



Winston Churchill Travelling Fellowship

Traditional Water Management in Sri Lanka & its relevance to the UK for Climate Change

Report to Trust

Trevor Turpin, Fellow 2006



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Rock carving at Isurumuni Monastery, Tissa Wewa, Anuradhapura thought to → represent the guardian deity of irrigation tanks.



← Cover photo: the seven-headed Cobra, the guardian of water in Sri Lankan culture (at sluice at Uda Walawe)



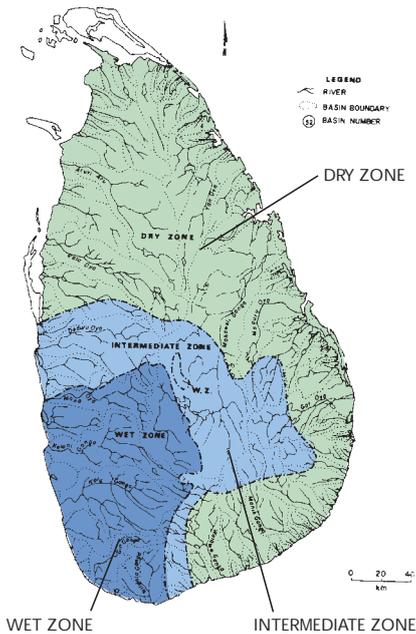
**“I look forward to the day when the Nile will pass through smiling countries and perish before reaching the sea”
Winston Churchill 1898**

Preface

This study was sponsored by the Winston Churchill Memorial Trust who invited applications in 2005 from prospective Fellows in the field of water workers. The study proposal suggested that, in a time of worldwide climate change, there may be lessons to be learned for the UK from traditional systems developed in Sri Lanka to deal with alternating periods of monsoon rains and drought. Following desk research in UK, a visit was made in July and August 2006 to various locations in Sri Lanka to observe the systems in current and proposed future use. This report records the findings of the study and considers the application for the UK and reports the achievements to date and further opportunities arising from the Fellowship (in accordance with WCMT requirements, this report is limited to 20 pages in length).



1 Introduction



Sri Lanka dry/wet zones

From previous visits and research, I had become aware of the use of the tank system in Sri Lanka and wondered if it may have an application in the UK in a time of climate change. There are many similarities between Sri Lanka and the UK: Sri Lanka is half the size of England in area with the same density of population; it has a respected natural and cultural heritage with national parks and World Heritage Sites, which in turn act as a constraint on the inevitable development pressures; finally, they are both islands!

The island has a south-central mountain range to 7-8000ft which influences the island's climate: the south west wind prevails from May to September and, as it meets the high ground, monsoon precipitation occurs reaching 200ins on the mountain slopes. From October to January the wind blows from the north east over the Bay of Bengal and results in the monsoon in the plains of the north during these months with an average rainfall of 50-75ins. Thus there is a wet zone to the south and central part of the island, and a dry zone in the north and south-east where the people initially settled. They therefore had to overcome the twin challenges of drought and monsoon in order to survive and thrive.

There is not a water shortage in Sri Lanka but, in a monsoon climate, the challenge is to manage the available water – a task which is increasingly facing the UK. My plan therefore was to see what we could learn from Sri Lanka. In the twelfth century, King Parakrama (1153 – 86) had said:

“Not a single drop of water received from rain should be allowed to escape into the sea without being utilised for human benefit”

In this respect there was even a similarity between his thinking and that of Churchill.



2 Climate change in the UK

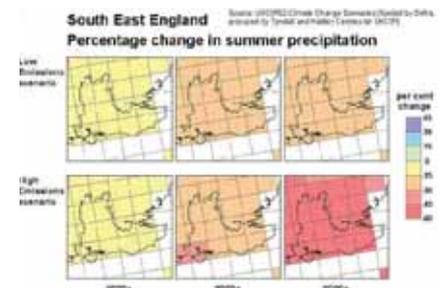
In the development area of the south east of England, the region is becoming warmer and by the 2050s average temperatures are predicted to rise by 3.5°C in summer. These high summer temperatures are becoming more frequent and very cold winters are becoming increasingly rare. (Average annual temperature may rise by 3.0°C). Warming is likely to be greatest in south-east where temperatures are predicted to rise by 5.0°C by the 2080s (1). Winters are becoming wetter (5-30% increase to be expected by 2050s) whilst summers are becoming drier (15-60% decrease by 2050s). Sea levels in the region (coupled with sinking land levels) may rise by as much as 1m by the 2080s resulting in almost continuous operation of flood defences such as the Thames Barrier to protect London. This will result in increase in insurance costs particularly in vulnerable geographic areas or economic sectors. The loss of particular habitats will naturally occur but the longer growing season may provide the opportunity for the introduction of 'novel' agricultural crops.

Development pressure is particularly focussed in the UK on the South East of England (Thames Gateway, Ashford odpm)(SEEDA) in precisely the area likely to be challenged by overall less rainfall and hotter drier summers. Hosepipe bans were introduced throughout the region in 2006 and remain in place in the Thames Water area and much of Kent, Surrey and Sussex. In July 2006, daily temperatures were some 2-3°C higher in London than in Colombo.

Following the lack of universal commitment to the Kyoto Protocol to the UN Convention on Climate Change (notable exceptions are the US and Australia), the ex Vice President of the United States, Al Gore, produced "An Inconvenient Truth" about the threat of global warming. This is on worldwide release and, indicative of the concern felt by a sizable proportion of the viewing public, by August 2006 became the 4th highest grossing documentary of all time. In 2005, the UK Government commissioned the Stern Review on the economics of climate change, which, among other conclusions in its Report of November 2006, reviewed the options adapting to a changing climate. Whilst the Review's focus was on measures to arrest global warming, Frances Cairncross, President of the Association for the Advancement of Science stressed at the annual meeting of the Association in September 2006, the need to adopt policies to adapt to a warmer Britain and, most importantly stimulating an understanding of such issues in schools. Measures would need to include flood defences, new crops and building controls and standards.



Environment Agency drought and hose pipe bans map



Environment Agency Thames region climate change in the South East



3 The Emergence of Water Management Systems in Sri Lanka



Basawakkulam Tank

Tradition has it that the Indo-Aryan colonisation of Sri Lanka began in the sixth century bce when a North Indian prince, Vijaya, arrived with his followers. He formed an alliance with a local princess and was crowned the first king of the island. It is likely that in fact he was just one of numerous travellers from southern India making the narrow crossing between India and Sri Lanka. It is certain that these settlers would have grown rice and were familiar with the shallow reservoirs formed by low embankments in use in South India (2). The first documented construction of a reservoir is from the early fourth century bce built by Prince Anuradha in Anuradhapura still in existence and known as the Basawakkulam tank of some 120 ha.

The formal systems

Anuradhapura



Royal Bathing Pond

The second tank to be built at Anuradhapura was the 160 ha Tissa Wewa created by King Tissa in the 3rd century bce, which fed the Royal Pleasure Gardens. A system of canals, conduits and channels link the reservoir to the bathing ponds in the gardens where the king and queen would bathe. The reservoir is fed from the river 37 miles away by a channel that has a gradient of 1 inch/mile. The channels feeding the ponds are sinuous with settlement chambers which allow sediment to be removed before entering the ponds.

Other ponds around this ancient city include the Elephant Pond and the Twin Ponds. These were both for the monks to bathe and date from 7-800 AD. They are both fed from the tanks and decoration includes the 5 headed cobra found throughout Sri Lanka which is reputed to ensure a constant supply of water. After the bathing ponds, the water overflows to fields for irrigation which include onions, aubergines, corn as well as rice. Before some of these ponds were restored during the 20th century they appeared even more remarkable than they do today: 'there is something very weird about these remnants of ancient luxury hidden in the lonely forest' (3)

Around Anuradhapura I also saw a number of ancient urinals or bidets. They have decorated platforms set above 3 clay pots buried one on top of the next. The pots are about 2 ft in diameter and are filled with sand, lime and charcoal to purify the water before it soaks into the ground.

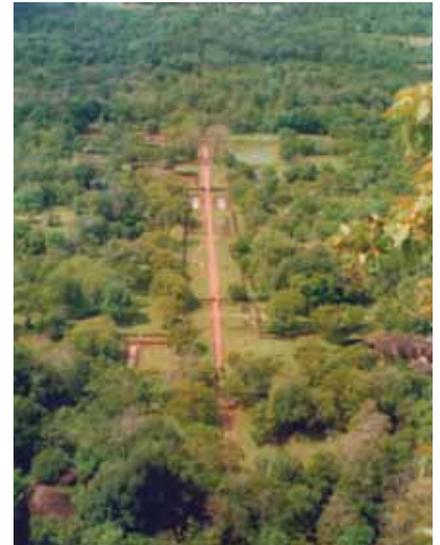


Urinal



Sigiriya

After the fall of King Dhatusena of Anuradhapura in 477AD his son Kasyapa built a rock fortress at Sigiriya. The approach to the granite rock (the Lion Rock) is surrounded by inner and outer moats and formal water gardens; water is fed by underground and surface drainage systems from elevated tanks during the rainy season, to form water spouts and fountains. On the top of the 200m high rock is a 25m square pond hewn out of the rock for water storage. The water gardens themselves were used for bathing by the various members of the King's court. The Fountain Garden has two long ponds with stepped sides fed by shallow serpentine streams paved with marble. These serpentine streams are punctuated by fountains consisting of circular limestone plates with perforations. They are fed by underground water conduits and operate by gravity and pressure. Water for the town was stored in the Sigiriya Wewa.

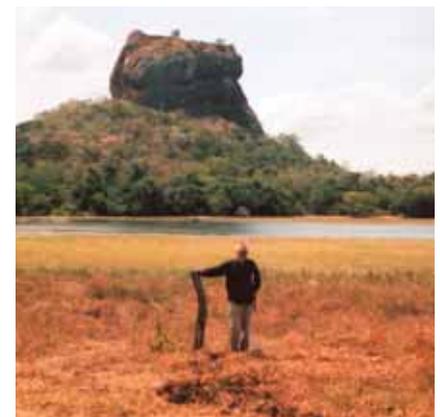


Sigiriya - formal water system

Polonnaruwa

Polonnaruwa became the capital of Sri Lanka after the destruction of Anuradhapura in 11th century but only lasted as a capital until the 12th century. It was fortified by King Parakrama and linked the existing reservoirs to create his 'sea' or samudra. Apart from seeing the various temples and other historic buildings, the principal purpose of this visit was to see this remarkable reservoir which covers 2500ha. Its bund is 12m high and is 13.67km long; it irrigates an area of 28sqmiles of paddy. The embankment required 4.6 million cu.m of fill which remained a world record until 1912 when the Gatun Dam was built for the Panama Canal. (7)

The reservoir was restored by the British in the 19th century when a new sluice was provided.



Sigiriya wewa

When all else fails...

The annual festival of the Esala month (July/August) held in Kandy at the end of the drought period is marked by a procession, the Perahera. This is a rain-making festival held in honour of the Buddha's Sacred Tooth Relic which Buddhists believe has the power to cause rain. (It is held in Kandy since this was the last royal capital before the British occupation – after which, in 1815, the capital was moved to Colombo). The Tooth Relic is kept in the Temple next to the banks of the Tank,



Parakrama sluice





Pera hera elephants

the Nuvara Veva, built by the last king of Kandy, Sri Wickrama Rajasinghe. It was constructed in 1810-12 by the damming of a stream which ran through the marshes that skirted the town. The Perahera is held on 10 successive nights and culminates in the morning of the fullmoon day of Esala. The pageant symbolises rain: it is led by whip-crackers representing the sound of thunder, followed by the torch bearers and fire jugglers, symbolising lightning and finally by elephants who are the rain clouds. It is a magnificent ceremony and the whole procession takes at least two hours to pass.

On the morning of the fullmoon day, lay-priests 'cut' the water of the Mahaweli Ganga and then return to the Temple with caskets of fresh water. Buddhists believe that it rains on the day of this water-cutting ceremony and, after the first three weeks of the Fellowship in the dry heat, that morning it rained for some five hours non stop! The Pali line, 'devo vassatu kalena (may gods give rain in due season) is recited everyday. The word devo can mean either god or rain cloud and for people engaged in agriculture is there a god higher than a rain cloud? (4)

The Tank Systems

The rural life was made possible at this time by conserving rain in artificial ponds and by creating stone dams across rivers or streams and leading the water along channels to the fields under cultivation. There are innumerable examples of these village tanks still irrigating fields below their embankments by gravity distribution. The Topographical Survey of Ceylon 1904, recorded 11,200 in Anuradhapura District and Northern Province alone.

They were called wewa (Sinhala) or kulam (Tamil). The Portuguese had referred to them as tanques meaning lakelets but the British converted this term to the inelegant word 'tank' which does little justice to these beautiful waterbodies.(2) The bunds (we-kanda in Sinhala) were grass covered earth banks from 1/8th to half mile long, 12-14ft high with 1:2 slopes. There is a freeboard of a few feet which is maintained by a spillway - vaan - generally sited at one end of the bund and the impounded water is conducted to the fields by a channel or ela running from an outlet taken under the bund, called a horowwa. Acknowledging that the first reservoirs were created in the Euphrates valley some 4000 years BC, Brohier maintains that it was only in Sri Lanka



10000 tanks in Anuradhapura



that the fusion of Babylonian and Egyptian patterns took place(2). In the first century AD, the small village tank progressed to the major tank created by the cooperation of several villages for their construction and maintenance.

The weaknesses of the village tanks were that, in times of heavy rainfall, water would overwhelm the bunds and cause a breach and consequent flooding, and, secondly that in dry weather up to half the capacity would be lost to evaporation. By the first century AD, the move away from these small tanks is recorded: deeper valleys were selected for the siting of tanks, the bunds were up to 30ft in height and up to a mile long. The shoreline rose to 3 miles and the cultivable area increased from 50 acres to over 500. However, by the third century AD the bunds were 50ft high and, as in the case of the Minneriya tank which has remained in existence to this day, submerged 4000 acres, could irrigate 6000 acres and would still be capable of irrigation supply after an absence of rain for 2 years. The land beneath the embankment was divided among the people according to a complex system but resulted in farmers' sharing the best and worst land equally.

The zenith of tank building was reached in the twelfth century. King Parakrama enlarged many existing tanks and at Polonnaruwa created the Parakrama Samudra with a dam 9 miles long, 50ft high and covering 5000 acres. It is estimated that with an earthwork of some 4.5 million cu.yds, it would have taken 1000 men 12 years, working 24hrs a day to complete. (2) It was the dual role of the rulers to first provide temples for the spiritual welfare of the people and then to create reservoirs for the growing of rice and vegetables.

After Parakrama's death in 1186, invasion from southern India led to Polonnaruwa being abandoned in 1214 AD and the seat of government moved around the country until settling in Kandy in the 1350s. The tank system was no longer maintained and was largely disused even during the period of Portuguese occupation from the 16th century. When the Dutch East India Co. arrived in the mid 17th century they attempted to resurrect the production of paddy – in order to benefit from their 10% taxation. The British again allowed the systems to fall into disuse until Sir Henry Ward became Governor in 1856 since when the tank systems have been maintained and developed.



4 The Current systems



Uda Walawe Dam

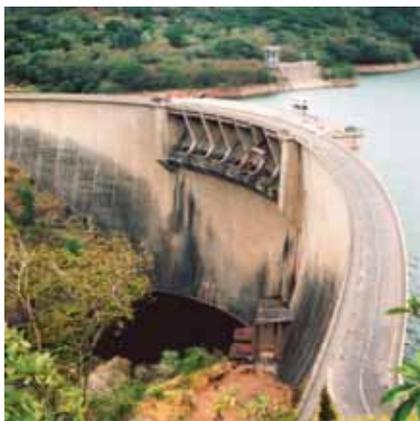
I visited a number of systems from traditional to modern to see how they had developed and were operated. It was not my aim to understand the complexities of current day water distribution in Sri Lanka but rather to study the extant traditional systems.

Walawe

In the south of the country the Walawe river basin covers an area of some 2400 sq km from the central highlands to its mouth near Hambantota on the south coast of Sri Lanka. Hundreds of small irrigation tanks constructed in ancient times are scattered throughout the catchment. In the early 1960s the government decided to develop the basin for irrigation and hydropower and in 1963 started the construction of the Uda Walawe dam, completed in 1976.

There was intense debate about this scheme and some (eg D L O Mendis) maintain that it was a) built in the wrong place and did not exploit the catchment potential and b) destroyed many local tanks and irrigation systems. His view (pers comm. 17/8/06) is that, if it had been constructed further upstream the existing systems could have been retained, increasing the areas available for paddy and other field crops. (the Left Bank extension project, representing the future of water management in Sri Lanka is described in Section 5).

Mahaweli – Victoria Dam



Victoria Dam

In the 1980s, based on advice and studies by British engineers, the Victoria Dam was built. It is a concrete arch dam 122m high and 507m along its crest. It was opened by Mrs Thatcher in 1985. This created the Victoria Reservoir which flooded the Mahaweli ganga valley requiring the relocation of 80,000 villagers and the loss of fertile bottom valley land. This was also a controversial scheme and representations were made to the World Commission on Dams during their investigations during 1999/2000. The Commission concluded that no more schemes should be promoted that had the effects on the environment caused by Victoria: loss of Victoria Falls with too much of the water being taken for energy with no overflow resulting in the virtual disappearance of the river. However the stored water is used for the generation by hydropower of 40% of Sri Lanka's total energy requirements. The water is then discharged downstream where it is fed to other reservoirs in the Mahaweli system for wider distribution in the north of Sri Lanka for treatment and potable use.



I met with Chief Engineer, Mr Aruppola, and discussed the performance and effects of the dam. He then arranged for me to be shown the dam, its galleries and spillways by his staff.

Parakrama Samudra

The Parakrama Samudra built in the 12th century has been provided with a modern sluice system to protect the embankment and to control flooding. It still works in the way originally intended – to store water during the rainy season and to provide water for crops during the dry season.

Matale

This town of some 80000 people lies in central Sri Lanka between the wet and dry zones on the main road from Dambulla to Kandy. I was the guest of Mr Zafarullah, Member of the Municipal Council, and the Vice Mayor Mr Jayasekara. The drinking water supply for the town is a fairly conventional 1970s system: water is abstracted from the river upstream treated at the treatment works (settlement, flocculation using alum) and then pumped to the service reservoir for distribution to the town. Drinking quality water was first provided to the whole population in the 1980s at a cost per cum.

However the poorest people are also able to use the public baths free of charge for washing and bathing. These are what interested me and Mr Zafarullah (a member of the International Water History Association) most. They are fed by natural good quality springs but unfortunately the facilities for the users (segregated men/women) are rudimentary. The Council is seeking funds to provide changing and drying facilities and I have subsequently approached Wateraid in the UK to see if they can help (see Section 7).

Kandalama

Similar to Parakrama Samudra, the region around Dambulla is served by a number of large tanks and canals which have been developed from the ancient systems. Of particular interest was Kandalama Tank (wewa) which was developed in 1951, shallowly submerging and extending some ancient tanks. The water is led via canals to irrigation systems where paddy and vegetables are grown.



Matale Water Treatment works



Women bathing, Matale



Kandalama Tank





Mr Sumanajith with Mr Bandaranayake and village wellvidane at Alistan wewa

Anuradhapura

The area around Anuradhapura has an intense concentration of the cascade system of tanks and I visited several with Dr Bandaranayake and Mr Sumanajith from the Department of Geography at Sri Jawadanapura University. Typical is the Alistan wewa which was restored in 1971 and provides irrigation sufficient for two cultivating seasons per year. 85 village families are supported by this shallow tank which has a dam 1 mile long and contains 40 acre/feet water. They grow paddy and soya beans. Cultivation meetings are held twice a year when the Agrarian Research Officer advises on the area of land that can be irrigated. One villager - the wellvidane - appointed by the village, operates the sluice. The tank is used for bathing, washing and animal husbandary as well as irrigation (drinking water is supplied from the Mahaweli scheme - see above).



Perryakulum Tank

The dam construction is quite simple with no constructed core - it comprises alternate layers of clay and clay/sand. Typically small tanks are 3 acres in area and irrigate 8 acres. We also saw the Pansala wewa tank at Maradankadawala whose bunds were being repaired and raised by 1 foot using local clay.

While in this area we also visited the 10th century Nachchaduwa Tank which stores water from the Malwath Oya which feeds Anuradhapura. This was restored in 1906.



Bund restorers at Pansala wewa



5 The future in Sri Lanka

Water management in Sri Lanka is exemplified by the Uda Walawe Left Bank Irrigation Upgrading and Extension Project. As noted in section 4 above, the right bank of the catchment was developed in the 1970s and 80s following the construction of the Uda Walawe Dam and irrigation works in 1967.

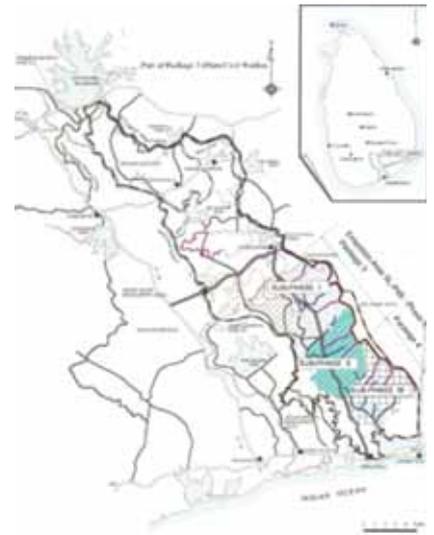
The left bank was only partially developed but, in 1996, infrastructure development providing a new spine road and drinking water supply to the town of Sooriyawewa was completed. This provided the impetus for further development of the southern part of the Left Bank area. Detailed design had started in 1995 and construction of Phase I was completed in 2001. Phase II started in 2000 and it was this development that I was able to see in progress.

The settlements covered by the Left Bank are some 12,000 ha of which 5000 ha is to be brought under irrigation and agriculture on completion. There are 22 ancient cascade tanks in this part of the catchment and they will be reinstated by MASL and connected to the main canal system.

The aims of the scheme are to increase income and improve the living standards of farmers. This is to be achieved through the provision of:

- irrigable land for the landless;
- increasing agricultural production (OFC and paddy);
- social infrastructure (schools, health and community facilities, housing, electricity);
- environmental conservation measures;
- marketing facilities for products.

I met with Mr Navaratne, the MASL Project Director for Uda Walawe Left Bank, at the Public Building at Sooriyawewa where there was a great deal of activity – it clearly acts as a centre for the community with both design work being undertaken by the project team in tandem with the local people – there were also childrens' classes and other social support offices – a real hive of activity. After a presentation by one of his officers on remote water level monitoring, we had lunch with the project team of some ten engineers, scientists and planners at which I explained the purpose of my visit. After lunch a small team answered my questions relating to the project.



Map Location of Uda Walawe
Catchment Left Bank



One of the new small tanks at Uda
Walawe Left Bank





Sluice of reinstated tank Uda Walawe



Weald hammer pond



Chartwell



Apart from the large tanks being reinstated as part of the scheme (some 22 no.) a series of high level small storage tanks (45 no.) are being provided. These are relatively shallow (1 m) and 5 – 10,000 m² in surface area.

12 small villages are being developed in the extension zone settling 5800 farming families.

6 Application to the UK

As Frances Cairncross said in her address to the British Association for the Advancement of Science in November 2006, while we have to try to reverse climate change, the fact is that it is already upon us and we have to learn to live with it. This means adjusting our lifestyle and, in the context of water, learn to conserve and distribute as appropriate to changing rainfall and temperature patterns. The systems developed over thousands of years in Sri Lanka – where water is plentiful and seasonal – would be eminently applicable to the UK's situation. To implement them however would mean various obstacles would have to be overcome. Foremost amongst these would be the existing planning UK system and the resistance to change particularly in the so-called (given the level of development, I have to remain sceptical) highly valued landscapes of Kent and Sussex. There is no easy answer to this – while the climate may change, views may remain entrenched – the prospect of 1000s of tanks across the Weald does not seem very likely. One thought to explore further is that a tank system may be replicated by the reinstatement of the old hammer ponds for the Tudor iron workings in the Weald.

It may be that the National Trust or other landowners may be receptive to the thought – this is to be pursued. Perhaps even Chartwell or a similar stately home in the care of the National Trust may be a site for a demonstration project using the ornamental ponds for storage and irrigation.

A second issue would be one of promotion. Who would take the initiative to develop systems to combat the effects of climate change? In Sri Lanka the Mahaweli Authority has become a planner, initiator, engineer and operator. In UK it may be that joint initiatives – supported by central Government – would have to be explored by local authorities, the Environment Agency and

water companies.

However, achieving planning consent for large scale reservoir schemes is notoriously difficult and taking 25 years from concept stage to realisation is not unusual. Such smaller scale projects as utilised in Sri Lanka should be far easier to achieve. Lastly would be the issue of management and maintenance. Traditionally local authorities in UK have resisted the adoption of flood alleviation ponds required of developers. This would have to be addressed but the Sri Lankan model seems to work – the local people identify the need, the government constructs the system and then the local people operate (ie distribute water according to availability and need) and maintain the tank bunds. In conclusion, much can be done but the political will is required.

7 Fellowship achievements and future opportunities

The most immediate outcome was one of personal discovery – living with the people of Sri Lanka and observing and participating in their culture and customs. Particularly rewarding was the opportunity to engage with people of similar interests; frustrations (eg broken appointments or lack of success in meeting people or contacts) had to be met and overcome but the unexpected meetings and opportunities more than compensated for this.

Before my trip I met with Natasha Barker (SEP) who was undertaking a water workers fellowship and lives in Bath; this was of mutual benefit in terms of support and shared experiences. After my visit I met with Ian Hope of the Environment Agency at the British Dam Society at Durham which may be of professional benefit so I feel I have gained new friends and colleagues.

As a result of the meetings with Dr Bandarayanake at Sri Jayawardanapura University we have a joint poster paper accepted for the biennial conference of the IWHA at Tampere in Finland in June 2007. I have asked a recent graduate colleague to join with us in this paper so that she will also gain experience of research and writing.

Articles in the local press and in *The Environmentalist* have helped spread the word about the Trust as well as the issue of Climate Change and issues in Sri Lanka. I have also approached



Wateraid to see if funds could be found for the improvement of the washing facilities and bathing at Matale. The response has not been encouraging so I have personally contacted the CEO of Wessex Water (Colin Skellett, Churchill Fellow of 1983) to see if there may be alternative funds and options. This was most positive and if Wateraid is not forthcoming then I plan to raise money through a local appeal.

Of longer term UK benefit was the opportunity to assist with the future leaders' trip to Malaysia organised by Clarendon School, Trowbridge. The International Student Leadership Programme has been running for two years and is a programme to develop gifted and talented young people from Wiltshire into international leaders of the future. Students work as teams on a global issue, working with e-mentors and propose possible solutions. The organiser, Maureen Nitek, heard about my trip and asked me if I would talk to the students before their journey and act as an e-mentor during their visit in November 2006. I spent an afternoon with about 20 16-17 year old students and talked about my experiences and about the issue of climate change. They responded so well to this that they decided to make climate change their topic for study and presentation in Kuala Lumpur. Dr Nitek was delighted with their performance – they rose to the challenge and kept referring to what Dr Trevor had told them!



Article in Wiltshire Times (Trevor Turpin circled)

Finally, I hope that through the publicity, papers and articles and presentations I will encourage others to take up the thought that the methods of dealing with water surplus and shortage in Sri Lanka may indeed be applicable to the UK.



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Glossary

Anicut: dam, dyke or embankment

Ara (or aru): a stream

Bisokotuwa: sluice leading from the upstream side of the bund to the fields below the tank

Chena: patch of jungle cleared by burning and felling and cultivated for vegetables. Used for a number of years and then allowed to regain fertility

Ela: brook, rivulet, channel

Ganga: large river (perennial)

Kulam (Tamil): tank

Oya: small river (non perennial)

Pokuna: a stone built bath

Relapana: wave breaker – stone revetments on inner surface of bund to protect from erosion

Samudra: sea

Tank: artificial reservoir built in valleys to hold up rainwater or water led into it from a river by means of a canal (from Portuguese tanque)

Tekkam: weir built across river to form artificial channel

Vana: spillway of tank or canal

Wewa (or wawa,veva): tank or reservoir



Diary

Saturday 15 July	train to Heathrow Booking clerk: "Single? Wont you be coming back within one month?" This is the first time in over 30 years when I have been able to answer "No!" –this really is 'The Chance of a Lifetime'
Sunday 16 July	arrive Colombo and stay at Galle Face Hotel, where I believe Churchill stayed (but sadly not the Commonwealth Suite that he would've stayed in! – which has a photo of Churchill 'The Man at the Helm')
Monday 17 July	visit British High Commission to register residence. No Cultural Section that I thought might have had an interest in my fellowship. Arranging visits and meetings for duration of stay.
Tuesday 18 July	visit British Council – again no interest in using visit for publicity purposes 'its very difficult'. (further arrangements)
Wednesday 19 July	visit to Sri Jaywardenapura University, Colombo where Geography Dept has interest in traditional water management. Meeting with Head of Dept and colleagues and offered use of their library and facilities. Visit to Mahaweli Authority and meet with Director Special Projects who suggests visit to south of island.
Thursday 20 July	follow up to meetings: faxes thanking for assistance, suggesting dates for field visits, suggesting joint paper for conference with University and press release for MASL.
Friday 21 July	Field trips all arranged, but little success in meeting with contact at IWMI. Rearrangement of accommodation and travel plans in order to visit MASL in south.
Saturday 22 July	Visit to Colombo bookshops and purchased titles recommended by university. Prepared press release for MASL.
Sunday 23 July	reading new books and began editing my own book 'Dam' for publisher
Monday 24 July	Train from Fort Station, Colombo to Anuradhapura – 6 hour journey from coconut and date palm groves and vegetable crops to paddy fields. Stay at British Governor's Residence built in 1879, now small hotel.
Tuesday 25 July	Met Mr Bandara, my guide to the ancient city for my stay and visited Royal Pleasure Gardens fed by Tissawewa reservoir 3rd century bce



Wednesday 26 July	Visit Elephant Pool and Twin Ponds
Thursday 27 July	visit Stone Bridge and saw cropping systems; visit to Archaeological Museum
Friday 28 July	visit Mihintale 16km from Anuradhapura; climb rock and have great feel for surrounding countryside; visit both tanks in ancient city
Saturday 29 July	Field visit with SJ University to cascade tank systems south of Anuradhapura; meetings with farmers, sluice operators and President of Farmers' Association. Visit Nachamaduwa Tank built in 900 and restored by British 1906.
Sunday 30 July	Field visit to Pansalawewa Tank at Maradankadawala – being repaired and have meeting with contractors – using British made mamoty tools. Continue on to Dambulla.(2 hr drive)
Monday 31 July	Staying at eco-hotel on banks of Kandalama Tank and adjacent to primary rain forest (built 1994).
Tuesday 1 August	completed my revisions of Dam. Tried unsuccessfully to make contact with academic staff at Peradeniya Univeristy in Kandy
Wednesday 2 August	rest/reading
Thursday 3 August	sent suggested changes to Dam to publisher. Wildlife trek in rainforest with ranger and visit traditional mud houses.
Friday 4 August	Visit to Sigiriya 5th century capital of Sri Lanka – water systems for landscaped gardens, moats and defences. Return via Sigiriya Wewa and Kandalama Wewa created in 1951 as part of Mahaweli H project; sluices and crops.
Saturday 5 August	drafted abstract for IWHA paper with Dr Bandaranayake; began WCMT report
Sunday 6 August	Visit to Pollonnuruwa and Parakrama Samudra 12th century tank
Monday 7 August	prepared presentation to SJ University on eia; WCMT report. Elephant ride and washing
Tuesday 8 August	Dr B accepted draft for joint paper and proposed lecture dates; reading



Wednesday 9 August	to Kandy via Matale (4hrs drive) for perahera in evening
Thursday 10 August	monsoon after perahera (rain ceremony); Kandy tank
Friday 11 August	Kandy bookshop; Prince of Wales fountain
Saturday 12 August	Matale Mr Zafarullah, Municipal Council: water treatment works, service reservoir and natural spring bathing pools. Return by train
Sunday 13 August	monsoon all day; WCMT report
Monday 14 August	Mahaweli Authority, Kandy. Meeting with Dep. Director (M&E) and visit to Victoria Dam (now closed to public for security)
Tuesday 15 August	to Embilipitiya for Mahaweli Project office (6 hrs by road). Uda Walawe Left Bank project visit - wild elephants (overnight Tangulla)
Wednesday 16 August	to Matara for train to Colombo (5 hrs) scenes of tsunami destruction along coast 18mths after event
Thursday 17 August	visit to Mr D L O Mendis, author and ex Irrigation Planning Dept, 4 hr discussion and lunch (SJ University on vacation so lecture cancelled)
Friday 18 August	re-visit to Mahaweli Special Projects Director, review of tour and provision of further data. Press release approved but further details inc impressions/conclusions to be included. Contact with IWMI.
Saturday 19 August	depart Colombo for London/arrive London



The author

Dr Trevor Turpin is an environmental consultant with over 30 years' experience of environmental management in the UK and overseas. He is a Fellow of the Chartered Institution of Water and Environmental Management and the Institute of Environmental Management & Assessment for which he serves on the Technical Standards Committee. He wrote his doctoral thesis on the environmental effects of dams in the UK. He has published numerous papers on environmental management in particular on the environmental effects of dams and reservoirs and is the author of *Dam* (Reaktion Books) to be published in 2007 and is co-author of the *Environmental Impact Assessment Handbook* (Thomas Telford 2002, 2003). In 2006 he was awarded a Winston Churchill Memorial Trust Travelling Fellowship.



At leisure at Kandalama Tank - washing an elephant

Acknowledgements

To my sponsors the Winston Churchill Memorial Trust for their financial and administrative support without which this study would not have been possible. Also to the many people in Sri Lanka, who I met during the course of the study, for their kind assistance in facilitating the field and desk research; (so many people have helped me that they are too numerous to mention here but are referenced and listed in the report). However, I owe a particular debt to Mr Ravi Fernando of MASL who not only facilitated my visits to the various sites of the Mahaweli Authority but also supported my visa application. I was very grateful to Dr G Bandaranayake who is a national expert on the traditional cascade systems of Sri Lanka and who was especially enthusiastic about my study and arranged and accompanied me on a number of field trips. I am also grateful to my employers, Nicholas Pearson Associates, for allowing me to be away from the office for the duration of the field trip; finally to Barbara Carroll and Christopher Pound who encouraged me to apply for the Fellowship.



Publicity

Wiltshire Times Series

www.wiltshiretimes.co.uk

FRIDAY, 11 MARCH 2006

Sri Lanka may hold key to coping with climate change

By Craig Evry

WITH global warming threatening to bring a monsoon climate to the United Kingdom, a Bradford on Avon man is travelling to Asia to find out how our water systems would cope if the predictions come true.

Dr Trevor Turpin, 59, of Avoncliff, will travel to Sri Lanka later this year to see how the islanders cope with monsoon conditions using 2,000-year-old water management systems.

He has been awarded a bursary through the Winston Churchill fellowship scheme to study Sri Lankan water management systems and see how the UK could adapt if global warming predictions come true.

The storm deluge which devastated the Cornish town of Boscastle in 2004 has led to an increased need to examine how the UK would cope if violent storms and flooding became the norm.

Dr Turpin, an environmental planner with Nicholas Pearson, was awarded £3,500 for his five-six week trip, which will include meetings with water board officials in Colombo.

He said: "I am concerned there is going to be a change



The flood devastation in Boscastle in 2004

in climate and if we can implement methods of mitigating by design or management through our water systems, that might be of interest to the Environment Agency and local authorities.

"Water companies in the UK are concerned about climate change and the Environment Agency is worried as far as flooding is concerned.

"Sri Lanka is about the same size as England and the population density is about the same.

"There is a sensitivity to the environment as there is here. They have very dry periods and the predictions is we will have too. But there will also be the storm events, like in Boscastle."



Dr Trevor Turpin is travelling to Sri Lanka to study how the country copes with a monsoon climate (31579/2)

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Trevor on mission to halt global warming

By Helen Thomas

SRI Lankan water systems dating back more than 2,000 years have a lot to teach us, according to a Bradford on Avon man given a grant to visit the country.

Dr Trevor Turpin, 59, of Avoncliff, spent five weeks on the island after receiving a £3,500 bursary from the Winston Churchill fellowship scheme.

The idea was for him to study water management systems to see how Britain could cope if global warming led to an increase in storms and flooding.

Dr Turpin said: "It was a lot of hard work but I had some incredible experiences like trying to scrub an elephant - I had to give up after about half an hour.

"I visited traditional water management systems and new developments and looked at the way people use the old systems and build on them to provide sustainable living for the future. I like to think there are elements we can learn and put into place from it.

"I met a number of people from local authorities the water authority and people from academia who have a lot of knowledge on the system."

Part of his trip included a visit to the World Heritage City of Anuradhapura, where he learned how farmers still use systems established in 500 BC to store water during the monsoon and then share it during the dry season.

He also travelled to the south of the country where the Mahaweli authority of Sri Lanka is promoting a scheme using the old tanks to enable development of



Trevor Turpin

farms and homesteads.

Dr Turpin, who works as an environmental consultant for Nicholas Pearson, now intends to write journal articles and a paper for international conferences to try and influence the environmental agency in this country.

"Britain had the hottest July on record this year and the drought was, perhaps predictably, followed by torrential storms," he said.

"When I was in Colombo it was actually hotter in Britain. Our summers are getting hotter and drier and winters are also wetter and, coupled with this, sea level rise threatens low-lying areas and exacerbates the risk of flooding.

"There are more people dwelling on the flood plains of Britain so we have got to look at our policies."

He said he was grateful to the Winston Churchill Trust, which provides travelling fellowships for overseas projects, for allowing him to make the trip.

"It was a brilliant experience," he said.



Above, Dr Turpin with Dr Bandaranayake from Sri Jayewardenpura University at Nachchaduwa tank, which was originally built in 900 AD



Left, construction workers rebuilding a dam at an old tank



Below, a women's bathing pool in Matale

Library closure dates

LIBRARIES in Wiltshire will be closing over the next few weeks...

The closures are so customer-friendly...

New play group plan

A GROUP for parents and toddlers is being launched in...

tant community facility for parents and carers in...

Publicity continued

Thursday October 5 2006

Local news



Bonh

Painting
Contem
Monday

Expert's journey of discovery

AN ENVIRONMENTAL consultant who has just returned from a field trip to Sri Lanka believes the country's ancient water management systems could hold the key to managing climate change.

Trevor Turpin, 59, of Avoncliff near Bradford on Avon, had his trip funded by the Winston Churchill Travelling Fellowship, which sends up to 100 people a year overseas to bring back experiences which might be beneficial to communities in the UK.

Dr Turpin worked for Wessex Water for 12 years and is now a director for Bath-based environmental consultants Nicholas Pearson Associates.

The aim of his five-week trip was to study the historic water management systems of Sri Lanka, which have been in place for several thousand years. His research will be used to look at the issue of climate change and how farmers in Sri Lanka store water during the monsoon and share it out during the dry season.

"I visited Sri Lanka a few times on vacation and was aware they have a tradition of water management systems going back up to 2,500 years," he said.

"They have managed to deal with the monsoon climate and droughts and I thought what a good example to the UK because, whatever happens, we are going to have climate change and maybe there are lessons we could learn."

During his stay Dr Turpin made field

By Lucy Rutherford

visits with staff from the University of Sri Jayewardenepura - one of the major universities in Sri Lanka - to the world heritage city of Anuradhapura, to learn how farmers still use systems established since 500 BC.

He also travelled to the south of the island where the local authority promotes a scheme using old water tanks to develop farms and homesteads.

"I went around the whole of the island apart from the Tamil area, which is relatively out of bounds to visitors," said Dr Turpin.

"To have five weeks and be able to go away and spend time with people in a foreign country and be part of the culture was remarkable. It was really worthwhile."

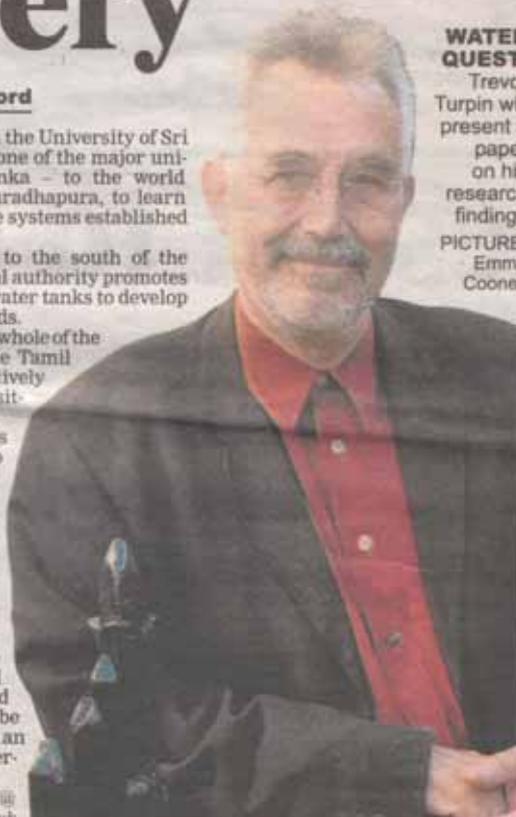
Dr Turpin will now be writing up his findings for the Winston Churchill Memorial Trust and next summer will be presenting a paper to an international conference in Finland.

L.rutherford@bathchron.co.uk

WATER QUEST:

Trevor Turpin will present a paper on his research findings

PICTURE:
Emma Cooney



With nearly 500 watercolours and 18th century to present ceramics ranging from studio pottery to jugs, this is a great opportunity to acquire work at affordable prices.

Viewing
Friday 6 October
Saturday 7 October
Morning of Sale

TUTOR DAY

April 25th

We are holding another tutor day in April this year. This is a chance for our tutors and dissertation supervisors to come to Bath and update their skills and exchange experiences. The tutor day offers a rare opportunity for the wider IEM team to get together we have an enjoyable time too at dinner the night before.

This year the Tutor Day is focussing on all aspects of dissertation supervision aiming to ensure that our MSc students get the support and guidance they need. If any students have ideas as to what should be included in such a day from their experiences of undertaking their dissertation, then we would be very interested in hearing them.

Project Managers can learn about EIA

Environmental Impact Assessment is becoming a more widely used tool and the expectations of planning authorities are increasing. So more project managers are finding that they need to know about EIA if they are to deliver the best developments on time and to cost. This was the view of EDF Energy when they approached IEM to run a short course to introduce their project managers to EIA. The two-day intensive course is scheduled to run on 15 and 16 June and is organised jointly with the Environmental Protection Subject Group of the Institution of Chemical Engineers. It will feature all of the usual IEM ingredients including advice from expert practitioners, a real-life case study for students to practice on and evening distractions organised by Sue. Further details will be available shortly but there is a limited number of places available so if you or colleagues are interested in coming along please let Sue know. The course fee will be £500 excluding accommodation.



CHURCHILL FELLOW

Dr Trevor Turpin, one of our Visiting Lecturers on the Residential Management course, has been awarded a Winston Churchill Travelling Fellowship. The Winston Churchill Memorial Trust was set up after Churchill's death in 1965 to provide the opportunity for men and women to acquire knowledge and experience abroad. Fellowships are available annually to any British Citizen, regardless of age, occupation or qualification, and past winners include people with a wide range of backgrounds from farmers to nurses, craft workers to firemen. It is expected that the project will be of benefit to the UK on the Fellow's return. There are different categories each year and those for 2007 will be announced in June 2006.

In 2006, a water worker category was proposed and Trevor, with a background in water management, suggested a project linked to climate change in the UK. He will travel to Sri Lanka and look at historic water management systems that have been developed over centuries to sustain a population of similar density to Britain but in an island which has to manage to live with monsoons and droughts.

The project will entail meeting with community leaders, historians and water authority staff to find out what systems are used, who manages them and how. The plan will then be to see if there are lessons for the South of England, in particular in a time of climate change and pressures for housing development.

Churchill famously said that he "look(ed) forward to the day when the Nile shall perish and never reach the sea", so as Trevor says "He clearly had a great interest in water management so this project seemed ideal". Clearly the selection panel concurred and future IEM students should prepare themselves for case studies based on Trevor's experiences!

See website for more information:

www.wcmt.org.uk

Publicity continued

EMA in Practice

Does Sri Lanka hold the key to dealing with climate change?

The ancient water management systems in Sri Lanka have sustained that civilisation for 2,500 years through a climate that alternates between drought and monsoon. Trevor Turpin wondered if the system might have an application in the UK in a period of climate change, enabling us to cope with the predicted drier, hotter summers and warmer, wetter winters with more frequent storm events. He visited Sri Lanka earlier this year and reports on his findings.

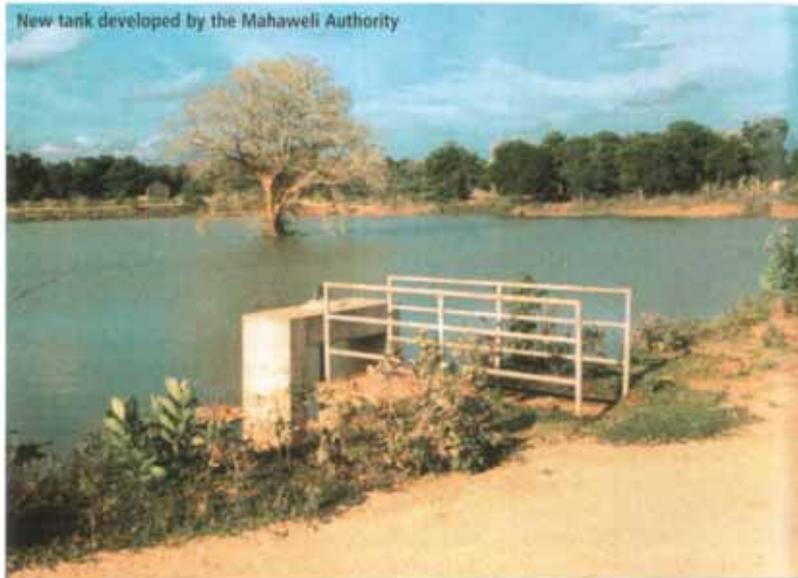
Introduction

Every year the Winston Churchill Memorial Trust awards a number of Travelling Fellowships to enable people from the UK from all walks of life, age and qualifications to travel abroad to learn from others' experiences – technology transfer in reverse. In 2005 a category applicable to water workers was announced and having worked in the water industry for 12 years in the 1970s and 1980s and continuing to work for the Environment Agency and water companies to the present day I applied, suggesting a study tour of Sri Lanka to check out my theory. The Trust agreed with my proposal and in July and August I spent several weeks travelling around Sri Lanka visiting the ancient sites and meeting with the local people who are still using, operating and developing the systems.

The systems comprise a series of cascade tanks which fill during the monsoon and then release water during the dry period. They are most used and particularly effective in the dry zones of Sri Lanka which receive less than 1,000 mm of rainfall per year.

They were brought to Sri Lanka from South India in about 500 BC and adapted to the topography of a gently undulating landscape that typifies the dry zone in the north of the island that was initially settled by the newcomers. The duties of these first kings of Sri Lanka were twofold: to build Buddhist temples for

New tank developed by the Mahaweli Authority



the spiritual welfare of the people and to build tanks for their social and economic sustainability.

They reached a high standard of sophistication in terms of their construction – the channels which conducted water for many miles had a regular and consistent gradient of one inch to the mile; to this day it is not known how this precision was achieved.

The systems comprised dams (or bunds) often several miles long and up to 50 feet high consisting of clay embankments protected from wave action on the water face by stone revetments. Sluices known as biscottis were provided in the upstream face to regulate the flow of water to irrigate the vegetable and paddy fields downstream.

Tanks

The zenith of Sri Lanka tank building was reached in 1100 by King Parakrama with his Parakrama Samudra (Sea) which has a dam some 10 miles long.

Parakrama is reported as saying "not a single drop of water received from rain

should be allowed to escape into the sea without being utilised for human benefit".

Due to internal conflicts the systems fell into disuse until the British occupation in the 19th Century (marked by the Convention of Kandy on 2 March 1815) when they realised the value of these tanks for the development of the economy and set about their restoration. The term 'tank' is the inelegant British adaptation of the word 'tanque' which the Portuguese used to describe these 'lakelets'. In fact they are often beautiful features, with graded shorelines fringed with coconut palm or banana plantations with purple water lilies or lotus flowers.

As part of my visit I saw a number of these tanks in the region of Anuradhapura (where there were over 10,000 such features) with staff from Sri Jayanadepura University in Colombo (who have a particular interest in the traditional systems) and met with the farmers to learn how they use, operate and distribute the water. In a typical instance one tank serves 80 families, who meet twice a

EMA in Practice

year to decide how the water is to be distributed.

Water management

In a developing country with a burgeoning population, the Government has continued the work the British started and the Mahaweli Authority of Sri Lanka (MASL) has continued the planning and development of the water management systems – largely using dams and river regulation in the wet zone in the central area of Sri Lanka to provide water by river and canal to the dry zone. In recent years this has been extended to the south of the country in a catchment known as the Uda Walawe.

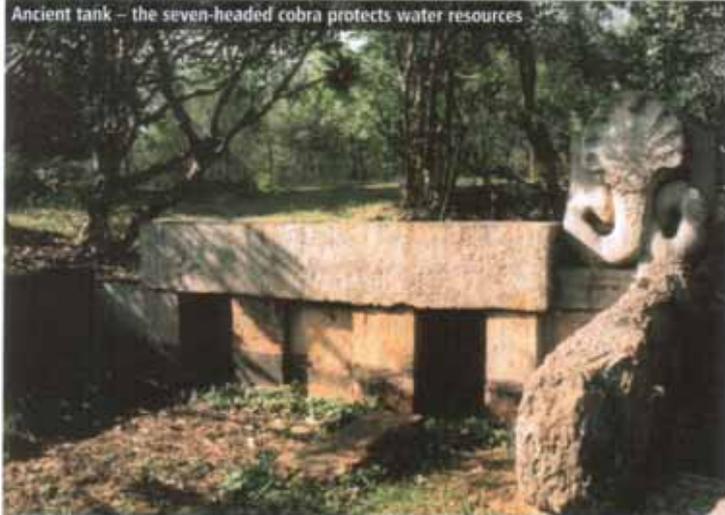
The first phase of this scheme in the 1960s created two new reservoirs which, although building on the old system, largely replaced it, and many of the smaller tanks were lost. The current works, the new Left Bank Scheme, is replicating the development work of the ancient kings, utilising existing tanks and providing new ones. In fact a dual system of tanks is provided such that water is available as required by the type of agriculture – 24 hours for paddy, or daytime only for vegetables such as maize, onion and beans.

The MASL is much more than a water irrigation scheme however, and provides land, homestead initiatives, education, healthcare, marketing and community facilities. Guided by MASL, the local communities themselves reach decisions about their future. One downside is that this area is also home to elephants and traditionally this has been a problem with elephants destroying the farmers' crops. The plan being enacted at Uda Walawe is to transfer the elephants from this scrubland to an extended reserve – in the reverse process the farmers in this land will move to the newly developed and irrigated zone.

Application in the UK

So what has all this to do with the UK? Firstly there are a number of similarities between Sri Lanka and the UK: both are islands; Sri Lanka has a land mass of 50 per cent of the UK with a proportionate population and has a rich ecological and cultural heritage which is jealously

Ancient tank – the seven-headed cobra protects water resources



protected (seven World Heritage Sites). And like the South East of England, land has to be found for development. I'm not about to pretend that 'Disgusted of Tunbridge Wells' is going to become a paddy farmer or that Essex girls will start banana plantations but I would suggest that there are lessons to be learned in terms of flood protection from severe storms and water storage and irrigable areas for agriculture.

With climate change we will have the opportunity to grow a different range of (perhaps higher value) crops; a different landscape will result and biodiversity will change. If we are aware of the coming changes we can have the opportunity to plan and adapt to them. There will be change – valued landscapes will develop and species and habitats will migrate.

Southern England will be different – it is unlikely that we will succeed in reversing climate change – but if we are prepared for this change we can create and manage new environments. Different yes, but not necessarily for the worse. Who knows, perhaps the iron workings of the Kent and Sussex Weald will be the tank systems of Southern England?

Trevor Turpin, FIEMA

Director

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*For more information on the Winston Churchill Memorial Trust see
www.wcmt.org.uk*



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International Student Leadership Programme - Malaysia 2006

Letter of thanks and student activities November 2006


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Colin Kay MA
Deputy Headteacher
Anne Green BA NPQH

12 March 2007

Dear Trevor

Malaysia Student Leadership Conference

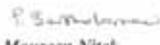
Thank you very much for your invaluable assistance with the students' trip to Malaysia. As you know these students from the West Wilts Federation of Schools were selected on the basis of their potential future leadership qualities. The students had to accept a challenge and, working with students from Malaysia, had to develop solutions to the problems set. After your talk on Climate Change and the Churchill Fellowship, they elected to adopt this as their topic.

The Conference was more successful than we could have anticipated. The students, despite their very different cultures, very quickly established friendships which informed their very professional approach to their challenge. They had two days to research and put together presentations which were delivered to the host KYUEM College and their Board of Directors. Scientific data and opinion was analysed and evaluated. The students very quickly realised that while there are no quick fixes, there are a number of short and medium term strategies that have to be put in place with some urgency. Your input was to prove the starting point for their exploration of a topic which they now understand in a real way is one of the biggest threats to our continued colonisation of this planet. We are in the process of being involved with a project with John Abbott and the Canadian Government on Climate Change called *Responsible Subversion*. This shows their commitment to this theme.

Apart from the formal session the students gained so much from face to face contact with their Malaysian counterparts where the different perspectives on Climate change and other issues could be explored. We trekked through the jungle in the Cameron Highlands and when the conference finished we spent an overnight stay at the coast.

Thank you once again for your expertise and unstinting support.

Kind regards


Maureen Nitek





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Member of Municipal Council
Matale



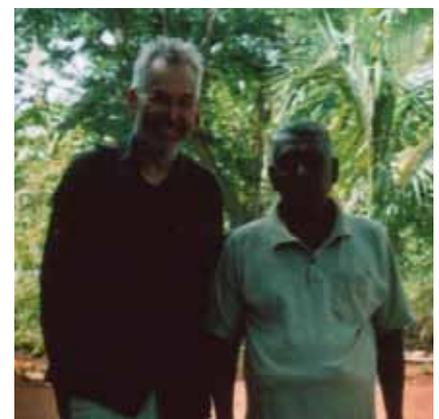
Mr Ravi Fernando



Mr Jayasekara & Mr Zafarullah



Mr Bandara



Mr Ranathunga

