

## FLOATING COMMUNITIES ON TONLÉ SAP LAKE, CAMBODIA: SPATIAL PATTERNS AND ADAPTATION CAPACITY



*Typical Floating House on Tonle Sap Lake, outside Siem Reap*

### INTRODUCTION:

This research investigates floating house communities on Tonlé Sap Lake and River in Cambodia. Tonlé Sap is an extensive, complex hydrological system, in which the lake area varies seasonally by a factor of 3 or more, water depth by an order of magnitude and river flows reverse direction seasonally. The area is characterised by high biodiversity and is a key to Cambodian food supply through large fish catches and extensive floodplain agriculture. Floating housing is widely distributed throughout the lake and river and is vulnerable to climate change.

The results demonstrate that the spatial patterns of floating houses on Tonlé Sap Lake and River differ and that there has been growth in the number of floating houses on Tonlé Sap River over an eight year period. There is a spatial relationship between the floating houses on Tonlé Sap Lake and the lake shore and a relationship between floating houses on Tonlé Sap River and stilt housing communities.

Interviews conducted during field work indicate that residents are concerned about changing environmental factors, and suggests that the residents are vulnerable to both climate change alongside other environmental changes. Results from a systems analysis indicate that the environmental, social and economic factors are highly interrelated and complex.

### MAJOR FINDINGS AND OUTCOMES:

A number of major findings arose from this research. These include findings regarding the spatial nature of the floating houses, the community structure and the social, environmental and economic systems surrounding the lake .

Spatial analysis demonstrated that the location of the houses was related to the lake shore on Tonlé Sap Lake and towards roads and stilt housing on Tonlé Sap River. There is also a difference in average distance between neighbour houses on Tonlé Sap River and on Tonlé Sap Lake.

The spatial nature of the communities is highly dynamic and closely related to the local environment. These spatial patterns indicate community adaptation to different environments. It was also found that there were approximately 864 buildings on Tonlé Sap Lake in 2004 and 2284 buildings floating on Tonlé Sap River in 2002-2003.

Due to diminished social capital and limited financial flexibility it appears that the communities on Tonlé Sap have lowered capacity to adapt to climate and regional changes. This is also due to their heavy reliance on natural resources as small changes to these natural resources, such as fish stocks, may decrease their capacity to generate income and to provide sustenance, both to themselves and other communities' dependant on Tonlé Sap for fish protein. There are a range of environmental changes which will impact on these communities, including climate change and damming of the Mekong. It is essential that communities are prepared for those changes, and that there is sufficient resilience in the system to cope with change.

The interviews in this research indicate the importance of fishing for income and sustenance and the fear of changes to the environment and storms within the floating communities. Interviews also indicated that residents are uncertain about the changes they will be facing, and in many cases are unaware of issues such as climate change and damming of the Mekong.

This research has clearly shown the links between social, economic, environmental and political systems. There are a number of essential links between these systems and the relationships are complex. Without more accurate modelling predicting impacts resulting from the damming of the Mekong and from climate change it is not possible to predict how the environment of Tonlé Sap and the people dependant on that community will be impacted.



*Floating Houses as "urban sprawl" on Tonle Sap River, near Phnom Penh*

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## PROJECT SIGNIFICANCE TO ADAPTING AND PROTECTING AUSTRALIA'S SETTLEMENTS AND INFRASTRUCTURE:

This research increased understanding of climate change adaptation issues in the Australasian region, specifically Cambodia. It has indicated some of the impacts that climate change will have on communities and the economy and demonstrated how some communities have already adapted to a dynamic environment. This research and some findings are also applicable to some other countries in the downstream section of the Mekong.

The increased understanding of how some communities have adapted to a dynamic environment, with both their community structure and infrastructure may also inform disaster mitigation practices in Australia. By utilising some features inherent in the floating house communities on Tonlé Sap it may be possible to increase Australia's capacity to be more resilient to extreme events such as flooding.

## FURTHER RESEARCH SUGGESTIONS:

Further research should be targeted at increasing the understanding of how floating communities on Tonlé Sap are impacting the water quality and health of the lake and river environment. This would allow management decisions to be better targeted to increase lake health, fish productivity and human health.

Further statistical analysis of the spatial patterns of floating houses on Tonlé Sap and the relationships with landscape features would develop understanding of the interactions between the floating and land based communities. This would increase capacity for governments and NGO's to respond to extreme events and tailor service providing such as schools and healthcare.

An increased understanding of the baseline of the fisheries would allow the impacts of environmental changes to be modelled more accurately. This would increase the capacity for fisheries management decisions to be scientifically tailored to improve fisheries outcomes.

Whilst the majority of respondents had access to schooling it was acknowledged that this was limited over a child's life due to cost, the impacts of this need to be more fully understood and research into how this could be changed to allow greater education for children and adults on Tonlé Sap should be investigated. This would increase understanding of how education can be improved which would increase community and individual resilience to change.

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