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Anita W. Lau-Bignon

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ANITA W. LAU-BIGNON

CNRS UMR 8504 Géographie-cités
191 rue Saint-Jacques
75005 Paris, France
eganita@free.fr

In the memory of Mrs Reine Gasc

During a trip to Cambodia, I could not miss visiting Siem Reap or the famous Angkor monuments... a lifelong dream. The first reason being that Angkor was the heart of the Khmer civilization, which is still deeply rooted in the Cambodian identity today. Secondly, because I discovered the current economic weight (in terms of agriculture and tourism) of the Tonle Sap Lake¹ as well as the environmental and ethnic issues at stake for the future of the Cambodian people.

The Tonle Sap Lake has influenced the Khmer civilization since its beginnings. According to ancient Chinese archives on which historic reconstructions are always based, links appeared between the Khmer empire and the Tonle Sap Great Lake as early as the kingdoms of Chenla (between the 6th and 8th centuries) and of Angkor (between the 9th and 15th centuries; figure 1).

In 802, King Javayrman II established the Khmer Empire in the northern territories of the Chenla kingdom. In the late 8th century, the center of power moved to the Northwest, closer to the Tonle Sap Lake. However, it was not until the 10th century that Angkor became the capital of the Khmer Empire. Ruled by Javayrman VII (1125-1218), the Empire reached its territorial height between the 11th and 13th century when it covered a large part of present-day Vietnam, Thailand and Laos. It rested its power on the wealth generated by the Great Lake: an intense rice production (several harvests per year) and an abundance of fish. The

1. The Tonle Sap Lake is the largest freshwater lake in South-East Asia. It reaches 12,000 km² during the rainy season and can recede by 15 to 60 km during the dry season.



Fig. 1/ From the Khmer Empire to present-day Cambodia

2. • HIGHAM C.F.W. (2001). *The Civilization of Angkor*. Berkeley, London: University of California Press, Weidenfel and Nicolson, 224 p.

• BRUNEAU M. with contribution of GRÜMEWALD F. (1995). « Le Cambodge traumatisé ». BRUNET R. (ed.). *Géographie Universelle. Asie du Sud-Est Océanie*. Paris: Belin-Reclus, p. 176-187.

3. JOHNSTONE G., PUSKUR R., DECLERCK F., MAM K., IL O., MAK S., PECH B., SEAK S., CHAN S., HAK S., LOV S., SUON S., PROUM K., REST S. (2013). *Tonle Sap Scoping Report*. Penang, Malaysia: CGIAR Research Program on Aquatic Agricultural Systems, 48 p.

4. CENTRAL INTELLIGENCE AGENCY (2014). *The World Factbook*. Washington. <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html>

export of these food productions helped maintain the royalty and its administration in place and it financed architectural ambitions. It is during this period of the Khmer Empire that floating villages or villages on stilts appeared on the Tonle Sap Lake. This lifestyle can still be seen today through local economic activities and the establishment of floating villages or villages on stilts. The Empire at its peak developed water transportation between the Great Lake and the Mekong River in order to move and exchange wood and precious stones. The Khmers' skills in hydraulic engineering allowed them to build in Angkor very large reservoirs, called "barays", which aimed at representing the primeval ocean (fig. 2). Vishnu is generally represented asleep floating on the waters of the cosmic sea, lying down on the sea serpent Ananta: this mythical scene of the origin of the world can be found on the bas-reliefs and architectural designs of the Angkor palaces. The Tonle Sap Lake was essential², not only for spiritual reasons but also for its food supplies and economic potential.

It is no exaggeration to say that the Tonle Sap was a major pillar of the emergence of the Khmer Empire and that it has remained very attractive for the Cambodian society today. According to demographic data, 1.5 million inhabitants live on and around the lake³: with a total population of 15.5 million Cambodian citizens⁴, this represents one Cambodian out of 10. This demographic weight has been accompanied by important economic activities over the past centuries: the Tonle Sap is still an important source of food but it has also become a tourist attraction. I therefore tried to explore the lifestyle of Cambodians by going North in the floating villages and the Prek Toal bird sanctuary where my guide's family has been living for generations. During a second trip, I went more east in a village built on stilts called Kampong Khleang (photo 1). These trips allowed me to observe the triple zonation of the lake and its surroundings and the economic activities that are engendered by it (fig. 3): the land area (emerged land), the floodplain (a zone liable to flooding between the maximum and minimum levels of the lake) and the lake area and its main rivers (always full of water).

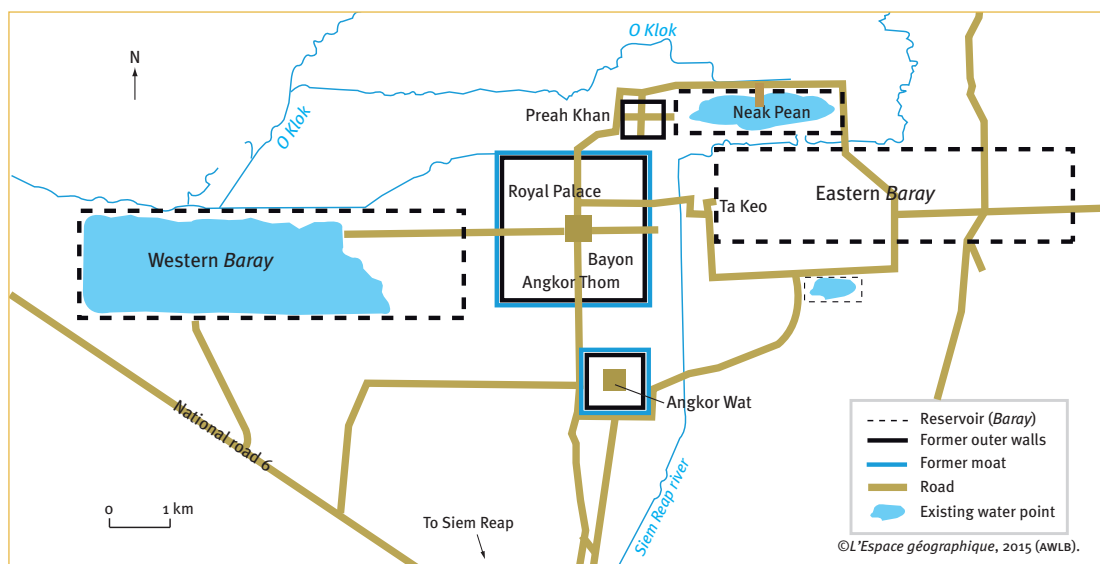


Fig. 2 / The Angkor archaeological site

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Photo 1/ Kampong Khleang, a village on stilts
built ten meters high. Taken by the author, January 2015.

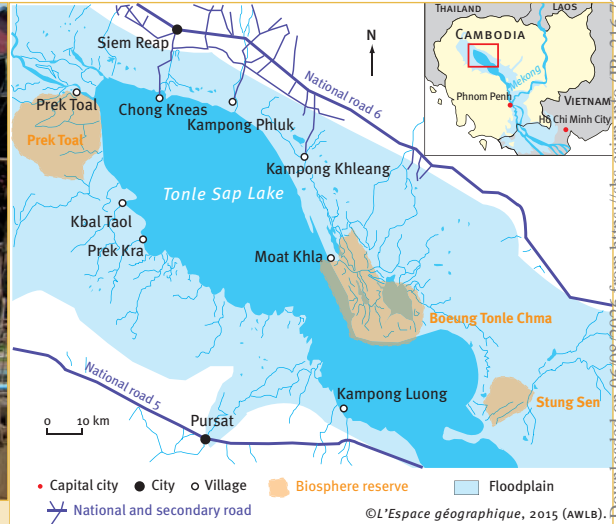


Fig. 3/ The Tonle Sap Lake or Great Lake

Around the lake, the emerged zone has, as is the case in Siem Reap⁵, an economy mainly turned towards tourist activities linked to the Angkor sites (handicrafts, hotels, markets, restaurants, transport). The Angkor sites are the most visited in Cambodia: between three (2012) and seven million (2015) visitors are estimated each year⁶ and are a source of employment for many types of trades. Even better, because the site has been recognized as UNESCO world heritage, it is undergoing many renovations and therefore requires technical skills and expertise (silk painting, wood carving, stone-cutting, etc.). Not only are these crafts encouraging the perpetuation of ancient cultural traditions, they also provide work to many craftsmen within governmental bodies or private shops as they are able to sell their products. Land-based villages do not depend on fishing but rather on local markets and the hotel industry. Rice cultivation represents the principal means of subsistence in this land area although it is a less profitable source of income than tourism due to yields being lower than those in the floodplain.

Once, I went all the way to Prek Toal, an ornithological natural reserve an hour drive from Siem Reap. During almost 45 minutes, the paved road crosses the floodplain and is built on a dam. It passes through hamlets that seem isolated in comparison to the huge palm-fringed rice fields that surround them (photo 2). However, the corollary of these open landscapes is an immoderate clearing of the riparian forest⁷. 70% of the income of the inhabitants of this floodplain comes from rice cultivation, the rice fields producing two, sometimes three crops a year. As we drive by, we can see ponds that trap fish, shellfish and frogs when water levels drop. These ponds can reach a depth of over three meters and a length of ten meters. They constitute a source of food for families and, during the dry season, they are gradually emptied depending on the needs of the families and on festive events (photo 3). Alongside the rice fields are minority crops such as corn, groundnuts and a large variety of vegetables. Very few animals (buffalos, cows) are found near houses on stilts or near the fields. Houses in floodplain villages are elevated as they must adapt to changing conditions, being flooded six months of the year during the rainy season. When approaching the Tonle Sap Lake, the asphalt gradually disappears and is replaced by a rough ochre silty dirt

5. Being the city the closest to Angkor, Siem Reap has become a tourist destination that offers a wide variety of accommodation. Due to a rising number of Asian tourists, many hotels are being constructed.

6. Internet links for these estimations: *Le Monde*: http://www.lemonde.fr/culture/article/2013/12/14/angkor-au-defi-du-temps-et-du-succes_4334351_3246.html et *Le Figaro*: <http://www.lefigaro.fr/arts-expositions/2013/05/06/03-015-20130506-ARTFIG00456-angkor-sous-pression.php>

7. • GRÜNEWALD F. (1993). « Pêche, forêt et agriculture dans un Cambodge à peine sorti de la guerre civile ». *Tiers Monde*, vol. 34, no. 134, p. 345-363.
• DE KONINCK R., ROUSSEAU J.-F. (2013). « Pourquoi et jusqu'où la fuite en avant des agricultures sud-est asiatiques ». *L'Espace géographique*, vol. 42, no. 2, p. 143-164.

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Photo 2/ Houses on stilts in the floodplain.

Taken by the author, January 2015.



Photo 3/ Endless rice fields an a pond.

Taken by the author, January 2015.

road. At one point, my guide showed me a big green house built at the time of the Khmer Rouge: it was strategically located to observe and control the comings and goings of the villagers. Very bad *things* would have happened inside. The long uncomfortable silence that followed symbolized the wounds that time has yet healed, but that humility quiets. The dirt road ends with a small pier on a canal that leads to the lake.

The villages located on the northern shore of the Tonle Sap Lake are floating villages of various sizes (up to several hundred houses) adapted to the different water levels. Some houses are connected, forming blocks of houses crossed by more or less wide passages that allow the circulation of boats. Only a few breezeblock houses have a stable anchorage point and, if the latter is located along the shoreline (official buildings, mobile phone antennas or temples on stilts), it is generally used for carrying electric and telephone cables. During another trip east of the Tonle Sap Lake, I took a highly elevated road between National Road 6 and the village of Kampong Khleang. By following this road, lined with houses on stilts and huge rice fields, we eventually reached the village on stilts of Kampong Khleang after maneuvering with difficulty when crossing other cars. This village is composed of hundreds of dwellings located along the river and along large passages with small boats attached at the foot of the houses. In the middle of the canal, some villagers are busy catching fish captured and kept inside pens made of assembled woven bamboo panels.

Needless to say, the main economic activity of the lake area is fishing: it provides 70% of the income of the Greak Lake inhabitants and constitutes 80% of the animal proteins in their diet. However, non-governmental organizations have boosted tourism in the past years by creating protected natural reserves that can be visited as I did in Prek Toal. According to the data available, between 300,000 and 350,000 tourists visit certain fishing villages and the surrounding reserves of the Tonle Sap area during the high season (between december and april). Although it is less attractive than the Angkor archaeological site, 5% to 10% of the visitors there still go to the Tonle Sap Lake (according to attendance figures). This sudden influx of tourists has led to an increase in the number of boat operators; they are generally former fishermen that have a perfect knowledge of the area and who have chosen to drive tourists to floating villages and natural reserves instead.

For many centuries, the Tonle Sap has therefore yielded economic resources that have speeded the rise of the Khmer Empire and that remain at the core of the current Cambodian identity. Nonetheless, there are economic, ecological and ethnic tensions in the region as these fields are not always compatible. This is the case, for instance, with the competition between different economic agents (professional and occasional fishermen) or between economic interests and ecological issues. An example of this would be a phenomenon I witnessed on the pier in Prek Toal. Along a large portion of the canal that leads to the lake, a crowd of fishermen was busy spreading the nets and removing the fish caught (photo 4). The fishermen had filled

8. The free access surface area represents 558,522 hectares.

their boats with a miraculous catch during the weekend when water levels had dropped very strongly and whole families were meeting on the riverbank in a festive popular atmosphere. How did this massive competition between professional fishermen happen? During the 1990s, the government granted free access to fishing. However, these fishing zones then underwent three management reforms in 2000, 2001 and 2012. In 2000, the government allowed commercial fishery on a large part of the lake, approximately 508,000 hectares. In 2001, the authorities reversed this decision and limited commercial fishery to 237,000 hectares. Finally, in 2012, the government annulled the 2001 reform, assigned certain zones to biodiversity conservation and opened others to the local communities for their fishing activities⁸. This change in governance was done too rapidly, without a clear programme and, in practice, it was not applied on a local scale. Today, it remains difficult to quantify authorized fishing zones and conservation zones as the situation is chaotic and the reforms did not alleviate the recurrent clashes between village communities concerning the exploitation of resources. Local communities are still fighting for the definition of a policy on the management of fishing and rice cultivation zones. In some places, villagers have cut down mangrove forests (theoretically protected zones) and built fish farms and irrigation systems without authorization. The authorities, with the help of international organizations, try to combat illegal fishing in protected zones (or sanctuaries), where aquaculture netpens allow for species to reproduce (photo 5).

Furthermore, the economic activities revolving around the lake entail ecological risks but also health and food related risks for the local populations⁹. On our way to Prek Toal (fig. 3), I observed that each household has its own vegetable garden and pig or poultry farm. These animals are generally kept in outdoor pens and their excrements are discharged directly in the immediate vicinity and in small streams. Water pollution is also caused by the pesticides and weed killers used by rice farmers. The Great Lake ecosystem and food security are therefore threatened and weakened. To this must be added the fact that families dump their kitchen and toilet wastes in the lake. By consequent, families often suffer from gastro-intestinal problems, fevers and itching. A balance must therefore urgently be found between the lake ecosystem (water, animals and plants) and the inhabitants¹⁰. The Cambodian government tries to improve the situation by enacting legislation but it is rarely applied and respected. I realized there the importance of the role of NGOs¹¹. Firstly, because these organizations directly employ local mobilizers and instructors specialized in various fields in order to develop information and technical training networks for villagers. Secondly, not only are the people living on the shores of the lake educated on sustainable development, they are also informed on the rational exploitation of resources and on the opportunities offered by ecotourism. NGOs particularly operate in the fields of education and awareness-raising. In the Great Lake area, there are between 4 and 7 active international NGOs in each village¹² that also provide financial and

9. COURADE G., HAUBERT M (1998). «Sécurité alimentaire et question agraire : les risques de la libéralisation». *Tiers Monde*, vol. 39, no. 153, p. 9-24.

10. See notes 3 and 7.

11. According to the Ministry of Foreign Affairs and International Cooperation, there are 555 international NGOs in Cambodia. <http://www.mfaic.gov.kh/?page=detail&menu1=219&menu2=1260&ctype=article&id=1260&lg=en>

12. According to a survey carried out by the French embassy in 2014, French NGOs represent 18% of NGOs established in the Siem Reap province, and over 130 have been counted in the whole country. A majority of them (41%) are located in the capital and intervene in the field of education (28%),



Photo 4/ Men fishing in the lake.

Taken by the author, January 2015.



Photo 5/ Net cage fish farming.

Taken by the author, January 2015.

12 (continued). health (26%), rural development (18%), training and professional inclusion (14%), microfinance and technical and financial support (14%). AMBASSADE DE FRANCE (2014). « Résultats enquête ONG 2014 ». Cambodia: service de coopération et d'action culturelle, 9 p.

13. I prefer to use the term watch-guard as it reveals the lack of military training.

14. CAMPBELL I.C., POOLE C., GIESEN W., VALBO-JORGENSEN J. (2006). « Species diversity and ecology of Tonle Sap Great Lake, Cambodia ». *Aquatic Sciences*, vol. 68, no. 3, p. 355-373.

15. Such as the black-headed ibis (*Threskiornis melanocephalus*), the painted stork (*Mycteria leucocephala*), the lesser and greater adjutants (*Leptoptilos javanicus*, *Leptoptilos dubius*), etc.

16. Goldfin tinfoil barb (*Hypsobarbus malcomi*); Siamese mud carp (*Henicorhynchus siamensis*); Catfish (*Pangasius hypophthalmus sutchii*);



Photo 6 / A solar energy powered house.

Some houses have solar panels to power electronic appliances and communication devices. In some other houses, cleaning the dishes and washing is simply done in the lake. Taken by the author, January 2015.

logistical support. Thanks to this assistance, some families living in isolated bamboo houses covered with palm leaves now proudly use solar panels for their energy supply (photo 6). Another example of this is that for the past decade, the number of microfinance agencies has increased in the country. This activity developed to address the common difficulty to obtain loans and to start a business, often due to a lack of education. Families have recourse to microfinance agencies to have access to loans, but in return they must learn to manage their activities in order to rapidly generate income and pay their debt.

When visiting the Prek Toal reserve, I was able to be directly immersed in the activities of two development agencies: USAID and Osmose. In the biosphere reserve, the American agency USAID installed four bamboo platforms for local watch-guards¹³ (photo 7). These agents are strategically located throughout the maze of canals to prevent and dissuade poaching. The only means they have to raise the alert is their mobile phones plugged on a battery connected to a solar panel. Every two weeks, USAID asks them to randomly change location in order to avoid attempts of corruption. Moreover, to monitor poaching, NGOs have implemented twenty or so observation points in trees in various strategic locations on the lake. Unfortunately for those who are caught illegally fishing or hunting, they can face prison for committing a crime against the agriculture, forestry and fishing act! Protecting biodiversity is also the primary mission of the French NGO Osmose: they look after a wide variety of species living in the bird sanctuary. To do so, a long work of identification and assessment was done: it revealed the presence of over 300 species¹⁴ in Prek Toal (birds¹⁵, plants, fish¹⁶, reptiles¹⁷). Some species are identified as endangered while others very rapidly proliferate, especially during the rainy season. This is the case of water hyacinths (photo 8) or the mimosa pigra which slow down the passage of boats, imprison fish in their root systems and suffocate other plants. These invasive plants greatly threaten biodiversity and upset the ecosystem. As a solution to this problem, Osmose encourages inhabitants to pick them and to turn them into pretty handicrafts (photo 9). Not only has this allowed the

control of these plant species, it has also provided a small income to women in precarious situations. Moreover, the Osmose project aims at developing ecotourism in the reserve and school classes for local youngsters. Boat tours are organized around the mangrove for visitors to admire in a privileged way the wildlife sanctuary. Osmose also creates educational posters. Some plant species (*Croton crabas*; *Crataeva roxburghii*; *Gmelina asiatica*) are illustrated on these posters either because they possess medicinal properties traditionally exploited, or because they can be used at home to replace polluting materials (combustion, biodegradable utensils).

Another source of conflict in the Tonle Sap area is the inter-ethnic tensions between Cambodian and Vietnamese villagers that can be felt when talking with local inhabitants. Vietnamese people started arriving on the lakeshore during the second half of the 19th century, under the French protectorate¹⁸. This wave of immigration was encouraged by rich Cambodian merchants of Chinese origin who recruited renowned fishermen. As for the French, they were hoping for

the expansion of fishing and hence for bigger revenues. Nowadays, international agreements¹⁹ between Cambodia and Vietnam authorize these immigrated populations to stay in the area. However, Cambodian fishermen denounce to national authorities what they consider as unfair competition. Vietnamese fishermen (whether of the Cham ethnic group or not) use fine-meshed nets²⁰ to catch all types of fish (some forbidden to Cambodian fishermen), even the small ones. This tolerance irritates local populations but the government does not wish to stigmatize the Vietnamese due to the agreements with Vietnam. The fishing practices they use also threaten the renewal of resources and consequently the efforts of the NGOs. Furthermore, Cambodians accuse the Vietnamese of staying between themselves. As for the Vietnamese there, they claim more consideration: because they are not Cambodian citizens, they do not have access to medical care and land ownership²¹.

The Tonle Sap Lake represents an ancient and vital establishment for the Cambodian people, descendants of the Khmer civilization. Nevertheless, despite its extreme wealth in resources, the Great Lake is today at the core of conflicts relating to economic, ecological and identity issues. This configuration is evocative of recent confrontations, in France or elsewhere, that stem from a similar combination of factors. In the case of the Tonle Sap Lake, the intervention of very numerous international organizations is beneficial for education and for the protection of the environment, two elements that are necessary to secure the future of the lake and its poor and economically vulnerable inhabitants. However, the actions of the NGOs are not always comprehended by the local population and their very high presence complicates the establishment of a dialogue with economic agents or with the authorities to find rapid and pertinent solutions. Finding a balance in this difficult equation is a challenge for the future, but it is an exciting challenge for those who have seen the ibises fly at dawn on the Tonle Sap Lake.



Photo 7 / A watch-guard on his platform.

Taken by the author, January 2015.



Photo 8 and 9 / Water hyacinths (*Eichhornia crassipes*)

Hyacinths, native to South America, are very invasive in the lake. After drying them, they can be turned into handcrafted objects (ropes, mats, hammocks, baskets, etc.) for tourists.

Taken by the author, January 2015.

16 (continued). Climbing perch (*Anabas Testudineus*); Marbled goby (*Pomatoschistus marmoratus*); Giant snakehead (*Channa micropeltes*), etc.

17. Turtles and crocodiles are becoming increasingly difficult to see. The latter are bred in farms near the lake for their leather or shows for tourists. There are many snakes that are eaten by certain Cambodians.

18. See note 7, GRÜNEWALD F. (1993).
 • BROCHEUX P. (2004). «L'empreinte de la domination coloniale française (1860-1954) en Indochine». In PELLETIER P. (ed.), *Identités territoriales en Asie orientale*. Paris: Les Indes Savantes, p. 175-184.

19. A Paris Agreement on Cambodia signed in 1991 by 18 countries (France, Vietnam, United-States, etc) formally put an end to the civil war and resulted in a stabilization of the relations with neighboring countries.

20. PIERDET C. (2008). « Marges aquatiques et politiques urbaines au centre de Phnom Penh (Cambodge) ». *Autrepart*, no. 45, p. 12-136.

21. See note 3, JOHNSTONE G. ET AL. (2013).