

Need for supply augmentation and demand management to mitigate impacts of climate change on the water sector.

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Sri Lanka's 2500 year hydraulic civilization in the context of a bimodal monsoonal rainfall regime and an undulating landscape evolved around storages and diversions to mitigate spatial and temporal shortages to meet livelihood needs of its essentially agriculture based population with the first such rainwater reservoir Basawakulama circa 400BC. The concept of integrated water resources management or IWRM as its known in modern times was an intrinsic part of the planning and development processes followed. Some storages were also built (without sluices) for the purpose of ground water recharge. The water source areas of the central highlands were left unscathed to ensure perennial river flow as much as possible and an intricate storage system developed especially in the drier parts of the country, many in a cascade format as land profiles allowed to ensure that rain was stored and used to support irrigated agriculture and livelihoods. Reuse of return flows were inherent in such systems and water was used many times over before discharging to the river and ultimately flowing to the sea. Basin efficiencies were thus of high order. Many large reservoirs built by construction of dams over rivers supplied water to the smaller reservoirs downstream and functioned as regulating reservoirs ensuring adequacy and timeliness of supply. Well established management rules issued as edicts by the king and also customary rules ensured efficient use, operation and system maintenance. Various reasons are adduced to the factors that led to abandoning the dry zone and population shifting elsewhere and abandoning of these systems. It is undoubted that in more recent times under colonial rule, enactment of the pernicious Waste Lands Ordinance of 1840 and opening of the central water source areas to establish plantations of coffee and then tea exacerbated the problem.

Modern Irrigation

The era of modern irrigation though disadvantaged and negated by the abolition of the *Rajakariya* system by the Colebrook Commission in 1933, really started during the British period (the Portuguese and Dutch were more interested in spices) when many efforts at restoring and rehabilitating these systems were initiated. Likely that impacts of the First World War which highlighted the need to ensure food locally contributed to this. Concomitantly with restoration of the smaller systems, larger systems were developed more to settle farmers in the dry zone thus reducing population pressure in the wet zone. The first such irrigated settlement Nachaduwa was initiated in 1929 under the Crown Lands Ordinance (CLO) followed by schemes such as Kagama-Katiyawa and Elahera, The Land Development Ordinance (LDO) of 1935 saw the rapid expansion of irrigated settlements with development of a large number of medium and major reservoirs in the Dry Zone especially in the NCP NWP and CP, later followed by Gal Oya and Walawe. A significant feature was that Gal Oya was developed as multi-purpose project (on the lines of the Tennessee Valley Authority) and had a hydro power component as well. A feature of these systems were that they were direct command area based and irrigated immediate lands under the reservoir and were not designed as regular regulating reservoirs for managing river flows. These settlements helped relocate population and with improved communication infrastructure, facilities and amenities are mainly responsible for the relatively low rural/urban migration to the capital city unlike most countries in Asia.

Trans Basin Diversions and River Regulation.

Minipe/Mahaweli diversion accounts for 2500 MCM water transfers from the Wet Zone to the Dry Zone basins reinforcing water for farming and livelihoods and assuring regular supplies for two season cultivation of expanded areas. In addition the Mahaweli reservoirs add over 500 MW of much needed hydropower to the national grid. The era of intense development of water sources was its peak in the latter part of the 20th century and in addition to the Mahaweli Accelerated Programme the construction of major reservoirs such as Kirindi Oya in Hambantota, Muthikandiya in Monaragala, Inginimitiya in Puttalam and Mahadivulwewa and Morawewa in Trincommalee added much needed supply augmentation to the water base. Notwithstanding the skepticism and questioned validity of these investments these crucial developments stand Sri Lanka in good stead in the context of the now severe climate variability/ climate change scenario and without which the Sri Lanka agricultural sector and rural livelihoods would have been impacted disastrously. At the time donors would evaluate such projects only on economic criteria based on direct benefits leading planners to overextend projected benefits which led to target gaps that needed filling subsequently. This led to the discourse on viability of such programmes which nevertheless have been vindicated by the actual ground situation. Fortunately at present extended benefits are factored in and both other socio economic gains by way of communication infrastructure and environmental benefit with ecosystem services allow for more realistic planning.

Unfortunately the major donors did about turn in the latter part of the century on financing water reservoirs based the World Commission on Dams recommendations that large dams were bad for the environment and there was hiatus for almost two decades in such developments with only added value projects being supported.

Suddenly with the realization that the extreme weather events both floods and droughts need resilient infrastructure to cope with and more supply augmentation to meet the greater deficits, the donors are again supporting both storages and importantly inter basin diversions including in Sri Lanka to compensate for the projected drier dry zone and wetter wet zone predicted by agro climatologists (Punyawardene et al). Therefore supply augmentation both through regulating reservoirs and inter basin transfers are and should be priority notwithstanding commitments to other important sectors of the economy.

Recent developments such as the Deduru oya reservoir that added security of supply to both irrigation and other uses downstream in the NWP, commissioning of Moragahakanda and now Kauluganga (due shortly) under the Mahaweli Development Programme with the NCP canal add water security to the region including to the north ,while Uma Oya/Kuda oya and new constructions such as Rambakan oya, Mundeni Ara, Lower Malwatu oya and projected Yan Oya Projects will further reinforce water resource supply to the respective regions. Current Projects such as the Upper Elahera Canal, NWP Canal project and Minipe Left Bank Project under the Mahaweli Water Security Programme will undoubtedly improve water security and availability including in the areas not covered by the Deduru Oya project at present and in Matale district. The 3 basin transfer of Kalu, Gin and Nilwala will notwithstanding the many issues to be resolved will enable a secure water supply by adding about 1000 MCM to the south and south east region. There is no doubt that these developments will ensure increase resilience, improve water security and also help as Disaster Risk Reduction (DRR) measures for flood control which needs our immediate attention. On the rehabilitation side there are many projects seeking to improve productivity and climate resilience of infrastructure.

Donors are no longer willing or able due to increasing donor fatigue to support continuing relief efforts under increased drought and flood (including landslide) scenarios in most countries. DRR therefore is no longer relief response issue but development issue and has to be a part of our development strategy.

From Supply Augmentation to Demand Management.

The nineteen eighties saw greater interest in Demand Management including participatory system management as way of improving water use efficiency and reducing costs of O&M. Use of various delivery mechanisms at main, secondary and tertiary levels were tried out some with very good results. Improved on farm management with water duties for land preparation have reduced significantly. Use of rotational supply including alternate paddy wetting and drying methods have reduced water demand allowing for increased cropping intensity in many systems. Conjunctive water use with ground water, use of rainwater for agriculture, mixed cropping/crop diversification and use of shortage cultivars have brought benefits by way of better coping with given climate change scenario. The increased use of technology options for water delivery including drip irrigation increasingly gaining popularity with cheaper options available all add to a better water and carbon footprints with respect to water use in agriculture. However many improvements with expanded coverage is needed to reach desired levels. Though an augmentation development, certain improvements to existing reservoirs such as the innovative “Piano” spills have been able to add capacity without increasing the submerged area significantly.

Water Governance

With 51 Acts and over 40 Agencies dealing directly with water it is inevitable that some duplication, confusion and even inaction results due to institutional hiccups. To realize the full benefits of added water resources, concomitant institutional/governance adjustments become necessary, more so to meet the diverse and expanding inter sector requirements. Need for Integrated Water Resources Management (IWRM) and goals set for the SDG and Nationally Determined Contributions (NDC) by Sri Lanka under the Paris Agreement require changes. An effort at Comprehensive Management of Water Resources in the eighties that led to a Water Policy now in limbo and failed legislation was undoubtedly caused by some faulty planning assumptions. It was suspiciously donor driven, sought to establish an enforcing authority rather than a facilitating one with proposed legislation that was more punitive rather than enabling. More importantly it was completely overarching and designed “*in perpetua*” not seen as needing flexibility to accommodate future sector evolution. The most important factor of first articulating the “Principles” under which water in Sri Lanka will be managed led to wide speculation and skepticism of intent and dropped due to wide protests.

With a complex management and response environment emerging due to climate change and increasing disasters (floods, droughts and landslides) it is now time to revisit the issue of water governance to reach the full benefits of the improving supply and demand situation.

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