

Evaluation of sustainable landscape-related lifestyles adapted to extreme seasonal pulse flooding in the Cambodian lowlands

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Keywords: ethno-botany, Lake Tonle Sap, life-style/landscape-coupling templates, seasonal flooding, sustainability
Nomenclature: Index Kewensis (<http://www.ipni.org/index.html/>, 2010/10/3)

Introduction

The persistence of self-sustainable societies is reliant upon continued good management of ecosystem services, and the traditional lifestyle is recognized as a repository for nature-harmonizing wisdom and skill.

The present landscape-ecological and ethno-botanical study aimed at identifying various landscape-related, self-contained lifestyles in the degrading Lake Tonle Sap lowland, Cambodia (Fig 1).



Fig. 1 Geographical arrangement of "permanent lake" (in dark-blue) and "floodplain" (in light-blue) constructing the Lake Tonle Sap ecosystem. Original illustration is quoted from "The Tonle Sap Great Lake" (FAO, 2003).

Results and Discussion

Lifestyles of the local people were closely interwoven with site conditions, although differences in occupation, age at immigration and property appeared to have resulted in small variations (Fig. 3).

Four basic types of "life-style/landscape-coupling templates" were identified, namely: (a) Floating-house style in littoral waters, (b) Stilted-house style on floodplain banks, (c) Mobile-house style on the migratory lake-shore and (d) Fixed-house style on the interior terrestrial lowland.

Finally, sustainable landscape management strategies incorporating aspects of these templates are discussed (Table 1).

Fig. 3 A collage showing the location of four core study sites (center), and schematic illustrations and/or photos summarizing the four basic types of "life-style/landscape-coupling templates" (surroundings). In each schematic illustration (excluding the case of "Mobile-house style"), (1) symbolic views are arranged around a detailed plane figure of the typical house (center of the illustration; removed a roof of a house), and (2) scientific names of characteristic resource plants are overlaid. Original satellite images are quoted from "Google Earth" (Google, 2010-2012).

(c) Mobile-house style on the migratory lake-shore



Views of typical Mobile-houses on main road across waterlogged floodplain in Chong Khneas study site.



Shorelines in the lowest (May) and the highest water season (Oct.) are overlaid in blue and orange broken lines, respectively.

(a) Floating-house style in littoral waters



A schematic illustration summarizing the "life-style/landscape-coupling template of the Floating-house style" in Chong Khneas study site.

Study Area and Methods

Field surveys were conducted in the rural areas around Siem Reap City (13° 22'N, 103° 51'E), including the vast lakeside floodplain characterized by extreme seasonal flooding-pulse and unique vegetation (Figs. 2 and 3).

(1) Aspects of landform, vegetation and human activities on a local community scale, and (2) characteristics (e.g., architecture, materials, biological species and function/usage) of houses, facilities, home-gardens and livestock on a family scale were described for both the flooded and non-flooded seasons during 2004-2011.

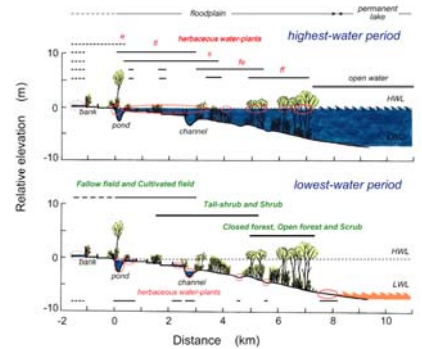
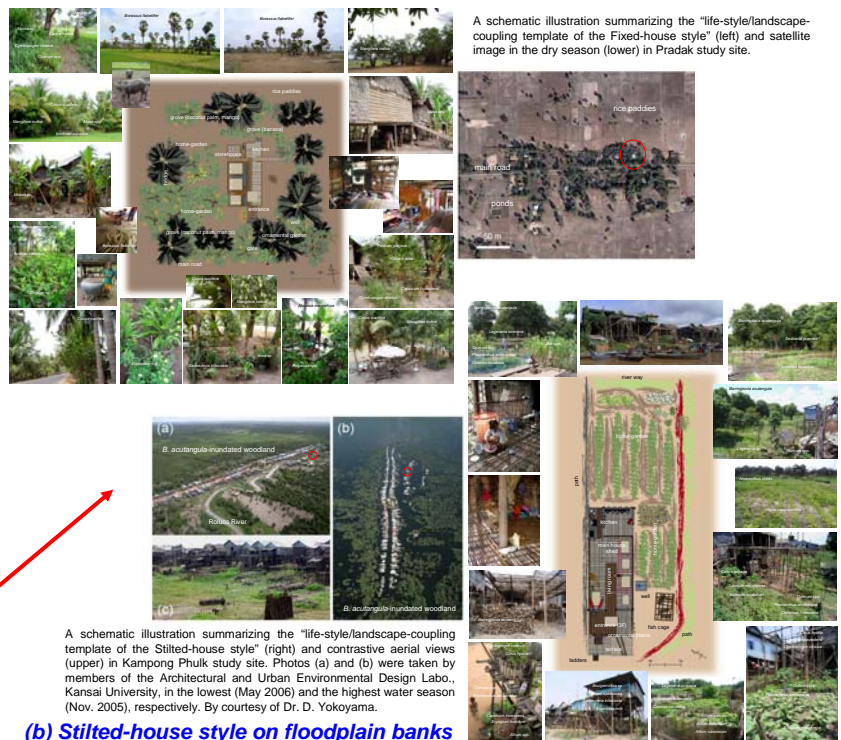


Fig. 2 Schematic diagram showing the spatio-temporal relationship among lake water, vegetation and human impacts in the study area. Contrastive seasonal phenomena corresponding with the large fluctuations of water-level are compared. For abbreviations of growth forms of herbaceous aquatic plants, e = emergent plants, fl = floating-leaf plants, fe = floating-emergent plants, s = submerged plants, ff = free-floating plants. Circles = dense habitat of herbaceous aquatic plants. HWL = highest water-level, LWL = lowest water-level. After Hirabuki et al. (2008).

(d) Fixed-house style on the interior terrestrial lowland



A schematic illustration summarizing the "life-style/landscape-coupling template of the Fixed-house style" (left) and satellite image in the dry season (lower) in Pradak study site.

A schematic illustration summarizing the "life-style/landscape-coupling template of the Stilted-house style" (right) and contrastive aerial views (upper) in Kampong Phluk study site. Photos (a) and (b) were taken by members of the Architectural and Urban Environmental Design Lab., Kansai University, in the lowest (May 2006) and the highest water season (Nov. 2005), respectively. By courtesy of Dr. D. Yokoyama.

(b) Stilted-house style on floodplain banks

Table 1 Summary of the four basic types of "life-style/landscape coupling," detected from the four core study sites in Lake Tonle Sap lowland.

Basic types of 'life-style/landscape coupling'	Typical sites in study area	Major landscape elements	Ground condition as a matrix element	Vegetation as a background elements	
		Homesteads as a patch element	Topography	Flooding periods and Max. depth	
		Houses and facilities			
		Cultivating styles †			
		Growth forms †			
		Usage †			
Floating-house style	Chong Khneas (littoral area)	Floating-houses Fishing-boats	Littoral of the migratory lake-shore near the mouth of Tonle Sap River	All year round-seasonally (5-12 months) ca. 6m	<i>Barringtonia acutangula</i> -dominant inundated woodland/shrub Lotus-cultivating ponds Rice paddies (extensive)
Stilted-house style	Kampong Phluk	Stilted-houses Fishing-boats	Bank of Roluos River near the lake-shore in the lowest water season of Lake Tonle Sap	Seasonally (6 months) ca. 6m	<i>B. acutangula</i> -dominant inundated woodland/shrub
Mobile-house style	Chong Khneas (migratory lake-shore)	Mobile-houses	Ashore of the migratory lake-shore near the mouth of Tonle Sap River	All year round-seasonally (5-12 months) ca. 6m	<i>B. acutangula</i> -dominant inundated woodland/shrub Lotus-cultivating ponds Rice paddies (extensive)
Fixed-house style	Roluos	Containers Home-gardens Ornamental-gardens	Interior edge of the vast floodplain (ashore in the highest water season of Lake Tonle Sap)	Frequently (within 1 month) ca. 0.5m	Rice paddies (extensive) Farmstead groves (small scale) Inundated shrub
	Pradak	Well	Interior lowland behind the vast floodplain	Very rare	Rice paddies (intensive) Farmstead groves (large scale) Water-plant communities in ponds Seasonal dry shrub

† Major categories are listed up for plants or vegetation.