抵御海啸的住宅
——为prajnopaya基金会而设计

Tsunami-safe(r) House: A Design for the Prajnopaya Foundation

建筑设计 MIT SENSEable City Lab

4个小的核心比1个大的核心的强度要高

模型图所示是在没有顶部限制的墙壁上的压力，变形平行于墙壁的水平位移，SAFE（R）®的墙头移动明显小于目前建成的住房。较小的墙头变形意味着倒塌的门槛承受着更高的压力，是因为砌石墙的倒塌一般是由于墙平面失稳的倾覆引起的。根据目前的假设，新的设计应能抵抗传统的设计5倍以上的海浪冲击。
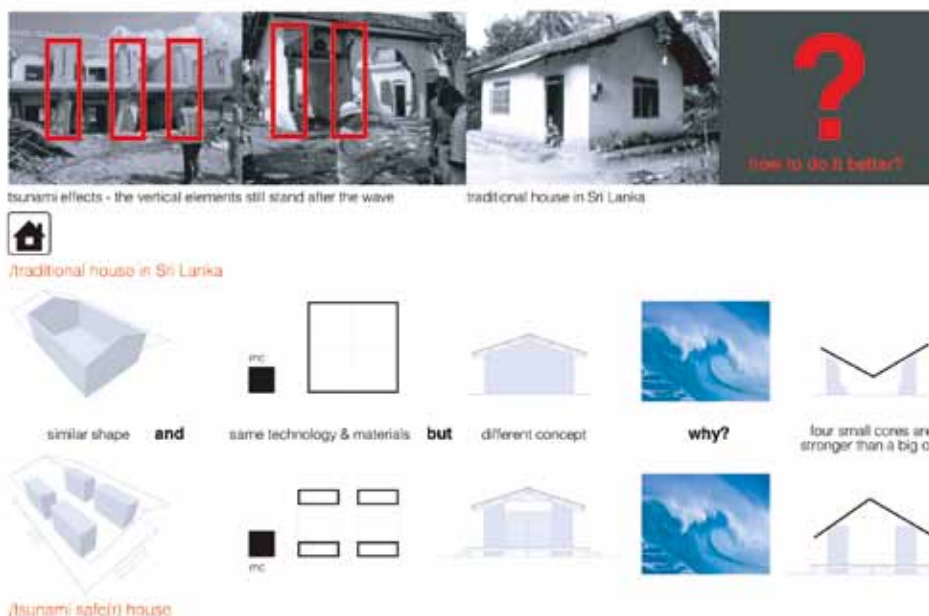
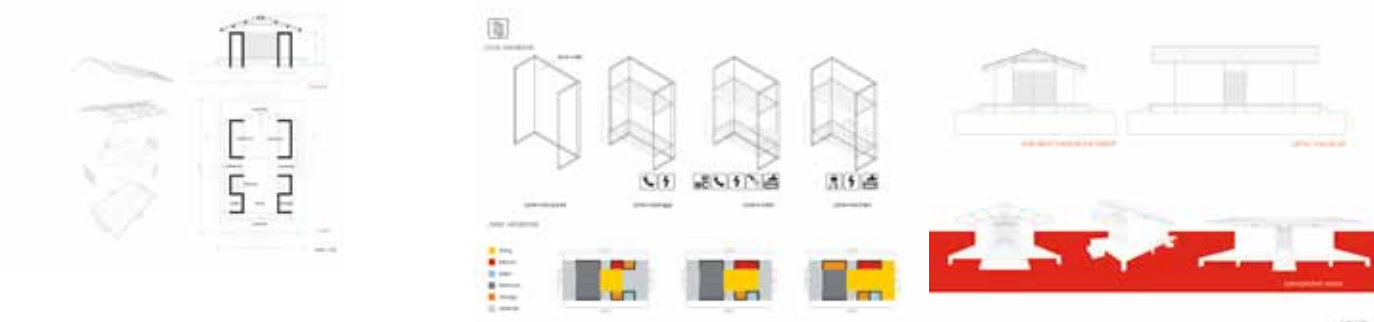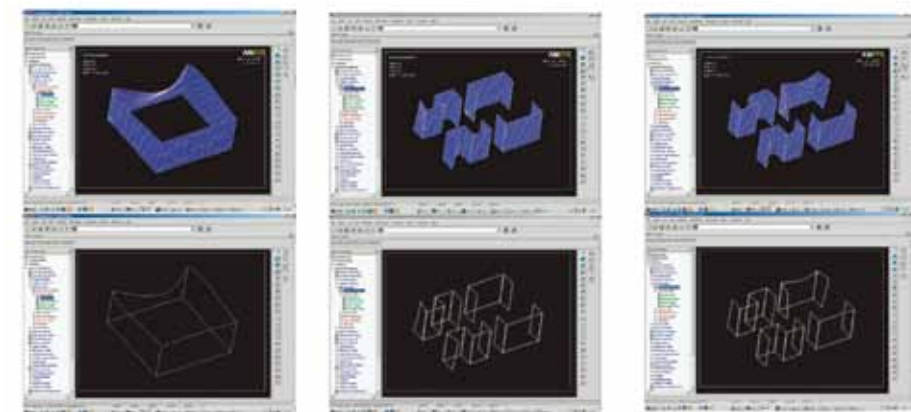屋顶盖由锡或瓷砖制作而成，遮阳避雨，经济实惠。屋顶结构是按照本地的施工技术由简单的元素组成。竹分区或重物折叠分区创建一个多孔和通风表皮，居民可以自己花时间升级改装。

核心元件由混凝土块制成，在海啸来临、不阻塞水流的情况下提供较高的刚度。升高的平台有利于向下方排水，并营造一个干净舒适的地面。

four small cores are stronger than a big one

model plots shown are of pressure on walls without top restraint. deformations shown are horizontal out of plane movement of wall. the modelling shows that wall head movement of the safe(r) ® is significantly less than that of the currently built dwellings. smaller wall head deformations means the collapse threshold is at higher pressures since collapse of masonry walls is generally initiated by the overturning of the wall due to out of plane instability. with the current hypotheses, the new design should be able to resist to a wave over five times higher than the traditional design.

roof cover is made of tin or tiles and provides economic protection against rain and sun.roof structure is made of simple elements following vernacular construction techniques.bamboo partitions or heavy weight collapsable partitions create a porous and ventilated skin, that can be upgraded by residents with time. core elements made of concrete blocks, provide higher resistance without blocking water flow in case of an incoming tsunami. raised platform facilitates water drainage underneath and provides a healthier ground.

tsunami effects - the vertical elements still stand after the wave   traditional house in Sri Lanka

/traditional house in Sri Lanka

similar shape **and**   same technology & materials **but**   different concept   **why?**   four small cores are stronger than a big one

/tsunami safe(r) house

孔隙度

为了最大程度地抵抗海啸，在垂直于海岸的方向创建4个独立的线性支撑，取代现有设计的统一表皮。此外，一个抬高的平台能保证更好地排水和健康生活。

可升级

随着时间的推移，最初核心元件之间的竹分区可以由居民DIY改造，为居民提供工作以及促进倒塌的建筑物的元件再利用。

经济性

建筑所有的墙壁和屋顶的表面与现有的房子大致一样，总成本相同甚至更少。

可扩展性

一个模块化系统可以让居民自由改变单元的大小，以适应不同的家庭大小。

灵活性

核心元件中多样的内部配置。

Porosity

in order to maximize the resistance to an incoming tsunami, four independent linear supports, perpendicular to the coast, are created. they replace the uniform skin of the existing design. also, a raised platform guarantees better water flow and health.

Upgradability

bamboo partitions are initially provided in between the core elements; with time they can be transformed and customized, engaging residents and promoting the reuse of elements from collapsed buildings.

Economy

the total built surface of walls and roof is approximately the same as the existing house; the total cost will be equal or less.

Expandability

a modular system allows inhabitants to expand the unit size to accommodate different household sizes.

Flexibility

different internal configurations within the core elements.

low tech

walls are made of concrete blocks strengthened with rebars; the roof is made of traditional wooden elements, covered with tiles or tin; partitions are made of recycled elements.
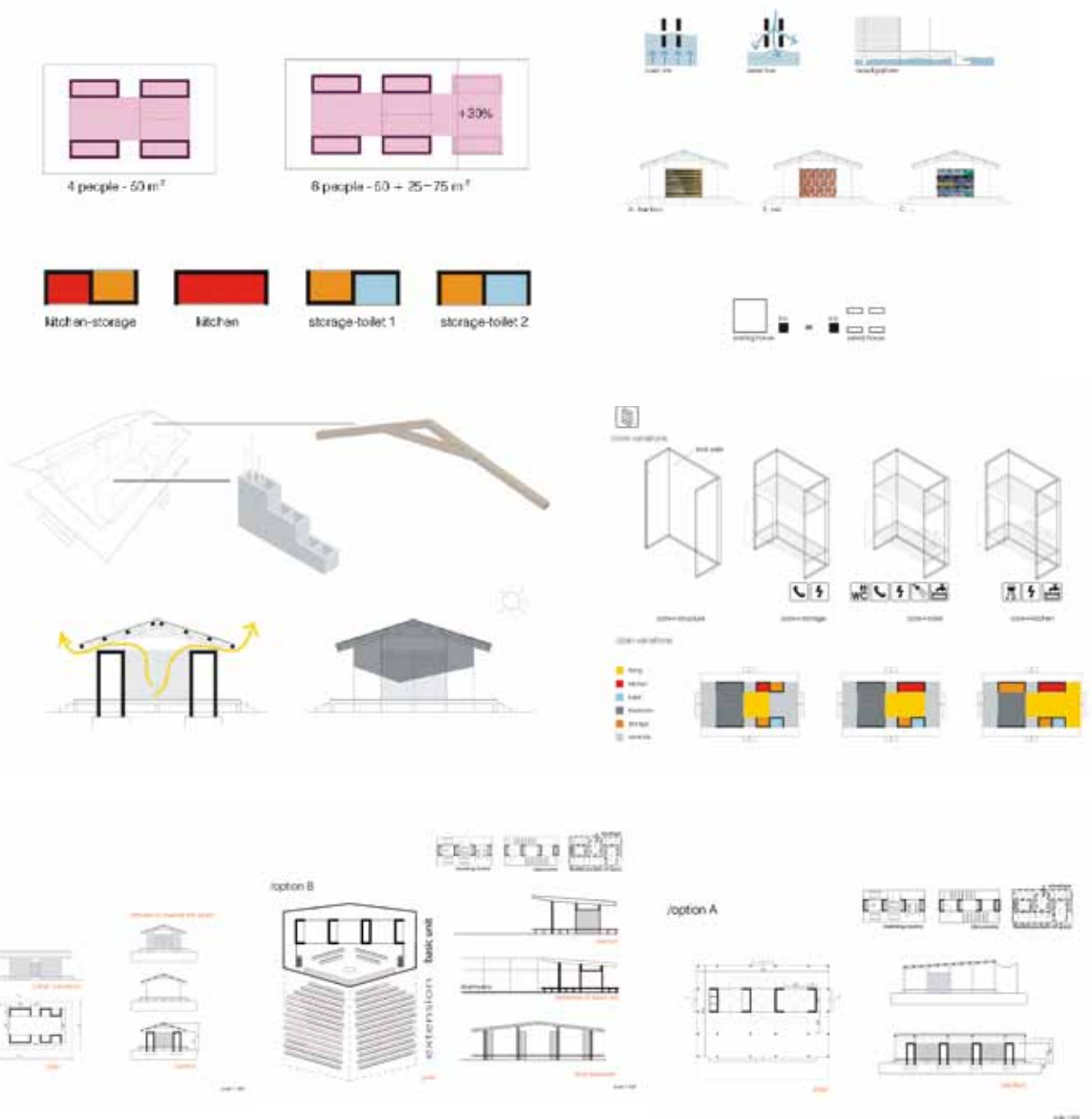
低技术

墙采用钢筋混凝土；屋顶采用传统的木质元件，用砖或锡覆盖；分区由可回收材料建造。

舒适度

多孔结构促进自然通风和遮阳，改善内部环境舒适程度。

社区中心

室内空间提供了灵活的适应不同活动需求的空间划分。内部大部分是老人和儿童的使用空间，其他大多数活动将在室外或屋顶下进行。在举行大规模集会时还将添加一个大帐篷。可移动旋转的分区使得建筑内部的重新配置变得容易。

房子里面提供了灵活的"口袋"空间。在此情况下，社区中心预计可聚集更多的观众举行公开演讲。它也可以暂时使用shamiyana（印度的一种帐篷）扩大其规模。

在此情况下，社区中心是一个基本房子加上补充部分。这可以采用工人熟悉的、非常容易的施工手段。

Comfort

the porous structure promotes natural ventilation and overshadowing, improving internal comfort.

Community center

the interior space provides flexible pockets of spaces for different programmatic needs. the inside will be used mostly by elderly people and children (day care, classroom, etc.). most other activities will take place outside, under the roof. In the event of very big assemblies a large tent will be added (see 'monsoon wedding'...). moveable and rotating partitions allow the easy reconfiguration of the building.

the inside provides flexible pockets of space. In this option, the community center anticipates a larger audience in a public speech. It can also be expanded temporarily using shamiyana.

in this option, the community center is an addition to a basic house. this could provide very easy construction means that are already familiar to the builders.