structure of the country has three layers of democratic institutions to perform the task of implementation. They are known as (i) National Government (ii) Provincial Governments and (iii) a large number of Local Government Bodies at local level. Accordingly, at the subnational level there are two levels of elected representations; the Provincial Councils known as, Palath Sabhas and Local Government Authorities identified as, Municipal Councils, Urban Councils and Pradeshiya Sabhas.

The National Government is headed by an executive President supported by a Cabinet of Ministers chosen from the elected representatives of the National Parliament. The Cabinet of Ministers with the help of Deputy and State Ministers oversee the execution of service delivery functions. Departments, Statutory Boards and Public Corporations with specific statutory functions assist the service delivery tasks of those ministries[33]. The next level of government is the nine

Provincial Councils established at each of the Provinces in the country. A Governor is appointed by the President[30] as the representative of the President to safeguard the national interests. The Governor appoints a maximum of five Provincial Ministers from the elected representatives of the Provincial Council to carry out various service delivery tasks and one out of these five Ministers is designated as the Chief Minister of the Provincial Council.

The third level of government is the Local Government Authorities comprising Municipal Councils (MC), Urban Councils (UC) and Pradeshiya Sabhas (PS). The MCs are for the densely populated urban agglomerations and headed by a Mayor. UCs represent relatively small towns and are headed by a Chairman whereas the Pradeshiya Sabhas also headed by a Chairman are for sparsely populated rural areas. The Heads of all three institutions are elected representatives chosen from the respective councils.

The service delivery efforts of these democratic institutions are to be executed under three channels. Two channels are for the reserved and devolved functions and one is an *ad hoc* mechanism for direct service delivery through the political community representations. These are illustrated by a schematic in Annex 8.

In order to ensure that the governments' desires for service delivery are met, it is important to coordinate the activities between the three levels of the government. This coordination is required to i) secure consistency in the provision of public services, ii) provide a link between devolved and non-devolved functions, and to iii) link agencies responsible for the administration of devolved and non-devolved functions.

The state has formally set up two committees for the purpose of coordination [38]. One is the District Coordination Committee (DCC) at the District level and the other is the Divisional Coordination Committee (Div.CC) at the Divisional Secretariat level. The composition, conduct and the responsibilities of each DCC and Div.CC is clearly spelled out in the administrative Circular-4/2019 dated 13.02.2019 of the Ministry of Internal and Home Affairs, Provincial Councils and Local Government (Annex 5). In this setting there are mechanisms for decision making, technical, administrative and implementation stakeholders to interact with each other. Also there are mechanisms for the service recipients who are the community to interact with each of the higher level stakeholders. There are central and regional environmental authorities to represent the needs of the silent stakeholder which is the environment. The institutions such as BOI, ministries in charge of industries and associated line agencies that represent the needs of the industrial sector. The recipient stakeholders also have a separate channel through the political representations which enables a feedback to the top policy maker of the government.

8.3.3 Stakeholder Participation in Water Allocation in Sri Lankan Context

There are numerous organizations that compete for their share of water and hence interested in the water allocations. Irrigation, potable water, environment, inland fishery, and hydropower are the main stakeholder sectors.

At the time of planning different water resource development projects, known demands are normally built into the project at the feasibility stage. As an example domestic, wildlife and other environmental or cultural needs are usually accommodated in the irrigation projects. It has been the policy to accommodate even the known industrial demands approved by the government.

Informal indications points to a practice where irrigation projects are designed to make use of two thirds of water yields leaving the balance to cater for future demands. The nature and scope of water demands due to rising living standards, improving economy and similar reasons are expected to deteriorate the current situations thereby challenging the prevailing allocation systems.

Most sectoral institutions providing service delivery are state owned. Hence, when water allocations are planned there are attempts to look after the needs of other associated agencies. As an example, it is indicated that when Mahaweli development projects were planned, the efforts were taken to provide water for Mahaweli new lands and also the nearby irrigation schemes managed by the Irrigation Department, Agrarian Services Department and the Provincial Councils. Additionally, the efforts are also taken to harness the best use of the water catering to the needs of the other water uses such as, hydro-power, recreation, inland fisheries and environment. However, there is no written evidence of a procedure or a legislation either to ensure that the equity is maintained or to consider about other stakeholders. It is also claimed that this approach is an understanding that exist not only with the Mahaweli development projects, but also with the the projects under the Department of irrigation.

However, there are occasions when the domestic water requirements provided by the NWSDB in the nearby localities had not been taken into account by the Department of Irrigation or the Mahaweli Authority. It is often mentioned that even with sufficient resources to develop own water sources, the NWSDB continues to rely heavily on the water sources already developed by either the Mahaweli Authority, Department of Irrigation or Agrarian Services Department. Such attempts by the NWSDB is said to create unrest among the existing water users; to be specific, among the farmers and the NWSDB.

Additionally, there is a concern about the quality of water in the irrigation reservoirs. In the past, accessing domestic water from irrigation reservoirs was not an option. Hence the quality of water in irrigation reservoirs was not a major issue. The water quality concerns of NWSDB has also been mentioned as one of

the constraints faced when attempting to reach for an amicable solution with regards to water sharing. Presently there are efforts to build consensus and arrive at tripartite agreements between the NWSDB, Irrigation Authorities and the Farmer Groups.

Water allocation is not confined to inter-organisational issues. There are many occasions when intra-organisations issues are surfaced. A major issue is the difficulty to match the upstream and downstream requirements during operations though they had been agreed during planning. This is a common occurrence not only with the cascade type of developments but also with the diversions. It is important for the planning personnel and operational staff to clearly lay down the assumptions to develop solutions during uncertain supply and demand situations. These factors can be meaningfully considered only when the legislations for water rights are in place and monitoring mechanisms are in place.

In the case of irrigation water there are community-based organisations that raise their voices to exert political pressure on water allocations. The organisations for domestic water supply are limited to those belonging to the community water supply schemes who are interested in their own source of drinking water supply. Thus far only irrigation farmer organisations are concerned about water allocations.

8.4 Stakeholders and Mechanisms Regulating Water Allocation

Various government bodies existing or appointed from time to time such as National Planning Secretariat, Committee of Development Secretaries and Inter-Ministerial Coordinating Committees etc at national level usually coordinate between agencies. Central Coordinating Committee on Irrigation Management functioned in 1990's under Ministry of Irrigation was a national level forum in which major water agencies were represented at highest level and issues related to water allocation was also taken up.

Presently a ministerial level coordinating committee for water allocation is chaired by Secretary to the Irrigation Ministry and represented by officials of two Ministries covering subjects on irrigation and water supply together with officials from Irrigation Department and NWS&DB. This committee basically discusses the water requirements of NWS&DB for their proposed projects and possibility of extraction of water from the existing irrigation reservoirs and interprovincial rivers.

Project Management Committees(PMC) which were established under the amendment 13 of 1994 to the Irrigation Ordinance were empowered to take decisions on seasonal and special situation water usage. Hence when there is a request for water sharing by the water service providers, the primary consent is sought from the PMC. The decision of irrigation official will be two-fold. One is

social acceptance and the other is technical feasibility. Consent of the farmer organisation has a greater weightage on social acceptance. Decisions of the PMC which has a greater dependence on the views of farmer organisations. The farmer organisations had been established under the amendment to the Irrigation Ordinance no. 48 of 1968 and had been registered under the provision of Agrarian Services Act No. 58 of 1979.

8.4.1 Water Management Secretariat(WMS) and Water Panel

The Mahaweli system composes of number of administrative districts with hydraulically inter-linked system of reservoirs used for multiple uses and managed by different agencies. This necessitates a more co-coordinated mechanism for management keeping in line with the water allocation practices in the system. According to the powers vested by the Mahaweli Authority of Sri Lanka Act 23 of Sri Lanka[129], a “Water Management Panel” and a “Water Management Secretariat” have been established to coordinate the water users in its areas of jurisdiction. As at present, the only mechanism for multi-stakeholder water allocation at national level in Sri Lanka is the water panel of Mahaweli Authority which coordinates the Ceylon Electricity Board(CEB), Water Board, Department of Irrigation(ID), and Metrology Departments[50]. Water Management Panel, which is a policy-making body comprises of senior representatives of the government agencies concerned with the management of the Mahaweli scheme, the District Secretaries of all the districts covering Mahaweli system and representatives of major farmers’ organizations. Water Management Secretariat (WMS) of the Mahaweli Authority of Sri Lanka provides information and recommendations to the Water (Management) Panel for its operational policy decisions[50]. Each year, WMS prepares two seasonal operational plans for water use in association with ID and CEB on the basis of information relating to water demands and the conditions of irrigation system. These plans are scrutinised and approved by the Water Management Panel, The implementation of the seasonal plan is monitored and reviewed by a Weekly Water Panel, which is represented by MASL, ID, NWS&DB and CEB. It should be noted that this representation which appears to consist of a selected set of state institutional stakeholders is headed or led by another water user. One key omission is the absence of a representation from the silent non-complaining water user which is the environment.

8.4.2 Project Management Committees and Farmer Organisations

Seasonal allocations in the case of irrigation projects are decided at a Project Management Committee(PMC). The District or Divisional administrative head (referred to as either District Secretary or Divisional Secretary depending on the spatial entity) with representations from custodian and management agencies, agrarian service providing agencies, other related government agencies, the water users and non-agricultural users form the PMC. It is the Irrigation Department

or the MASL's responsibility to ensure the implementation of the agreed allocation plan taking public safety, third party rights, sustainability of the system, equity, efficiency and productivity and any other national interest into account.

The Project Management Committees meet regularly. Meetings are held at least once a month in order to monitor and review the water management plan and to effect any subsequent changes to the plan that would become necessary. Water allocation problems due to events such as droughts occurring within a constituency are dealt by using time tested methods such as sharing land (bethma), changing crops etc. Irrigation water requirements of farmers in a designated area is conveyed to the PMC through the representatives of farmer organisations. At the PMC, local water allocation rules are determined either by negotiations between farmers or through intervention by a state official. Such rules among these stakeholders are based on the principle of equity or by granting priority for standing crops over those which are yet to be planted.

8.4.3 Public Utilities Commission of Sri Lanka (PUCSL)

The PUCSL which functions under the jurisdiction of the Public Utilities Commission of Sri Lanka Act No.35 of 2002, has been empowered to take action for the water service industry. In determining appropriate regulation, the Section 17 of the PUCSL Act requires the Commission to consult, to the extent the Commission considers appropriate, any person or group whom may be affected or likely to be affected by the decisions of the Commission. At the consultations the PUCSL requires to inquire about the stakeholder concerns and address the representations made by the affected parties. Presently the PUCSL is in the process of fulfilling the legal requirements for the regulation of the water services.

A Water Services Reform Bill no. 163 which was approved and gazetted on 13th October 2003 was questioned in Supreme Court stating that the local authority water service provision has been affected. The Supreme court by its decision on 20th November 2003, informed the Parliament not to proceed with the bill as it is not in conformity with the article 154G of the Constitution. Subsequently the government of Sri Lanka in its budget speech of 2016 expressed the need for regulation and hence the PUCSL commenced action on the Draft Water Services Bill which included only the regulation of NWSDB and the private service providers. Accordingly, a Cabinet Memorandum has been drafted and submitted for consideration. Upon submission of the draft-Bill to the Attorney General for approval, consultations between Attorney General and the PUCSL has concluded with a requirement to make changes to include all service providers. Presently the PUCSL is in the process of redrafting the bill following the advice of the Attorney General [21], [130]–[133].

As at present the PUCSL recognizes only the water supply and drainage sector as the water service industry. However, in future when the need arises, the

terminology used may have to be clearly defined or changed to encompass the services rendered in the entire water sector.

8.4.4 District Agricultural Committee

District Agricultural Committees consist of agencies relevant to agriculture and the farmer organisations. These committees were formed to resolve irrigation water issues and agricultural practices in each district. However due to the recent increasing demands for water, these committees also discuss water sharing among different water users.

8.4.5 Statutes Mandating Stakeholder Participation

The statutes in Table 6 have made provisions clearly defining the stakeholders to be involved in the decision-making process of water use/allocation.

Table 6: Stakeholder Recognition in Statutes

<p>Irrigation (Amendment) Act No. 13 of 1994</p>	<p><i>Section 5A (1) – “In respect of every major irrigation work being a part of a inter-provincial irrigation and land development scheme which is specified by the Secretary to the Ministry of the Minister in charge of the subject of Irrigation there shall be a Project Management Committee consisting of..”; (Defines the Stakeholder composition of PMC</i></p>
<p>Agrarian Development Act No. 46 of 2000</p>	<p><i>Part-V-Institutional Structure of Farmers’ Organisations</i> (Defines the Stakeholder composition of FOs)</p>

9 Land Mark Water Allocation Cases in Sri Lanka

9.1 Overview

There had been many news items, reports and research publications on water allocation issues in Sri Lanka that needs a critical review for the development of a framework for water allocation. Simultaneously PUCSL invited communications from the water user organisations, to capture their experiences with regards to water allocation and sharing in Sri Lanka. A literature survey conducted for the present work revealed many examples and some of the key details are presented below. Information was collected over the phone by contacting relevant officials and farmer organization leaders when sufficient literature could not be found to build up the case studies and they are recorded as personal communication reported by the contacted person.

According to the database of NWSDB, by end of 2018 about 343 major, medium and small-scale water supply schemes were operated by NWSDB with a total abstraction of 707 MCM from different water sources in the country. Surface water, springs, groundwater and conjunctive use of groundwater and surface water are the four different types of sources used in major water supply schemes. Surface water extractions from rivers and reservoirs are nearly 76 % of water distributed by NWSDB[134].

Three reservoirs dedicated for water supply, namely Labugama, Kalatuwawa in Kelani basin and Per Aru in Parangi Aru basin are owned and operated by NWSDB. Most of the other reservoirs and irrigation canals used to extract water are under the purview of either Irrigation Department, Mahaweli Authority of Sri Lanka and Provincial Irrigation Authorities. Village tanks are scarcely used as extraction sources because they run out of water during the dry season which lasts about 6 months of the year.

Currently, there are many reservoir schemes and trans-basin diversion schemes being constructed by the Irrigation Department and Mahaweli Authority. In most of these newly planned schemes, potable water requirement has been incorporated and infrastructure necessary for water diversion and conveyance are included. The recent multipurpose projects appear to include infrastructure for potable water extractions and make allocations from the planning and design stages. In Rambaken Oya and Deduru Oya reservoir projects which were commissioned recently the planners had incorporated potable water requirements in its original proposals submitted for approvals. Presently, water allocation and extraction in these projects are taking place without conflicts. This may be due to the early stakeholder consultations performed during the project approvals and also because the extractions are being carried out withing the planned requirements.

In case of drinking water allocation requests to extract water from existing reservoirs, are normally evaluated by the organisations operating the reservoir. In case of reservoirs managed by the irrigation department there are guidelines[3] for reservoir operation analysis and water balance to perform technical evaluation of water allocation requests. It is expected that similar guidelines are available with other reservoir operating institutions. In case a particular catchment is incapable of providing the water requirements, then the responsible institutions are expected to evaluate options such as trans basin diversions, changes to capacity of infrastructure, improving water use efficiency etc. Once changes to the existing setting is evaluated and alternatives are identified, then the practice of water organisations is to conduct consultations with existing water users specially with farmers and nowadays with inland fishermen too. Many drinking water supply schemes had successfully commissioned without any conflicts with existing water users[135]. However, especially in the Anuradhapura district, there had been cases where farmer consent for water sharing had not been granted. It is worthwhile to explore the reasons for such denials as most of the other dry zone reservoir schemes also face such water sharing conflicts.

9.2 Need for Case Study

Potable water scarcity occurs either due to physical scarcity or due to financial scarcity. Restrictions on finances are usually taken care of by the government through finances available from the state coffers or through assistance received from international financing institutions. Physical scarcity of water is the non-availability of water at a particular location at a particular time. In most cases physical scarcity of water is not due to natural conditions but because water is getting locked up for a purpose other than the desired intention to use. Usually in Sri Lanka, the physical scarcity of drinking water is because water is reserved for agriculture. In Sri Lanka there are many instances where social and political pressure had been exerted by the farming community due to fear of a possible physical scarcity. Therefore, it is important for authorities to consider the socio-political issues during water allocation and resolve them through proper dialogue.

In order to address the natural physical scarcity specially in arid and dry zones of Sri Lanka, inter-sectoral water transfers need to be arranged. In Sri Lanka in an environment where no individual rights are held, the bulk allocation is generally controlled by the state and reallocation is mostly made through the state.

There are two types of transfers viz. temporary and permanent transfers. Temporary transfers are to fulfil requirements at a crisis situation such as drought or for an annual religious event such as Poson-Poya festival celebrations in Anuradhapura in June or Kataragama-Devala festival season in August. Priority for such social requirements are arranged and usually there is less resistance for

such transfers. Once the crisis or festival season is over, allocations revert to the original pattern.

A permanent transfer is an administratively agreed transfer between water users. In Sri Lanka, a general permanent transfers are administrative agreements between potable water suppliers such as National Water Supply and Drainage Board and custodian irrigation organisations such as irrigation Department, Mahaweli Authority of Sri Lanka, or Provincial Councils. Such agreements are made only after the consent of the existing irrigation users are received. Though there are obvious social and economic gains arising out of transferring water from irrigation to domestic water, such decisions have not been challenged only because of a simple economic criteria. This is because, the community places a high value on agriculture due to its importance associated with food security and rural livelihood sustainability.

Water allocation is also dependent upon the political structure and administrative boundaries. For instance, a transfer within a local administrative or a political boundary such as province or a district is easier to deal with than a situation involving different provinces or districts where a transboundary conveyance is required. Taking the above into account, decision-making on sharing water incorporates wider aspects of the local political economy such as social, transaction, political, and sometimes even environmental costs attached to the various demand- or supply-oriented options, pre-existing customary (or other) rights and water uses[136]. Some of the significant cases of water transferring from agriculture to potable water sector, in Sri Lanka are discussed below.

9.3 Water Sharing Case of Thuruwila Reservoir

City of Anuradhapura, is a transit point to many travelers. It connects many major cities and hence is a fast growing city in the northern dry zone. Having an average annual rainfall of approximately 1,270 mm, Anradhapura district is a major agricultural area. This area having many irrigation reservoirs operated and maintained by the Irrigation Department, receives water from Mahaweli river diversions. The two water sources for Anuradhapura drinking water supply scheme are Tissa wewa and Nuwara wewa, which are also irrigation reservoirs. During 1990's NWSDB provided a restricted supply of 8-12 hours per day for a population of 56,000.

By 2002 Anuradhapura urban council area population was nearly 84200. As a major pilgrimage centre in the country, it entertains, up to 1.3 to 1.5 million of pilgrims, twice a year during Wesak and Poson poya seasons. Anuradhapura faces a problem of drinkkng water because of the increasing urban population and the visiting population. The two religious events fall during May and June and they

are the dry months of any given year. Hence water is a challenge for water supply authorities. Augmentation of the water sources was a priority for the Anuradhapura-Group-Town-Water Supply scheme (AGTWS). NWSDB was able to secure funds from ADB and French Government for expansion of water supply facilities in 1993[137].

However, water supply extension project was delayed due to the inability of securing reliable and cost-effective raw water sources. NWSDB preferred to extract the total water requirements from Nuwara wewa and Tissa wewa which were existing sources of extractions and because of the close proximity to the Anuradhapura city area. Another reason was the reduction of capital costs for construction of additional treatment plants and conveyance pipe lines [138].

Irrigation Department resisted this option citing inadequacy of inflow to both reservoirs and also the likelihood of resistance from farmers cultivating in both schemes. Water supply authorities identified some other irrigation reservoirs such as Nachchaduwa, Rajangana, Kalawewa and Thuruwila as possible alternative sources. Objections of the Irrigation Department which indicated complexity of operations and likelihood of farmer disputes made the NWSDB to discard the Nachchaduwa reservoir as an option. A survey by the NWSDB on the possibility of paying compensation to farmers also failed as seventy percent of the farmers were not willing to get compensation for their water.

NWSDB then investigated the Thuruwila reservoir as an option, as suggested by Irrigation Department. Thuruwila reservoir received water only from its own catchment and benefitted 350 farmer families. In most of the years, the water yield had been sufficient to cultivate the rice crop in both seasons. At the time of proposed transfer, Anuradhapura was receiving drought reliefs for the third consecutive year. Thuruwila was almost the only system in NCP, which did not require drought relief[137]. This indicates that Thuruwila is a self-sustained system even though it depends only through its own catchment.

However, when Irrigation Department conducted an operation study incorporating domestic water requirements indicated by NWSDB, water deficit situations were identified. Hence requests were made to Mahaweli Authority for the release of additional water to Thuruwila wewa through Yoda Ela. In 1998 the MASL agreed to release the additional quantity as required.

After the assurance by MASL, the detail designs and procurement procedures for construction of waer supply system was commenced by the NWSDB. However even with continuous recommendations by Irrigation Department to conduct stakeholder consultations, the NWSDB had failed to conduct timley consultations. In the year 2001, the ID and NWSDB signed an agreement after giving due consideration to the technical feasibility and availability of finances. The continuous intervention by the political leadership of Anuradhapura was a key

factor when making the project a reality. Once the news of this proposal reached the Farmer Organisations, majority of Thuruwila farmers objected to the diversion of water from their reservoir to fulfill the drinking water demand of Anuradhapura city. Farmers formed an organization called the "Thuruwila Surakeeme Vyaparaya" (TSV) to express their concerns. The TSV canvassed the political leadership, appealed to the irrigation department and to the NWSDB but once the TSV realized that the project was in progress with political support they made an appeal to the Human Rights Commission arguing that the proposed project had violated the fundamental rights of people of Thuruwila village. The TSV presented many grievances and proposed alternatives. The TSV also launched a rigorous campaign against water extraction and had appealed to all national and provincial level political leaders and Ministers in charge of irrigation and water supply as well. In parallel the TSV while pending the inquiry at Human Rights Commission filed a case at Supreme Court with the support of a NGO. The respondents were Minister of Irrigation, Director General of Irrigation, NWSDB, Mahaweli Authority, Chief Minister of NCP and Attorney General. The main issues raised by the TSV were lack of information and the loss of livelihood[137].

The Supreme Court considered facts shared by both parties about the poor quality of drinking water, the related health issues, inundation of land due to raising of Thuruwila spill and impact to the farming community in Thuruwila scheme. The court considered compensation for the people whose lands are to be inundated by increasing the spill level of the Thuruwila tank.

According to the decision by Supreme Court all stakeholders came to a mutually agreed settlement with conditions. Irrigation Department agreed to allow NWSDB to extract water from Thuruwila reservoir with 6 main conditions[139].

Irrigation Department and NWSDB signed two agreements for sharing of water in Thuruwila reservoir. One of them for the operation and maintenance of Thuruwila scheme and the other for the operation and maintenance of its feeder canal system. Farmers in Thuruwila had to forego two cultivation seasons in order to allow the water level to be lowered for construction. They were given employment opportunities in constructions and also compensation for two cultivation seasons.

However, after implementation of the project in 2005, it has revealed that the drinking water project had generated many advantages for the beneficiaries resulting an overall improvement in the economic and social welfare in Anuradhapura. During the study conducted by HARTI in 2008 [138] it had been observed that the majority of farmers in Thuruwila scheme had not experienced any negative impacts on agriculture production and productivity, after sharing water, as water transfer from Yoda ela (Mahaweli system) diverted water as agreed.

According to the MOU signed between ID and NWSDB, during a water scarcity, priority of water allocation between two parties shall be guided by Seasonal Operation Planning Meeting of Mahaweli Authority and as decided periodically by Project Management Committees of Nuwara wewa, Tissa wewa and Thuruwila wewa.

HARTI report further shows that the first priority accorded in water allocation for both Thuruwila and Anuradhapura during water scarcities is drinking, followed by sanitation. Water for agriculture is the third priority and water for ecology takes the fourth priority.

Many felt that if the water supply authorities at the initial stage of the project formulation had sought sufficient participation from local communities and water users when taking management decisions then the legal battle could have been avoided. It had been recognised that this case provided a clear message indicating the need of transparency when taking decisions for project implementation to overcome public mistrust about water sharing interventions.

The strong environment Impact assessment procedure enforced for new reservoir constructions is not applicable for water supply projects of this nature because these are attempting water extraction from an existing reservoir. If at least a social impact assessment had been made a mandatory requirement from the initial stage of any project, it would open an effective mechanism for community consultation.

Documentation on this case study focuses on the social problem but without a strong reliance on the technical capabilities on resource assessment and efficient water management capabilities of both water managers and farmers. There are no documentary evidence about water assessment and water allocation models and methods that enable a better judgement to find the undelying cause for the dispute. It may be prudent to note that though there are many factors that need to be considered for rational water management, it surfaces as a social problem that gets prolonged probably due to the lack of transparency from the side of technical and management institutions and also due to the poor understanding of recipient communities or due to both.

9.4 Water Sharing Case of Rajanganaya Reservoir

The existing Thambuttegama water supply system had been built under the Mahaweli Project and it consumes 2,500 m³ per day from the Nallachchiya Tank of Thelhiriyawa which is fed by water from the Kala wewa Mahaweli system. Water from the reservoir is purified and distributed for drinking water purposes to around 4,750 households. A new water supply project was planned and implemented to provide relief to the people in the area due to the high demand for drinking water from a surface water source. This was mainly because of the high

prevalence of kidney disease in the area which is believed to be due to usage of groundwater. Final project report of this project indicated that this water supply system, would provide water to 28 Grama Seva areas in Thambuttegama Divisional Secretariat Division, 04 Grama Niladhari Divisions in the Galnewa Divisional Secretariat Division and 12 Grama Niladhari Divisions in Talawa Divisional Secretariat Division[136].

Due to the problems in the quality and quantity of groundwater in the area, water for the project was proposed to be obtained from a surface water source and then supplied for drinking purpose after a process of purification. After a consideration of these concerns, NWSDB decided to obtain water from Rajanganaya reservoir, which provides irrigation water to over 3,500 families where the farmers cultivate 16,500 acres in both Yala and Maha seasons. [1].

NWSDB had launched the project and once the Chinese contractor mobilized for laying of pipe lines, farmer organisations opposed to the release of drinking water from the reservoir. A protest was staged on February 28, 2018 by 64 farmer associations in the right and left banks of the Rajanganaya scheme. Farmers stated that the proposed water supply project would consume more water than the estimated quantity and hence affect their livelihood farming practices. The police obtained a court order suspending the protest. The farmers ignored the order and demanded a project suspension order. The disagreement culminated in a clash between the police and farmers which resulted injuring farmers and policemen, an arrest of 60 farmers. A series of discussions were held with the intervention of the District Secretary which finally led to the suspension of the project by a letter issued on 3rd March 2018. One major issue was that at this point of time, the state had released 50% of the advance payments out of the foreign loan and delays were a huge cost to the national economy.

Unfortunately, by 2018, farmers in Rajangana reservoir had faced two consecutive dry years during which many had to forego their cultivations. Irrigation Department too had faced difficulties in water management within the system as the drainage water from Kalawewa system to Rajangana reservoir too was limited. Hence farmers had lost confidence over a reliable drainage water supply to their reservoir, which can be guessed as the main reason for uprising[140].

A background information search reveals that the farmers had been agitating over a long time to prevent water extraction. The main issue had been the lack of a state assurance indicating a fair hearing to their grievances. The farmers required the authorities to address the following grievances and concerns.

- a) *The project implementation would result in less water available for cultivations. The loss of approximately 25,000 Acft of water resulting a significant impact on the cultivations.*

- b) The water supply authorities had not studied the option of a further downstream source which had not agricultural issues.*
- c) The farmer doubts about the promises made by the politicians and officials*
- d) The loss of water security during severe droughts with a serious threat to the livelihoods, the flora and fauna.*
- e) The non-availability of farmer awareness programs sufficiently enlightening about the issues, repercussions and remedies of the project*
- f) Suspicion of water being extracted for a water bottling industry*

Two factors had been noted in this dispute. One is that there had been a need to reach consensus among stakeholders to extract water from the Rajanganaya reservoir. The other is that the consensus building would require efforts commencing from project formulation stage.

According to the provisions of the Irrigation Ordinance, the District Secretary is the empowered authority for settlement of disputes on water management issues and hence District Secretary of Anuradhapura had intervened to temporarily hold the project. Discussions at district level involving the key stakeholders (Project management committee, Irrigation Department and NWSDB) had been concluded without reaching consensus by convincing the farmer organisations.

Construction of water tower and laying of the water distribution pipe lines were to hold for some time. However, as at present, the contractor had started the works after a lapse and expecting NWSDB would direct them to a new water source or obtain consent of farmers to extract Rajangana water through conflict resolution capability of Project Management committee.

NWSDB had made a statement indicating that alternative measures would be taken during the droughts and that water would not be extracted throughout the day. It is understood NWSDB has studied few options for water extraction such as minor reservoirs under Mahaweli system, get additional releases from Kalawewa and creation of additional storage in the upstream of Rajangana reservoir. None of these have been found to be viable other than water sharing from Rajangana reservoir. Hence the issue still remains unresolved even though construction of infrastructure of water supply project had continued.

It is fair to assume that in this case also lack of transparency of the project to all stakeholders and especially the recipient stakeholders had been the prime reason for the dispute. The inadequate capacity of water managers to negotiate a technical solution and the inadequate capacity of farmers to settle for a win win solution can also be cited as a matter to be noted by the managers who attempt rational water allocation.

9.5 Water Sharing at Wahalkada and Mahakandarawa Reservoirs

Sharing of water from Wahalkada and Mahakandarawa reservoirs is associated with the Anuradhapura Northern Water Supply Project (ANWSP). Anuradhapura District provides a large contribution to the national economy through food production as it is an agriculture-based district where main livelihood of the inhabitants is farming [141]. According to 2012 estimates, the North-Eastern part of Anuradhapura District having an approximate area of 2,740 Km² had been with a population greater than 200,000 persons. In this area which is predominantly rural, the population, for their drinking water, rely mainly on groundwater tapped by either shallow or deep wells. The prevalence of a high content of fluoride in groundwater has resulted in a large number of patients associated with dental and skeletal diseases. According to recent reports, Chronic Kidney Disease (CKD) of unknown Etiology (CKDu) has become a great health problem especially in Medawachchiya, Kebithigollewa and Padaviya areas. Reports also indicate that in Padaviya and Medawachchiya there are high levels of fluoride in drinking water and a high level of CKD-prevalence life.

Though there is a need to shift the source of drinking water from groundwater to safe surface water, the district of Anuradhapura has only seasonal streams to extract water. Hence the water supply authorities had investigated the option of extracting water from the Mahakanadarawa and Wahalkada irrigation reservoirs. In the project area, there are six small scale water supply systems operated and maintained by NWSDB and another 50 water supply schemes being operated by CBOs. Groundwater is the source

for these systems. Except for one CBO system others have been reported with the problem of high fluoride concentration in the source water.

The proposed new water supply system (ANWSP) was planned to integrate the existing NWSDB and CBO water supply schemes. The proposal had two main features. One is the conversion of the source of existing schemes from groundwater to surface water that would tap the irrigation canals from Mahakanadarawa and Wahalkada reservoirs. The other is for the Mahakanadarawa System to cover Medawachchiya and Rambewa DSDs and for Wahalkada System to cover Padaviya, Kebithigollewa, Horowpothana and Kahatagasdigiliya DSDs.

Mahakandarawa reservoir has a 45 MCM capacity supporting the livelihood of around 5237 farmer families whose main income is from agriculture. Most of the farmers cultivate paddy. Full extent of 2835 Ha of irrigable area is cultivated in Maha season and nearly 1500 acres are cultivated in Yala season. Water quantity needed to be extracted for water supply from Mahakanadarawa Wewa had been estimated as 3.25 MCM/annum from the year 2024 and 6.53 MCM per annum from the year 2034.

Wahalkada Wewa, located across Yan oya river is of 53 MCM capacity serves nearly 2025 Ha of agricultural area for both Yala and Maha seasons. Main livelihood of 5000 families is agriculture who solely depend on water issued from Wahalkada reservoir. The reservoir depends on inflow of its catchment and there is no supply to augment the reservoir storage.

Immediate drinking water supply requirement from Wahalkada reservoir had been calculated by NWSDB as 5.26 MCM/annum. According to the extension program that had been prepared, this value starting from 2024 is expected to increase up to 10.00 MCM per annum in 2034.. It was identified that the Wahalkada reservoir cannot fulfil the forecasted drinking and agriculture water requirement in the year 2034 without an augmentation.

As the other alternative source for Wahalkada water supply project, NWSDB had considered Yan oya reservoir, which was under construction by the Irrigation Department. Once water quality testing being carried out, water in Yan Oya reservoir indicated a problem of water quality during the months from May to July in 2012 while the Wahalkada reservoir water had fulfilled the quality requirements. The drinking water standards specified a fluoride threshold of 0.8 mg/L as allowable. The Yan oya values were between 0.81 mg/L to 1.2 mg/L and the Wahalkada values were between 0.25 mg/L to 0.38 mg/L. Therefore, the NWSDB had opted to use water from Wahalkada reservoir since the cost of water treatment was low.

The new Yan Oya Reservoir intends to feed the Wahalkada Irrigation Scheme to irrigate an additional extent of 400 ha. NWSDB expects to receive a maximum of 7 MCM/annum by the year 2034 as the drinking water requirement for its users in the other designated areas, to compensate their water extraction. Hence anticipating water from Yan Oya diversion, the irrigation department in the year 2018 had given its consent to issue water from Wahalkada reservoir.

However, when the farmer's consent was requested for this arrangement, the Project Management Committee (PMC) of Wahalkada Reservoir had opposed the proposal. As a result, the NWSDB had to change their plans that proposed to extract water from Wahalkada reservoir.

As a remedial measure, in the year 2018, the Irrigation Department, expressed the ability to release water from Yan Oya reservoir to fulfill drinking water requirement. . NWSDB had no option but to accept this offer even though treatment cost is high during certain periods. As per this arrangement the extraction of 28,600m³/day was arranged at a location downstream of LB sluice of Yan Oya reservoir and not from Wahalkada reservoir.

Since Yan Oya reservoir is a new scheme, farmer organizations have not yet been formed to claim their share. Irrigation Department had the flexibility to decide

water allocation for different sectors. Accordingly, an MOU was prepared and signed by ID with NWSDB to issue water to Anuradhapura North Water supply project (Phase II) from the new Yan Oya reservoir. The MoU included four conditions as, i) Drinking water supply shall be given to resettlement areas under Yan Oya project on priority basis, ii) Settlement areas in Wahalkada and Padaviya WS schemes also to be included in service areas, iii) Raw water extraction shall be metered and records also will be available for inspection by Irrigation officials, iv) During dry periods extractions to be decided jointly by ID & NWSDB by making use of the project management committees and ID field officers who handle seasonal water issues.

NWSDB water extraction plan from Mahakanadarawa wewa had also to be postponed due to shortage of water in the reservoir. The NCP Canal Project which is under construction had allocated drinking water of around 70 MCM/year for 15 major towns in North Central and North Provinces at the planning stage itself. Most of the target towns served by the Mahakanadarawa water supply system under the “Anuradhapura North Integrated Water Supply Project” are the same towns covered by the NCP Canal Project. Therefore, sufficient water is anticipated for both water supply and irrigation from the NCP canal.

In these two cases (Wahalkada and Mahakandarawa reservoirs) consent of the farmers could not be obtained for water sharing even with the promised augmentations to the reservoirs. The recent experience of frequent droughts due to climate change impacts, loss of thrust over the broken promises made by the officers for additional water supplies and also lessons of previous protests by fellow FOs in the Province (eg. Rajanganata, Thuruwila) would have influenced their reaction to the request of sharing water in the reservoir. It can be noted that NWSDB had to rely on new water resources infrastructure facilities planned and implemented by Irrigation Department and Mahaweli Authority. In both the cases, abstraction of water for potable use will be not directly from the reservoir, but from another location in a proposed water transfer system.

9.6 Sharing water from the Iranamadu reservoir

Drinking and cultivation requirements in Jaffna Peninsula depend on groundwater stored in its limestone aquifers replenished by the limited rain during a single rainy season from October to December. Over the years, an increased extraction of groundwater, contamination of groundwater by industrial waste & urban sewage, and a most likely reduction of recharge had caused an intrusion of salinity into aquifers that had in turn made the groundwater unsuitable for drinking. It has also been noted that the practice of Jaffna farmers that leads to intensive agriculture had aggravated the situation because of groundwater contamination by agrochemical and fertilizer leachates. Over

decades many governments had attempted to address the acute water crisis in the Jaffna peninsula. These had shown that imposing a safe limit for extraction of groundwater is inadequate to meet the present and future water needs of people in Jaffna. This led to the message that large scale extraction of groundwater in Jaffna to meet the expanding demand of urban water supply is beyond the capacity of the limited aquifers. Hence water supply authorities were looking for external sources out of the peninsula to transfer water, mainly through pipe lines[142].

In the Jaffna-Killinochchi Water Supply & Sanitation Project (JKWSSP) launched in 2011 with ADB funds[143], it was proposed to extract 27,000 m³ per day from Iranamadu reservoir in Killinochchi district. This is to augment the existing drinking water supply projects in Jaffna that cater to about 300,000 users and to facilitate sanitation of about 80,000 people. The drinking water supply component consisted of; i) Rehabilitating and improving headworks at the Iranamadu reservoir to increase water resources and tank efficiency levels; ii) Constructing a water intake, a raw-water supply system, a water treatment plant, and a treated water pumping station, iii) Laying treated-water transmission mains to the Jaffna Municipality and iv) Providing water connections to an urban council and Pradeshiya Sabhas en route to Jaffna Municipality.

A Memorandum of Understanding (MOU) signed between farmers of Iranamadu Irrigation Scheme, Provincial Irrigation Department and National Water supply and Drainage Board stipulated the terms and conditions to be fulfilled before extracting water from the Iranamadu tank. As per this MOU, it was proposed to rehabilitate and strengthen the dam and associated structures of Iranamadu tank while increasing the capacity by means of a two feet raise of full supply level. The improvement proposed under the JKWSSP had been named as “Iranamadu Component”.

Iranamadu reservoir with a catchment area of 581 sq km and a capacity of 131 mcm (in 1978) is located in Kanagarayan Aru river basin of Northern Province. Under provisions made by 13th amendment to the constitution in 1988, the Northern Provincial Council controls the reservoir system and water resources of the provincial rivers. 40% of the district population depend on the irrigation water which serves 8,455 ha and 9,100 families. 100% of the command area is cultivated with paddy during the Maha season while Yala season extent entirely depends on the water availability in the reservoir.

As planned, most of the water towers and part of the distribution network had been completed by 2017. However, the extraction of water was met with farmer resistance stating that the capacity of reservoir was inadequate to meet even the cultivation requirements during both seasons. As a solution, additional funding was made available to increase the capacity of the reservoir[142].

Continued farmer protests, which are believed to be based on political backing brought the project to a halt. The farmer protests indicated opposition to the diversion of water to Jaffna district across Killinochchi district. This highlighted a transboundary issue of water transfer. It was also observed that Jaffna people were not keen to receive water from Killinochchi due to social taboos that also need careful consideration when providing technical options for water allocation. The protest from one social group and the lack of interest from the social group has created a situation that had caused the need to revisit national investments that are promoted by the institutional stakeholders. This case shows that due to the social issues, the Asian Development Bank had suspended the work stating that it is essential to obtain farmer consent prior to recommencement of this water sharing project.

As the potable water shortage problem is acute in Jaffna, government restructured the project to include a Reverse Osmosis plant at a cost of US\$ 120 million for which ADB financing was obtained. The cabinet approval was granted in 2017 to extend the project period till 2020.

Irrigation Department in the meantime conducted a study on “river to Jaffna” by converting Wadamarachchi lagoon a fresh water body, enabling NWSDB to extract water. A project was launched with the local funds by appointing a Project Director and construction staff was deployed from the Irrigation Department in latter part of 2019, with the approval of the cabinet[139].

NWSDB conducted another feasibility study for usage of drainage water in Kanagarayan Aru. All these proposals are being reviewed to select the best suitable option to provide drinking water for Jaffna peninsula. Hence it is most unlikely the sharing of water in Iranamadu reservoir will take place in near future.

9.7 Sharing water from Muruthawela irrigation reservoir

Muruthawela reservoir in Hambantota district has a capacity of 48 MCM and an irrigable area of 6150 Ha. Muruthawela scheme system operations are administered by considering three spatial entities requiring irrigation water. They are, Muruthawela L. B., Urubiku Oya and Kirama Oya irrigation areas. The farmer organisations under this scheme are also organised on the same basis.

The Muruthawela reservoir, constructed in 1971, issues water for an anicut schemes along Uruboku Oya. Water is issued to honor the riparian rights in this scheme which had been constructed in 18th century and renovated in 19th century. Kirama Oya scheme (constructed in early 19th century) which comprises of anicut schemes also is fed by the Muruthawela reservoir.

Command area of the reservoir consists of i) 1710 ha of Muruthewela new lands in Tract I(T-1), Tract II(T-2) & Tract III(T-3) under the Left Bank Main Canal(LBMC), ii) 324 ha of lands under Right Bank Main Canal(RBMC), and iii) 2430 ha of existing lands in Uruboku oya scheme. Lands in Tract I area are cultivated in both Yala and Maha seasons. Full extent of Tracts II & III is not cultivated in both seasons. In both seasons, water releases from the reservoir assigns priority to the Urubokka Oya scheme because of the riparian rights. In addition, the RBMC receives a discharge of 0.7 m³/s for a period of 10 days for both July and August in order to fulfil the water shortage in its cascade tank system. Area under Tack I (under LB canal) has not been issued water until 1995, and hence it was excluded from the service area.

Water deficit during Maha and Yala cultivation seasons is a frequent occurrence that concerns the Irrigation sector. In this regard, an approximate number of 2200 farmer families in T-1, T-2, and T-3 of Muruthewela, with a main livelihood of irrigated agriculture are facing many hardships due to inadequate irrigation water during the said periods.

Weeraketiya water supply project was planned by NWSDB in late 90's to fulfill drinking water needs of Weeraketiya and Walasmulla electorates which has approximately 27,000 beneficiaries. The National Water Supply & Drainage Board (NWSDB) planned to extract 2500 m³/day from the reservoir to fulfill the drinking & domestic requirements of mostly urban dwellers. Financial allocation was made possible with the blessings of the strong political leadership in the area. Though areas away from the reservoir system were to receive pipe borne water, the Muruthewela new lands, together with area of T-1, T-2 and T-3 within the system were not included as the beneficiary area for this water supply scheme.

NWSDB spent nearly Rs.200 million and completed the construction of water tower, intake and conveyance pipe lines by the year 2000. Even though the lands utilized for the project belonged to the Irrigation Department, a formal approval had not been granted for construction. The interventions of political leadership enabled the construction without questioning the legitimacy of construction.

Farmer organisations conveyed their displeasure about the extraction of water from the reservoir. As a result, NWSDB was not allowed to extract water for nearly 8 years after construction of water tower, intake and treatment plant. The strong farmer protests were able to set aside any political influence. However, after this period, stating humanitarian considerations as a reason, the farmers opted to refrain from protesting against water extraction.

In parallel, some critical water shortage problems at the tail end of Muruthawela system was resolved by the Irrigation Department after seeking support from Mahaweli Authority. Additional water was diverted to the tail end via a transfer canal which brought in drainage water of Udawalawa system to end the tail end

water shortages. It has been noted that such remedial actions were helpful to develop farmer confidence towards water authorities and hence a change in attitude with regards to the water sharing.

According to the irrigation officials, construction of water tower and distribution network was done without officially informing the current users and operators. This is a notable case where domestic water supply authorities failed to get consensus from the existing users and also lost goodwill of the Irrigation Department which is the custodian of the reservoir and the water manager of downstream irrigated cultivation system.

9.8 Review of Sri Lankan Cases

According to the data base of NWS&DB [180] of existing water extractions for the water supply schemes, 44 number of reservoirs under purview of Irrigation Department, Mahaweli Authority and Provincial Councils are being used as water source in addition to the 03 no of dedicated reservoirs owned by NWS&DB. Extraction of water for potable use was opposed only in few cases by the current users, ie farmers.

The Sri Lankan case studies points to many concerns varying from misinformation, lack of prior consultations, breach of trust due to non-transparent procedures in allocation etc. The Iranamadu reservoir in Northern province, the Muruthawela reservoir in Southern province, The Rajangana, Mahakanadarawa and Thuruwila reservoirs in North Central province, are located in geographical areas which face seasonal water shortages. There had been water disputes in wet zone locations such as the presently subdued Basnagoda forthcoming reservoir case where the people from the upstream Kegalle district had raised a transboundary concern. However, such cases are very limited.

The case studies make it clear that the water allocation problems arise due to the threat of resource insufficiency. The resource adequacy or insufficiency depends on the conclusions of the interested parties. In many disputes the noticeable factor is that the farmers are of the opinion that the water resources are inadequate while the institutional managers are confident that the resources are sufficient to serve the purposes. It is felt that this is the major issue that needs to be addressed.

There are many highlights that could be extracted from the case studies as probable reasons for the disputes. These issues must be carefully looked at and appropriate policies, rules, regulations and capacity building must be incorporated to ensure acceptable water allocations. The lack of disputes in other regions amongst the identified concerns clearly points to a major concern across the country. That is the methods and practices that are in place to ensure the efficient use of valuable water resources. The probable reasons for the issues described in the disputes that were studied can be listed as,

- a) *The lack of stakeholder involvement from the beginning of water sharing projects*
- b) *The lack of willingness of a particular group of stakeholders to accept the concerns of another affected set of stakeholders*
- c) *The lack of capacity of institutional stakeholders in problem solving*
- d) *The lack of capacity of recipient stakeholders to capture the message transferred by the institutional stakeholders*
- e) *The transparency of water resources assessment methods and results from such practices*
- f) *The transparency of the water infrastructure design and incorporation of adequacy*
- g) *The transparency of water allocation methods and prioritization between competing users*
- h) *The possibility of prolonging a dispute to obtain the desired result of a decision maker*
- i) *A resulting significant loss of state and finances due to implementation delays of public projects*
- j) *The lack of transparency in the estimation of water resources variability with time and across administrative boundaries*
- k) *The lack of transparency in the estimation of water resources by incorporating the uncertainties in both supply and demand.*
- l) *The lack of monitoring mechanisms involving stakeholders*
- m) *Lack of measures to compensate the affected parties due to unacceptable justifications, false promises, and erroneous implementation identified after settlement of disputes or during the operational phases*
- n) *Lack of holistic water resources planning for a reasonable horizon indicating the future plans for the multiple use of available water resources at a particular water source.*

10 Water Allocation Cases – Regional and International

10.1 Overview

A research report by IWMI (International Water Management Institute)[144] has carried out a comparative study of water allocation cases where a large number of cities worldwide are reviewed and the ways in which they increase their water supply had been analysed. This document shows that, in many cases, augmentation of supply is achieved through transfers of water from agriculture, or from ecological reserves and aquifers. This document has identified that transfers can be either, gradual or outright, minor or major, surreptitious or open, above the surface or underground, and with or without compensation. The cases highlighted in this document and two others are found adequate to enlighten the regional and international cases of water allocation.

10.2 Philippines

10.2.1 Water Supply for Manila

This is a case where water reallocation had been attempted but had to be supported with additional water sources to serve competing water users.

Manila in Philippines, a megacity that has continued to expand despite a constrained water supply, presents an interesting case, due to two reasons. First one is because the city faces a high risk of water shortage as 97% of the city supply is derived from a single source that combines the Angat multipurpose reservoir and Ipo reservoir. The second reason is because since 1976, the Philippines, has a formal system of water entitlements based on the “Western-USA” principle which is “first-in-time, first-in right”. In case of formalised water reallocation, this system requires the payment of appropriate compensation to those deprived of their formal rights.

The Angat /Ipo reservoir system is managed by the National Power Corporation (NPC) though power is generated only as a by-product of releases to Angat-Maasim irrigation scheme. The National Irrigation Administration [NIA] holds the original water right of 3.1 Mm³ /day and Manila Metropolitan Waterworks and Sewerage System [MWSS] holds an original right of 1.9 Mm³ /day (in 1996). NIA has been unable to utilize its full entitlement due to lack of development, flooding of low-lying areas and loss of irrigable land to urban expansion.[1]. Under the 1995 Water Crisis Act, MWSS received an additional 1.4 mcm from NIA’s unutilized right. The provisions of the Water Code were strengthened to give Manila Metropolitan Waterworks a clear priority at times of drought. In the year 2000, supplies to Angat reservoir were augmented by the Umiray-Angat trans basin diversion project to bring MWSS’s total supplies up to about 4 Mm³ /day. Further projects are planned to take this water allocation to 8.9 Mm³ /day by 2024.

Manila had secured its needs by a mix of reallocation, refurbishment and new projects, which is costlier than formally reallocating more of Angat's irrigation entitlements. Despite NIA denials, urban encroachments on to agricultural land enables further reallocation without adversely affecting irrigation.

In practice, each drought becomes a crisis that requires political intervention, resulting in rationing not only for irrigators but also for domestic consumers. At times of drought NIA builds its case on prior rights while MWSS arguments are based on the legal primacy. Though institutional mechanisms are in place, they are notably insufficient especially relating to funds needed for compensation. The understanding is that the solution would be a detailed compensation package that anticipates a drought and agreed in advance in paying procedure. Even then, reallocation of water from Angat reservoir has limits since supply variability to Manila would increase as its share of this single surface source rises.

Severe financial and contractual problems have led to heated legal disputes, which resulted in one of the two concessionaires seeking early termination. Water is costlier, the service poorer and pollution more severe than they might have been prior to the changes experienced due to privatization.

Moreover, industries have installed boreholes to guard against shortage, leading to saline intrusion to ground water and subsidence of land. Despite these deficiencies, it is claimed that overall daily water production rose from 3.1 to 4.1 Mm³ between 1997-2002, the population served rose from 7.2 to 9.4 million, average water availability increased from 16 to 19 h/day and the delivered supply rose from about 150 to 180 l/c/day. During the severe drought of 1997-1998, supply to 30,000 ha of irrigated land was suspended for two seasons while supplying to the city too curtailed by 34 percent and availability to only 4 hours/day. Manila remains dependent on a single source and has to resort to increasingly costly and distant inter-basin transfers to augment its supply. The worst hit drought in recent history has occurred in 2019 January. Metro Manila is now serviced by two private companies for its water needs, namely Maynilad and Manila Water. A new reservoir La Meas has been added to the system by now, which can regulate water receiving from two upstream reservoirs. However, the supply was not sufficient to fulfill the urban requirement and the government is drafting an executive order which upgrades the National Water Resources Board (NWRB) to a body under the Office of the President for "policy, direction-setting, and the integration of all government efforts pertaining to water" [144], [145].

10.2.2 Water supply for Metro Iloilo

This case[146] shows a conflicts between national policies and local agreements in provisioning domestic water supply thereby leading to clashes between competing users, river and watershed degradation. This case highlights that the current institutional regulatory framework is weak in terms of clarity of purpose.

The domestic water supply in Metro Iloilo (one of the city centers south of Metro Manila) is taken from a watershed that contains a smaller watershed which is a Protected Area and managed by the National Government. On the other hand, this larger watershed is managed by the locally organized Watershed Management Board. This board is composed of more than 20 representatives of government, non-government, and academic institutions. Due to its sheer size, it is quite difficult to really point out who is ultimately responsible for the stewardship of this watershed. There is therefore a need to clarify the relationship between the Protected Area Management Board of the smaller Watershed, established by an Act of the National Government, and the Watershed Management Board, established under the Local Government Code. In the meantime, this issue poses challenges for the sustainability of the water supply in the province, manifested in the following: 1) deforestation in the upper watershed, landslides, flooding or drying up of water source especially during the summer months (non-availability of water); 2) conflicts due to the competing uses of the water; and, 3) degradation of the riverbed caused by sedimentation and quarrying which is improperly regulated.

10.2.3 Indigenous Community and Local Government

The conflict for the rights to the use of water between the indigenous cultural communities (ICC) and the local governments (LGUs) representing the state is another example of tensions in water governance in the Philippines. The case is detailed in a book published in 2011 entitled, "An Upland Community In Transition: Institutional Innovations for Sustainable Development in Rural Philippines by Agnes C. Rola[147]. This case has been quoted in a subsequent publication [146] and hence extracted for easy reference. In this an ICC residing near the mouth of the river and other water sources are not willing to share the water for an LGU project on rural water supply that is meant for lowland household consumption. The State enforced its stewardship of natural resources citing the provisions of the Water Code that anybody can apply for a water permit for the use of the resource beyond household needs. While the law provided public information about water permit application, mechanisms for doing this has not been instituted. Thus, in practice, an entity securing a water permit does not necessarily ask the permission of local communities who use said resource. This practice runs counter to the customary laws and other national laws. For example, as supported by the Indigenous Peoples Rights Act (IPRA) of 1997 and implemented by the National Commission on Indigenous Peoples (NCIP), any use of resources within the ancestral domain of the IP should get permission from the community following the principle of free and prior informed consent or FPIC (RA 8371).

10.2.4 Ciudad Mistica Sacred Use of Water

This case reported from the Philippines highlights the conflicts arising from the policy of commoditization of water in the rural areas and the customary water laws. Water is used differently in the sacred area, mostly to meet spiritual needs of the locals and pilgrims.

Ciudad Mistica is one dominant religious group in this municipality of “sacred waters”. This organization has become the water elite because they control the most abundant water source in the area. The Ciudad Mistica’s exclusive water access to this source and its members’ relatively better position creates tension with other religious groups as water supply from other sources are decreasing.

On the other hand, drawing water from the major water reserves in Mt. Banahaw, in the province of Quezon, settlers on its slopes have felt that while they are closest to the water resource base, their own supply from the water district is threatened by two phenomena: 1) diversion of supply to where demand is high, and 2) pricing of water beyond the financial capability of many traditional users. The increasing pressure on the water resources of Mt. Banahaw has made it apparent that water is finite and has a cost. It must therefore be managed for sustainable and equitable use by its many stakeholders.

The indigenous hierarchy of uses of water in this area is consistent with the Water Code of the Philippines except for one most important use in this village: water use for rituals or sacred activities by women. The second step in the hierarchy ladder is the household use which is also predominantly done by women. Men will also use the water for gardening and other commercial-based activities. The local government and institutions are just one among the many users of the resource, according to the local people, who also say that there has to be a local initiative to clarify the water allocation in the area. According to the community members, the state rule from the Water Code needs to be modified to accommodate the local priority water use, which is for spiritual needs[146].

10.3 Thailand

10.3.1 Drinking water for Bangkok

In Thailand, the growth of the Bangkok Metropolitan Area (BMA) had made the water demand to increase from 0.46 Mm³ /day in 1978 to approximately 7.5 Mm³ /day in 2000, a sixteen-fold increase over 22 years. This demand has been met by increasing the share of the Chao Phraya river flow allocated to the city up to approximately 45–50 m³/s together with the use of groundwater. Volume extracted from the aquifer is generally estimated at 3 mcm /day in the BMA. A total of 95 percent of the water used in the manufacturing sector comes from

underground water. Future demand is planned to be met from the adjacent “water-rich” Mae Klong basin via a canal with a planned capacity of 45 m³ /s.

This indicates, first, that the priority given to Bangkok has been readily translated into an increased diversion of surface water, causing detrimental effect to irrigation since the amount available in the dry season is reduced. Secondly, the impact of the shift has been mitigated by allowing industries to mine deep aquifers at the cost of land subsidence and sustainability. In parallel, it has been mentioned that conservation programs had been undertaken with the aim to reduce current level of 40% unaccounted water in potable water sector. With 33,995 factories in Bangkok (in year 2000) and its surrounding provinces, and around 10 million inhabitants, BMA’s growth has hardly been constrained by water. The city of Chiang Mai, too, has developed its water supply by appropriating canal water from nearby irrigation schemes. These provide 50,000 m³ /day of the city supply (corresponding to 70% of its supply), partially by reducing the supply to irrigated areas and balance 30% coming from the Ping River.

Water flowing in the main canal of the Mae Taeng irrigation system has been gradually tapped by innumerable houses and by the city of Chiang Mai. Likewise, around 5–10 % of the water controlled by the Mae Kuang dam, on the east of the valley, is now transferred to the city. This prompted complaints from irrigators who are already water-stressed in the dry season, when only one-third of the area can be put under cultivation[144].

10.3.2 Flood Management

During the 2011 Flood, RID in corporation with RIO 12 (Regional Irrigation Office 12: responsible for the area on the right bank of Chao Phraya River) and RIO 10 (responsible for area on the left bank of Chao Phraya River) followed up and evaluated the situation throughout 24 hours. The operation itself was undertaken by the RID Project Office (O&M Office) for dams, regulators and pumping stations. The Project Office usually communicated to RIO and received the instruction from RIO. RID attempted to reduce flow at the Chao Phraya Dam by diverting water to rivers/canals on both banks of the river, taking into account efficiency of the dam and the capacity of the river downstream of the dam in order to prevent river overflow. However, this arrangement could not be done as planned because of inadequate capacities of river and canals and conflicts of people who are affected, etc.

Generally, it is concluded that actual flood discharge and volume in the 2011 Flood exceeded the design discharge of each hydraulic structure, particularly the regulator. In the actual operation during the 2011 Flood, the Project Office received the official information and instructions from RIO. RIO obtained the information from either the RID Central Office or other information sources, while the regulators in the Tha Chin River were operated following the instructions of

RIO 12 where the orders are directed by the Flood Relief Operation Center (FROC). It is reported that there were no major issues in the official information transmission through the interview survey. However, some of the respondents of interview reported that the flood information/instruction requiring for operation of their structures were quite limited. This case highlights the need to transparent information access to stakeholders to avoid water conflicts[148].

10.4 Malaysia

10.4.1 A National Issue

In Malaysia, the growth of population and the expansion of the industrial and manufacturing sector have led to a rapid increase in water demand in the country. The domestic and industrial water demand has increased from about 1.3 billion m³ in 1980 to 2.6 billion m³ in 1990 and is projected to reach 4.8 billion m³ by the year 2000. The irrigation water demand is increasing less rapidly from about 7.4 billion m³ in 1980 to 9.0 billion m³ in 1990 and is expected to reach 10.4 billion m³ by the year 2000. The aggregate total water demand is therefore estimated at 15.2 billion m³ by the year 2000 as compared to 11.6 billion m³ in 1990 with the domestic and industrial water supply sector registering the highest percentage increase. In this respect, the irrigation sector is also expected to face mounting pressures from the domestic and industrial water supply sector over its share of the water resources in a river basin wide context. In water-stressed basin, there is a need to develop inter-basin or even interstate transfer of water subject to technical and economic feasibility. In practical situations, it is often found that many of these proposals can be cost prohibitive, even for domestic and industrial water supply projects under the present pricing policy and structure. Hence in the near future, many of the water allocation conflicts between agriculture and non-agriculture sectors may have to be resolved through a policy of reconciliation. Every effort should be made to improve water use efficiency or to cut down undue losses as compared to the construction of massive new capital works. Where the conditions are favourable, groundwater resources could also be developed to supplement surface water resources for agricultural and non-agricultural purposes[149].

10.4.2 Drinking water in Kuala Lumpur

Malaysia's urban and industrial development has generated an annual growth in water demand of 12% in recent years. The city of Kuala Lumpur (KL) has a population of 1.4 million (in year 2000) and relied entirely on surface water. KL's rivers have their sources in the Klang river basin, which supports 1,500 major industrial premises. All residents in the city receive 24-hour piped water, and per capita consumption is 132 l/day. Despite high rainfall runoff that feeds KL's four main reservoirs, these can no longer meet the rising water demand and as a result water shortages have occasionally occurred, notably in the dry season. As the

agricultural water use in the basin is almost negligible, little reallocation was possible. In response to water shortages, an interstate project (and trans-basin too) to transfer water from Pahang state to Selangor state has been considered. The project includes a dam and the transfer of around 1.5 Mm³ per day through a 45- km tunnel from the Kelau river in Pahang to the Langat river in Selangor. The diversion plan was opposed by NGOs, which stress that the water systems in KL and the state of Selangor have leakage losses of 40 percent of supply and wasted around 1 Mm³ of water per day in 2000 . Activists also stress that the Kelau dam would damage the Kelau river ecosystem and require the resettlement of indigenous people and 150 Malay farmers[144].

10.4.3 Multiple use in Pong River

Water use conflict has been encountered frequently in the Pong river basin where the Ubonratana hydropower dam is located. This hydropower dam is a multi-purpose dam to serve not only for electricity generation but also distribution of water for communities, agriculture, industries and pollution protection. Land use along the Pong River is occupied with agriculture and irrigation area, communities and industry. There are large industries including pulp and paper mill, sugar mill and liquor mill located along the Pong River downstream of Ubonratana dam. A large quantity of water is consumed by industry. ~~In the meantime, the effluent discharge (after treatment) if it is not adequately treated might cause water quality deterioration to the river.~~ There are water use conflicts among water users along the Pong river basin, particularly the downstream section (from Ubonratana reservoir to Nong Wai irrigation weir) where the pulp and paper mill located. A study has been conducted in the Tambon Municipality.

In this study it had been found that there is a severe conflict of water use between, industry and agriculture, tourism and agriculture, and also between residential users and other water use sectors. The study using stakeholder responses had revealed that there were conflicts in policy, plan, project, and working of the line agencies when attempting to perform water resource management. The study also noted that, there was a lack of data to assess domestic water use in each season, a lack of understanding among stakeholders due to different personnel character, thoughts, needs, customs, culture, traditions and beliefs, a poor use of stored water and the water releases, an inefficient method used for the temporal releases of water for various purposes, This study had concluded that conflict management could be made possible through community participation process with the use of appropriate methods for negotiation using dialogue for mutual agreement with transparency and impartiality[150].

10.4.4 Transboundary between Singapore

Future Directions, which is an international, an independent, and a not-for-profit strategic research institute has studied an international transboundary water

dispute between Malaysia and Singapore. In November 2019, Malaysia renewed calls for Singapore to co-operate in revising a 1962 water supply agreement. According to Malaysia's Natural Resources Minister, Xavier Jayakumar, the water reserve margin in the state of Johor has fallen to four percent and may reach zero by 2020. The recommended margin is ten per cent. Under the 1962 Water Agreement, Singapore may extract 946 million litres a day from the Johor River. Singapore pays \$0.01 for every 3785 litres (1000 gallons) of raw water and sells treated water back to Malaysia at \$0.18 per 3785 litres. The agreement expires in 2061.

The 1962 Water Agreement is mentioned as the the most contentious obstacles to good relations between Singapore and Malaysia. Malaysia is said to claim the need to renegotiate the arrangement between the two countries because it is 'manifestly ridiculous'. On the other hand Singapore while claiming that Malaysia had lost the right to re-negotiate the price of water when it failed to do so in 1987 also state that it effectively subsidises the cost of treating the water it sells back to Malaysia. The Malaysian Government hopes to boost revenue by renegotiating the terms of the Agreement and increasing the price of water sold to Singapore. There are also suggestions that other domestic nationalistic concerns have influenced Malaysia's position. Singapore views any breach of this agreement as a threat to its sovereignty. Furthermore, Singapore is highly reliant on Malaysia for its water, receiving nearly half of its water supplies from its neighbour. Singapore has tried to diversify its water sources by watershed management, recycling and desalination but its reliance on Malaysia and the impacts of climate change have put Singapore among the countries most likely to be water-stressed by 2040. Water prices have particular political significance in Singapore, where an increase in water prices last year led to rare protests against the government. Malaysia and Singapore have extensive and complex levels of economic interdependence because of being significant trading partners, due to movement of people between countries, foreign direct investments. Both countries are tied by their commitment to a Five Power Defence Arrangement. It is felt that because of the interdependence between the two countries, tensions over water agreement is unlikely to escalate any further than harsh words[151]

10.5 Indonesia

10.5.1 Irrigation water in Ciwalengke

This case is about the Ciwalengke irrigation system, in the Bandung district, which has seen its water gradually diverted by local factories. These industries have used a large array of legal and illegal measures to tap water and have been barely challenged by local farmers or the administration. This can be attributed, in part, to the social and political power of the factory owners[144]. It also reflects the inappropriateness of the legal dispositions, the mixed feelings of farmers who

also benefit from the job opportunities offered to their children and higher prices for their land, and the limited bargaining power of Water User Associations. Other river diversions for the domestic supply of the Bandung city are also reported to have been implemented without any consultation with the farmers. Jakarta city has overexploited its groundwater resources and, is now forced to expand supply by constructing more dams in neighbouring basins.

10.5.2 The River Ayung

Overexploitation of water resources at the tail end of an irrigation system in the region of South Bali, near one of the tourist centres, is illustrated in this case study. Tensions between the social institutions for local water management and powerful state-backed stakeholders in water distribution from the river Ayung have caused rural–urban water conflicts for the last 10–15 years. The case illustrates how water shortages are ascribed to the dominance of the tourism industry, private companies selling bottled drinking water and regional water delivery services, all of which the peasants hold responsible for crop failure in dry years. It is reported that water scarcity is caused due to lack of coordination between privatized and previously centralized water resource management based on economic priorities for the tourism sector and urban regions and water use for agriculture.

The paddy fields in the area had been converted into houses, tourism-related infrastructure, offices, public yards, and other private businesses. According to studies done, the main motives behind these changes were mainly economic reasons related with i) high demand for land to build houses or private business including tourism related activities, ii) limited irrigation water supply during dry season, iii) lack of labor force during peak season for rice farming, and iv) lack of appropriate balancing policies for traditional rice farmers. From an Indonesian social perspective, land and water are valuable not only as material resources but also as an intimate part of culture, history and social life. A value-based approach is demanded by the farming community as solutions which can account for the multiple and mutually dependent functions of land and water[152].

10.5.3 Water Conflicts and Environmental Resources

Though there are only limited reports on water conflicts with regards to the environmental balance, there are cases which indirectly points to such conflicts and reconciliation efforts in Indonesia.

A report which mentions the concept of a “Environmental Sustainable Livelihood Governance Program in Indonesia[153] that had sought to improve the well being of communities facing major environmental problems or conflicts over renewable resources in selected watersheds. This report points to the important aspects related to the optimizing use of local capacity, and emphasizing local ownership,

local participation, and donor coordination. The goals of this program includes increased levels of environmental awareness and capacity for all stakeholder groups on key issues affecting communities within the selected watersheds, achieving greater equity and social cohesion among stakeholders utilizing conflict resolution processes and negotiated solutions over access to and management of natural resources, and increase sustainable livelihood opportunities for rural poor in selected watersheds.

10.5.4 Water Supply East Timor

This report also highlights a program which has focused on its development efforts in East Timor on securing water supply[153]. In facilitating resolution of emerging conflicts of interests, such as between water users and people living in the headwater areas, the project performs long-term peace-building work. In this reconstruction project, seven communities are provided not only with plants and equipment, but also with water technicians and experts.

10.6 India

In India there are many cases of water conflicts. One reason for this has been mentioned as the absence of a clearly stated order of priorities which is enabling certain stakeholders/users/bureaucrats to use the ambivalence to inappropriately distort the allocations and priorities of water use[154]. The IWMI publication on water transfers mention the following cases from several places in India[144].

10.6.1 Chennai (Madras)

Chennai (Madras) is a text-book example of how large cities located in water-short areas resort to multiple means to access water, though it still has one of the lowest levels of per capita consumption in India if not in the world (68 l/c/day) with a supply limited to 3 h/day on average. Chennai is mostly supplied water from four tanks (Poondi, Cholavaram, Red-Hills, and Chembarambakkam) and groundwater (55%) derived from wellfields in the Araniyar-Kortalaiyar basin and coastal aquifers as well as from wells operated by municipal corporations and from the 200,000 private wells in the city.

In 1976, Tamil Nadu reached agreement with Maharashtra, Karnataka, and Andhra Pradesh on a supply from the Krishna river via the Teluguganga canal. The project encountered numerous technical, financial and political problems and water from the Krishna reached Tamil Nadu only in 1996. Ever since, supply has been erratic and during the following 6 years it amounted in total to no more than was supposed to be delivered each separate year (1.4 Mm³) under the agreement. Emergency measures taken during the drought that started in 2000 continued many years, the state government adopted following strategies as, i) pumping water from the Neyveli aquifer and transporting it by lorry, ii) purchasing water from private agricultural wells in the vicinity of the city (and buying wells themselves), iii) transporting water by tanker from the Chengalpattu-Kolavai lake, iv) bringing water from the Mettur reservoir in the Cauvery river basin, by rail; and installing bore-wells and tanks to supply water to slums. Another seven long term measures had been taken since 1990s.

Chennai launched a project to receive water through a 230-km long pipeline from the Veeranam dam in the Cauvery river basin in 2004. It envisaged diverting water from Pallipalayam, also in the Cauvery basin, as well as from rivers that were already in an extreme state of scarcity. This is despite the fact that Cauvery was the most water-constrained major basin in India and had been the subject of a longstanding dispute between Tamil Nadu and Karnataka.

All these diversions were to impact on irrigation, notably in the deltas that lie at the tail end of the river systems. Well-fields supplying Chennai had deprived

number of farms as well as local water supply systems, like in Palayaseevaram, which once had a water supply 24 h/day and now receives water of poor quality, and that too only 1.5 h/day. There is no mention of compensation being paid to the affected farmers other than in the case of the direct diversion from farm wells in the vicinity of the city[144].

10.6.2 Coimbatore in Tamil Nadu

Coimbatore, also in Tamil Nadu, has imported water from the western Ghats in Kerala since the 1930s. In the early 1990s, it implemented a diversion from the nearby Bhavan river, a tributary of the Cauvery, despite the pre-existing use of this water for irrigation[144].

A recent study has revealed that more flexible water allocation policies offer Tamil Nadu a possible way out of water-induced economic stagnation and will be good for the environment and the poor[155].

The state of Tamil Nadu, India, is in the grips of a water crisis, with demand far outstripping supply. As the economy of the state grows, this crisis is going to become ever more serious. To date the focus of state water policy has been on trying to augment supplies, from within the state (even from desalinization) and from neighbouring states. In addition, the water use is regulated in a way that does not encourage the highest value uses. International experience shows that supply-side measures must be complemented by demand-side measures and that practice must move away from fixed, command-and-control allocation policies towards flexible allocation mechanisms, which facilitate the voluntary movement of water from low to high-value uses.

Newspaper accounts over the past few years points to the following: i) Severe water scarcity and droughts in the lower Cauvery Delta, ii) Disputes between Tamil Nadu and the neighboring states of Karnataka and Andhra Pradesh and Kerala over the allocation of inter-state water, iii) Major problems in obtaining an adequate raw water supply for Chennai City, iv) Dramatic reductions in groundwater tables, v) Approximately 30% reduction in the storage capacity of the tank system, vi) Growing conflicts between different water using groups in the state and vii) Pollution threats to scarce water supplies.

A study had been carried out to evaluate whether such a change in allocation policies is worth doing. 17 River basin optimisation models had been developed which had included an assessment of the economic value of water in different end-uses – agriculture, domestic and industry. The results had suggested that a shift to a flexible water allocation system would bring major environmental, economic and social benefits to the state. Compared with the current “fixed sectoral allocation” policy, a flexible allocation policy would, in 2020, result in 15% less overall water used; 24% less water pumped from aquifers; 20% higher state

income; with all strata, rich and poor, benefiting similarly, with one important exception, that of agricultural laborers.

10.6.3 Andhra Pradesh

Hyderabad is rated as the top destination for IT-enabled service businesses among eight Indian cities. Hyderabad's economy has grown much more rapidly than the average growth rate of all Indian cities. The population has been increasing at 3.84 percent per annum during the last 25 years, taking it from thirty-first to the twenty second largest city in the world.

Hyderabad is located in a drought-prone area and, despite recent economic success, water supply has fallen behind demand. Per capita supply is little more than 90-100 l/c/d (including non-revenue water) and rationing is pervasive. The major water source has been the Godavari river basin (Manjira river tributary), supplemented by overexploited groundwater. More recently, a major new project drawing water from the Krishna river and involving a 400-m pumping head has come on stream, delivering an initial 0.205 Mm³/day. By 2021, the project aims to deliver 1.23 Mm³ / day (450 Mm³ /yr), almost tripling total supply and, independent of any other projects.

While the Godavari river is relatively in surplus, and the multipurpose Singur dam retain unutilized flows. The Krishna river is now getting overcommitted in the dry season, with recurring shortages in the lower basins since 2000 and right to access for water in that is disputed by three states.

The Krishna Tribunal allotted 22.6 Bm³ (or 39%) of the 75 percent dependable flow to Andhra Pradesh (AP) so that in 2021 Hyderabad should account for no more than about 2 percent of Andhra Pradesh's dependable share. Nevertheless, diversion from Sri Sailem LB canal to Hyderabad is located upstream of the 0.9 million hectare (Mha) Nagarjunasagar and 0.5 Mha Krishna delta irrigation projects. As development proceeds, not only in AP but also in Maharashtra and Karnataka, these tail-end systems will face declining supplies, especially during dry years. No mention was made of Hyderabad Water Supply in the Tribunal's report because Hyderabad was not an issue in 1976, yet it can be expected to receive priority at times of shortage, with the tail-end irrigation systems unlikely to receive any compensation as their supplies dwindle.

In future many planned water supply projects target to draw water from two major sources, the Yeleru and the Raiwada reservoirs, which are also used by farmers. The Vishakhapatnam Industrial Water Supply Project envisages capacity augmentation of the existing Yeleru Left Bank Canal (YLBC) system that presently delivers about 180 MI/day of water from the Yeleru reservoir. The demand in the immediate future is estimated at 260 MI/ day (2006), which in the long run would increase to 600 MI/day.

The solution eventually adopted is to build a pumping and diversion scheme from the Godavari river to increase supply into the tank. The cost of that investment is to be partly borne by the industrial group. This example shows that a costly solution has been preferred to the political costs attached to expropriation of local farmers, in this case because it is to be largely paid by private interests and also because the impact of the abstraction of water from the Godavari is more dispersed and less visible, although likely to be significant in times of drought[144].

10.6.4 Kerala Industrial Use

A much publicized example of conflict between industry and agriculture is that between a Coca-Cola plant in the Pallakad district in Kerala and surrounding farmers. The uncontrolled abstraction of groundwater by a bottling company has depleted the aquifer, dried up several open wells and bore wells and turned the quality of water from nearby wells unfit for consumption. An area of 250 hectares of wet paddy land was reported dry. While the respective impacts of the factory, the past drought and the development of bore wells for agriculture are still a matter for contention, it must be noted that the matter was made worse by the lack of transparent information on the effective use of water by the factory. The Government of Kerala, based on the critical drought situation in the region, ordered a ban on groundwater use from February to June 2004.

10.6.5 Delhi Water Supply

The new Delhi's water crisis has been detailed in the Water Policy 2016[156]. The National Capital Territory of Delhi (NCT Delhi), which is the largest metropolis in north India, has undergone explosive demographic expansion increasing pressure on water sources in various river basins in north India as well as on its internal groundwater resources. The small city state is high on consumption [with an insatiable demand], low on internal resource and high on external dependence [mainly dependent on river Yamuna, Ganga, Bhakra Beas system-all snow fed northern rivers]. Delhi has limited options to influence developments outside its boundary. With restricted sources of supply, no addition to its supply is expected for at least next 10-15 years.

Delhi's population according to 2011 census, is expected to reach 26 million in 2030. The city, which presently just about manages to meet its water demand, is likely to face increasing water stress under a business as usual scenario. Concern for water security in Delhi has picked up from a nascent stage in the last decades to a centre stage issue in recent years. As the NCT advances towards the 3rd decade of the 21st century it faces the daunting challenge of meeting rising demand in the face of rapidly changing externalities which are erratic rainfall, decline in river flow, uncertainty of dam based resource augmentation, declining groundwater output, reduced water for environmental flows, unmet demand, increasing friction with riparian states.

Historically, the focus for most public authorities in addressing the water challenge has been to consider additional supply. With narrowing external choices supply side planning is reaching its limits. The challenge of ensuring enduring water security in a climate of multi-faceted uncertainty requires a long term perspective, considering long term variables of low predictability, in order to satisfy demand while managing this critical resource in a wise and sustainable manner. The NCT Delhi has realised that, water security is no longer a simple matter of supply side management but has come to acquire multiple dimensions. It now requires, i) Ensuring affordable and adequate water supply to all sections of the population/sectors, ii) Careful balancing between development and environment, iii) Ameliorating political conflict between increasingly assertive upper and lower riparians, iv) Financial sustainability, v) Equity in distribution spatially and amongst economic classes, vi) Sourcing new supplies from distant basins in the face of increasing local resistance, vii) Negotiating regulatory factors, institutional & constitutional requirements, viii) Addressing issues of demand management and efficiency, ix) Incorporating technological innovation and x) Ensuring long term water availability in the face of variable supplies

NCT Delhi has been blamed for not having a strategic approach and for depending on the central government and the supreme court to bail it out in crisis. The recent Jat agitation referred to as Haryana, Feb., 2016, has demonstrated Delhi's vulnerability to external pressures, the fragile nature of its dependence on external sources and on the mercy of upper riparians. Delhi has to consider a possible simultaneous disruption of peak of summer water supply by Punjab and also the effects of climate change on the Yamuna streamflow. NCT Delhi has been blamed for not strengthening the water availability by ensuring future water security[156].

In addition, Delhi is a rapidly expanding city which aims to catch up with the demand for drinking water. The city can access only about 6 percent of flows in the Yamuna river due to upstream diversions by the states of Uttar Pradesh and Haryana. The Sonia Vihar water treatment plant, which is to treat 0.635 Mm³ /day (232 Mm³ /yr) from the Ganges river, was inaugurated in June 2002. Treated water is to be piped to Delhi, at a time when the capital is approaching a population of 15 million and consumes 742 Mm³ /yr, against a real "demand" estimated at 1,200 Mm³ /yr. Water is taken from the Upper Ganga irrigation canal, which has been lined to avoid seepage, raising protests from farmers relying on groundwater in the canal's vicinity. Emotional statements from social activists who see food security in the area threatened were published in media[144].

10.7 The Western USA

10.7.1 Conflict Resolution

A publication on the historical context of alternative water conflict resolution methods reinforces the importance of alternative water conflict resolution methods. Some ideas, such as prior appropriation, may (or may not) be part of the underlying culture of a particular region. The ability to import and adapt any particular method for water conflict resolution ultimately depends on the laws and institutions, cultural fabric, and indigenous traditions of different regions. The western Americas historical to modern experiences highlight the types of water conflicts and the evolution of dispute resolution[157].

10.7.2 Prior Appropriation

The particular experience of the western USA lead to a specific system of rights, with its advantages and drawbacks. The system has a concept of prior appropriation. Prior appropriation means that agricultural activities not only often have priority but also quantitative rights than cannot be circumvented or redistributed.

Water allocation and rights in the western USA differ depending on the state but are generally based on the prior appropriation rights system that emerged in mining camps in the mid nineteenth century. To avoid violent disputes between existing and new mines, prior appropriation ensured that water once diverted (or “appropriated”) from a stream would remain available to the original user.

The right is absolute but subject to the test of “reasonable use.” Diverting more water than necessary is considered wasteful and therefore, not part of the right. Consequently, users are not encouraged to save water as this would generate an “excess” that would legally return to the public domain. Likewise, users with water in excess of their needs are reluctant to publicize such a situation, even to enter into a market transaction, for fear of losing their right. This “first-in time, first-in-right” system grants the first settlers “senior” rights (defined as “water duty” related to the area put under beneficial use), whereas later ones are only given “junior” rights on any water possibly remaining after the former are served.

As many of the senior rights are historically held by irrigation districts, this legal system now entails constraints on the reallocation of water to towns. At first sight, it might appear contradictory that problems of transfer occur precisely where private rights have been defined most rigorously and where, in general, trading has been made possible.

In fact, a number of conditions are generally attached to market transactions of water. The public trust doctrine, which allows the protection of the public’s interest in fishing or navigation, is now extended to incorporate recreation and

environmental preservation as well. The Federal Reserve right doctrine has been used to claim water rights for national parks, federal land and Indian reservations.

Some states and counties have passed area-of-origin protection laws that prohibit or limit trans-basin diversions in the name of “the public interest,” or in order to protect local economies, culture and environment. More difficulties arise when reallocation, transfers and/ or infrastructure concern federal rivers or several states. Local, state and federal laws often conflict and transactions or interventions may give way to lengthy court hearings and litigation.

Social scientists also warn that in the western USA, water is not just a factor of production but the “stuff of life.” Rural counties are doomed to perish without their agricultural base, with a consequent loss of jobs, opportunities and the fiscal base.

Western USA and also in some other parts of the USA encounter severe competition between agriculture, cities and the environment. However, shortage of water in the deserts of Arizona is a relative notion. Phoenix enjoys the supply of the Central Arizona Project (CAP) that brings water from the Colorado river and exhibits a conspicuous consumption rate of over 1,000 l/c/ day. The city displays golf courses that are watered year-round, 200 parks, 50 of which are irrigated, 28 public swimming pools and about 20,000 residents who drench extensive lawns. Even some cities like Las Vegas, sited in the desert, with a per capita consumption of 1,200 l/day, defy common sense and need ever more distant transfers to support their growth.

In a context like the western USA, where individual water rights are defined, water markets or other types of transactions and transfers appear as one of the major options to reallocate water despite the often high transactions (e.g., legal) costs. Since most senior rights are held by irrigation districts, changing demographic and economic conditions warrant a permanent transfer of rights[144].

10.7.3 Colorado River

The Colorado River is one of the most litigious rivers not only of the western US, but of the entire planet. It passes through seven states of the western United States, before flowing to Mexico. Controversies between the seven western states with sharing of the waters have marked the history of the Colorado River, since the middle nineteenth century. Since the 1920s, the river has been marked by multiple compacts between the stakeholder states. At the international level, the U.S. and Mexico have also been involved in talks over the quality of the Colorado waters. This work describes the evaluation of domestic dispute among the states over the issue of water quantity of the Colorado River. The other types of ongoing

disputes on the Colorado, having intersectoral and international connotations, have not been considered here.

The interesting aspect of the interstate Colorado dispute is the incessant attempts on the part of the stakeholders to end the controversy through compacts and agreements. Compacts and agreements have often been taken as instruments to nullify potential conflicts over water use. The latest agreement of the innumerable ones on the Colorado is the *Colorado Water Delivery Agreement 2003*. This agreement is another action to avoid a potential dispute among the stakeholder states over water use.

The Colorado water the disputes have been multi-dimensional. Of all the disputes, conflicts between upper and lower basin states have been particularly contentious and long-drawn. Within the seven states of the US, it has often been stated that in the present day context, the Colorado waters are not only fully allocated; they are over-allocated. An interstate compact has allocated 17.5 million acre-feet (21586 million cubic metres) of water among the riparian states, but estimates of actual average annual flows range from 13.5 million (16652 million cubic metres) to 15.0 million acre-feet (18502 million cubic metres). Shortages have not arisen in most years because most states have not yet developed the infrastructure needed to capture their allocation.

Tracing back in the history of the disputes with the Colorado waters, by the early 1920s, the Colorado basin states were anxious about their share of the Colorado water. At that point of time, southern California held most of the human population of the western United States and encompassed the largest and the most productive agricultural lands of the west. Research points out that in the present day context, the primary nature of the controversy is with increasing water use by California, with the state's burgeoning growth being viewed with an identical concern as it was viewed in the 1920s. When the US Supreme Court ruled in June 1922 that the law of prior appropriation (first-in-time, first-in-right principle) applied regardless of the state boundaries and the federal report also recommended the construction of a dam "at or near Boulder Canyon" that could increase California's access to the Colorado River, the other states, particularly those in the upper Colorado basin started getting alarmed. Hence, the upper basin states, especially Colorado, advocated for the apportionment of the existing water resources. The growing state of California had the Colorado waters in its sights, and somehow, it was extremely receptive to negotiating an apportionment, which would clear the way for federally funded river development. Negotiating the apportionment was the first major interstate conflict in the region, and according to many, it typified the history of conflict and conflict resolution processes employed in the basin[158].

10.8 Myanmar

10.8.1 Salween River International Transboundary

The hydropower politics of the Salween River, has a focus on the projects proposed in Myanmar and their connections with neighbouring China and Thailand via electricity trade, investment, and regional geopolitics. This case described in Endorsements for Knowing the Salween, is an international transboundary water allocation situation that leads to conflicts. An attempt has been made to contextualise and better reveal the contested nature of project and connection from a point of view of hydropolitics. Salween River in Myanmar, has experienced a complex history of conflict and multiple associated claims for territory, political authority, and legitimacy. Underscoring these links, even the 2017 strategic environmental impact assessment baseline study of Myanmar's hydropower electricity sector commissioned by the International Finance Corporation states that "natural resource exploitation is linked to armed violence, including hydropower development". In this context, the terrain and assumptions of conventional water governance analysis are unsettled , which in turn requires a critical hydropolitics analysis.

The case study has evaluated the multi-scaled processes and multiple actors involved in water allocation, including for water governance and electricity governance, which intersect in the planning and materialization of large hydropower dams. The pipeline projects are advanced by consortiums formed of transnational corporations from Thailand and China working with Myanmar companies, and backed by various Myanmar and Thai government agencies via bilateral and regional agreements and through national planning processes. It is necessary to note how scale itself is produced through these contested processes. Proponents of large dams have framed them as a "development solution" for the Salween basin via promoting regional connectivity, industrialization, electrification and associated poverty alleviation. Yet, this frame has also been contested at different scales, in particular by Ethnic Armed Organizations, Civil Society Organizations, and International Non-Governmental Organizations across a range of issues including on human rights, environment and social impacts, and the ongoing prevalence of conflict in the context of the ongoing peace negotiations and assertions by some actors for democratic federalism. Meanwhile, civil society collaborations for the Salween Peace Park also reconceptualize and decentralize water governance. These efforts not only position the actors involved as agents in water governance, but also rethink the scales of governance across local and subnational arenas.

Finally, it is the history of conflict in the Salween Basin, which remains unresolved to this day, that must be foregrounded as a key issue in how plans for large dams on the Salween River have unfolded. In the technical documents of planners, the

issue of conflict is not really acknowledged, or is only recently so, but on the ground conflict and security fundamentally determine project outcomes including for potentially impacted communities. Given the technical, legal, and political complexity of these large dams and the great uncertainty in Myanmar's ongoing peace process, there is a strong argument that Myanmar's peace negotiations need to be concluded before such projects are discussed as a part of a broader discussion on resource governance[159].

10.9 Review

Universally water allocation has become a topic that receives the full attention of water managers. This is because of the lack of timely interventions by the authorities to prevent conflicts and protests over water sharing. There are many cases reported in the region and also in other parts of the world.

Several reported Incidents in Philippines, Thailand, Malaysia, Indonesia, India, Western USA and Myanmar on water allocation were extracted and evaluated. Anywhere on earth the same type of current uses and responses can be observed with very little variation. Resolution of water sharing problems has one fundamental requirement. That is the need to introduce a new water sharing mechanism If the present issues cannot be resolved with available legislative and administrative provisions. It could be noticed that government interventions in case of a water crisis in agriculture due to a shifting of water allocations out of agriculture to urban sector takes place only when there is a huge demand from the community or when there is a significant economic benefit to the government

It has also been realised that by incorporating marginal improvements, higher system efficiencies can be achieved in the irrigation systems, allowing saved water to be shared. In order to stop the aggravation of conflicts between agricultural and other competing users a government must understand this and take appropriate action to improve system efficiencies. Over time many have noted that in cases where there had been intense competition, the agriculture sector invariably adjusts with an increased system efficiency.

Around the globe, water transfers had taken place under various mechanisms. There are international water allocation and sharing, internal and interstate water sharing, water sharing among watersheds, and transbasin water transfers. These are typical across the world. The solutions are also similar but with a touch of regional, cultural, socio economic specifics associated with a particular case. The solutions are various but typical options either associated with the supply side or the demand side. Almost all cases highlight the need to carefully handle the stakeholders starting from the planning stage and continuing upto the operations. Among other things, the cases indicate the importance of considering the socio political vulnerabilities along with the climate change impacts.

In both developed countries and in developing countries, an effective administration could be seen as the most important mechanism to share or allocate water between users. The key factor is the formal administrative decisions that are taken by either national, provincial or a river basin entity, with appropriate authority. In case of Agriculture, option of compensation is feasible only in cases where water share of farmers is readily identifiable. Typically, formal administrative decisions require a clear identification of cases where farmers are willing to forego their share of water. In cases where this cannot be established, there is a high likelihood of political pressure on the administrators and decision makers.

The methods adopted to address specific water allocation cases can be categorised under two broad categories as, i) based on formal and informal rights and ii) based on administrative decisions. These also can be further sub divided as indicated below.

- 1) Based on formal and Informal rights already in practice (with or without compensation)
 - In a free market
 - In a regulated market
 - By legal means
- 2) Based on administrative decision
 - By formal decision (eg; reallocation during droughts or purchase of wells or reservoirs)
 - By “stealth” Operation;
 - ✓ by means of management of existing resources,
 - ✓ by means of investment in new diversions
 - ✓ by means of investment in out-pumping of agricultural users in wells
 - ✓ by means of encroachment on reservoirs in irrigated areas

11 Current Situation, Stakeholder Consultation and Confirmation

In November, 2019 Public Utilities Commission of Sri Lanka commenced the present study on “Sustainable Water Resource Management for Drinking Purposes”. In preparation to this study, PUCSL had conducted several province wise stakeholder consultations. After the commencement of the present study one major stakeholder consultation was held.

11.1 Regional Public Consultation Sessions Conducted by the PUCSL

In the early part of year 2019, PUCSL conducted a series of province wise stakeholder consultative sessions where there had been one in each province. The objective of these PUCSL consultations had been the creation of a discussion on pressing issues in the water service industry in order to create a platform for the design of an appropriate regulatory framework [160].

Altogether 214 representative comments/concerns had been recorded in all Nine sessions with an average of about 24 representations per province (within a range of between 30, the highest in Sabaragamuwa and 19, the lowest recorded in both Southern and Eastern Provinces). However, according to PUCSL the total number of participants at all nine sessions had been more than 3,000.

The participants of these sessions have been divided in to two broad categories. The first category which is the consumers or beneficiaries constitute of direct consumers or beneficiaries of water supply, the general public and their representatives. These representatives are either personnel making representations on behalf of the consumers or their politically elected representatives such as chairmen or council members of Local Authorities and Provincial Councils, public officers such as Divisional Secretaries, Secretaries, officers of Local Authorities, officers of other public organizations and representatives of civic societies. The second category constitutes the representatives of direct water service providers such as NWSDB, DNCWS, CBOs, LAs, and officers of other public organizations indirectly related to water sector.

One of the major concerns surfaced at these sessions from consumer perspective reflects the general expectation to receive good quality pipe born water at their doorsteps. Irrespective of their status with respect to either physical, social, economic or technical considerations, consumer have no preference with regards to the water supply service delivery either by a public agency or by a community based utility. The supplier issues are the scarcity of water and lack of water at existing sources, lack of funds and increasing cost of water supply infrastructure. The stakeholder consultation had revealed the need to have a clear policy on the regions to be provided with water supply services,

11.2 Specific Stakeholder Consultation Conducted for the Current Study

A comprehensive stakeholder consultation session on the current study of “Sustainable Water Resource Management for Drinking Purposes” organized by the PUCSL was held on 26th February 2020 at the Sri Lanka Institute of Development Administration (SLIDA). The main objective of this consultation was to obtain confirmation to the assessment of the current situation with respect the water resouces allocation in the country that was carried out by the study team. In this connection, PUCSL had previously written to all water sector stakeholders to provide available information on, i) available laws, regulations, circulars or any other documentary evidence pertaining to ownership/custodianship of water, ii) documents pertaining to procedures and practices adopted by the respective agency in relation to water allocation, iii) description of methods and practices pertaining to (a) identification of water users (b) management of demand, (c) management of supply and (d) dispute resolution if applicable; and iv) a list of stakeholders’ respective agency has consulted in connection with water allocation and records of such events for the last two years. Several institutions had responded stating that they do not perform water allocation. Several others had responded without requested details and a few provided some indirect information.

About 40 participants from identified water sector institutions in the country were invited by PUCSL for the stakeholder consultation session. 30 representatives from 10 water sector institutions participated(Annex 3). A structured presentation explained the current situation with respect to the process, policy, legislation, methods of assessment, stakeholder consultation associated with water allocation in Sri Lanka that had been identified by the study team. This was followed by a discussion session which sought confirmation of the current situation from the respective stakeholders.

Majority of the findings that are described in the earlier sections of this report were presented to the stakeholder institutions. The following aspects of water resource management in the Sri Lankan context were emphasised and were confirmed by the key water sector stakeholders.

11.2.1 Current Water Allocation Process

There are no accepted guidelines, an institutional setup with a clear mandate, or an approved mechanism to decide on water allocation from existing irrigation reservoirs, rivers and ground water sources for emerging demands for potable water in the country. Presently possibility of water allocation from existing irrigation reservoirs is assessed after checking the water stress situations on the basis of reservoir storage, area under irrigation, crop water requirement and the past experiences. For extraction of water from rivers too NWS&DB seeks concurrence from Irrigation Department and Mahaweli Authority to ensure

current water extractions for irrigation will not be deprived. The Ground Water Section of the NWS&DB does testing and work together with Water Resources Board whenever ground water extraction is necessary. However there is no national data base on ground water resources and hence site specific information only is used for such projects.

There is a void in the availability of verified and accepted models for water allocation. There is a need to ensure the availability of an established procedure to determine water requirement and priorities assigned to different users. There is an absence of a clear-cut and transparent policy and guidelines to determine water requirements for different uses.

However, in almost all the irrigation reservoirs currently under construction, potable water requirement and environmental water requirements have been considered and accommodated. The SEA report [179] which gives details of all the water resources development projects planned by Ministry of Irrigation and Department of Irrigation has indicated the water allocation set apart for consumptive uses such as irrigation, potable, and environment separately. Water needs in the relevant areas have been provided by the NWS&DB in all these new water resources development projects.

11.2.2 Objectives and Practice of Water allocation:

There are many policies on water resources and they are fragmented. Water allocation practice is based on a hybrid system of balancing supply, demand and the development priorities which is adhoc. There is an absence of a clear-cut policy on how the priorities are determined. Key state institutions perform on demand water allocations based on the mandates that had been assigned. The indication is that the present allocation objective are not sufficiently transparent to show that they are in accordance with national or any other development strategy.

The practices such as identification of water users, management of demand involving seasonal planning, water management techniques, management of supply involving identification of sources, approval for extraction, development of infrastructure, continuous monitoring, water management techniques, disputes and dispute resolution are dependent on a range of methods and practices incorporated under a wide variety of water related mandates or on case by case stakeholder consultation processes. The diversity does not appear to perform the function of amicable water allocation ensuring sustainable contributions to the national economy.

11.2.3 Sharing water amongst competing users

The current methods are unspecified and handled on a case by case basis. Some water managers perform time to time discussions. There is a void in the

availability of a well-defined policy for sharing of water amongst competing users. There is a lack of a structured mechanism for satisfactory stakeholder participation. Presently the best water sharing mechanism in the country is that practiced by the Mahaweli Authority of Sri Lanka and its Water Management Panel but only has control over a limited part of the country. There is no evidence of specific statutory powers granted for water allocation. There is a gap in the authority to define and determine water stakeholder importance, scope and roles at various scales of governance and administration. There is a lack of support on the rights of stakeholders in the water allocation process except for a limited coverage in the Irrigation Ordinance and in the Agrarian Development Act.

11.2.4 Defining water entitlements-

Sri Lanka does not possess a clear definition for water entitlement to provide a fair share to water users. Prevailing legislation does not clearly state whether the water management authorities are water custodians or users. Available laws are fragmented and not specific with respect to water entitlement. There are about 15 laws covering various aspects associated with water sharing. There are no regulations or circulars pertaining to water entitlements of different users.

11.2.5 Dealing with Variability and Uncertainty

There is no policy, accepted method, guidelines or a practice for the incorporation of spatial and temporal variability associated with the water resource, water use and water users. This is the same with respect to the incorporation of uncertainty associated with the water resource, water use and water users due to climate change or a change in the political or socioeconomic setting. There is a lack of evidence with regards to using at least adhoc methods for the incorporation of variability and uncertainty in the process of water allocation.

12 Water Allocation and Modelling

12.1 General

Water allocation, monitoring and management is very important to ensure rational use of water which is the world's most valuable resource. Studies have revealed that at least 20-30% of water currently used in developing countries by households and industries could be saved by adopting appropriate regulatory and policy instruments such as tariffs, quotas and groundwater extraction charges[161]. This work also mention that similar savings are also possible in irrigated agriculture by investments in infrastructure and crops, while imposing irrigation rates. Usually, the importance of water allocation is surfaced either with conflicts related to water sharing or when users waste water that had been lawfully allocated. In these situations, the primary issue is the water rights. It is because, user groups cannot make decisions regarding water if they have no rights over that water[162]. Water conservation, environmental protection, rational development and utilization of water resources, conflict resolution and the development of water markets all depend on the definition and allocation of water rights[163].

The Helsinki Rules, adopted by the International Law Association(1967) and Convention on the Law of the Non Navigational Uses of International Water Courses, embraced by the United Nations (1997), assert that water should be allocated in an equitable and reasonable manner and should not cause appreciable harm to riparians[164]. In 2010, the United Nations made a declaration recognizing Right to Water as a fundamental right. The supreme court of India has expanded the meaning of the constitutional right to life' to include the 'Right to Water'. It had been expressed that, this by implication states, that the volume of water required for ensuring this right must be 'reserved' in every water infrastructure project without exception[154]. However as described previously in this report, in most countries including our country, water rights are not very well established. Therefore, it is important to review water allocation under a general setting.

12.2 Principles and Practices

Water allocation is generally considered to be the process of allocating or sharing water between different users or consumers based on a set of principles defined in a water allocation policy statement. Water allocation between users' needs to be based on various priorities or supply principles that are normally set by government policy[163].

In the review of international cases done for this report, it was noted that the water allocation practices are either based on formal and informal rights already in practice or based on administration decisions. The rights can be based on a free

market, regulated market or on a legal means. Administration decisions can be either formal or stealth operations.

There are various water rights allocation principles that are used for the practices in different countries, including those of riparian ownership, prior appropriation and public rights that had evolved according to local context. In regions with relatively abundant water such as Europe and Eastern America, riparian principles have dominated. Conversely in regions of relative scarcity such as western America, the prior appropriation doctrine has dominated, supplemented by riparian rights. In Japan both 'upstream priority' and 'first in time, first in right' principles have been implemented together. In China, water allocation principles have also evolved according to changing political and economic priorities[163]. As indicated, there are two main principles behind water allocation policy. They are either completely controlled by the government or managed with the concept of a mixture of market and government allocation[162].

There are several methods of water allocation. In early literature, water allocation methods had been recognised as, marginal cost pricing, public allocation, water markets and user-based allocation. In case of marginal cost pricing method, the objective is a price for water to equal the marginal cost of supplying the last unit of that water. Public or administrative water allocation, instead of treating as a market good, water is perceived as a public good. A market-based allocation of water is referred to as an exchange of water-use rights under a set of rules. User-based allocation requires collective action institutions with authority to make strong decisions on water rights ensuring efficient allocation. The effect of user-based allocation on water conservation depends on the content of local norms and the strength of local institutions [162], [165]

One classification is to identify water allocation methods as implicit and explicit systems. Implicit allocation systems provide water through top-down, government driven planning processes. Explicit allocation system is a time bound licences or permits to specific users. Another is to classify as, user-based and market-based systems. User based allocation is a system which depends on the history of stakeholder cooperation. Market based allocation is a new approach which depends on the economic value of water for various uses. Apart from these, in the recent years the governments are opting to the consideration of environmental water allocation to avoid irreversible environmental degradation. Further details and the advantages and disadvantages of these systems are described in the document on water allocation by Mott MacDonald (UK) [163].

Describing, determining or identifying the water allocation policies and practices is not sufficient for rational water management. A decision maker must select a practice to use for water allocation. In this, when selecting the best method of water allocation, there are criteria to assist the choice. They are, flexibility in the allocation of supplies, security of tenure for established users, whether real

opportunity cost of providing the resource is paid by the users, predictability of the outcome of allocation process, equity of the allocation process and political and public acceptability [162].

12.3 Modelling

The selection of a suitable water allocation policy and a practice must be sufficiently supported with other tools to ensure rational water management. This is simply because, the principles or guidelines of reasonable and equitable use etc., are difficult to apply directly in practice. Measurable criteria and models need to be designed and used to achieve fair apportionment of water in the light of water shortages[164].

This can be fulfilled by an optimal water allocation model which has the capacity to evaluate the established water supply security by considering relativity, systematism, limitedness, dynamism, and economy. These criteria have been described as, i) Relativity: the balance between the supply capacity and the size of the users' demand ii) Systematism: capacity to perform a system analysis and address the weaknesses of the system. iii) Limitedness: Defined limited water security and performance, iv) Dynamism: Water supply and demand to be dynamic under the influence of environmental changes, economic development and social progress, v) Economy: Appropriate selection of method by considering the economy of engineering technologies[166].

Mathematical models use various methods to allocate water. Hatmoto(2006) mentions the possibility of using four alternatives depending on the users requirement. The four methods are, a) First come first served. b) Fixed proportion, c) Proportional to the water demand. d) Trial and error to achieve balance[167].

When dealing with water allocation options with spatially and temporally varying sources and demands and especially with multiple water users, prioritisation of available alternatives is essential. Hence water models must be capable of selecting the best alternative by considering both hydrology and economics. A review of the state of the art of modelling approaches to integrated water resources management at the river basin scale done in 1999, with particular focus on the potential of coupled economic hydrologic models had summarised the important requirements. This work had addressed the issues related to increasing water demand and the resulting inter-sectoral competition over water by considering both the economic and hydrologic aspects.

Accordingly such models dealing with these factors need to ensure, i) integrated water quantity and water quality regulation, ii) spatial and temporal externalities resulting from the distribution over time and across locations of water supply and

demand, iii) crop acreage and crop production functions incorporating both water application and salinity, iv) effects of uncertainty and risk concerning both water supply and demand, v) appropriate representation of water demands from all water-using sectors for analysis of inter-sectoral water allocation policies and vi) economic incentives for salinity and pollution control, water conservation, and irrigation system improvement[168]. The techniques implemented to develop these models vary from simple proportional allocation schemes to sophisticated linear programming techniques, while the implementation tools are ranging from spreadsheet to the comprehensive Geographical Information System, and some others with the aid of programming languages such as FORTRAN [167].

When modelling water allocations, there is also a need to consider the human-environmental interactions. It is increasingly acknowledged that multi-agent simulation(MAS) is an adequate modelling technique to represent human-environment interactions. Applying MAS approach is useful in representing feedback mechanisms between water availability and water use. It has been shown that it is possible to validly depict spatial-temporal variability of water availability influenced by water use and vice versa[169].

Hydro economic river basin level water allocation models are multi criteria decision models. There are several options to develop water allocation models. A comparison of such multi criteria decision model alternatives described in Golfam et Al (2019) demonstrate the potential of such systems[170]. Hydro economic models which treat water allocation between users need to consider water quantity and quality dimensions. One such water allocation non-linear optimisation model is the Colorado River Institutional model (CRIM) which links river flow, salinity concentrations, demand sectors across river locations, annual consumptive use benefits, hydropower benefits, and costs and benefits of salt discharges to achieve the objective of maximisation of net economic surplus. Model solutions provide estimates of economically efficient allocations subject to physical and institutional constraints[171].

The water allocation modelling has advanced well beyond research. A GIS based, Hydrological modelling and decision support tool for water allocation in the North Eastern British Columbia which has an approximate extent of 175,500 km², has the objective of supporting water use approvals and water licences under the water act by providing information to the industry, first nation and others[172]. The aforementioned demonstrates the need and availability of modelling options for water allocations.

12.4 Model Parameters, calibration and verification

Literature does not provide a clear indication of weights assigned for water users except the order of priority to be used in water allocation models. Though literature pertaining to most nations indicate a priority order of water use, the

presidential decree of the Philippines demonstrates a fine example where water use priority, the organisations with management authority etc., are clearly spelled out[83].

Consent-based planning [173] is a method to include environmental concerns in to modelling work. Such factors also must be embedded in basin models as rules and associated parameters in order to fulfil environmental safeguards. In Indonesia, a model implemented in five river basins had applied high penalties (priorities) for public water supply and industries and lower penalties for irrigation [167].

The practice is for such penalties (priorities) to be used as model parameters. These models which use such parameters as guides, are then calibrated and verified with appropriate consideration of chosen water allocation policies and practices. In 2006 a work on calibrating holistic water resources-economic models had compared the difference between a calibrated normal model and an uncalibrated normative model when responding to the change of water prices and thereby showing the significance of model calibration [174]. These whole-of-basin hydrological models are needed to better manage great river basins of the world which are threatened by a range of processes including climate change, over-extraction, and decline in water quality and stream flows. However, the lack of an effective means of calibrating these complex, multi-parameter hydrological models has potentially restricted their development and application. Most models in the developing world fall in to the category of either uncalibrated or weakly calibrated models. Overcoming these challenges, the work by Gao et al (2020) in Murray Darling Basin offers a useful tool to calibrate complex, whole-of-basin hydrological models thereby reducing a significant barrier to the more widespread development of large-scale river basin modelling [175].

12.5 Code and Institutions

The choice of water allocation options including the models, parameters, prioritization etc., must be embedded in codes of practice to ensure good water management practices. The strength of a water code is partly highlighted by the presidential decree of the Philippines. The Water Code passed in 1976 had authorized the National Water Resources Board (NWRB) to grant water rights, levy the appropriate fees for these rights, and collect charges for water development. The Code also recognizes seniority of rights such that the earliest approved rights have priority over others to the use of a limited supply of water. In times of drought or any emergency, however, the use of water for domestic and municipal purposes takes precedence over agriculture or related uses. In this regard, the Code also provides that such a reallocation requires payment of due compensation to the affected sector. It likewise allows the transfer or lease of water rights in whole or in part to other parties subject to approval by the NWRB[165].

Dinar et al (1997) [162] discussing institutional mechanisms for water allocation states that “User-based allocation requires collective action institutions with authority to make decisions on water rights”. Wang et al (2003) in their work mention that the effectiveness of user-based allocation depends on local norms and the strength of local institutions, but such institutions are not always in place or strong enough to allocate water efficiently[176]. Cooperation and collaboration between water user and water regulatory institutions is an important factor for successful water allocation. The Philippine Institute for Development Studies in their water allocation modelling work stresses that adaptive collaboration among water institutions is a potent mechanism for shaping water policy and management. Their ability to allow for each others’ differences in capabilities, capacities, and water concerns in the interest of achieving a consensus on water decisions and actions, would lead to strengthening of policymaking and water management systems[165].

12.6 Allocation Model in Sri Lanka

Water allocation among different uses under a single source (usually in an irrigation reservoir) is made using a simple model designed using Excel worksheets. By changing the real time values of various parameters on type of crops in current cultivation season, acreage cultivated, rainfall received etc. the water available for sharing can be decided. When the allocation need to be made under a complex system where availability of water at the source depends on water transferred from other sources such as trans-basin diversions, the above simple model cannot be used and hence a dedicated simulated model need to be developed.

The first water allocation simulation model of a complicated water resources system in Sri Lanka is the one used by the Water Management Secretariat of the Mahaweli Authority. Water allocation based on this model had taken place for over three decades. Though the present coverage of this system is limited to 9 river basins in the island covering an approximate land area of 41%, the model in practice provides a good foundation to develop a structured water allocation framework by building on the present water allocation system.

12.6.1 Mahaweli Model

The publication titled, “Simulation model for participatory decision making: water allocation policy implementation in Sri Lanka” (2012), describes a computer-based model which has been in use for the last 27years covering approximately 72% of Sri Lanka’s total available surface water[177].

This work has described the process of implementing allocation policies in the formal water allocation system with the involvement of multiple stakeholders. Mentioning that the water allocation process with its complex interconnections is a difficult task and has a significant impact on the social and economic life of the

country, the publication indicates that without well established policies and tools, balancing water allocation between users calls for the implementation of a “wise” option which is that acceptable to all but not necessarily financially best allocation option. In this model, the method of water allocation for domestic, industrial and environmental requirements has been indicated as an embedded system which is not specific.

The process describes an impressive stakeholder consultation process but some information points to an allocation system providing water through a top-down, government driven allocation system. It appears that the feedback mechanisms require a strong system which enables finer resolution interventions. This state driven allocation mechanism which points to an allocation system with a strong inclination to the agricultural water releases also indicate that there is a high priority for water supply.

The described model calibration method, the estimation methods associated with model inflows and storage values used in the model reflects the need of better information to assess the adequacy of model calibration and verification. Similarly, there is no indication of a revisit to evaluate the sufficiency of penalty systems though continuous monitoring and evaluation. The information in the publication suggests that the stakeholders of sectors other than those looked after by the three principal stakeholders are either very cooperative, helpless or poorly educated to claim their rights. Though there are no visible water conflicts of significance, it is important to capture whether water allocation fulfills the national economic aspirations. The provided details does not indicate the methods available to overcome uncertain situations such as climate change. Hence, there is a high probability to create conflict situations when the stakeholder numbers increase with time and also if the resource gets depleted because of uncertain events. As the publication has described, this is the only occasion that had attempted a display of transparency with regards to the methods and parameters used in this water allocation mechanism.

12.6.2 Stakeholders and Practice

In literature, when assigning water allocation priority, water user stakeholders are divided according to sectors. In case of sectoral water resource allocation, the implementation agencies would utilise the water for an intended purpose. In Sri Lanka most government institutions seek access to water to fulfil multiple uses. Therefore, a water allocation model in the Sri Lankan context must seek criteria that prioritizes water according to water sector institutions. Even the National Water Supply and Drainage Board provides water for drinking, domestic and industrial purposes. Mahaweli authority provides water for agriculture, drinking, industrial, recreation and environmental purposes. The Schematic shown below(Figure 3), extracted from the publication titled “Political and Institutional Context of the Water Sector in Sri Lanka an Overview” clearly demonstrates this

concern with regards to a single agency handling multiple uses[48]. Hence the institutional structure prevailing in Sri Lanka points to an inherent issue of attention when assigning priority based on a sectoral use framework. The spatial coverage and the timing of water use by water sector agencies also must be considered when an appropriate allocation model is developed.

Food production	Water supply and sanitation	Hydropower	Environment	Industries
MIWRM	Ministry of City Planning and Water Supply	Ministry of Power and Renewable Energy	Ministry of Mahaweli Development and Environment	Ministry of Industries and Commerce
Ministry of Agriculture			Forest Department	
Ministry of Mahaweli Development and Environment	National Water Supply and Drainage Board	Ceylon Electricity Board	CEA	Ministry of Public Enterprises Development
ID, WRB	Department of Community Water Supply		GSMB	
DOA, DAD			CCD	
MASL	MASL	MASL	NGJA	
			MEPA	
			MASL	MASL

Figure 3: Public Institutional Stakeholders and Water Use Interests in Each Sector [48]

13 Devising a Water Allocation Framework

13.1 Phases of the Framework

A water allocation framework must guide water management using a system which sets out how much water can be abstracted and how that abstraction will be managed during a particular time period including present and an objectively determined future. A water allocation framework to be practical and successful, it must lead to a systems approach, a logical sequence, a method of validation and successful stakeholder participation. In essence a water allocation framework must embed an initiation phase, development phase, implementation phase, and an evaluation phase to develop a rational water allocation system. In literature, out of many publications on methods of developing water allocation systems, the water allocation planning method of Western Australia provides a set of structured information leading to the development of a framework for Sri Lanka[178].

13.2 Initiation Phase.

At this stage detailed scoping must be carried out to identify stakeholders and perform a situation analysis that would reveal the relevant resource and allocation issues.

Accordingly, the present work identified the water sector stakeholders, associated literature, case studies, etc., and carried out a situation analysis where current situation related to water policy, legislation, stakeholder issues, methods practiced etc., were comprehensively studied and reported.

13.3 Development Phase.

The development phase is the core of a water allocation framework. In this the target is to determine how much of water resources can be allocated for water use or water users and then how this allocation system can be managed. In order to perform this task it is necessary to identify the objectives behind water use, the reliability of the resource integrity, and the intentions with regards to the environment. Hence it is necessary to assess information, set objectives and allocation limits and define the management approach.

An important factor that need to be taken care of is, consistent stakeholder consultation to obtain guidance for the success of development phase. Stakeholder consultation will ensure transparency and achieve consistency in the performance. Hence it is important to develop and verify supporting documentations and release them to all stakeholders for further review and consensus building. These supporting documentations must include, resource assessments, allocation

methods, and limits together with reasoning behind every decision. The satisfactory completion of development phase results in an acceptable water allocation system ready for implementation.

As a guidance, the achievements intended at the completion of development phase can be outlined as,

1. Context and scope of water allocation
2. Targets of water allocation
3. Water allocation limits
4. Water allocation policies
5. A water allocation system for the Implementation of water issues
6. A mechanism for the Evaluation of (planned) water allocation during implementation
7. Public Consultation and Finalisation of the water allocation system

The four important stages in the development phase are, i) Assessment of Information, ii) Identification of Objectives and Allocation Limits, iii) Defining the management approach and iv) Arriving at the final water allocation system.

13.3.1 Assessment of Information

In this step the target is to capture the i) Water resource availability and trend, ii) Water resource use and trend and the iii) Requirements for the environment, social and cultural activities.

At first, the success of development phase depends on the available information. Therefore, a significant effort must be for the collection of information and for verification. This information are to be collected with the support of stakeholders, evaluated and accepted by the stakeholders. Such evolving documentation must be made available for stakeholders to access and evaluate when necessary. It is recommended that such documentation is made available in a public web site to demonstrate the commitment of the state or the regulators. The targeted quantitative achievements in this step can be elaborated as below.

i. Water resource availability and trend

1. Establishing hydrological or hydrogeological models which estimate flow and recharge
2. Establishing the inflow components under future climate and landuse scenario

3. Establishing surface water and groundwater interaction and aquifer interconnectivity

ii. *Water resource use and trend*

1. Establishing current water demands
2. Establishing the future water demands under development and other relevant scenario
3. Establishing main stakeholder concerns with regards to water rights, allocation and use

iii. *Water requirements for the environment, social and cultural activities*

1. Establishing ecological water requirements and thresholds
2. Establishing social and cultural water requirements and thresholds
3. Establishing stakeholder concerns associated with the environment

13.3.2 Identification of Objectives and Allocation Limits

In this step it is necessary to define the objectives of water allocation framework and then set environmental water and allocation limits. In this connection the following tasks must be executed with adequate stakeholder consultations.

- Defining objectives (consistent with the resource, the environment, current and future water demand and identified issues)
- Identification of strategies to meet objectives and performance indicators
- Identification of criteria for assessing allocation options
- Development, Analysis and Evaluation of the Allocation Options using Transparent modelling
- Obtain and Evaluate stakeholder inputs on Allocation Options
- Decision making on the appropriate environmental water and water allocation thresholds

- Development of management strategies consistent with the decided allocation thresholds
- Documentation of Accepted Costs, Risks and Benefits

13.3.3 Defining the management approach

In this step the management approach is defined for the entire allocation plan. Hence it is necessary to clearly set out the policies, rules and regulations. In relation to these, it is very important to ensure statutory instruments to manage water abstraction. The instruments may include simple measures in lower use areas and complex arrangements in higher use areas. Apart from these, the management instruments must evaluate the achievement of objectives pertaining to water allocation, and take appropriate remedial measures. The following are typical tasks when defining the management approach.

- Development of policies and supporting legal instruments to upkeep the water resource objectives and deliver the management strategies
- Determination of the performance indicators to measure the achievement of objectives
- Development of a monitoring program to test the water resource and performance indicators
- Establishment of Institutions and resources to ensure the implementation of the water allocation system
- Establishment of other related actions required for plan implementation, including triggers in high demand areas where immediate management responses are required.

13.3.4 Final water allocation system

The water allocation system that has been developed in consultation with the main stakeholders requires approval of the public. At this stage a close stakeholder relationship is required to gather feedback on the proposed system. Therefore, a draft plan is submitted for public comments and then finalised for implementation. Finalisation of the developed system under public scrutiny may involve revisiting the proposal. This depends on the complexities of the issues that are coupled with the developed system.

At the public consultation stage, it is necessary to,

- Gather public and stakeholder contribution
- Assess and respond to the stakeholder inputs
- Address the requirements to arrive at the final allocation system

Once the allocation system is finalised then it must be submitted to necessary approvals and then the final water allocation system must be released for implementation.

13.4 Implementation and Evaluation phase

Water allocation system developed using the framework must be implemented only with the required approvals. Once approved, the relevant institutions are required to implement the management approach which is already in the developed system. The institutions that ensure the water allocation by undertaking various responsibilities must be provided with adequate resources to fulfil the implementation aspirations. In parallel, community awareness programs and workshops must be carried out to ensure successful implementation. The evaluation must include a “resource review” and a “system evaluation statement”.

The resource review requires to include the measurement and monitoring information associated with the implementation together with the following.

- Trends in water levels or flow in a quantitative manner
- Trends in water quality, at identified locations
- Trends in other measurements that are described in the developed system
- Any desired changes to the monitoring program
- Water resource update in cases with new information investigations have provided new information
- Future activities planned for the associated spatial extents

The evaluation statement of this phase should include the following.

- Water allocation status (as in changes to status and over-allocated resources)
- New water allocation issues
- Adequacy of Implementation actions
- Triggers reached and associated performance
- Performance of the system (as in performance indicators and objectives)
- Evaluation of management set out in the developed system
- Considering new water allocation planning issues identified by water users and others
- Future actions/steps

14 The Water Allocation Framework for Sri Lanka

14.1 General

The present work carried out a comprehensive situation analysis and a thorough evaluation of the national, regional and international practices, methods and systems to recommend the final solution as the water allocation framework for Sri Lanka highlighting the needs with respect to the required amendments to the existing laws/policies/institutions. The framework development carried out two important key stakeholder consultations. One on 26th February 2020(Annex 3) for the identification and confirmation of the method that had been used to arrive at the framework and then the other on the 17th September 2020 to present and incorporate the comments received on the given recommendation(Annex 12). The final recommended solution by the present work which is the establishment of a sound water allocation framework is as follows.

14.1 Recommended Water Allocation Framework

The water allocation framework at the outset must emphasise on a,

- Systems Approach that is based on a,

Clear logical sequence,

Giving priority to transparency,

Ensuring a method of validation, and

Devising a comprehensive stakeholder evaluation

at each step of decision making.

The framework is to include the following phases. An initiation phase, A development phase, An implementation phase, and an evaluation phase.

14.2 The Initiation Phase.

This stage should include a detailed scoping to identify stakeholders and perform a situation analysis leading to the relevant resource and allocation issues. This has already been carried out by identifying the water sector stakeholders, associated literature, case studies, etc., and through a situation analysis which also included current situation related to water policy, legislation, stakeholder issues, and methods practiced.

14.3 The Development Phase.

This is the core of the water allocation framework for Sri Lanka. However this cannot be done in isolation. Therefore this must be well founded on the initiation phase.

Firstly, directives must be given to the stakeholders to establish the objectives behind water use, the reliability of the resource integrity, and the intentions with regards to the environment.

Secondly, the established information must be assessed, objectives must be reviewed and finalised and then the allocation limits must be defined while establishing a sound management approach for water allocation.

Thirdly, the first and second tasks described under this task must be subjected to a transparent, well formulated stakeholder consultations while maintaining consistency.

Finally, the acceptable water allocation system must be identified for implementations. In this connection, the outputs must be aligned carefully to outline the following.

1. Context and scope of water allocation (as guided in this report)
2. Targets of water allocation (with a sound systems approach and through stakeholder consultation)
3. Water allocation limits (with a sound systems approach and through stakeholder consultation)
4. Water allocation policies (as guided in this report and well supported with an overarching parliamentary enactments, rules and regulations obtaining guidance from the legal draftspersons)
5. A water allocation system for the Implementation of water issues (the setting up of a rational methodology supported by stakeholder consultation, ensuring overarching systems as recommended in the report and confirmed through stakeholder participation, the establishment of institutions with responsibility while avoiding duplication which was highlighted in the situation analysis)
6. A mechanism for the Evaluation of water allocation during implementation (This must be carefully planned at the initial stages, then embedded in to the mechanism and institutional arrangements to fulfill the auditing of performance)
7. Public Consultation and Finalisation of the water allocation system (Transparent stakeholder consultation with room to improve the finalised allocation system during operations)

As identified in the detailed evaluation carried out by the present study, in the Sri Lankan context it is important to note the current situation, best practices, and

the structured methods applied elsewhere. It must be mentioned that the report has gone beyond its scope to study and present many directions that would guide the processes in the development phase. This report while providing key information embedded in the main text has provided addendums to support decisions. Such details must be well used as a stepping stone when finalising water allocation system.

14.4 The Implementation phase

In case of Sri Lanka implementation phase would require significant attention. The multiplicity in the administrative structure presented in the addendum, the numerous policies, ambiguities in the legislation, a plethora of existing water managers as described in the main report would have to be carefully scrutinised prior to and after the commencement of the implementation phase.

Hence, the established water allocation system developed must be implemented only with the required approvals. The implementation phase must carefully plan and include community awareness programs and workshops to ensure successful implementation.

14.1 The Evaluation phase

This is one of the weak areas in the Sri Lankan context. The situation analysis or available literature do not point to a structured review mechanism that must be reinforced with third party independent reviews and associated publications. Hence the needs highlighted in the framework development requirements section in this report must be carefully adhered to. In this aspect the recommended “resource review” and the “system evaluation statement” must be included to ascertain a sustainable water allocation framework.

14.2 The Way Forward – Immediate Next Step

Having completed a thorough analysis of the present water allocation system in Sri Lanka, the present work would strongly recommend a step by step approach to arrive at a water allocation system which is transparent, rational, acceptable to stakeholders, and hence sustainable. Therefore, the next step in the development of a water allocation system for Sri Lanka is to follow the framework elaborated and recommended above.

In a nutshell, this report is the documentation showing the situation analysis that has been completed and the framework that has been accepted by the key stakeholders. The next is to achieve the first step of the development phase. In this connection it is necessary to undertake the following as the three immediate moves and they are,

- Water resource availability and trend
- Water resource use and trend
- Water requirements for the environment, social and cultural activities

In case of the resource availability, the regulator for water sector has to establish its position. Then this authority for water sector regulation, must direct the water sector institutions to identify the present systems and then perform an evaluation with stakeholder consultation in order to arrive at a national guideline for water information. Once it is done, a systematic approach must be incorporated to achieve the other requirements lined in the framework.

15 References

- [1] Arumugum S., *Water Resources of Ceylon its Utilisation and Development*. Water Resources Board, Sri Lanka, 1969.
- [2] B. Kamaladasa, *Irrigation Development in Sri Lanka*. The Institution of Engineers, Sri Lanka, 2007.
- [3] A. J. P. Ponrajah, "Design of Irrigation Headworks for Small Catchments," Department of Irrigation, Colombo Sri Lanka, 1984.
- [4] National Water Supply and Drainage Board, "History of NWSDB." [Online]. Available: http://www.waterboard.lk/web/index.php?option=com_content&view=article&id=8&Itemid=104&lang=en. [Accessed: 18-Nov-2019].
- [5] Asian Development Bank, "Sector assessment: Water supply and other municipal infrastructure and services," 2016.
- [6] K. A. U. S. Imbulana, N. T. S. Wijesekera, B. R. Neupane, M. M. M. Aheeyar, and V. K. Nanayakkara, Eds., *Sri Lanka Water Development Report: 2010*. UNESCO & Ministry of Irrigation and Water Resources Management, 2010.
- [7] Price waterhouse Coopers(PwC), "Water Sector of Sri Lanka (Embassy of the Kingdom of the Netherlands)," 2014.
- [8] Department of National Planning Sri Lanka, "Public Investment Programme 2017-2020," 2017.
- [9] Statistics Department - Central Bank of Sri Lanka, *Economic and Social Statistics of Sri Lanka*, no. July. Rajagiriya: Published by Statistics Department Central Bank of Sri Lanka, 30, Janadhipathi Mawatha, Colombo 01, Sri Lanka, 2018.
- [10] National Audit Office Sri Lanka, "Annual Report of the Auditor general 2018," 2019.
- [11] S. Piyasiri, "Surface waters, their status and management," *people's bank. colombo 02 Econ. Rev.*, vol. 35, no. July, pp. 23–31, 2009.
- [12] E. of the K. the Netherlands, "Water Sector of Sri Lanka," no. June, p. 98, 2014.
- [13] Food and Agriculture Organization, "FAO AQUASTAT Database Sri Lanka," *Food and Agriculture Organization*, 2019. [Online]. Available: <http://www.fao.org/nr/water/aquastat/data/query/results.html>. [Accessed: 20-Dec-2019].
- [14] Ministry of Agriculture Rural Economic Affairs Irrigation and Fisheries and Aquatic Resources Development, *(n) Sri Lanka: Overarching Agricultural*

- Policy Draft*, no. August. Ministry of Agriculture, Rural Economic Affairs, Irrigation, and Fisheries, and Aquatic Resources Development, 2019.
- [15] P. H. Sarath Gamini, “Challenges in the Water Sector and Wastewater Sector,” 2015.
 - [16] SVP Development Team, “Extra copy : Sector Vulnerability Profile: Water. Supplementary Document to: The National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016,” 2010.
 - [17] Department of Census and Statistics of Sri Lanka, *Household Income and Expenditure Survey 2016 Final Report*. 2018.
 - [18] M. Samaraweera, “Annual Report 2018- Ministry of Finance,” 2019.
 - [19] Ministry of Forestry and Environment, “State of the Environmental Report Sri Lanka 2001.” United Nations Environment Programme, p. 149, 2001.
 - [20] Asian Development Bank, “Experience with donor coordination: The case of water supply and sanitation in Sri Lanka,” 2017.
 - [21] M. Fan, “Sri Lanka’s Water Supply and Sanitation Sector: Achievements and a Way Forward,” 2015.
 - [22] National Water Supply and Drainage Board, “NWSDB Annual Report 2012,” 2012.
 - [23] Ministry of City Planning and Water Supply Sri Lanka, “National Water Supply and Drainage Board: Corporate Plan 2016-2020,” 2016.
 - [24] Rural Water and Sanitation Section of NWSDB, *Statistical Guide Book of RWS-NWSDB*. National Water Supply and Drainage Board, Sri Lanka, 2017.
 - [25] World Bank, “Project Performance Assessment Report: Sri Lanka—Second Community Water Supply and Sanitation Project,” Washington, DC:, 2017.
 - [26] D. Karna, “New Tap: Water Supply and Sanitation Improvement Project , Sri Lanka,” 2018.
 - [27] Ministry of Justice -Thirteenth Amendment to the Constitution Sri Lanka, “Thirteenth Amendment to the Constitution Sri Lanka.” [Online]. Available: <https://www.lawnet.gov.lk/1947/12/31/thirteenth-amendment-to-the-constitution-2/>. [Accessed: 24-Nov-2019].
 - [28] Ministry of Justice-Provincial Councils Act No. 42 of 1987, “Provincial Councils Act No. 42 of 1987.” [Online]. Available: <https://www.lawnet.gov.lk/1946/12/31/provincial-councils-3/>. [Accessed: 24-Nov-2019].

- [29] Parliament Secretariat, *The Constitution of the Democratic Socialist Republic of Sri Lanka*, no. Revised Edition. Parliament Secretariat, 2015.
- [30] S. L. Paffrel Organisation, *Provincial Councils in Sri Lanka: A Guide to Understanding the Structures, Organization and the System.* .
- [31] T. Somasekaram, *The National Atlas of Sri Lanka*. Sri Lanka Survey Department, 1988.
- [32] Wikipedia, “Administrative divisions of Canada.” [Online]. Available: https://en.wikipedia.org/wiki/Administrative_divisions_of_Sri_Lanka. [Accessed: 11-Nov-2019].
- [33] H. Vu *et al.*, “Sri Lanka- Public Investment Management Assessment (PIMA)-Draft Report,” 2017.
- [34] PADCO: GHK International: Brockman Tym International: Ceywater Consultants: TEAMS, “Urban Development and Low-Income Housing Project (TA No. 2791 – SRI (ADB)),” 1998.
- [35] M. Samad, M. Aheeyar, J. Royo-Olid, and I. Arulingam, *The Political and Institutional Context of the Water Sector in Sri Lanka an Overview*. Publications Office of the European Union, 2016.
- [36] Peoples Action for Free and Fair Elections (PAFFREL)-Provincial Councils in Sri Lanka, “Provincial Councils in Sri Lanka.” [Online]. Available: http://www.paffrel.com/posters/131202101231Sri_Lankawe_Palathsabha_English.pdf. [Accessed: 01-Nov-2019].
- [37] Department of Census and Statistics: Local Government Statistics 2017, “Local Government Statistics 2017,” 2017. [Online]. Available: http://www.statistics.gov.lk/Pocket_Book/chap15.pdf. [Accessed: 01-Nov-2019].
- [38] Ministry of Internal and Home Affairs and Provincial Council and Local Government: HA Circular 4/2019, “District and Divisional Coordinating Committee Meetings.” [Online]. Available: <http://www.moha.gov.lk/web/images/circulars/2019/E/1551338355-HA-Circular-4-2019-sinhala.pdf>. [Accessed: 01-Nov-2019].
- [39] Daily Financial Times, “100-Day Revolution: Mini-Budget in Full,” 2015.
- [40] W. L. & R. D. Ministry of Sustainable Development, “Decentralized Capital Budget Programme - 2017,” 2017. [Online]. Available: www.mrd.gov.lk/web/index.php?option=com_content&view=article&id=37:decentralized-capital-budget-programme-2017&catid=9&Itemid=127&la.... [Accessed: 27-Dec-2019].
- [41] S. L. Ministry of Finance and Mass Media, “Department of Project Management and Monitoring,” 2019. [Online]. Available:

www.pmm.gov.lk/index.jsp?sid=1&id=110&pid=109. [Accessed: 28-Dec-2019].

- [42] Department of National Planning Sri Lanka, “Performance Report Reportment-of National Planning 2018,” 2018.
- [43] SVP Development Team and Mawilmada NAtappaty SDela JNalaka GWeerasinghe BNandana MBellanawithana AWimalasiri RKumari N, “Sector Vulnerability Profile : Water,” 2010.
- [44] Government Notifications: 28 December 2018, *The Gazette of the Democratic Socialist Republic of Sri Lanka Extra Ordinary-2103/34*. 2018.
- [45] Government Notifications: 21 September 2015, *The Gazette of the Democratic Socialist Republic of Sri Lanka Extra Ordinary- 1933/13*. 2015.
- [46] W. Lincklaen Arriens, J. Bird, J. Berkoff, and P. Mosley, “Towards effective water policy in the Asian and Pacific region,” in *Proceedings of the Regional Consultation Workshop*, 1996, no. 19, p. 310.
- [47] SVP Development Team, “Sector Vulnerability Profile: Water. Supplementary Document to: The National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016,” 2010.
- [48] M. Samad, M. Aheeyar, J. Royo-Olid, and I. Arulingam, “The Political and Institutional Context of the Water Sector in Sri Lanka an Overview,” Luxembourg: Publications Office of the European Union, 2016.
- [49] S. Sadeghi-Tabas, S. Z. Samadi, A. Akbarpour, and M. Pourreza-Bilondi, “Sustainable groundwater modeling using single- and multi-objective optimization algorithms,” *J. Hydroinformatics*, vol. 19, no. 1, pp. 97–114, 2017.
- [50] M. Sirisena, M. Amaraweera, and A. Jayarathna, “Annual Performance Report & Accounts - Ministry of Mahaweli Development and Environment,” 2017.
- [51] Ministry of Agriculture Rural Economic Affairs Livestock Development Irrigation and Fisheries and Aquatic Resources Development, “Draft National Policy , Strategies and Institutional Framework for Water Resources Development, Conservation and Management,” 2019.
- [52] Ministry of Water Supply and Drainage, “National Drinking Water Policy,” 2010.
- [53] Ministry of Agriculture Rural Economic Affairs Irrigation and Fisheries and Aquatic Resources Development, “Sri Lanka-Overarching Agricultural Policy Draft,” no. August, 2019.
- [54] Centre for Entrepreneurship SMEs Regions and Cities, “OECD Principles

- on Water Governance,” no. May, pp. 1–24, 2015.
- [55] N. K. Whittlesey and R. G. Huffaker, “Water Policy Issues for the Twenty-First Century,” *Am. J. Agric. Econ.*, vol. 77, no. 5, p. 1199, 1995.
 - [56] J. Winpenny, “Water policy issues,” 1997.
 - [57] Food and Agricultural Organisation, *Reforming water resources policy - A guide to methods, processes and practices*. 1995.
 - [58] Lord Selborne, “The Ethics of Freshwater Use: A Survey,” 2000.
 - [59] Food and Agricultural Organization of the United Nations (FAO), “First FAO Conference 1943,” 1943. [Online]. Available: <https://www.flickr.com/photos/faoftheun/25700070487>. [Accessed: 22-Jun-2020].
 - [60] Food and Agricultural Organization of the United Nations, “Universal declaration of human rights,” 1948.
 - [61] UN Human Rights, “International Covenant on Economic, Social and Cultural Rights,” 1966.
 - [62] FAO, “World Food Conference,” 1974. .
 - [63] United Nations, “International Decades,” 2020. [Online]. Available: <https://www.un.org/en/sections/observances/international-decades/index.html%0AAabout>. [Accessed: 24-Jun-2020].
 - [64] United Nations, “The Water for Life decade 2005-2015 and beyond,” 2005.
 - [65] A. Dinar, M. W. Rosegrant, and R. Meinzen-Dick, “Water Allocation Mechanisms: Principles and Examples,” *Policy Res. Work. Pap.*, no. July, 1997.
 - [66] UNICEF FAO and SasiWaters, *Water in India: Situation and Prospects*. UNICEF, India Country Office, 2013.
 - [67] World Bank, “Deep Wells and Prudence: Towards Pragmatic Action for Addressing Groundwater Overexploitation in India,” 2010.
 - [68] A. Narayanamoorthy and L. Venkatachalam, “Farmers’ Right to Water,” *The Hindu Business Line*, 2011. [Online]. Available: <https://www.thehindubusinessline.com/opinion/farmers-right-to-water/article20337532.ece1>. [Accessed: 09-Jul-2020].
 - [69] U. Amarasinghe, B. Sharma, N. Aloysius, C. Scott, V. Smakhtin, and C. de Fraiture, *Spatial variation in water supply and demand across river basins of India*, no. 83. 2004.
 - [70] MoWR, “Ministry of Water Resources India.” [Online]. Available:

<http://mowr.gov.in/>. [Accessed: 09-Jul-2020].

- [71] R. M. Saleth, *Strategic Analysis of Water Institutions in India Application of a New Research Paradigm*. 2004.
- [72] Government of India, “National water policy India,” India, 2012.
- [73] A. A. Cronin, A. Prakash, S. Priya, and S. Coates, “Water in India: Situation and prospects,” *Water Policy*, vol. 16, no. 3, pp. 425–441, 2014.
- [74] Centre for Science and Environment, “Water resources development in India: Critical issues and strategic options,” 2002.
- [75] Government of India Ministry of Water Resources, “Report of The Committee for Preparing Roadmap for Implementation of National Water Policy,” no. 2012, 2013.
- [76] Asian Development Bank, *Indonesia Country Water assessment*. Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines, 2016.
- [77] Asian Development Bank, *River Basin Management Planning in Indonesia: Policy and Practice*. 2016.
- [78] P. Helmi, “Water Governance in Indonesia : Moving Toward River Basin Frameworks ‘ Water Governance : Issues and Actions in Southeast Asia ’, Asia and Pacific Day – Third World Water Forum (3 rd WWF),” in “*Water Governance: Issues and Actions in Southeast Asia*”, *Asia and Pacific Day – Third World Water Forum (3rd WWF)*, 2003, pp. 1–21.
- [79] World Bank Group, “Toward Efficient and Sustainable River Basin Operational Services in Indonesia,” The International Bank for Reconstruction and Development 1818 H Street, NW Washington, DC 20433, USA, 2015.
- [80] J. Kho and E. Agsaoay-Saño, “Customary Water Laws and Practices: Philippines,” 2005.
- [81] Philippines: Environment Monitor, “State of water environmental issues Philippines,” 2003. .
- [82] G. Tabios III, “Water Governance in the Philippines and Some Thoughts on Governance,” 2010.
- [83] F. E. Marcos, *Presidential Decree No. 1067, s. 1976*. Philippines, 1976.
- [84] National Water Resources Council, “WATER CODE OF THE PHILIPPINES: Implementing Rules and Regulations,” *Water Code Philipp. Rules Regul. 1-27*, pp. 1–27, 2005.

- [85] A. C. Rola, C. L. Abansi, R. Arcala-Hall, J. C. Lizada, I. M. L. Siason, and E. K. Araral, "Drivers of water governance reforms in the Philippines," *Int. J. Water Resour. Dev.*, vol. 32, no. 1, pp. 135–152, 2016.
- [86] *Winning the Water War: Watersheds, Water Policies and Water Institutions*. 2004.
- [87] S. Sukhaparamate, "National Water Footprint and Water Management Policy in Thailand," Nagoya University, 2015.
- [88] S. Thanopanuwat, L. Kumpa, S. Pattanee, and S. Sethaputra, "Thailand's water vision: A case study," *Food and Agriculture Organization of the United Nations*, 2001. [Online]. Available: www.fao.org/3/AB776E/ab776e04.htm. [Accessed: 20-May-2020].
- [89] GGKP, "Green Growth Knowledge Platform: Thailand Country Planning Framework," 2020. [Online]. Available: https://www.greengrowthknowledge.org/search/site?keyword=Thailand+development+plans++&sort_by=search_api_relevance&sort_order=DESC. [Accessed: 01-Jul-2020].
- [90] C. Sukhsri, "Water Resources Law in Thailand," 1999.
- [91] Bangkok Post, "Master Water Plan given Green Light," 2019.
- [92] Government of Thailand, "PM emphasizes Govt's progresses and plans for national water management," *Reliefweb*, 2018. [Online]. Available: <https://reliefweb.int/report/thailand/pm-emphasizes-govt-s-progresses-and-plans-national-water-management>. [Accessed: 01-Jul-2020].
- [93] C. Sutherland, M. Hordijk, B. Lewis, C. Meyer, and S. Buthelezi, "Water and sanitation provision in eThekweni Municipality: a spatially differentiated approach," *Environ. Urban.*, vol. 26, no. 2, pp. 469–488, 2014.
- [94] P. Rogers and A. W. Hall, "Lessons from South Africa: A New Legacy Framework for Local Governance's Good Practice," in *Best Ethical Practices in Water Use*, the United Nations Educational, Cultural and Scientific Organization, 2004.
- [95] E. Makaya *et al.*, "Water governance challenges in rural South Africa: exploring institutional coordination in drought management," *Water Policy*, pp. 1–22, 2020.
- [96] J. P. Enqvist and G. Ziervogel, "Water governance and justice in Cape Town: An overview," *Wiley Interdiscip. Rev. Water*, no. December 2018, p. e1354, 2019.
- [97] A. Kibaroglu and A. Baskan, "Water Policy Turkey," *Springer, Berlin, Heidelb.*, 2011.

- [98] M. E. Bariş and A. A. Karadag, “Water resources management issues in Turkey and recommendations,” *J. Appl. Sci.*, vol. 7, no. 24, pp. 3900–3908, 2007.
- [99] Ministry of Foreign Affairs, “Turkey’s Policy on Water Issues,” *Republic of Turkey*. [Online]. Available: http://www.mfa.gov.tr/turkey_s-policy-on-water-issues.en.mfa. [Accessed: 13-Jun-2020].
- [100] A. Kibaroglu, V. Sümer, and W. Scheumann, “Fundamental Shifts in Turkey’s Water Policy,” *J. Mediterr. Geogr.*, vol. 119, pp. 27–3412, 2012.
- [101] P.G.Somaratne, J. K. L. R. Perera, B. R. Ariyaratne, D. J. Bandaragoda, and I. W. Makin, *Developing effective Institutions for water Resources Management: A Case study in the Deduru Oya Basin, Sri Lanka- Working Paper 58*. International Water Management institute, 2003.
- [102] Cooray and L.J.M., “The reception of Roman-Dutch law in Sri Lanka,” *Comp. Int. Law J. South. Africa*, vol. 7, pp. 295–320, 1974.
- [103] Getches and D.H., *Water Law in a Nutshell*. Thomson West, 1990.
- [104] R. W. Lee, *The elements of Roman law: with a translation of the Institutes of Justinian*. Sweet & Maxwell, 1946.
- [105] G. L. Peiris, *The law of property in Sri Lanka - Vol . 1*, vol. 1. Lake House Investments, Colombo, 1983.
- [106] H. Gamage, “Land and water sector development in Sri Lanka.” [Online]. Available: <http://www.fao.org/3/ac623e0k.htm#bm20>. [Accessed: 09-May-2020].
- [107] USLegal, “Groundwater Law and Legal Definition,” 2020. [Online]. Available: <https://definitions.uslegal.com/g/groundwater/>. [Accessed: 05-Jul-2020].
- [108] R. A. Wurbs, Ed., *Water Allocation Systems*. Books on Demand, 2013.
- [109] M. Solanes, “Water Resources Legislation : A search for common principles,” International Innstitute for Sutainable Development. 2010. [Online]. Available: <https://www.iisd.org/publications/water-resources-legislation-search-common-principles>. [Accessed: 21-Sept-2020]..
- [110] R. E. Beck, Ed., *Water and Water Rights , vol . 2*. The Michie Company, Charlottesville, 1991.
- [111] USEPA, “Getting in Step: Engaging Stakeholders in Your Watershed, 2nd ed.,” 2013.
- [112] K. A. U. S. Imbulana, N. T. S. Wijesekara, and B. R. Neupane, Eds., *Sri Lanka National Water Development Report*. Colombo Sri Lanka: MAI&MD,

- UN-WWAP, UNESCO and University of Moratuwa, Sri Lanka, Paris and New Delhi KEY, 2006.
- [113] Wijesekera, N. T. S., Weerakkody, and N. C., “Public Participation in Environmental Assessment of Development Projects - The Sri Lankan Situation,” *Eng. J. Inst. Eng. Sri Lanka*, vol. 39, no. 2, p. 7, 2006.
 - [114] Bradley, M. R., Karunadasa, and I. H., “Community Participation in the Water Supply Sector in Sri Lanka,” *J. R. Soc. Health*, vol. 109, no. 4, pp. 131–136, 1989.
 - [115] Ediriweera and I. V.W., “Strategies adopted for sustained water supply and sanitation through community participation in sri lanka,” in *Maximizing the Benefits from Water and Environmental Sanitation: Proceedings of the 31st WEDC Conference*, 2005, pp. 153–156.
 - [116] M. M. M. Aheeyar and L. E. D. Smith, “The impact of farmer participation on water distribution performance in two irrigation schemes in Sri Lanka,” *Sri Lanka J. Soc. Sci.*, vol. 1&2, no. 22, pp. 27–43, 1999.
 - [117] S. Megdal, S. Eden, and E. Shamir, “Water Governance, Stakeholder Engagement, and Sustainable Water Resources Management,” *Water*, vol. 9, no. 3, p. 190, 2017.
 - [118] Asian Development Bank: PN 47381-001, “Stakeholder Communication Strategy SRI: Mahaweli Water Security Investment Program,” 2015.
 - [119] Ministry of Water Resources India, “Constitution of Committee for suggesting a road map for implementation of National Water Policy,” 2012.
 - [120] D. J. Bandaragoda, “Stakeholder Participation in Developing Institutions for Integrated Water Resources Management: Lessons from Asia,” 2005.
 - [121] International Capacity Development Network for Sustainable Water Management, “Cap-Net Tutorial on Basic Principles of Integrated Water Resources Managment,” C/O Global Water Partnership, PO Box 24177, SE-104 51, Stockholm, Sweden, 2005.
 - [122] peersl-Partnerships for enhanced engagement in research (PEER) SCIENCE, “Panel Meeting of Water Management Secretariat-Sri Lanka,” 2013. [Online]. Available: <https://peersl.wordpress.com/2013/10/16/panel-meeting-of-water-management-secretariat-sri-lanka/>. [Accessed: 27-Jan-2020].
 - [123] Mahaweli Authority of Sri Lanka, “Mahaweli Water Panel Meeting Minutes 2020 Yala Season,” *Water Management Secretariat*, 2020. [Online]. Available: mahaweli.gov.lk/wms.html%0ACentral. [Accessed: 11-May-2020].
 - [124] Department of National Planning Sri Lanka, “Public Investment Program

- 2017- 2020,” 2017.
- [125] RWS Section of NWSDB, “Rural Water Supply Database (Districtwise Summary),” 2017.
 - [126] National Water Supply & Drainage Board Sri Lanka, “NWSDB Annual Report 2015,” 2015.
 - [127] Z. Speed, R. Yuanyuan, L. Le Quesne, T. Pegram, G. Zhiwei, *Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning*. 2013.
 - [128] J. Bird, W. L. Arriens, and D. Von Custodio, “Water Rights and Water Allocation,” no. February, 2008.
 - [129] Parliament of Sri Lanka, *Mahaweli authority of Sri Lanka (Act 23) of 1979*, no. 35. 1979, pp. 177–191.
 - [130] Asian Development Bank, “No ref Sector assessment: Water supply and other municipal infrastructure and services,” 2016.
 - [131] ADB/JICA/World Bank, “Toward Sustainable Water and Sanitation Services in Sri Lanka: Beyond Sustainable Development Goals to Supporting the National Economic Vision,” 2016.
 - [132] Silva, Sarath. N., Yapa, H.S., Weerasuriya, T.B., “Supreme Court Decision on Water Reform Act -20 November 2003.” 2003.
 - [133] R. Hakeem, “Cabinet Memorandum: Regulations for Water Services Industry in Sri Lanka.” 2017.
 - [134] NWSDB, “Report on water abstraction and requirements for water sector,” 2018.
 - [135] B. Kamaladasa, “Views Expressed by Director of Irrigation, Ms Manjula Samarakoon Samarakkon at PUCSL stakeholder meeting,” 2020.
 - [136] K. Wickramasinghe, “Thambuttegama farmers Losing their calm before the ‘Storm,’” 2018.
 - [137] K. Athukorala, “Collective Action for Protection of Water Rights: The Case of Thuruwila, Sri Lanka,” in *Eleventh Conference of the International Association for the Study of Common Property*, 2006.
 - [138] M. M. M. Aheeyar, V. K. Nanayakkara, and M. A. C. . Bandara, “Allocation of Water among Different Water-use Sectors in Sri Lanka: Lessons of Experience,” 2008.
 - [139] B. Kamaladasa, “Internal Working Paper of Water Management Branch,” 2018.

- [140] B. Kamaladasa, "Personnel communication with Divisional Irrigation Engineer Rajangana and Director of Irrigation in Anuradhapura," 2020.
- [141] M. H. M. Hamseen and S. S. Sivakumar, "Conflict Resolution in Multiple Water User in North Central Region of Sri Lanka," *Int. J. Sci. Eng. Res.*, vol. 8, no. 10, 2018.
- [142] J. Ratnasiri, "Water for Jaffna – ground water , sea water , lagoon water or pristine Knuckles water?," *The Island*, 2019. [Online]. Available: http://www.island.lk/index.php?page_cat=article-details&page=article-details&code_title=212652. [Accessed: 20-Jun-2020].
- [143] ADB, "Democratic Socialist Republic of Sri Lanka : Jaffna and Kilinochchi Water Supply and Sanitation Project -37378," 2010.
- [144] F. Molle and J. Berkoff, "Cities versus Agriculture: Revisiting Intersectoral Water Transfers, Potential Gains and Conflicts," *Assessment*, no. June 2014, p. 80, 2006.
- [145] R. Rivas, "Manila Water's supply crisis: What we know so far," *Rappler*, 2019. [Online]. Available: <https://www.rappler.com/newsbreak/iq/225953-what-we-know-explanation-manila-water-supply-crisis>. [Accessed: 12-Jun-2020].
- [146] A. C. Rola, J. M. Pulhin, G. Q. Tabios, J. C. Lizada, and M. H. F. Dayo, "Challenges of water governance in the Philippines," *Philipp. J. Sci.*, vol. 144, no. 2, pp. 197–208, 2015.
- [147] A. C. Rola, "An Upland Community in Transition - Institutional Innocations for Sustianable Development in Rural Philippines," *Inst. Southeast Asian Stud. Publ.*, vol. (Vol. 442), 2011.
- [148] JICA, "Project for the Comprehensive Flood Management Plan for the Chao Phrya River Basin," 2013.
- [149] M. E. and M. Mokhtar, "Irrigation: Types, Sources and Problems in Malaysia," *Irrig. Syst. Pract. Challenging Environ.*, 2012.
- [150] C. Apipalakul, W. Wirojangud, and T. K. Ngang, "Development of Community Participation on Water Resource Conflict Management," *Procedia - Soc. Behav. Sci.*, vol. 186, pp. 325–330, 2015.
- [151] P. Sleet, "Domestic Concerns Driving the Water Dispute Between Malaysia and Singapore," *Future Directions International*, 2019. [Online]. Available: www.futuredirections.org.au/publication/domestic-concerns-driving-the-water-dispute-between-malaysia-and-singapore. [Accessed: 10-Jul-2020].
- [152] S. Strauß, "Water Conflicts among Different User Groups in South Bali, Indonesia," *Hum. Ecol.*, vol. 39, no. 1, pp. 69–79, 2011.

- [153] A. Kramer, “Water and conflict (Policy briefing for USAID),” 2004.
- [154] V. Paranjpye and M. S. Rathore, “Position Paper on Understanding and Implementation of National Water Policy of India - 2012.” India Water Partnership (IWP), p. 30, 2014.
- [155] R. Bhatia *et al.*, “Water in the economy of Tamil Nadu, India: More flexible water allocation policies offer a possible way out of water-induced economic stagnation and will be good for the environment and the poor,” *Water Policy*, vol. 8, no. 1, pp. 1–13, 2006.
- [156] S. R. Negi, “Water Policy for Delhi - Delhi Jal Board,” 2016.
- [157] M. McKinney and J. E. Thorson, “Resolving water conflicts in the American West,” *Water Policy*, vol. 17, no. 4, pp. 679–706, 2015.
- [158] N. Ghosh, “Interstate Water Disputes in the Colorado Basin in Western United States,” *Decision*, vol. 36(3), no. 23, pp. 23–37, 2009.
- [159] C. Middleton, A. Scott, and V. Lamb, *Hydropower Politics and Conflict on the Salween River-in Knowing the Salween River: Resource Politics of a Contested Transboundary River*. Springer, 2019.
- [160] Public Utilities Commission, “Stakeholder Consultation on Access and Adequacy of Water Services in Water Service Industry,” 2017.
- [161] R. Bhatia and M. Falkenmark, “Water resource policies and the urban poor: Innovative approaches and policy imperatives. Report 46877,” 1993.
- [162] A. Dinar, M. W. Rosegrant, and R. S. Meinzen-Dick, “Water Allocation Mechanisms: Principles and Examples,” *World Bank Policy Research Working Paper 1779*, vol. 41, no. 2. World Bank, pp. 84–93, 1997.
- [163] China Water, DFID, and Mott MacDonald, “China – UK , WRDMAP Integrated Water Resources Management Document Series Thematic Paper 2.7: Water Allocation Issues,” *Water Resources Management*, no. May. p. 52, 2010.
- [164] L. Wang, L. Fang, and K. W. Hipel, “Mathematical programming approaches for modeling water rights allocation,” *J. Water Resour. Plan. Manag.*, vol. 133, no. 1, pp. 50–59, 2007.
- [165] A. C. Rola, H. A. Francisco, and J. P. T. Liguton, *Winning the Water War: Watersheds, Water Policies and Water Institutions*. Philippines: Philippine Institute for Development Studies, 2004.
- [166] J. Wang *et al.*, “Optimal Allocation of Water Resources Based on Water Supply Security,” *Water (Switzerland)*, vol. 8, no. 6, 2016.
- [167] W. Hatmoko, “Modeling of Real-time Water Allocation Planning,” in *3rd*

Asian regional Conference ICID , Malaysia, 13-15 September 2006, 2006, no. April.

- [168] D. C. Mckinney, X. Cai, M. W. Rosegrant, C. Ringler, and C. a Scott, *Modeling Water Resources Management at the Basin Level: Review and Future Directions*. 1999.
- [169] P. R. van Oel, M. S. Krol, A. Y. Hoekstra, and R. R. Taddei, “Feedback mechanisms between water availability and water use in a semi-arid river basin: A spatially explicit multi-agent simulation approach,” *Environ. Model. Softw.*, vol. 25, no. 4, pp. 433–443, 2010.
- [170] P. Golfam, P. S. Ashofteh, T. Rajaei, and X. Chu, “Prioritization of Water Allocation for Adaptation to Climate Change Using Multi-Criteria Decision Making (MCDM),” *Water Resour. Manag.*, vol. 33, no. 10, pp. 3401–3416, 2019.
- [171] J. F. Booker and R. A. Young, “Modeling intrastate and interstate markets for colorado river water resources,” *Journal of Environmental Economics and Management*, vol. 26, no. 1. pp. 66–87, 1994.
- [172] A. Chapman, B. Kerr, and D. Wilford, “Hydrological Modelling and Decision-Support Tool Development for Water Allocation, Northeastern British Columbia,” *Geosci. BC Rep.*, pp. 81–86, 2012.
- [173] C. Robb, S. Harris, and T. Snelder, “Water Allocation: A Strategic Overview: Prepared for Ministry of Environment,” no. 4455/1. Lincoln ENvironmental, p. 36, 2001.
- [174] X. Cai and D. Wang, “Calibrating holistic water resources-economic models,” *J. Water Resour. Plan. Manag.*, vol. 132, no. 6, pp. 414–423, 2006.
- [175] L. Gao, M. Kirby, M. ud D. Ahmad, M. Mainuddin, and B. A. Bryan, “Automatic calibration of a whole-of-basin water accounting model using a comprehensive learning particle swarm optimiser,” *J. Hydrol.*, vol. 581, no. March, p. 124281, 2020.
- [176] L. Z. Wang, “Water Resources Allocation: A Cooperative Game Theoretic Approach,” *J. Environ. Informatics*, vol. 2, no. 2, pp. 11–22, 2003.
- [177] H. Manthirithilake and B. S. Liyanagama, “Simulation model for participatory decision making: Water allocation policy implementation in Sri Lanka,” *Water Int.*, vol. 37, no. 4, pp. 478–491, 2012.
- [178] W. A. Department of Water, *Water Allocation Planning in Western Australia - A guide to our process*, WaterResou. Department of Water, Government of Western Australia, 2011.
- [179] Ministry of Agriculture, Rural Development and Irrigation (2018), Strategic Environment Assesments of Water resources Development Projects in Sri

Lanka.

[180] National Water Supply and Drainage Board (2019), Summary report for raw water abstraction by NWS&DB from Irrigation/Mahaweli Tanks in year 2018

Annex 1: Summary of PUCSL Consultations and Issues

The Process of Stakeholder Consultation

PUCSL conducted a series of stakeholder consultation sessions, one in each Province and altogether 9 sessions covering the entire country.

Level of Representations at each Session by Province

S.N.	Province	Number of Representations
01	Eastern Province (EAS)	19
02	Sabaragamuwa Province (SAB)	30
03	North Western Province (NWP)	29
04	Uva Province (UVA)	26
05	Southern Province (SOU)	19
06	Western Province (WES)	21
07	Northern Province (NOR)	24
08	Central Province (CEN)	20
09	North Central Province (NCP)	26
	Total	214

Representation/Participation at Stakeholder Consultation Sessions

The first category, the consumers or beneficiaries constitute of direct consumers or beneficiaries of water supply, the general public as well as the representations made on behalf of them, such as elected representatives, i. e. either Chairmen or the Council Members of LAs and PCs, public officers like Divisional Secretaries, Secretaries and Officers of LAs, Officers of other public organizations and representatives of civic societies. The second category constitute of the representatives of direct Water Service providers like NWSDB, DNCWS, CBOs and LAs, and Officers of other public organizations indirectly related to WS. However, it is interesting to note that some of the representatives of both categories have raised comments and concerns overlapping each other's boundaries or interests, common to both and/or leading to better service delivery and use. Some of the comments made by both parties are not specifically related to their own interests but expressed in good faith, in view of long-term sustainability of the water resource as a whole.

An attempt was made to present a wide variety of comments by classifying as six major issues for easy comprehension. The categories are as follows.

1. Concerns of Water Consumers/Beneficiaries;

2. Concerns of Water Suppliers/Providers;
3. Problems faced by Suppliers in Sharing of Water with Other Uses/Users;
4. Issues Related to Use of Groundwater;
5. Issues Related to CBO schemes; and
6. General Suggestions for a Better Service of the Water Sector.

Concerns under each category is detailed in the following sections.

1. Comments and/or the Concerns of Water Consumers/Beneficiaries

From the consumer side, the comments and concerns raised at those sessions can be broadly categorized in to:

- 1.1 Total absence of water supply service;
- 1.2 Inadequacies in currently available supply of water;
- 1.3 Issues with regard to quality of water supplied; and
- 1.4 Issues with regard to general performance of the supply services.

1.1 Total Absence of Water Supply Services

This category consists of the issue where there is discrimination among households with regards to the water supply connection and the issue where there is discrimination amongst neighboring villages with regards to water supply systems.

This discrimination and resulting absence of water supply service has been the commonest and mostly mentioned representation at all stakeholder sessions even though there had been some regional variation with regards to the intensity. The Eastern, North Western, North, Southern and Uva Provinces had shown highest concerns.

1.2 Inadequacies in Currently Available Supply of Water

This category represents both households/areas who receive water supply limited to some part of the day as well as those households/areas with no water supply during some part of the year, particularly during the dry season. This too had been another major issue which received relatively high representations at the stakeholder sessions. This problem is more prevalent in Eastern, North Western, North, Uva and Sabaragamuwa Provinces.

1.3 Issues with regard to Quality of Water Supplied

Concerns/comments raised at the stakeholder meetings with this regard constitute the perceptions of the consumers perhaps without any scientific basis. Most of the quality concern representations appear as those with respect to water supplied by the CBO schemes. It appears that either there is no proper mechanism in place to ensure the quality of water supplied by CBO schemes, or it is the perception of representatives. There had been a few specific comments about the varying levels of Chlorine in water that also varied from time to time. However, there had been no specific references to a water supply source or a system.

Similarly, in some regions there had been adverse comments about the quality of supply with water bowsers during dry spells of the year. This quality issue is prevalent in Eastern, North Western, Sabaragamuwa, Uva, and North Central Provinces.

1.4 Issues about Performance of Water Supply Services

This issue comprised of uninformed water cuts, idle meter registering, leaks and breakdowns not attended on time, poor maintenance of supply lines, long time taken to attend to request for new connections, unreasonable water supply disconnections and unreasonable water tariffs. This issue has received more attention in Eastern, Uva, Sabaragamuwa, Southern Provinces with relatively less attention in other Provinces.

2. Major Concerns of Water Suppliers/Providers

The water suppliers/providers under this category consisted of officers of NWSDB, DNCWS, CBOs, LAs and water related agencies. Concerns or the problems of these water providers as surfaced at these stakeholder meetings are broadly grouped under three categories. Viz:

- 2.1 Lack of water or lack of sufficient amount of water;
- 2.2 Lack of water of sufficient quality; and
- 2.3 Problems associated with the execution of water supply

2.1 Lack of Water or Lack of Sufficient Water

This implies either absolute scarcity of water or inadequate volume at already used or newly available water sources. The shortage range from no water to periodic lack of water. At all stakeholder sessions this issue has been raised as a major impediment to the expansion of water supply coverage. This is a major concern in the North Western, Northern, Eastern, Western, Uva, Sabaragamuwa and Central Provinces.

2.2 Lack of Water of Sufficient Quality

This issue has received wider attention in all stakeholder sessions as it heavily impacts on water purification processes. The reasons attributed to poor quality of water at existing sources includes, open dumping of waste, excessive use of agrochemicals, discharge of untreated industrial and household effluents and salt water intrusion.

2.3 Problems Associated with Executing Water Supply

This problem as discussed at stakeholder sessions include lack of funds, high cost of developing water supply infrastructure, unplanned settlements (without due consideration to availability of water), high supply cost per unit in sparsely populated areas, restriction in laying pipes along roads and high levels of water wastage at user end.

3. Water Suppliers and Sharing Water

The problem of sharing water between irrigation and drinking water had come to surface at stakeholder sessions of Eastern, Sabaragamuwa, North Western, Northern, Central and North Central Provinces, while water sharing problems between upstream and downstream customers have been discussed at Eastern, Sabaragamuwa and Central Provinces.

Water sharing issues faced by CBOs included conflicts with agriculture users (Sabaragamuwa, North Western, and North Central Provinces), those who rely on domestic wells for their own use (Sabaragamuwa), between two CBOs using same source (Sabaragamuwa) and the use of water sources either originate or running through plantation estates in the upper catchments (Sabaragamuwa, Uva and Central).

4. Issues Related to Use of Groundwater

Over extraction of groundwater resource had been brought up at North Western, Uva and Northern Provinces, as reasons for creating drinking water supply problems. Pollution of groundwater as a result of waste discharges to surface water bodies and because of salt water intrusion had been mentioned at all above mentioned Provinces and also at Provinces of Central, Sabaragamuwa and Western.

5. Issues Related to CBO Schemes

The general message that had come out at all stakeholder sessions is that there is no common set of standards and/or regulations applicable to CBO schemes in the country. The need to regularize and strengthen the capacity of CBOs in terms of both technically and financially had been strongly emphasized at almost all stakeholder sessions. There had been more representations at Sabaragamuwa, Uva, Central, North Central, North Western and Western Provinces. There had been a significant amount of concerns about the quality of water supplied through CBO schemes in general. Lack of testing facilities at CBO schemes had been a key issues at Sabaragamuwa, North Western and North Central Provinces. Need for regularization of water tariffs of CBOs had been emphasized at sessions of Sabaragamuwa, Western and North Central Provinces. High cost of electricity, land issues and lack of water during dry spells had been discussed as other issues faced by CBOs.

6. General Suggestions for a Better Service

This had received wider attention and representations in all stakeholder sessions. The summary of suggestions made in this connection are as follows;

- Protection of source are is a high Priority
- Close monitoring to prevent water pollution in general, development of settlements close to water sources particularly in the Estate sector, and disposal of Gully-Bowser contents are of prime importance
- Enhancing of stakeholder awareness on the value of water
- Promote and protect use of wells for domestic drinking purpose
- Small reservoirs need to rehabilitated and protected;

- Priority must be given to supply water to those who are without an alternative
- Ensuring proper coordination between water and water related agencies

Annex 2: Report of Stakeholder Consultation Workshop held on 26th February 2020

Report of the Stakeholder Consultation Workshop organized by PUCSL on the Study of Sustainable Water Resource Management for Drinking Purposes held on 26th February 2020 at the Sri Lanka Institute of Development Administration (SLIDA)

A Stakeholder Consultation Workshop on the current study of “Sustainable Water Resource Management for Drinking Purposes” organized by the PUCSL was held on 26th February 2020 at the Sri Lanka Institute of Development Administration (SLIDA). There are many water sector institutions in the country (Annex 6, Annex 7). Although about 40 participants from key water sector institutions in the country were invited for the sessions (Annex 9, Annex 10), only 30 representatives from 10 institutions participated (Annex 3). The objective of this Stakeholder Workshop was assess the prevailing situation with regards to the water resources management amongst competing users by collecting information related to the water allocation process, objectives of allocation, sharing water amongst competing users, defining water entitlements and dealing with variability and uncertainty.

The introductory presentation made by the PUCSL, explained that the motivation for the current study emerged from the matters arising out of a series of public consultation sessions on drinking water supply conducted by PUCSL in all nine provinces of the country. Three main issues surfaced in these sessions with regard to drinking water had been, (i) quality issues related to drinking water supply, (ii) absolute scarcity or inadequate supply of drinking water; and (iii) the issues related to sharing of water with other users.

The stakeholders were briefed about the process adopted by the study and the request that had been made through PUCSL (Annex 9) to collect available information pertaining to, i) available laws, regulations, circulars or any other documentary evidence pertaining to ownership/custodianship of water, ii) documents pertaining to procedures and practices adopted by the respective agency in relation to water allocation, iii) description of methods and practices pertaining to (a) identification of water users (b) management of demand, (c) management of supply and (d) dispute resolution if applicable; and iv) a list of stakeholders’ respective agency has consulted in connection with water allocation and records of such events for the last two years. The request for information received responses from the Irrigation Department, Mahaweli Authority, NWSDB, Water Resources Board, Department of National Community Water supply, Disaster Management Centre, NARA, Coastal Conservation Department, NPD, Ministry of Finance, Department of Agrarian Services, CEA, and Department of Agriculture. Most institutions indicated there non involvement in

the water allocation and stakeholder consultations. Other submitted responses indicated that the details expected to assess the current situation were not available to classify as requested. Therefore the situation analysis had to be limited to literature and interview information. Hence the main purpose of this workshop was to present the situation analysis findings and obtain a confirmation and guidance on the way forward. The methodology of the study was presented to the stakeholders and the stakeholder consultation intentions were explained (Figure 4),

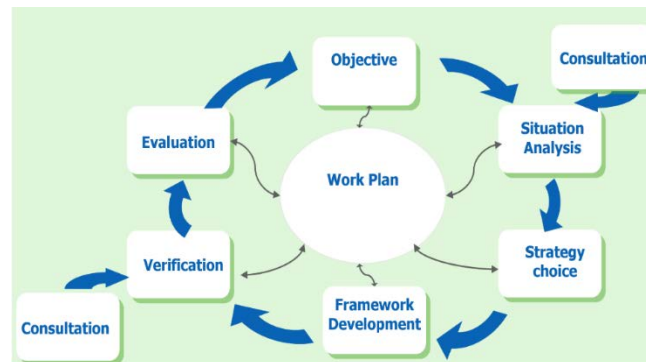


Figure 4: Methodology used in the Present Study

The stakeholders were explained about the literature findings in the areas of concern listed above and an agreement was reached that the present study would culminate by the development of a framework to proceed towards finding a suitable systematic model for sustainable water resources management for drinking purposes. The stakeholders while expressing the view that a water model development was not the solution that should be the outcome from this study stated that the first attempt must be to develop a framework which will lead to a water allocation model after sufficient case studies backed with appropriate water resources assessments.

The stakeholder discussion was mainly based on the details from the literature survey and expert knowledge that presented the current situation. After the presentation of each detail, the stakeholders interacted with their knowledge, acceptance or suggestions.

The study team findings with regard to each of the key aspects were first explained and then the participants in the audience was asked to either approve, disapprove or provide new factual information regarding the prevailing situation. The details pertaining to the study team observations and findings are as indicated below.

1. The Current Water Allocation Practise of the Country

Findings from Information Survey by Team

- Currently there is an absence of set guidelines, an institutional setup with a clear mandate, or a set mechanism to decide on water allocation in the country, the current practice is Adhoc and the decisions are on a case by case basis and even then, there seems a lack of consistency;
- Present water allocation is done on the basis of reservoir storage and the past experiences
- As it now exists, there seems a void in the availability of water allocation models which are presently accepted and applied to the water allocation process. Though there are claims stating the availability, such information had not been received, cannot be found as publications, reviewed publications on the model or applications are not available, there is an absence of a mechanism to identify the accuracy of assessments or verification of allocations that had been practiced using such models. Hence the agencies which claim performing acceptable water allocation practices cannot be categories as institutions with reliable and transparent systems.
- As it now exists there seems a void in the availability of an established procedure to determine the water requirement and the priorities assigned to different users
- As it appears now, there is no clear-cut policy and guidelines on water requirements and especially in the case of environmental flow requirement

Comments of Participants:

- Sometimes water allocation priorities are determined solely based on the powerfulness of the political influences with the user or user representative;
- In case of groundwater allocation, the quantity is usually determined on the basis of availability and past experiences and if the quantity requested is very high then the allocation is delayed till additional investigations are carried out to ascertain the availability of the required quantity;
- In the case of demand estimation for drinking water; planning horizon is 30 years and a 120 lt/per person/per day requirement is considered;
- In the case of demand estimation for irrigation schemes acute problems do not arises because there aren't substantial demand variations as the area cultivated under each scheme remains the same over time
- In case of environmental flow requirements; in the past there had been instances where the entire flow of a water course is channelled to

impound reservoirs by ignoring environmental flow requirement. This was because there no representation to demand the environmental flow requirement

2. Objectives and Practice of Water allocation:

Findings from Information Survey by Team

- There are many policies on water resources and they are fragmented;
- Water allocation practised in certain reservoirs and basins seems to be based on a hybrid system of balancing supply and demand and the development priorities however, still there seems an absence of a clear-cut policy on how the priorities are determined
- The state institutions namely, National Water Supply and Drainage Board, Department of Community Water Supply, Community Based Organisations, Local Governments, Irrigation Department, Mahaweli Authority of Sri Lanka, Department of Agrarian Development and Water Resources Board performed on demand water waler allocations based on the mandates that had been assigned.
- It appears that the allocation objectives are not in par with a national or any other development strategy
- The practices such as Identification of water users is being carried out at the planning stage of the project and new users during operations under the Irrigation Ordinance, MASL Act, NWS&DB Act /Technical guidelines/ Internal circulars; Management of Demand involving Seasonal planning/ Water management techniques are carried out under Irrigation Ordinance, MASL Act, NWS&DB Act etc.,; Management of Supply involving the Identification of sources/Approval for extraction (where necessary)/Development of infrastructure /continuous monitoring/ water management techniques are performed with Institutional memos/internal circulars; Disputes and Dispute Resolution is performed by discussing at Project Management Committees/ FO meetings and discussing at District Agricultural Committees by using Irrigation Ordinance, MASL Act, and NWS&DB Act.

Comments of Participants:

- The participants did not provide a disagreement with the findings and there were no specific comments received from the audience in connection with this topic.

3. Sharing Water amongst Competing Users:

Findings from Information Survey by Team

- As it now exists there is a void in the availability of a well-defined policy for sharing of water amongst competing users, in most cases it is practised on a case by case basis
- As it now exists in the country there is a void in the availability of a structured mechanism for satisfactory stakeholder participation
- As it is now the best water sharing mechanism in the country is that practiced by the Mahaweli Authority of Sri Lanka and its Water Management Panel which has its control in a limited spatial extent.
- There is no documentary evidence pertaining to specific statutory powers granted for water allocation among competing water users
- There are no documented evidence of authority to define water stakeholders determination of their importance, scope and roles at various scales spanning across national, provincial or regional administrative level, river basin or at watershed level enabling easy water sharing.
- There are no legislation, regulation or circulars with regards to the rights of stakeholders in the water allocation process

Comments of the Participants:

- Several participants though not certain, were of the view that the Mahaweli Water Panel is mandated by a parliamentary Act to perform water sharing among competing users
- Participants also commented that the PUCSL parliamentary Act provides authority to cater to the needs of the water industry and hence the water sharing can be performed.
- However there was no certainty among the participants but the team expertise indicated that there is an absence of specific legislation entrusting an agency to perform water sharing in the country.

4. Defining water entitlements

Findings from Information Survey by Team

- In this context Sri Lanka does not possess a clear definition for water entitlement in order to provide a fair share of water to recipient stakeholders
- The prevailing legislation does not clearly state whether the authorities who are involved in water allocation are water custodians or users.

- This ambiguity creates a conflict of interest when providing opportunity for a fair system of water sharing
- Available laws are fragmented and not specific with respect to water entitlement. There are 15 laws covering various aspects associated with water sharing and they can be listed as, Roman Dutch Law, Forest Ordinance No. 16 of 1907, Land Development Ordinance No. 19 of 1935, Irrigation Ordinance No. 32 of 1946, State Lands Ordinance No. 8 of 1947, Water Resources Board Act No. 29 of 1964, National Water Supply and Drainage Board Law No. 2 of 1974, State Lands (Recovery of Possession) Act No. 7 of 1979, Mahaweli Authority of Sri Lanka Act 23 of 1979, National Environmental Act No. 47 of 1980, 13th Amendment to the Constitution 1987, Mines and Minerals Act No. 33 of 1992, Agrarian Development Act No. 46 of 2000, Sri Lanka Electricity Act No. 20 of 2009, Local Authority Laws – Municipal Councils Ordinance No. 29 of 1947, Urban Councils Ordinance No. 61 of 1939, Pradeshiya Sabhas Act No. 15 of 1987.
- There are no regulations or circulars pertaining to water entitlements of different users.

Comments of Participants:

- Participants agreed with the findings of the study team and expressed the need to establish appropriate legislation to provide a fair share of water for all water users
- Participants expressed the need to consider developing the legislation which is flexible to consider the priorities that vary spatially, temporally, socially and economically.
- There were no other specific comments given by the participants in this connection.

5. Dealing with Variability and Uncertainty

Findings from Information Survey by Team

- There is no policy, accepted method, guidelines or a practice for the incorporation of spatial and temporal variability associated with the water resource, water use and water users
- There is no policy, accepted method, guidelines or a practice for the incorporation of uncertainty associated with the water resource, water use and water users due to climate change or a change in the political or socioeconomic setting.

- There is no evidence of using at least adhoc methods for the incorporation of variability and uncertainty associated with the resource, use and users

Comments of the Participants

- Most participants indicated the ignorance with respect to the use of variability and uncertainty with respect to water resources assessments and use
- Irrigation department guidelines has a provision of using probability based water resources inputs when designing reservoirs and schemes and this practice can be extended for appropriate water resources allocation among competing water users.
- No other specific comments with this connection were received from the audience.

6. General comments/concerns of workshop participants

- Conflicts arising in the use of water from springs which flow through Estates because of the issues that range from water pollution created by activities of the Estates, to prohibition of access to water resource due to ownership of lands
- Problems such as pollution of water and shortage of supply at water sources faced by drinking water supplies
- Absence of a National level institutional mechanism to address sustainability of water resources;
- It has been recognised that the attitudes and approaches used by water agency officials matters to a significant extent when trouble free water allocations are attempted. This gives rise to the the urgent need of proper guidance and regulations.
- Political influence in certain cases have aggravated farmers' agitations for amicable water sharing.
- After introduction of Inland fishing industry, the traditional water users of the reservoirs were affected as there is a need to maintain minimum water storage for fishery thus creating water stress in agricultural areas.
- There are Customary Rights on water such as in the case of water of Menik Ganga/ Kataragama Perahera festival, water for Tisa and Nuwara wewa for Poson and Wesak festivals,
- Participants indicated several key cases of success stories and failures associated with stakeholder participation during water sharing from many districts of the country.

Workshop was concluded after explaining the future strategy in the framework development for the purpose of sustainable management of water resource for drinking purposes in Sri Lanka.

**Annex 3: Invitees/Participants at the first Stakeholder Consultation Workshop held at
SLIDA on 26.02.2020**

Identified Stakeholders other than PUCSL					
#	Response Requested Agency/Organization	Name of Invitee/Participant	Designation	Present	Absent
01	Ministry of Water Supply Services	Mr. ACM Nafeel	Addl. Sec.	√	
02	Ministry of Water Supply Services	Ms. KGD Priyanka	Dir. (Dev.)		√
03	Ministry of Water Supply Services	Mr. D. Nallaperuma	A.D (Dev.)	√	
04	Ministry of Irrigation	Eng. WB Palugaswewa	Addl. Sec.	√	
05	Ministry of Irrigation	Eng. SMLDK De Alwis	Dir. (WRM)	√	
06	Ministry of Irrigation	Eng. RMB Rajakaruna	Dir. (WRP)	√	
07	Irrigation Department	Eng. (Ms) Inoka Samarasuriya	Addl. DG (SM)		√
08	Irrigation Department	Eng. Nihala Siriwardana	Addl. DG (Irri. P&D)	√	
09	Irrigation Department	Dr. (Eng.) K. Weligepolage	Dir. Irri. (WRP)		√
10	Irrigation Department	Ms. T.J Meegastenna	Dir. Irri. (WM)	√	
11	Water Management Secretariat	Eng. (Ms.) GKT Samarasinghe	Dir. (WM)		√
12	Water Management Secretariat	Eng. Sandun Galappaththi	DD (WM)	√	
13	NWS&DB	Mr. Tilina Wijetunga	Addl. GM (P&P)		√
14	NWS&DB	Mr. Dinesh Gunatilaka	DGM (Sew.)	√	
15	NWS&DB	Mr. Ananda Munasinghe	Addl. GM (P&D)		√
16	NWS&DB	Ms. Anoja Kaluarachchi	Addl. GM (P&D)	√	
17	NWS&DB	Mr. Lasantha Rupasinghe	Addl. GM (Dev.)	√	
18	NWS&DB	Mr. Manjula Priyankara	Addl. GM (S/E)	√	
19	NWS&DB	Mr. PHS Gamini	CE/Kandy North Proj.	√	
20	Dept. of Community Water Supply	Mr. HMJ Herath	DG		√
21	Dept. of Community Water Supply	Ms. WA Weerakkody	DD	√	
22	Water Resource Board	Mr. RMSK Kumarasinghe	DG	√	
23	Water Resource Board	Mr. KMUCB Kulatunga	AGM	√	
24	Ministry of Plantation	Mr. R Rushandan	Dir. (PMD)	√	
32	Forest Department.	Mr. BKSS Kumara		√	
25	SLLRDC	Representative			√
26	Dept. of Agriculture	Representative			√
27	CEA	Representative			√
28	Disaster Man. Centre	Representative			√
29	National Planning Dept.	Representative			√
30	Coast Cons. Dept.	Representative			√
31	Dept. of Agrarian Serv.	Representative			√
33	National Aquatic Res. Agency	Representative			√
Participants from PUCSL and University of Moratuwa					
#	Agency/Organization	Name of Invitee/Participant	Designation	Present	
34	PUCSL	Mr. Damitha Kumarasinghe	Director General	√	
35	PUCSL	Mr. Chamath Gunawardana	Director (R/A)	√	
36	PUCSL	Mr. Gamini Sarachchandra	Director (Env.)	√	
37	PUCSL	Mr. Shantha Jayasinghe	DD (Consum. Affairs)	√	
38	PUCSL	Mr. Roshan Weerasooriya	DD (Consum. Affairs)	√	
39	PUCSL	Mr. BC Pasindu	AD (Regul. Affairs)	√	
40	PUCSL	Mr. BWR Balasuriya	Cons. (W/S/Ind)	√	
41	University of Moratuwa	Prof. NTS Wijesekera	Project Team Leader	√	
42	University of Moratuwa	Ms. Badra Kamaladasa	Cons. Water Res.	√	
43	University of Moratuwa	Mr. Anandalal Nanayakkara	Cons. Legal Water Res.	√	
44	University of Moratuwa	Mr. D Daluwatta	Cons. S/H Involvement	√	

Annex 4: Function Lists of Central Government and Provincial Councils

Ninth Schedule to the Constitution of the Democratic Socialist Republic of Sri Lanka

(As amended up to 15th May 2015) – Revised Edition - 2015

List I

• Provincial Council List

(Functions to be devolved to and carried out by the Provincial Councils)

- Police and public order (unless in the Reserved List)
- Planning (implementation of provincial economic plans)
- Education and educational services (unless in List II or III)
- Local Government (except for constitution, form and structure)
- Provincial housing and construction (other than National Housing Development Authority)
- Roads, bridges and ferries (other than national highways and bridges and ferries on national highways)
- (Certain) Social services and rehabilitation
- Transport (certain aspects)
- Agriculture and agrarian services (mainly extension work)
- Rural development (no further explanations)
- Health (unless in List II or III)
- Indigenous medicine
- Rest houses under Local Government and circuit bungalows under “devolved departments”
- Pawnbrokers (other than provided by banks)
- Market fairs
- Food supply and distribution
- Cooperatives (also appears in List III)
- Land (other than in List II or III)
- Irrigation (other than in List II or III)
- Animal husbandry (certain aspects)
- Promotion, establishment and engagement in income-generating projects (unless contrary to Central Government interests)
- Reformatories, borstal institutions, etc.
- Possession, transport, purchase and sale of intoxicating liquor
- Burials, burial grounds, cremations and cremation grounds other than national memorial cemeteries
- Libraries, museums, etc. controlled or financed by the Provincial Council
- Ancient and historical monuments and records other than those of national importance
- Regulation of mines and mineral development as defined by an Act of Parliament
- (Certain) Corporations
- Regulation of unincorporated societies and associations
- Theatres, dramatic performances, music, cinema

- Sports (other than national sports associations)
- Betting and gambling (excluding taxation)
- Provincial debt
- Offences against statutes (in the context of this list)
- Fees (in the context of this list)
- Electrical energy other than power generated to feed the national grid
- Borrowing of money as determined by an Act of Parliament
- Taxation:
 - Turnover taxes as determined by an Act of Parliament
 - Betting taxes, taxes on prize competitions and lotteries (other than national lotteries)
 - License taxes, liquor
 - Motor vehicle license fees as determined by an Act of Parliament
 - Dealership license taxes on drugs and other chemicals
 - Stamp duties on transfer of properties such as land and motor cars
 - Toll collections
 - Court fines
 - Fees charged under the Medical Ordinance
 - Fees charge under the Motor traffic Act
 - Departmental fees in the context of this list
 - Fees under the Fauna and Flora Protection Ordinance
 - Fees on lands alienated under the Land Development Ordinance and Crown Lands Ordinance
 - Court fees
 - Regulatory charges under the Weights and Measures Ordinance
 - Land revenue (e.g. for valuation)
 - Taxes on lands and buildings
 - Taxes on mineral rights as determined by an Act of Parliament
 - Other taxation as determined by an Act of Parliament
- Protection of the environment as determined by an Act of Parliament

List II

Reserved List

1. (Functions to be carried out by Central Government)

- National policy on all subjects and functions
- Defense and national security; internal security; law and order
- Foreign affairs
- Posts and telecommunication; broadcasting; television
- Justice in so far as it relates to the judiciary and the courts structure
- Finance in relation to national revenue, monetary policy and external resources; customs
- Foreign trade; inter-province trade and commerce
- Ports and harbours
- Aviation and airports
- National transport (e.g. railways, national highways, etc.)
- Rivers and waterways; shipping and navigation; maritime zones; State lands and foreshore
- Minerals and mines
- Immigration, emigration and citizenship
- Elections (presidential, parliamentary, provincial councils, local authorities)
- Census and statistics
- Professional occupations and trainings
- National archives; archaeological activities and sites and antiquities declared to be of national importance
- All subjects and functions not specified in List I or List III

List III

Concurrent List

2. (Functions to be carried out jointly by Central Government and Provincial Council)

- Planning:
 - Formulation and appraisal of plan implementation strategies at the provincial level
 - Progress control
 - Monitoring progress of public and private sector investment programmes
 - The evaluation of the performance of institutions and enterprises engaged in economic activities
 - The presentation of relevant data in the achievement of plan targets
 - The dissemination of information concerning achievement of plan targets
 - Publicity of implementation programmes
 - Manpower planning and employment databank
 - Nutritional planning and programmes
- Education and education services (basically schools and personnel other than national schools and personnel of such schools)
- Higher education
- National housing and construction: the promotion of integrated planning and implementation of economic, social and physical development of urban development areas
- Social services and rehabilitation (relief, rehabilitation and resettlement)
- Agricultural and agrarian services (agro-linked industries, farms, soil conservation, plant pests)
- Health (schools for training auxiliary medical personnel; supervision of private medical care, control of nursing homes and diagnostic facilities; population control and family planning)
- Registration of births, marriages and deaths
- Renaming of towns and villages
- Private lotteries
- Festivals and exhibitions
- Rationing of food and maintenance of food stocks
- Cooperatives (also appears in List I)
- Surveys (in the context of Lists I or III)
- Irrigation (larger schemes)
- Social forestry and protection of wild animals and birds
- Fisheries other than beyond territorial waters
- Animal husbandry (certain aspects)
- Employment
- Tourism
- Trade and commerce in, and the production, supply and distribution of products with need of national control
- Newspapers, books and periodical printing presses

- Offences against statutes in the context of this list
- Fees in the context of this list
- Charity; religious institutions
- Price control
- Inquiries and statistics in the context of this list
- Adulteration of foodstuffs and other goods
- Drugs and poisons
- Extension of electrification and regulation of use of electricity
- Protection of the environment
- Archaeological sites and remains other than national
- Prevention of the extension of diseases between provinces
- Pilgrimages

APPENDIX II - Land and Land Settlement

State land shall continue to vest in the Republic and may be disposed of in accordance with Article 33 (d) and written law governing this matter.

Subject as aforesaid, land shall be a Provincial Council Subject, subject to the following special provisions:

1. State land -

1:1 State Land required for the purposes of the Government in a Province, in respect of a reserved or concurrent subject may be utilised by the Government in, accordance with the laws governing the matter. The Government shall consult the relevant Provincial Council with regard to the utilisation of such land in respect of such subject.

1:2 Government shall make available to every Provincial Council State land within the Province required by such Council for a Provincial Council subject. The Provincial Council shall administer, control and utilise such State land, in accordance with the laws and statutes governing the matter.

1:3 Alienation or disposition of the State land within a Province to any citizen or to any Organisation shall be by the President, on the advice of the relevant Provincial Council, in accordance with the laws governing the matter.

2. Inter-Provincial Irrigation and Land Development Projects.

2:1 Such projects would comprise irrigation and land development schemes-

(a) within the Province initiated by the State and which utilize water from rivers flowing through more than one Province; a Provincial Council however, may also initiate irrigation and land development schemes within its Province utilizing water from such rivers;

(b) within the Province which utilize water through diversions from water systems from outside the Province; and

(c) all schemes where the command area falls within two or more Provinces such as the Mahaweli Development Project.

2:2 These projects will be the responsibility of the Government of Sri Lanka.

2:3 The principals and criteria regarding the size of holdings of agricultural and homestead lands arising out of these projects will be determined by the Government of Sri Lanka in consultation with the Provincial Councils.

2:4 The selection of allottees for such lands will be determined by the Government of Sri Lanka having regard to settler selection criteria including degree of landlessness, income level, size of family and agricultural background of the applicants. The actual application of these principles, selection of allottees and other incidental matters connected thereto will be within the powers of the Provincial Councils.

2:5 The distribution of all allotments of such land in such projects will be on the basis of national ethnic ratio. In the distribution of allotments according to such ratios, priority will be given to persons who are displaced by the project, landless of the District in which the project is situated and thereafter the landless of the Province.

2:6 Where the members of any community do not, or are unable to take their entitlements of allotments from any such project, they would be entitled to receive an equivalent number of allotments in another Inter-Provincial Irrigation or Land Development Scheme. This unused quota should be utilized within a given time-frame.

2:7 The distribution of allotments in such projects on the basis of the aforesaid principles would be done as far as possible so as not to disturb very significantly the demographic pattern of the Province and in accordance with the principle of ensuring community cohesiveness in human settlements.

2:8 The administration and management of such projects will be done by the Government of Sri Lanka.

3. National Land Commission.

3:1 The Government of Sri Lanka shall establish a National Land Commission which would be responsible for the formulation of national policy with regard to the use of State land. This Commission will include representatives of all Provincial Councils in the Island.

3:2 The National Land Commission will have a Technical Secretariat representing all the relevant disciplines required to evaluate the physical as well as the socio-economic factors that are relevant to natural resources management.

3:3 National policy on land use will be based on technical aspects (not on political or communal aspects), and the Commission will lay down general norms in regard to the use of land, having regard to soil, climate, rainfall, soil erosion, forest cover, environmental factors, economic viability, &c.

3:4 In the exercise of the powers devolved on them, the powers shall be exercised by the Provincial Councils having due regard to the national policy formulated by the National Land Commission.

Annex 5: The section quoted from “Home Affairs Circular-4/2019

“District Coordinating Committee at district level and Divisional Coordinating Committee at divisional level, is the principal committee responsible for the coordination and supervision of all the development projects implemented within the respective area. Action will be taken to appoint a Senior Cabinet Minister as the Chairperson and a senior Member of Parliament representing the Government as the Vice-Chairperson of the District Coordinating Committee and to appoint a Member of Parliament representing the Government as the Chairperson and a member of Provincial Council representing the Government as the Vice-Chairperson of the Divisional Coordinating Committee. Accordingly, in order to implement the development activities with proper coordination, in more appropriate manner and also with the participation of relevant parties, all the committees are hereby informed to take the following course of action”.

The above is an extract from the “Home Affairs Circular-4/2019” ” [38]

Annex 6: List of Water Related Agencies and their respective Ministries

#.	Name of the Agency	Name of the Ministry in Charge
1	National Water Supply & Drainage Board (NWSDB)	Ministry of City Planning, Water Supply and Higher Education
2	Department of National Community Water Supply (DNCWS)	Ministry of City Planning, Water Supply and Higher Education
3	Mahaweli Authority of Sri Lanka (MASL)	Ministry of Mahaweli Development and Environment
4	Central Environment Authority (CEA)	Ministry of Mahaweli Development and Environment
5	Climate Change Secretariat (CCS)	Ministry of Mahaweli Development and Environment
6	Irrigation Department (ID)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
7	Department of Agriculture (DA)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
8	Water Resources Board (WRB)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
9	Department of Agricultural Diversification and Settlement Authority (Hadabima Authority)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
10	Disaster Management Agency (DMC)	Ministry of Public Administration, Disaster Management
11	Meteorological Dept (Met. D)	Ministry of Public Administration, Disaster Management
12	Plantation Human Development Trust (PHDT)	Ministry of Hill Country New Villages, Infrastructure & Community Development
13	Board of Investment (BOI)	Ministry of Development Strategies and International Trade
14	Ceylon Electricity Board (CEB)	Ministry of Power, Energy and Business Development

#.	Name of the Agency	Name of the Ministry in Charge
15	National Aquatic Resources Research and Development Agency (NARRDA)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
16	Coast Conservation Department (CCD)	Ministry of Mahaweli Development and Environment
17	National Planning Department (NPD)	Ministry of National Policies, Economic Affairs, Resettlement & Rehabilitation, Northern Province Development and Youth Affairs
18	National Buildings Research Org. (NBRO)	Ministry of Public Administration, Disaster Management
19	Industrial Technology Institute (ITI)	Ministry of Science, Technology and Research
20	Ministry of Health & Indigenous Medicine (Mo H)	Ministry of Health, Nutrition & Indigenous Medicine
21	SL Land Reclamation & Development Corporation (SLLRDC)	Ministry of Megapolis & Western Development
22	Dept of Census & Statistics (DC&S)	Ministry of National Policies, Economic Affairs, Resettlement & Rehabilitation, Northern Province Development and Youth Affairs
23	Land Use Policy Planning Dept. (LUPPD)	Ministry of Lands and Parliamentary Reforms
24	Department Forest Conservation (DFC)	Ministry of Mahaweli Development and Environment
25	Geological Survey and Mines Bureau (GSMB)	Ministry of Mahaweli Development and Environment
26	Dept of Agrarian Service (DAS)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
27	Natural Resources Management Centre (NRMC)	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development
28	Public Utility Commission of Sri Lanka (PUCSL)	Ministry of Finance
29	Hotels	Ministry of Tourism Development, Wildlife and Christian Religious Affairs

#.	Name of the Agency	Name of the Ministry in Charge
30	Government Schools	Ministry of Education
31	Municipal Councils, Urban Councils, Pradeshiya Sabhas	Ministry of Internal & Home Affairs and Provincial Councils & Local Government
32	Estates	Ministry of Plantation Industries

Annex 7: List of Ministries and Regulatory Agency involved in Subsectors of Water

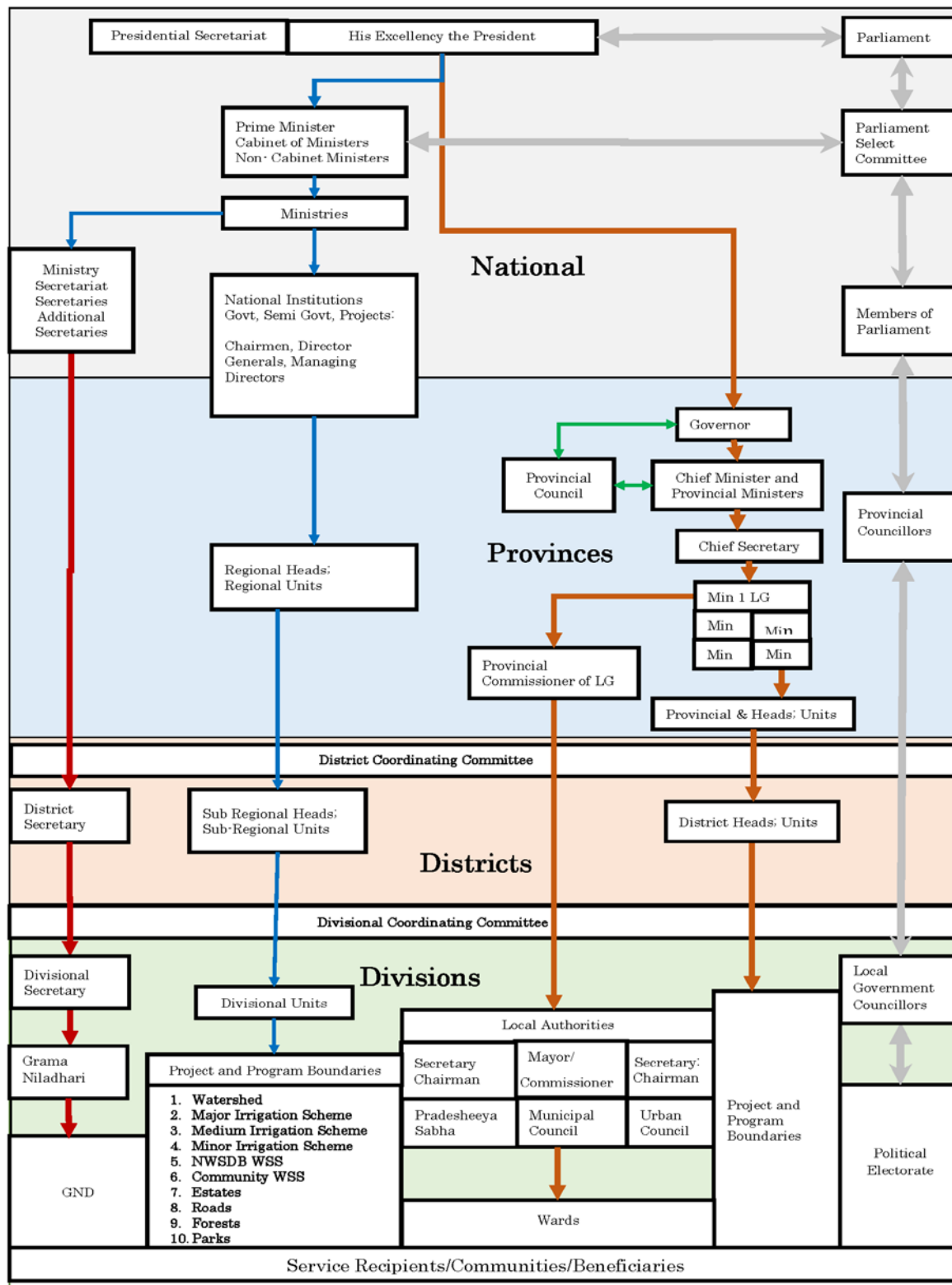
#	Name of Organisation	Service Delivery Sub Sector		
		Water Resources	Water Supply	Sanitation
1	Ministry of Defence		X	X
2	Ministry of Mahaweli Development and Environment	X	X	X
3	Ministry of National Policies, Economic Affairs, Resettlement & Rehabilitation, Northern Province Development and Youth Affairs	X	X	X
4	Ministry of Tourism Development, Wildlife and Christian Religious Affairs	X	X	X
5	Ministry of Finance	X	X	X
6	Ministry of City Planning, Water Supply and Higher Education	X	X	X
7	Ministry of Foreign Affairs			
8	Ministry of Health, Nutrition & Indigenous Medicine		X	X
9	Ministry of Power, Energy and Business Development	X		
10	Ministry of Internal & Home Affairs and Provincial Councils & Local Government	X	X	X
11	Ministry of Mega polis & Western Development	X	X	X
12	Ministry of Plantation Industries	X		
13	Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries & Aquatic Resources Development	X	X	

#	Name of Organisation	Service Delivery Sub Sector		
		Water Resources	Water Supply	Sanitation
14	Ministry of Highways & Road Development and Petroleum Resources Development	X	X	
15	Ministry of Public Administration, Disaster Management	X	X	X
16	Ministry of Lands and Parliamentary Reforms	X		
17	Ministry of Housing, Construction and Cultural Affairs		X	X
18	Ministry of Hill Country New Villages, Infrastructure & Community Development		X	X
19	Ministry of Education		X	X
20	Ministry of Development Strategies and International Trade		X	X
21	Public Utility Commission of Sri Lanka	X	X	
	Number of Agencies Involved	13	17	14

Annex 8: State Water Sector Service Delivery Setting in Sri Lanka

Reserved(Service Delivery)Functions				Devolved(Service Delivery)Functions			Direct (Crisis Management -Adhoc) Service Delivery
Spatial Coverage of Governance	Institution (2 sets under ministries)		Implementation	Boundary of Governance	Institution	Implementation	Stakeholder Representative
Central Government	Presidents Office		President	Central Government	Presidents Office	President	Members of Parliament
	Parliament		Parliament Members				
			Cabinet of Ministers				
			Non Cabinet Ministers				
	Ministries		Secretary to the Minister				
	Department/Corporations/Statutory Boards	Ministry Secretariat	Additional Secretaries				
			Heads of Institutions				
	Regional Units	District Secretariat	Regional Heads	Provincial Councils	Provincial Ministries	Governor	Provincial Councillors
			Sub Regional Heads			Chief Minister	
						Provincial Board of Ministers	
	Sub Regional Units	District Secretariat	District Secretary		Provincial Seretariat	Chief Secretary	
District Coordination Committees							
Central Government	Divisional Units	Divisional Secretariat	Divisional Heads	Local Government MC, UC, Pradeshiya Sabha	Municipal Council	Mayor	Local Government Councillors
			Divisional Secretary		Urban Council	Chairman	
			Unit Managers		Pradeshiya Sabha	Chairman	
	Project Program Bounded units						
Divisional Coordination Committees							
Central Government	Project Program Bounded units	GN Divisions	Grama Niladhari	Village Level Grama	Wards		Member Gramodaya Mandala
Community./ Recipient Stakeholders							

Prepared by: Prof N.T.S. Wijesekera



Prepared by Prof N.T.S. Wijesekera

Annex 9: The draft letter from PUCSL to Key water stakeholders.

30th October 2019

Study on Sustainable Water Resource Management for Drinking Purposes

Competition for the limited supply of freshwater has increased due to increased demands by various water users. Competing water uses include human consumption for survival and economic development along with the sustenance of environment. Though a majority of the public would claim water for human consumption as the top priority, there are power groups who claim otherwise. In this backdrop, the clear and loud message that had come out at the PUCSL consultations is “Water services available for drinking purposes is inadequate “is understandable.

In Sri Lanka, access to sufficient quantities of drinking water with adequate quality is a human right guaranteed by the constitution. Therefore, the common understanding is that drinking water supply takes the top priority among the water users. However the PUCSL mandated to look in to the issue of non-sufficiency of drinking water would like to know the current situation concerning the surface and groundwater availability prior to resorting to solutions proposed by stakeholder agencies. Hence the PUCSL has initiated a study to explore the solutions available to resolve this issue of unavailability of adequate quantity of good quality water at the sources for supplying as drinking water.

Under the above circumstance, your contribution to the study is considered invaluable. Therefore, we would kindly request you to provide us the following information available with you to facilitate this study.

1. Available laws, regulations, circulars or other documents pertaining to custodianship of water
2. Documents pertaining to procedures and practice adopted by your agency in relation to water allocation
3. Descriptions of methods and practice pertaining to, 1) Identification of water users 2) Management of Demand 3) Management of Supply 4) Dispute Resolution and related documents if available
4. A list of stakeholders you have consulted in connection with, 1) water allocations and 2) outcome records within the last two years.

Since the present study has a target period of 5 months, we would appreciate if you could provide these information as early as possible (preferable within two weeks).

Through this study we are looking forward to arrive at a sustainable water allocation solution acceptable to Sri Lanka’s water sector.

Annex 10: Identified water sector stakeholders for consultation


4th November 2019

1. NWSDB
2. DNCWS
3. MASL
4. CEA
5. ID
6. DA
7. WRB
8. DADA
9. DMC
10. BOI
11. CEB
12. NARRD(NARA)
13. CCD
14. NPD
15. SLRDC
16. Forest Department
17. GSMB
18. Dept of Agrarian services
19. Ministry of Irrigation and Mahaweli Development
20. Ministry of Water Supply


Annex 11: Stakeholder Responses received by the PUCSL at the ToR development Stage

- Department of Irrigation

FROM: FAX NO. : 0112584485 29 May 2019 9:24 P1



වාණිජ මහලයේ
நீர்ப்பாசனத் திணைக்களம்
IRRIGATION DEPARTMENT



011-2584984 011-2581162 Director General Telephone (General)	011-2595890 011-2581162 Director General Email Address	011-2595890 011-2581162 Director General Email Address
-----------------------------------------------------------------------	-----------------------------------------------------------------	-----------------------------------------------------------------

P.O. Box 1138, No. 230, Saddhuloka Mawatha, Colombo 07, Sri Lanka
www.irrigation.gov.lk

DI/WM/ Miscellaneous/002/2019 28-05-2019

Director General
Public Utilities Commission of Sri Lanka
Level 06, BOC Merchant Tower,
28, St. Michael's Road,
Colombo 03

29 MAY 2019

Dear Sir,

Sub: Sustainable Water Resource Management for Drinking Purposes.

This refers to letter dated 2019-04-29 on above subject.

Since the water service industry is listed in the schedule of the PUCSL act, it is much more convenient to address commonly the problems of water services holistically. Following facts world help to understand the context.

- The requests made by National Water Supply and Drainage Board has been considered and provided the maximum possible quantities considering the technical feasibility including Rajangana Water Supply Project. However Rajangana Water Supply Project could not implemented due to social issues. It has to be analyzed separately.
- Food production is also to be focused, since it need water service. Sri Lanka imports food stuff required for the nation. Paying dollars which is mostly earn by laboring to Middle East countries is in difficult situation according to the Treasury and Central Bank of Sri Lanka.
- Providing water for industries also important issue in considering the economics development of the country.
- It is required to decide whether we need to fulfill 100% pipe born water or 100% safe water source. (Since dug wells have been completely neglected.)
- We should separately identity domestic water requirement against washing and gardening requirement.
- The farmers of the existing Irrigation schemes do not have other alternatives without farming for their survival.

සමස්ත වතුර පානීය කළමනාකරණය
 Managing Rain Water --- Make Sri Lanka Prosperous

- Aspects of the draft TOR has to be amended as follows.

- I. Technically review the natural and man-made issues and constraints met by local water service providers in basin wise in case of water service.
- II. Review the existing legal provisions and institutional perspectives on ownership of water resources, access to the same and water allocation. It is required to adhere to reparation right of users at present.
- III. Review international Best Practices of water allocation.
- IV. Evolve and recommend a suitable water allocation system for Sri Lanka, considering our cultural, historical and societal needs and current laws/Acts/rules/right etc.
- V. Carryout stakeholder consultations and develop pros and cons of proposed water allocation system.
- VI. Propose a final solution for the water allocation with required amendments to the existing laws/policies/institutions and or introduce new laws/policies institutions to overcome the situation.

Public consultation is required in Irrigation Schemes specially before implementation of any new law and regulation to minimize the conflict.

For your information and necessary action please.

Thank You,
Yours faithfully,



Eng. S. Mohanarajah
Director General of Irrigation


Eng. S. Mohanarajah
Director General of Irrigation
Irrigation Department
Buddhaloka Mawatha,
Colombo 07

P1 29 May 2019 9:25

FRX NO.: 0112584485

FROM :



- National Water Supply and Drainage Board

<p align="center">ජාතික ජල සම්පාදන හා ජලපවහන මණ්ඩලය தேசிய நீர் வழங்கல் வடிகாலமைப்புச் சபை National Water Supply & Drainage Board</p>							
පාලක தலைவர் Chairman	Tel : 2634488 Fax : 2611234	இரண்டாம் பதவி உப தலைவர் Vice Chairman	Tel : 2635883 Fax : 2610034	ප්‍රධාන කාර්යාලය தலைமை அலுவலகம் Head Office	2638246, 2638256 2638259, 2638260 Tel : 2621621	ප.ම.ප. த.பெ.இல. P.O. Box	14, කැලවිනියා Mt. Lavinia
කාර්යාලාධිපති பொது குகாணியாதிபதி General Manager	Tel/Fax : 2636449	இயக்குநர் தொழில்நுட்ப அலுவலர் Working Director	Tel : 2636901 Fax : 2611590	Hunting No : 2638999 Fax : 2636449 E-mail : nwsdbch@sltnet.lk		ලංසු පාර காலி வீதி Galle Road	රත්මලාන இரத்தமலானை Rattmalana, Sri Lanka.
මගේ අංකය எமது இல My No.	Addl.GM/P&P/Regulations			ඔබේ අංකය உமது இல Your No.		දිනය திகதி Date	24-July 2019

Mr. Damitha Kumarasinghe
 Director General
 Public Utilities Commission of Sri Lanka
 Level 06, BOC Merchant Tower
 28, St Micheals Road
 Colombo 03

Through;

The Secretary
 Ministry of City Planning, Water Supply & Higher Education

SUSTAINABLE WATER RESOURCE MANAGEMENT FOR DRINKING PURPOSES

This is in reference to the PUCSL letter No. PUC/2019/CP/COA/05 dated 06.06.2019 regarding above matter.

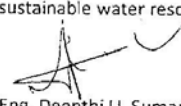
In respect to Water Resources Management coordination between Irrigation Department, Mahaweli Authority and the NWSDB on High Level Steering Committee has been appointed. The mandate of the Committee is to allocate the water resources for drinking water purposes and to address the key water resource issues.

Furthermore, Irrigation Department too is carrying out an independent study on water resources in specific areas and Irrigation Department has already initiated a Master Plan Study on Water Resources. In this context launching another study under PUCSL shall be well coordinated between Irrigation Department and Mahaweli Authority to avoid any duplications.

Also, at present a Master Plan study is currently been carried out under World Bank assistance and under this Master Plan Study a comprehensive Study on Water Recourse is to be done.

The Master Plan Study is expected to provide a clear picture of the position with regard to water resources availability and current position.

As such it will be beneficial to study the outcome of the Master Plan Study prior to launching another study on sustainable water resources management for drinking water under PUCSL.


 Eng. Deepthi U. Sumanasekara
 General Manager
 NATIONAL WATER SUPPLY & DRAINAGE BOARD

MINISTRY OF CITY PLANNING AND WATER SUPPLY
 "Water - Every Drop is Precious"

**Annex 12: Invitees/Participants at the Second Stakeholder Consultation Workshop held
at the Ministry of Water Supply on the 17.09.2020**

	Name	Designation	Agency/	Presence	
				Yes	No
1	Mr. S J Wijayabandu	Secretary/State Ministry	Ministry of W/S Services	√	
2	Mr. A C M Nafeel	Addl. Secretary	-do-	√	
3	Ms. K G D Priyanka	Dir/Dev.	-do-		√
4	Mr. Damindra Nallaperuma	Asst. Dir. (Dev.)	-do-	√	
5	Ms. U A C N Kumari	Asst. Dir. (Dev.)	-do-	√	
6	Eng. S M D L K De Alwis	Secretary/State Ministry	Ministry of Irrigation	√	
7	Eng. W B Palugaswewa	Addl. Sec. (Dev.)	-do-		√
8	Eng. R M B Rajakaruna	Dir. (WRP)	-do-	√	
9	Eng. Nihal Siriwardana	DG	Irrigation Department		√
10	Dr. (Eng.) K Weligepolage	Addl. DG (WRP)	-do-		√
11	Eng. H M Junaid	Addl. DG (SM)	-do-	√	
12	Eng. D Abesiriwardena	Dir. Irri (WM)	-do-	√	
13	Eng. W C N Wickramasinghe	Dir. Irri (WRP)	-do-	√	
14	Eng. G K T Samaratunga	Dir (WMS)	Water Man. Secretariat		√
15	Eng. K L I C Kariyawasam	DD (WMS)	-do-	√	
16	Mr. Tilina Wijetunga	Addl. GM (P&P)	NWSDB		√
17	Mr. Danesh Gunatilaka	DGM (Sew.)	-do-	√	
18	Mr. Ananda Munasinghe	DGM (P&D)	-do-	√	
19	Ms. Anoja Kaluarachchi	AGM (P&D)	-do-	√	
20	Mr. Lasantha Rupasinghe	AGM (Dev.)	-do-	√	
21	Mr. Manjula Priyankara	AGM (S/E)	-do-	√	
22	Mr. Sarath Gamini	Chief Eng. Kandy North Proj.	-do-		√
23	Mr. H M Jayatilaka Herath	DG	Dept. of Comm. Water Sup.	√	

	Name	Designation	Agency/	Presence	
				Yes	No
24	Mr. S K K Mudali	Dir. (Adm.)	-do-	√	
25	Mr. G R R Karunarathna	GM	Water Resources Board	√	
26	Mr. K M U C B Kulatunga	AGM	-do-	√	
27	K M S M Kumarasinghe	Hydrologist	Ministry of Plantation	√	
28	H M B P Weerasinghe		-do-	√	
29	Mr. B K S S Karunaratna		Forest Dept.	√	
30	Representative		SLRDC		√
31	Representative		Dept. of Agriculture		√
32	Representative		CEA		√
33	Representative		DMC		√
34	Representative		NPD		√
35	Representative		CCD		√
36	Representative		Dept. of Agrarian Ser.		√
37	Mr. Balasooriya		PUCSL	√	
38	Mr. Shantha Jayasinghe		PUCSL	√	
39	Mr. Roshan Weerasooriya		PUCSL		√
40	Mr. W A T Dhanuska		PUCSL	√	
41	Prof. Sohan Wijesekara	Consultant	Univ. of Moratuwa	√	
42	Ms. Badra Kamaladasa	Consultant	Univ. of Moratuwa	√	
43	Mr. Anandalal Nanayakkara	Consultant	Univ. of Moratuwa	√	
44	Mr. D Daluwatta	Consultant	Univ. of Moratuwa	√	