Traditional Wisdom In Sustainable Use Of Earth Resources

M. Asoka T. De Silva

Historical Backdrop

It is on record that with the advent of Buddhism to Sri Lanka, the World's earliest wildlife sanctuary was established by King Devanampiyatissa in 246 BC. Subsequently fostered by the great philosophy of Buddha, conservation of biological as well as all other earth resources, and their sustainable use, became a unique and unparalleled tradition in ancient Sri Lanka. The concepts of biodiversity conservation have since then been ingrained in the cultural and religious beliefs of the people of Sri Lanka. During monarchial rule, forests and animal lives were an important part of the social fabric. Forests were generally owned directly by the king, and considered crown property or Rājasan thaka. Any sort of activity within these Tahansi Këllë or 'Forbidden Forests' was strictly prohibited.

It is known that in ancient Sri Lanka, almost every province of the Kandyan Kingdom had several such 'Protected Areas', where any kind of cultivation, felling of trees, hunting or fishing were strictly prohibited, and punishable by a heavy fine. These laws were enforced by a type of 'Forest Department' comprising the Këllë Korale appointed by the King. The ancient repository of Sinhala Laws Nīti Nighanduwa is known to have recorded that all elephants were the property of the Crown, and killing an elephant had been perceived as one of the most atrocious of all crimes. Monarchs from ancient times upheld this noble tradition. In fact it is known that in the 12th Century AD, King Keerthi Nissanka Malla had proclaimed that no animal should be killed within a radius of seven Gau (equivalent to 35.7 km) of the sacred city of Anuradhapura.

Against this backdrop, it is not difficult to understand the professed psychosocial mindset of our great ancestors who migrated to this resplendent island way back in 543 BC, which has since been eloquently expressed in the following terms:

"The Aryan migrants were the truest children of nature. They lived in nature and with nature. Their outlook on life and of the world was influenced by their conception of the forces of nature. But it was not the malevolent forces in nature, its dreadful and life-crushing manifestations that moulded their psychology. It was rather the benevolent aspect of nature which helped the Aryans in the development of their mental and spiritual faculties to the fullest. They were free from depressing inhibitions, and had no sense of fear and dread in the subconscious mind. Nature taught them to retain naturalness and freshness, to inspire hopefulness, to revel in enjoyment and to maintain a supreme ardour and zest for living. The philosophy of naturalism coloured their religious ideas. They visualized nature's powerful and life-promoting forces. The Aryans attributed to these their happiness and prosperity. The Aryan was in fact, a primitive student of nature. To understand the laws underlying the forces of nature was beyond him. He interpreted their significance from the utilitarian standpoint and appreciated their value in relation to man and society" (Dharma-Vijaya or The Revolt in the Temple, 1953).

Sri Lanka's varied climate and topography has resulted in a rich biodiversity distributed within a wide range of ecosystems. Among the terrestrial ecosystems are forests

of varying types, grasslands, and a network of rivers, wetlands and freshwater bodies. These together with the coastal and marine ecosystems such as seagrass beds, coral reefs, estuaries and lagoons, and associated mangrove swamps, constitute the spectrum of natural ecosystems in the country.

Indigenous Knowledge in the Management and Sustainable Use of Earth's Resources

Indigenous knowledge used at the local level by communities was the basis for decision making pertaining to food security, human and animal health, education, natural resource management, as well as all other vital activities for the sustenance of a contended and a satisfying livelihood. Being a knowledge system passed down from generation to generation, usually by word of mouth, it covers all aspects of life, including the natural environment and the earth's resources, which have been matters for survival of communities that generated this knowledge.

With the decline of the hydraulic civilization, Sri Lanka's capital began to shift from the Dry Zone to the Wet Zone, and to the hill country, which eventually became the stronghold of the Sinhala people against invading forces. Population shifts across different agro ecological zones from the Dry Zone to the Wet Zone and to the hill country required an agrarian society to adjust to new environments and try new ways of managing land and water.

In a report presented at a Workshop for the Development of a National Strategy for Incorporating Traditional Knowledge in Development Practices, held in 2002, Hemanthi Ransinghe explained that in the hill country, the people modified their lives to the wetter and more rugged terrain. Paddy cultivation in the deniyas (valley bottoms) was irrigated during the drier periods through canals that collected water from the springs in the hill slopes. Hills performed the function of reservoirs, and the management of watersheds necessarily formed an integral component of the agricultural enterprise. Different ecological segments of the slopes were recognized, as reflected in village names such as Ovita, Ovilla and Ovilkanda according to their location. Valley bottoms around which the settlements arose were named after the valley with the suffix of deniya (e.g. Gurudeniya, Peradeniya etc.). At the lower segment of the catena, forest gardens were developed in the homesteads. Further up, chena cultivation was practiced occasionally on a largely sustainable basis. Hilltops were permanently kept under a thick forest cover, which helped to control soil erosion and regulate water flow.

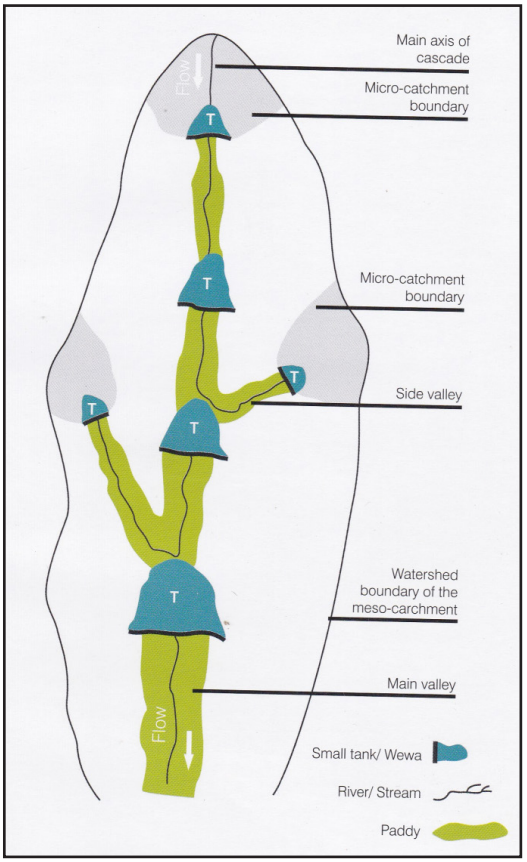

Fig 1 : Diagrammatic Representation of Small Tank Cascades

The Kandyan Forest Gardens and Other Types of Homegardens

At this point it must be noted with great consideration the unique small scale models of homestead farming popularly known as Kandyan Forest Gardens. Though these are now on the decline due to fragmentation of ancestral properties as well as due to commercial considerations, such gardens have been known to demonstrate the highest levels of biodiversity conservation known anywhere.

The Kandyan Forest Garden became a man-made forest consisting of various fruits and other economically useful tree species such as nutmeg and cloves. It essentially copied the diversity and intricate interrelationships of the natural forest. The multi-storied nature of cropping managed to utilize the sunshine optimally and effectively which falls to the garden. Resource utilization in the horizontal layers too were at the maximum in these Gardens. Kandyan Forest Gardens are located between the valley bottoms and high slopes to avoid damp conditions, and benefit from a deep soil cover and seepage of moisture from the upper regions.

The micro environment of a Kandyan homestead provided a suitable base for the continuity of human settlements in a wet montane setting.

Less intensively managed homegardens are found in most other districts of Sri Lanka especially in the low country Wet Zone in the western and southern coastal belts, and in the low country Dry Zone. Except for cocoa and coffee, most of the Kandyan homegarden species are grown less intensively. In addition, fruit bearing species like Rambuttan and Mangosteen were also found in these gardens. Homegardens usually have live fences of leguminous type plants, especially Gliricidia sepium, Kapok etc. The canopy cover of these is not dense and ranges from 25 -75 %. Cattle, goats and poultry are reared in these systems. Legumes thus planted help to increase soil fertility and provide food and fodder. In many homesteads in the Dry Zone, planting of useful tree species is widespread. Drumstick trees are grown in fences or hedges, as their crowns are very light, while the pods are popular and very nutritive. Production of these trees starts within one year of planting, and the bark of the tree is of medicinal value. In some other systems, Sesbania grandiflora is planted in the Dry and Semi-Arid Zones. Local people use the tender leaves and flowers as vegetables. Production in this case is also within one year of planting. It is an important producer of green manure and fodder, especially in the dry season.

Medicinal trees with pasture
Medicinal plant gardens with pasture constitutes another ancient system located in the districts east of central Sri Lanka, and the best examples are found near the town of Bibile. The medicinal trees are scattered in typical savannah grasslands, and are said to have been planted first in the days of Sinhala Kings. Aralu (Terminalia

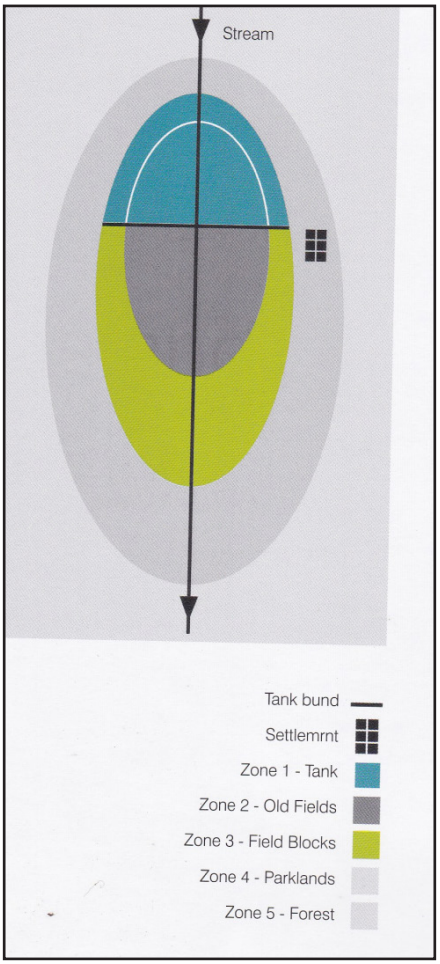

Fig 2 : Diagrammatic Layout of a Typical Traditional Dry Zone Agro-ecosystem

chebula), Bulu (T. belerica) and Nelli (Phyllanthus emblica) are the principal tree species found. Cattle grazing and goat rearing are practiced on the intervening grasslands. Fire hazard is a problem in the dry months of May to August, but the trees can withstand ground fires. Wildlife including elephants move into these areas, from nearby National Parks, but cause no damage to the valuable medicinal trees.

Silvo-aquaculture is a practice restricted to the mangrove forest areas along the coast. The country has around 12,000 ha of mangrove forests which produce timber, fuel wood, bark, fish and shell-fish. Prawns are cultivated in some areas near Negombo, Colombo and Kalutara along the west coast. The mangroves provide the spawning grounds for prawns and other shell-fish and many types of fish. The mangrove forests along the north-western and eastern coasts are also familiar breeding grounds for indigenous and migratory water birds. Mangrove fuelwood is used by villagers and small industries that make bricks and tiles.

Traditional Socio-cultural Beliefs in Harnessing of Earth's Resources
Traditionally people of Sri Lanka had a simple way of life in close harmony with the natural environment. Local communities had a vast storehouse of traditional knowledge and experience passed down through generations. Much can be learnt from their skills in sustainable management of complex ecological systems. According to their beliefs the sun gave life to both humans and animals, while paddy seeds water and all other essentials in life also had their origin from the sun. The moon produced the ocean tide which had a tremendous influence on man and his environment. They believed that so long as the sun and the moon rose in the sky, the rivers would flow wetting their land and bestowing enormous benefits to them. They cultivated their fields, planned their food and clothes based on the belief that they are part of the larger environment.

They based their calendar according to the increases and decreases in the size of the moon, and therefore the twelve month calendar was named Duruthu, Navam, Madin, Bak, Vesak etc. These names had a significance relevant to that particular period and their life pattern was linked with these divisions. Thus farming and production timings were set apart for those particular months that were environmentally most suited for such activity. This was their pattern of sustainable development.

The Strategies Adopted by Wannietto in the Management of Earth's Resources

Wannietto, or the Veddhas constitute a group of people who live on hunting and gathering of food in forests. They performed an important function in the protection of the forest cover. They considered themselves as wardens or guardians of their hunting grounds. Wannietto had a tremendous affection for forest resources and developed a protective attitude towards it. According to the leaders of Wannietto, Lord Saman, the God of Adam's Peak granted them a warrant to look after the well-being of life in Sri Lanka's extensive forests.

Wannietto were able to utilize the products of forests, causing no damage to resources therein. This is firstly due to the fact that their needs were limited to basic requirements such as food and shelter. Secondly, Wannietto had no specific goals or targets to achieve in their lives. There was no competition among the members of the community to reach certain targets. Thirdly, the population numbers of Wannietto were small, and the annual demand for resources was very low. The renewable forest resources were ample to supply the meagre demands of Wannietto. Fourthly, the ancestors of Wannietto did not indulge in any form of monetary transactions. As such their demands were to fulfill the unity among the members of the community, and to help in preserving and maintaining the traditional environmental knowledge that was passed down from their ancestors. The social and environmental values that came from generation to generation are considered as unwritten laws among Wannietto.

The true Wannietto are basically hunters and food gatherers. Hunting provided them with meat, hides, teeth and bones that were used as raw materials. Teeth and bones of some species were considered to be items of medicinal value too.

One of the basic strategies adopted by Wannietto in hunting is not to destroy animals haphazardly. A hunting group would always decide on the type of animal that they wish to kill on a particular day. For instance, if a decision has been taken to kill a deer, other edible species of animals were spared in hunting areas.

These unwritten laws were cultural adaptations of Wannietto to prevent wastage and over exploitation of faunal resources in forests. Wannietto refrained from frequent killing of animals belonging to one particular type in order to prevent over exploitation.

The protective attitude they extended towards female animals facilitated reproduction of wildlife. Wannietto always spared the suckling animals. Moreover, animals which are about to litter were also reprieved. It was also revealed that Wannietto were discouraged from killing animals which were quenching their thirst at water holes or water bodies. Over exploitation, wastage and frequent hunting of wildlife resources were minimized by adopting methods such as sharing the carcass and preserving meat. Methods of meat preservation adopted by Wannietto are as follows:

(i)Sun drying;
(ii)Smoked meat; and
(iii)Immersion of meat in bees' honey and placing in a trunk of a tree, or a cavity in a granite rock.

The leaders of Wannietto have adopted special methods in trapping animals that did minimum damage to the environment.

1.'Habaka' or wooden trap was used to catch animals such as wild boar, iguana and hare.
2.Thadiya is a mobile trap which was placed in front of anthills or cavities in tree trunks to trap animals that come out from their habitats. The basic principle adopted in constructing this trap is not to destroy the habitats of species.
3.Lula was a contraption meant to trap large animals such as deer and sambar.
4.Manda parrots, Watuwa and medium sized birds were caught by using Manda.

Wannietto carefully observed the foot paths of groups of sambar,

and placed pointed poles or sticks to trap them. The method of using hunting dogs is also frequently practiced by Wannietto. Hare and wild boar were located by following their hunting dogs. Most common equipment used by Wannietto were the bow and arrow to kill animals such as deer and sambar, who were located at a considerable distance.

Some beliefs and attitudes followed by Wannietto however, helped indirectly in protecting certain faunal species in forests. Elephants, cobras and peacocks were considered as deities. Porcupines were spared as they were treated as the dead relatives (uncles) of Wannietto.

Although Wannietto are hunters and food gatherers, some engaged in "chena" or shifting cultivation. It has been shown that products of chena cultivation were preserved by following methods that were practiced for several generations. For instance, dried fruits of Diyalabu (Lagenaria siceraria) were used to store grain which were mixed with wood ash. Green-gram and kurakkan were stored by mixing with the sap of Nika (Vitex negundo) to prevent insect attacks.

Traditional knowledge on plant species facilitated Wannietto to select fire wood that retain heat for a long time. Kuratiya (Memecylon arnottianum), Kara (Canthium coromandelicum), Seru (Cymbopogon – Citratus) and Vellang are a few examples. It has been reported that Wannietto refrained from using wood that produced excess of smoke, which they apparently realized would pollute the air. The popular timber tree Milla (Vitex pinnata L), was known to emit an excess of smoke, and hence was never burnt. It seems obvious that Wannietto were aware that excess of smoke could polluted the air, and consequently of their living environment, which itself constitute a life supporting earth resource.

Chena cultivation is widely practiced amongst Wannietto. Selection of a suitable land for cultivation was an important factor in determining high production. Sloping land with rock outcrops were avoided as they are highly vulnerable to erosion. Forest lands along rivers and oyas were preserved. Lands where there were fruit bearing trees were not cleared for chena cultivation. As the location of termite hills was a good indicator of high water retention capacity of soils, Wannietto preferred such lands for cultivation.

Traditionally, Wannietto have not lived in permanent dwellings. Even today their housing requirements are minimal. In construction of huts, large trees were not felled, instead branches of trees were cut to obtain their needs. Some of the commonly used species are as follows:

Liniya (Helianthus annuus)
Ehala (Cassia fistula)
Weera (Dryptes sepearia)
Kon (schleichera oleosa)
Wa (Cassia siamea)

The roofs of their dwellings were thatched with Iluk (Imperata cylindrica) grass.

Wannietto were able to find a wide range of naturally produced food items such as yams and plants from the forests. The problem of over exploitation and exceeding carrying capacity did not arise as these vegetables were available in plenty. Wild yams such as Katu-ala (Dioscorea pentaphyll), Gonala (Dioscorea intermedia), Alala, Dubada and Hiran-ala were a good source of carbohydrates. Seed of Hal (Vataria copollifera), Beraliya (Shorea megistophylla), and Madu (Cycas), and the plant heart of Kitul, Indi, Madu, and Thala were ground to flour and used for various preparations. Wild bread fruit and banana are known to have been used from prehistoric times. In addition, a large number of other forest plants such as wood apple, Indi, Weera, Palu, Longan, velvet tamarind, tamarind, donga, timbiri, ulkenda, have been used as fruits.

Herbal plants such as Monerakudumbiya (Vernonia cinerea) and Hulanthala (Ageratum conyzoides) were frequently consumed by Wanniatto.

It is clear that that Wannietto were able to obtain their basic needs from the environment without causing any loss or damage to earth resources.

Sustainable Conservation of Water, Soil and Ecosystems through Landscape Agriculture
Some of the initial design observations of small tank networks have been described as "Cascades" by Prof C. M. Madduma Bandara in 1985. A cascade is defined as a connected series of tanks organized within the meso-catchment of a dry zone landscape, storing, conveying and utilizing water from an ephemeral rivulet (see Figure 1).

Dr. C. R. Panabokke, in a study carried out in 2002, claimed that in an earlier study it had been revealed that 71 river basins located within the dry zone accounted for 15,499 small tanks, some of which are now abandoned, while 90% are clustered as cascades.

It is significant that in the operation of small tank cascade systems, the drainage from paddy fields in the upper tiers of the cascade flowed into downstream tanks for reuse in paddy fields in the lower tiers. The efficient operation of such a system no doubt required a high level of skills in management and co-ordination, because negligence or complacency at any one stage in this delivery chain could have disastrous consequences in the lower reaches of the system.

In a field study in some remote villages of the Anuradhapura District, Dr. M. U. A. Tennakoon (2005) had apparently discovered from village elders that the small tank network systems were well known among themselves as Ellangāwa in these ancient villages. This term had been in common use among residents of many of the ancient village organizations of the Anuradhapura District.

It is therefore clear that land use associated with such small tank cascades also required a profound knowledge of resource management, because the ultimate result is the transformation of a natural system with its diverse and fixed assets into an agro-ecosystem which entails a turnover of resources. This traditional village land use pattern is based essentially on a 3 tier arrangement that comprise the paddy field, the home gardens and the chena, which ensures self-sufficiency in food, and stability of the home economy.

The landscape architecture characteristic in traditional land use had been investigated by Dr. M. U. A. Tennakoon in 1986, who showed how the gravity-guided tank irrigation system, widely practiced in the drought-prone northern dry zone had helped to save field crops from water shortages in ancient times. This land use system had apparently evolved to fit in with the topographical and drainage pattern of the land. Although there may be some variations, in different areas, the ancient village land use system is believed to conform to a basic pattern consisting of 5 broad zones as given below, and illustrated in Figure 2.

1.Zone 1 comprises the main irrigation tank (the nerve centre) formed by throwing an earth dam across a seasonal stream.
2.Zone 2 is the "Old Paddy Field" (Purāna Wela) which consists of the land that lay below in closest proximity to the tank. This paddy field has almost a guaranteed supply of water and manpower, by virtue of its location.
3.Zone 3 represents an expansion of irrigated agriculture beyond the periphery of the Purāna Wela by farmers, where individually owned plots which are generally larger in extent than those in the old paddy fields are cultivated.
4.Zone 4 is situated further away from the tank, where irrigation is almost impossible. A greater part of Zone 4 lies along the sides of the zone 3 Field Blocks, and is home to short grasses, isolated trees as well as shrubs, and hence named as "Parklands".
5.Finally there is the Zone 5 which occupies a large extent of the village land, comprising mainly forest, and is located as a continuous girdle (similar to Zone 4) round the tank.
It must be noted that the cardinal policy objective of Sri Lanka's ancient rulers was to provide all means necessary to produce their own food and nutritional needs by ensuring a bounteous supply of water.

In the maintenance of irrigation structures each Pangukaraya had the specific responsibility to contribute his physical and human resources capability for the repair and maintenance of irrigation streams and canals that served his requirements. In fact water management was generally through rules, regulations, rituals, customs and participation of the community. In tank desiltation, every Pangukaraya was expected to clear a section of the tank bed.

One of the most dominant cultural traditions practiced in the dry zone by the inhabitants of ancient agrarian societies was the ritual known as the 'pot ceremony' or Mutti Mangallaya, a self correcting sustainable agricultural activity practiced in the hydraulic society of Sri Lanka. It is a genuine participatory management system founded on collective conscience, enshrining community based commitments, rights, obligations, and decision making. This ceremony has been studied and reviewed by numerous Sri Lankan and foreign scholars because of its unique and cost effective regulatory process for ecosystem protection, irrigation, water management and organized crop production. This

ceremony continues to be practiced even to this day in some areas of the Anuradhapura and Kurunegala Districts

Indigenous Knowledge in Water Resource Management
The type of irrigation technology that was developed in the hill country, not only enhanced water supplies down-stream, but also contributed to the mitigation of landslides and soil erosion. In the hill country, the hills were utilized as reservoirs' that fed the canals that encircled them along the contours. These canal systems in turn fed the contour terraced rice fields (hel malu) that controlled the supply of water efficiently.

In larger irrigation schemes like the Minipe left bank canal, it was possible to capture the waters of the upper watersheds of many streams that drained the Dumbara (Knuckles) ranges. The adoption of this principle could be seen in several other sites of ancient irrigation works.

Two other forms of indigenous water management practices, and attempts that have been made to adapt them to present situations are reflected in the bethma system, and the harnessing of rain water through a properly managed crop calendar in harmony with the advance of seasons.

With regard to social and cultural aspects of indigenous water management that contributed to promote community spirit and bind the society together, some ceremonies such as mutti mangalya seem to prevail in some rural areas of the Nuwara Kalawiya. However, recent attempts are reviving the Vel Vidane system or këlë koralë and the introduction of Vari Sabha Mandapa had only limited success. Crop diversification on the other hand as a means of increasing water use efficiency and productivity, has demonstrated encouraging results.

Certain forms of traditional land tenure and land use within the purana village setting appear to have become somewhat obsolete in the current day context. The fragmentation and dispersal of paddy plots over the entire yaya as a precaution against various risks such as droughts and damage by wild animals and cattle is considered unsuitable in the present context, and attempts have been made for consolidation into larger individual holdings. Similarly, other arrangements such as kurulu paluwa in the paddy fields and the jala gilma in the upper tank beds and tis bambe near the gangoda had come under increasing pressures due to increasing population and demand for land. The spread of tavalu cultivation in the tank-beds has gradually eliminated the gas gommana that protected the tank from excessive siltation. It appears that the time had come to preserve at least a few traditional village tank systems that still retain such sustainable elements for the benefit of the rural population.

The ancient water and soil conversation systems of Sri Lanka are classic examples of man's active adaptation to nature. They include river diversion systems and storage systems, themselves consisting of small, medium and large reservoirs. A third item called vettiya has also been identified as having an unique dual function of both diversion and storage. These systems had been constructed over a long period of time, beginning in about the mid first millennium BC.

D. L. O. Mendis claims that the proven stability and sustainability of these ancient water and soil conservation ecosystems over many centuries has been considered to have evolved based on the following seven stage hypothesis.

1.Rain-fed agriculture
2.Seasonal or temporary river diversion using sticks and stones to build river diversion structures, in order to assist, or take advantage of the natural seasonal flooding of a river, for flood or inundation irrigation agriculture on river banks.
3.Permanent river diversion and channel irrigation systems, using permanent diversion structures made of stone and brick masonry, sited on good rock foundations.
4.Construction and operation of weirs and spillways on contour channels using technology similar to that necessary for construction of permanent river diversion structures.
5.Invention of the sluice (sorowwa) with its access tower (bisokotuwa) based on the experience of operation of weirs and spillways on contour channels.
6.Construction of storage reservoirs incorporating the sluice for control and issue of irrigation water to the fields.
7.Damming perennial rivers, using the sluice for temporary river diversion during river closure, or by the twin tank method.

Another important consideration is the ancient earth embankment without a sluice, and with its

ends curved in the downstream direction, which had been mistakenly considered as breached, or as abandoned small tanks on topo-sheets. According to D. L. O. Mendis, a large number of these found in Southern Sri Lanka are called Vetiyas by local peasants, and are now recognized as unique water and soil conservation devices, with both diversion and storage functions, the latter in the soil itself, not on the surface as in small tanks. The small tank is stable and sustainable with a drought resisting capability of a large reservoir to augment it. The ancient vetiya, with its dual function, like the electron, in maintaining the water table, is scientific in modern forms. Vetiyas, small tanks, and small river diversion structures called amuna or anicut, together make up micro water and soil conservation ecosystems, while large reservoirs and channels constitute macro ecosystems.

Yet another marvel in soil and water conservation was the idea of King Dhatusena, who conceived the idea in the 5th Century AD, of forming a massive lake by throwing back the waters of the Kala Oya with an embankment which submerged 300 square miles of its watershed, and consequently joining Kalawewa and Balaluwewa together. This embankment is said to comprise a stupendous spill made of hammered granite, excellently dressed and flattened at the crest, with an intervening bund in the low land between the Kalawewa and Balaluwewa, allowing for the exit of flood waters.

The King it is said ensured that the water from this large lake would ultimately be carried in a giant canal 40 feet wide, the Yoda Ela, a distance of 54 miles to Anuradhapura to feed the city tanks. This canal also known as Jaya-ganga, meanders over the first 17miles at an unbelievable gradient of no more than 6 inches per mile. Thereafter it is led into deep gorges across saddles between watersheds flowing gently along the surface of the terrain bordering the traditionally preserved thick jungle corridors, drawing rain water and the flood waters of small streams.

Thus apart from the technological ingenuity of this complex hydraulic system, it conforms and measures up to the best principles of ecology, soil conservation, and water management, whereby the canal, apart from conveying the surplus water from the reservoir system and the flood waters of the cross streams, scientifically taps and drains optimally the precious resource from the sub-soil springs of the surrounding micro-climatic ecosystem, while also ensuring least loss of water through surface evaporation. It is the traditional wisdom and knowledge system of our fore-bearers that ensured the performance of such a multiplicity of functions by the ancient reservoirs and canal networks, that continues to baffle the present day environmentalists, engineers, scientists, and development planners, many of whom have been the unfortunate participants and witnesses to the tragic mistakes of modern times.

Mr M. Asoka T. De Silva
6/9, De Silva Road,
Kalubowila,
Dehiwela

SAND – AN ENDANGERED EARTH RESOURCE

Sand is a resource that seems to be in infinite supply. We cannot do without it, but if we use less sand, we might stop this precious resources from slipping through our fingers.

Between 60 and 75 percent of the sand we mine goes to make concrete. It is cheap, which is why we use twice as much of it as all other building materials combined.

Dredging sand from the sea floor stirs up a soup of particles. When the sediment settles, it blankets coral reefs and plants, stopping them feeding and photosynthesizing.

Sand mining has degraded marshes in south-east Brazil, an important habitat for the critically endangered Sao Paulo marsh antwren.

The impact of the 2004 Indian Ocean Tsunami would have been less severe in Sri Lanka, if not for the removal of dunes that would have protected the coast.

Boats transporting sand may also carry invasive species like the Asian clam, while sand pirates have harvested so much from islands in Indonesia that at least 24 of them have disappeared.

The solution is to decrease our need for sand. We may need to change the way we build: a new wave of architecture might change that.