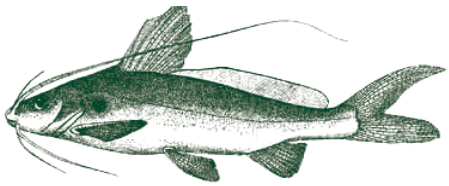
# Is the **Siem Reap** River **a river**?



By Matti Kummu and Terry Lustig

***There's no need to redraw the maps. But new research is uncovering fascinating things about medieval Khmer water management, as delegates to the latest annual meeting of the MRC fisheries program in Siem Reap recently found out.***

The monumental Angkor temples in northwest Cambodia have been studied in great detail over the past century. Recent research has uncovered an equally impressive feature of the medieval capital - an extensive hydraulic network stretching across more than a thousand square kilometres. The network can still be seen in radar and satellite images, and the main features are still evident from the ground. One is a channel which runs through Angkor to the Tonle Sap Lake. Now known as the Siem Reap River, it starts in Phnom Kulen and flows through the modern provincial capital before reaching the lake. In pre-Angkorian times, however, this watercourse didn't exist (See figure 1).

Today, the Angkor hydrological regime contains three watersheds - Puok, Siem Reap and Roluos - spread over 2,885 square kilometres. But before the Angkor kingdoms emerged in the 9th century, the region had only two main watersheds which were the Puok (including most of the present Siem Reap watershed) and the Roluos. During the Angkor period, the natural water system changed with human activities such as the construction of channels and water reservoirs. These ancient reservoirs are known as *trapeangs* (dug into the ground, fed by rain and groundwater, and unrelated to the channel network) and *barays* (basically tanks with sides of earthen embankments fed by channels and rainfall). Part of the main water-related constructions were offtake channels diverting water south from the Puok River from as early as the 10th century.

### Artificial watercourse

Originally a constructed channel, the Siem Reap River is one of these offtakes from the Puok which now carries most of the water flowing through Central Angkor. This artificial watercourse has now captured most of the waters of the Puok River, which used to flow generally southwest from the Kulen Hills to the Tonle Sap (see Figure 2). The channel probably diverted water to the Eastern Baray. Another major offtake was the Great North Channel which most probably was built to get water to the Western Baray.

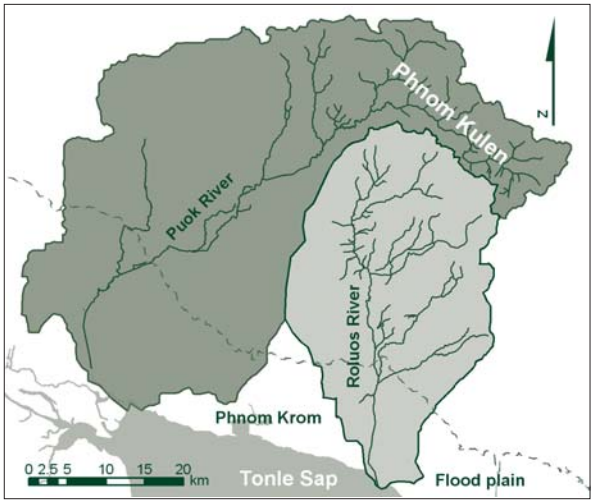



**Figure 1.** Watersheds before Angkorian period (modified from Kummu, 2003)

The Siem Reap River now diverts water southwards from Puok River until it meets the north bank of the Eastern Baray. It then runs due west, then again south past Angkor Thom and Angkor Wat to the Lake. The watershed is now about six hundred square kilometres with an average flow of 6.8 cubic metres a second. Unlike the Puok River, which meanders naturally across its flood plain, the Siem Reap channel is, in the main, deep and straight without any flood plain (see Figure 3).

Many modern artificial watercourses have also been built along straight lines. But people have only recently started to appreciate that channels built in straight lines are not sustainable, causing the sort of problems seen in Europe such as floods and the loss of natural ecosystems.

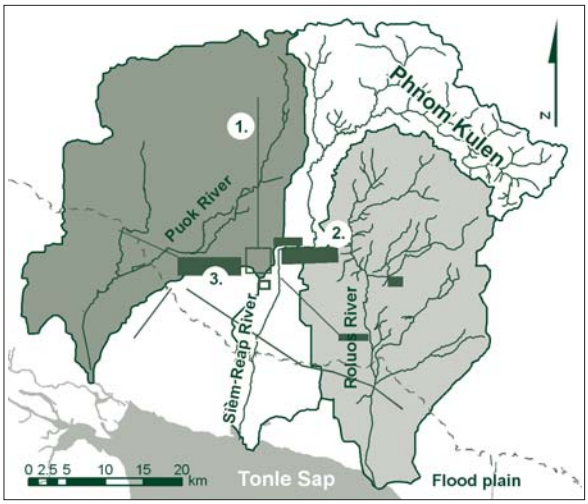



**Figure 2.** Watersheds after human impact on natural water courses during Angkor period. 1. The Great North Channel 2. East Baray 3. West Baray. (Modified from Kummu, 2003).

The population of Angkor was not spared from these problems. Because the Siem Reap Channel was much straighter than the natural rivers, the water flowed faster and eroded the bed of the channel- by as much as 10 meters in some places - and it's most likely that problems emerged in diverting water to the Eastern Baray and elsewhere. How fast this erosion happened is still under research.

Although the Siem Reap River was originally a human-built channel and not a river, it has become a river over the past thousand years with small meanders and its own unique ecosystem. It will never be a typical river for the area but it is now more of a river than a channel. So it does not have to be renamed "Siem Reap Channel" on maps of the present Angkor area.

*Matti Kummu is a hydrologist with the Water Resources Laboratory at the Helsinki University of Technology who also works on the MRC's Finnish-funded Lower Mekong Modelling Project and is a member of the Greater Angkor Project. He made a presentation on Angkor water management to the 12th annual meeting of the MRC Fisheries Programme in Siem Reap in June and also led a field trip to the area. Dr. Terry Lustig is a water and ecological engineer with 40 years experience in the Asia-Pacific region who is also a member of the Greater Angkor Project team. The authors plan to publish their research findings in a series of articles next year. They would like to acknowledge other members of the Greater Angkor Project team - particularly Prof. Roland Fletcher, Dr. Dan Penny, Dr. Christophe Pottier and Damian Evans - as well as the Australian Research Council for funding the project.*

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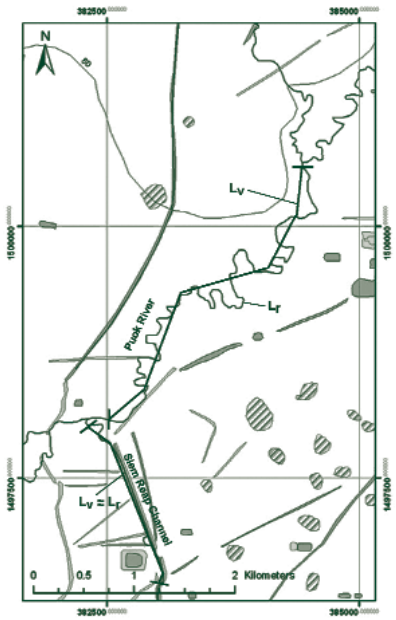


**Figure 3.** Comparison of natural river course to artificial channel.