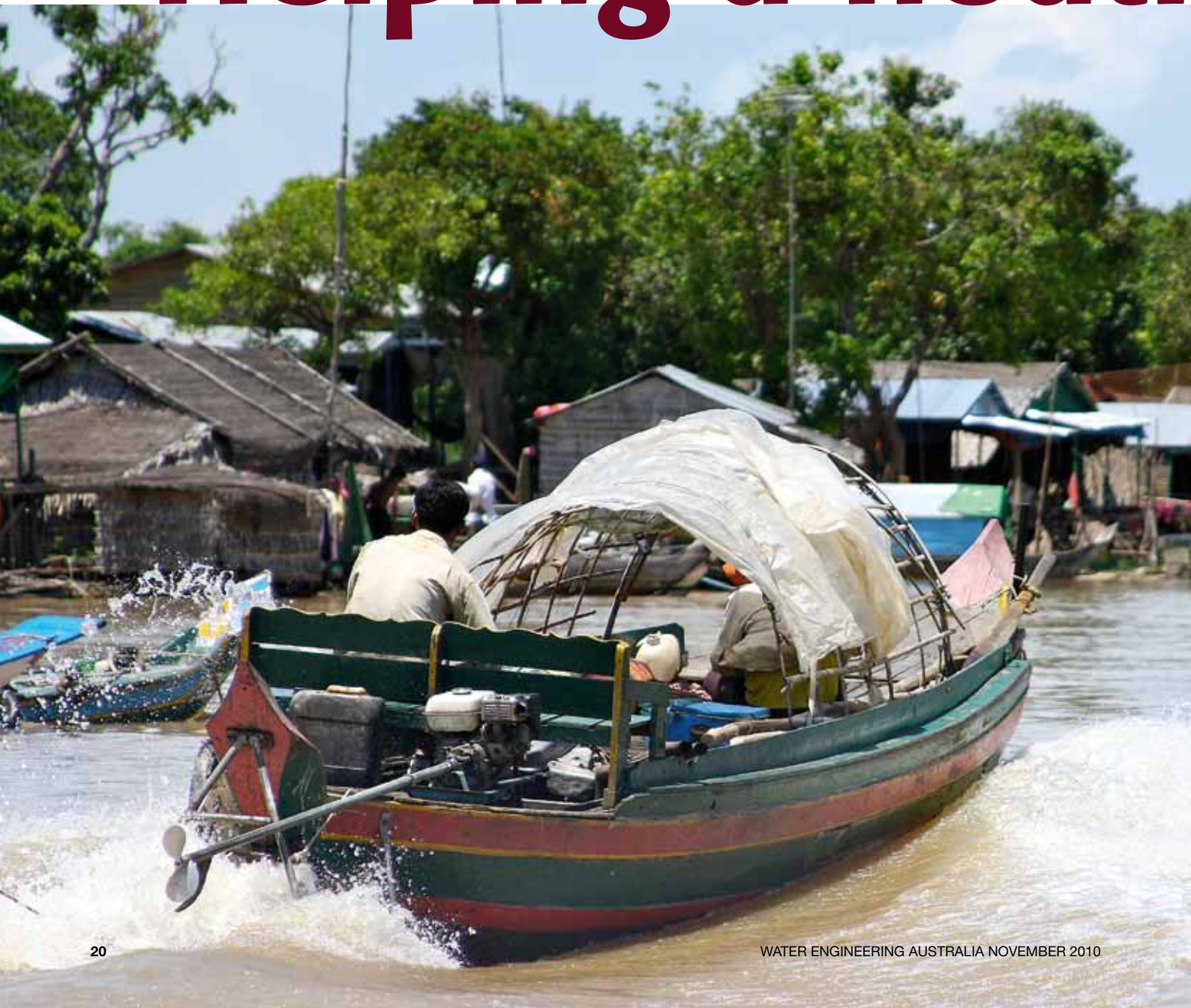


People living on and around the Tonle Sap Lake and the Mekong River have no effective and affordable sanitation systems.

PHOTOS: MAX SHAPRIA

# Helping a floati



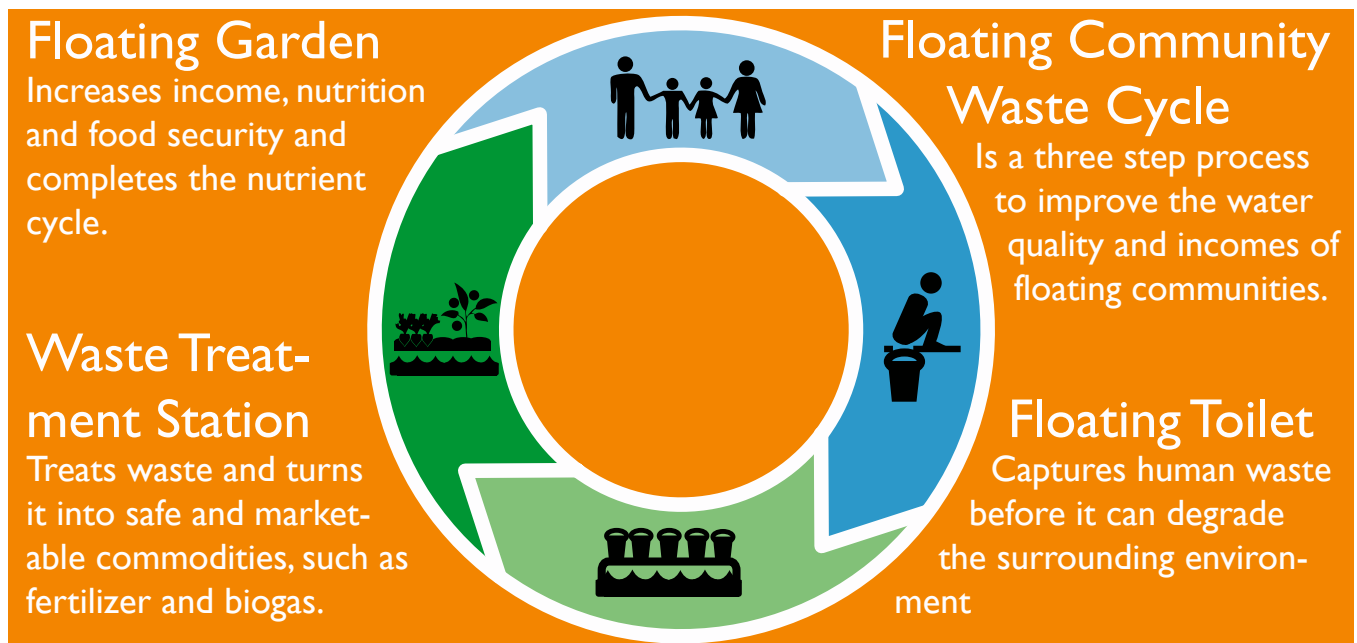


# ng community



**Australian engineers are working with local partners to develop a floating sanitation system for people living on one of the world's largest lakes.**

*by Michael Brown*



A diagram of the Floating Community Waste Cycle.

In Cambodia between 1.1 and 1.5 million people are living in flood-affected areas on and around the Tonle Sap Lake and the Mekong River. These communities have no effective and affordable sanitation options, instead they urinate and defecate directly into their environment, contaminating the water source for drinking, washing, bathing, swimming and fishing. Surveys have shown that residents of these areas have high rates of diarrhoea and other preventable waterborne diseases due to exposure to levels of *E. coli* in their environment that are well above recommended World Health Organisation levels.

In response to this situation, Live & Learn Environmental Education Cambodia and Engineers Without Borders Australia (EWB) have been in partnership since 2008 to develop appropriate technology for this problem faced by the floating communities

### The heart of the Mekong

Tonle Sap, often translated as “Great Lake”, is the largest freshwater lake in southeast Asia. The famous ancient Khmer city of Angkor Wat is located a short distance to the north.

During the wet season, some of the floodwaters from the swollen Mekong River reverse the flow of the Tonle Sap River, which normally drains the Tonle Sap Lake. The lake’s depth increases from 1m to around 10m, while its surface area expands from 2500km<sup>2</sup> to as much as 15,000km<sup>2</sup>.

Writing in the *International Journal of Water Resources Development* (Vol 22 No 3), Marko Keskinen from the Water Resources Laboratory at the Helsinki University of Technology in Finland said this hydrological phenomenon has created an important floodplain ecosystem and around half of Cambodia’s population benefits directly or indirectly from this resource. “The Tonle Sap Lake is among the most productive freshwater ecosystems and one of the most fish-abundant lakes in the world.”

on the Tonle Sap. The focus of the project is to develop innovative technologies and practices for human waste management for the floating communities, and then demonstrate these in a method that provides an incentive for the community to take up improved sanitation by generating social, economic and environmental dividends.

Therefore the priorities are to:

- remove faecal matter from the water source
- improve livelihoods of floating communities
- develop solutions that are self-sustaining, reliable, culturally appropriate, environmentally viable and affordable
- provide opportunities to develop a market-based solution.

Beyond the commonly accepted challenges of implementing sanitation in land-based communities worldwide – such as creating demand, behaviour change, affordability, and sustainability of systems - sanitation in these floating communities is further challenged by the absence of technology options and multiple generations who have been without any exposure to sanitation practices in their homes.

The unique Tonle Sap environment has driven a strong need for local information and feedback throughout the innovation process. This has been obtained through a two-way consultation process between the partners and the local community. Local knowledge has been and remains a critical factor governing the successful implementation of not only an appropriate system design, but also accompanying sanitation education for the local community.

This level of community involvement has made it much easier and quicker to develop a solution that is sustainable, affordable and culturally appropriate. It has enabled our design team in Australia to understand the context and challenges of working in the floating communities. Without this level of involvement, the project would be very difficult to complete and would almost certainly be a failure, as the solution most likely would have been inappropriate for the communities’ needs.



The project team included (l-r) EWB engineer Michael Brown, community water sanitation officer from Live & Learn Daneath Hong, community liaison officer Lay-Im, and school teacher and community liaison officer Hackley Ke.

PHOTO: MAX SHAPRIA

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An installed floating toilet.

PHOTO: MICHAEL BROWN

In 2009 a basic floating toilet system was developed. Upon completion of a comprehensive review of existing sanitation options used around the world urine diversion desiccation was selected as the most appropriate for initial trial in the floating communities. Working with local fabricators the team designed a basic floating latrine and developed a manufacturing technique using locally available materials, for a cost of US\$40.

These toilets were then tested in 14 sites in the Phat Sanday floating community in Cambodia. It quickly became apparent that the waste life cycle of the waste needed to be considered holistically to ensure the maximum value could be extracted, providing an incentive for the community to take up sanitation. With close consultation with EWB, Live & Learn and the Phat Sanday floating community, the Floating Community Waste Cycle was developed.

Not only has the Phat Sanday community been essential in developing the process, they have been very willing and supportive in the trial of each phase, and are providing good feedback and suggestions to improve the process and design of each element. In mid-2010 the team commenced design of second element of the cycle, the Floating Community Waste Management Station. This was completed in September 2010. The aim of the Waste Management Station is to treat the waste and turn it into a safe and marketable product, such as fertiliser or biogas.

Currently the waste from the floating toilets is treated by simply storing and drying the waste at the Community Waste Management Station. This was selected from a variety of methods as the most cost effective and reliable. However, we will trial other methods such as solar heat treatment and biodigestion in December 2010. The winning team from the 2009 EWB Challenge will visit Cambodia, and build and trial their competition winning floating biodigester concept at the

Waste Management Station to produce biogas for the floating communities.

Once waste is treated it will be used as fertiliser in a floating garden bed, which has also been built on the Waste Management Station. We hope to have enough treated waste to start planting vegetables in late 2010 or early 2011.

Upon completion of the floating garden the next step will be to focus on developing the supply and demand of the floating toilets to enable a wider rollout in the many floating communities in Cambodia.

Two supply and demand generating techniques, Community-Led Total Sanitation and Sanitation Marketing, have already been successful in making large in-roads into sanitation uptake in land-based communities in Cambodia. Our team will adapt these principles and work with small local businesses to improve the design and cost of the floating toilet, and develop a market place around the logistics of waste treatment and fertiliser creation.

The end goal is to create a sustainable sanitation cycle that provides an attractive option for steadily improving the health and sanitation of communities on Tonle Sap, and other communities in similar situations around the world.

The project received support from the Planet Wheeler Foundation, the Cambodian Ministry of Rural Development, UNICEF and Innovations for the Base of the Pyramid in South East Asia. ●

*Mechanical engineer Michael Brown has been volunteering as project manager of the Tonle Sap Floating Toilet Project in Cambodia. He has six years' experience in the automotive industry, most recently being a program manager on one of Holden's alternative fuel projects.*

*For more information about EWB or to volunteer go to [www.ewb.org.au](http://www.ewb.org.au)*



The project team with the Community Waste Management Station, a floating waste treatment barge, under construction.

PHOTO: MAX SHAPRIA