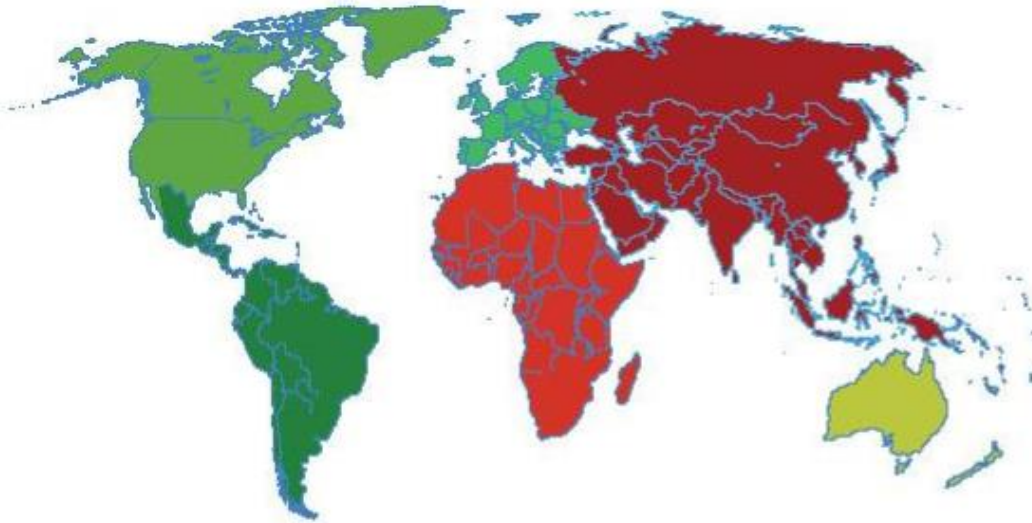
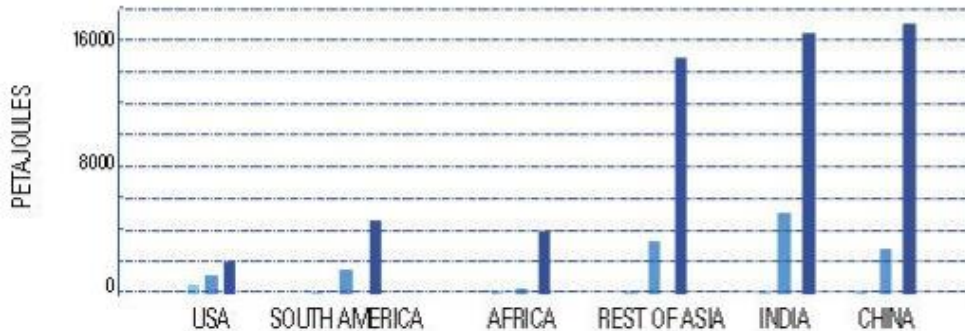
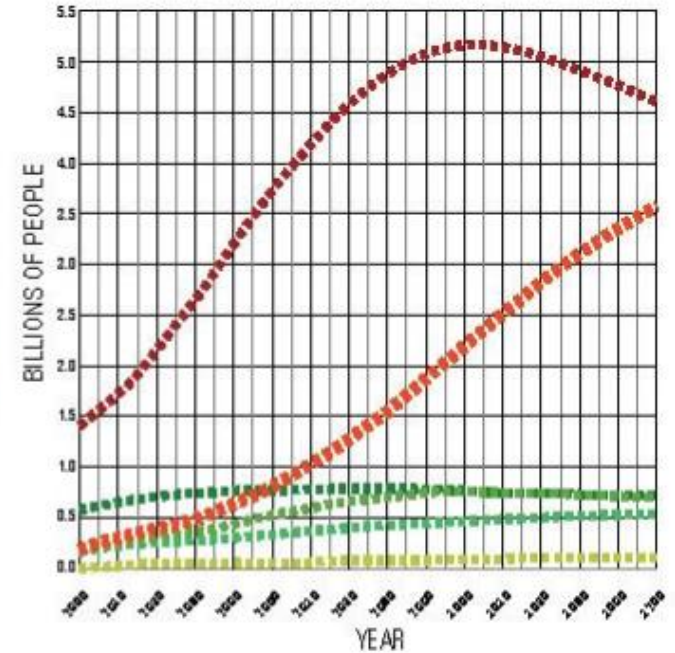


IMPACT OF GLOBAL POPULATION GROWTH PATTERNS ON RESIDENTIAL COOLING LOADS



Source : United Nations, Department of Economic and Social Affairs, Population Division: World Urbanization Prospects, the 2011 Revision. New York 2012



**70% NET INCREASE
COOLING LOADS³**

current 
2050 
2100 



Source: Isaac, M., van Vuuren, D.P. (2003). "Modeling global residential sector energy demand for heating and air conditioning in the context of climate change" Elsevier Ltd.

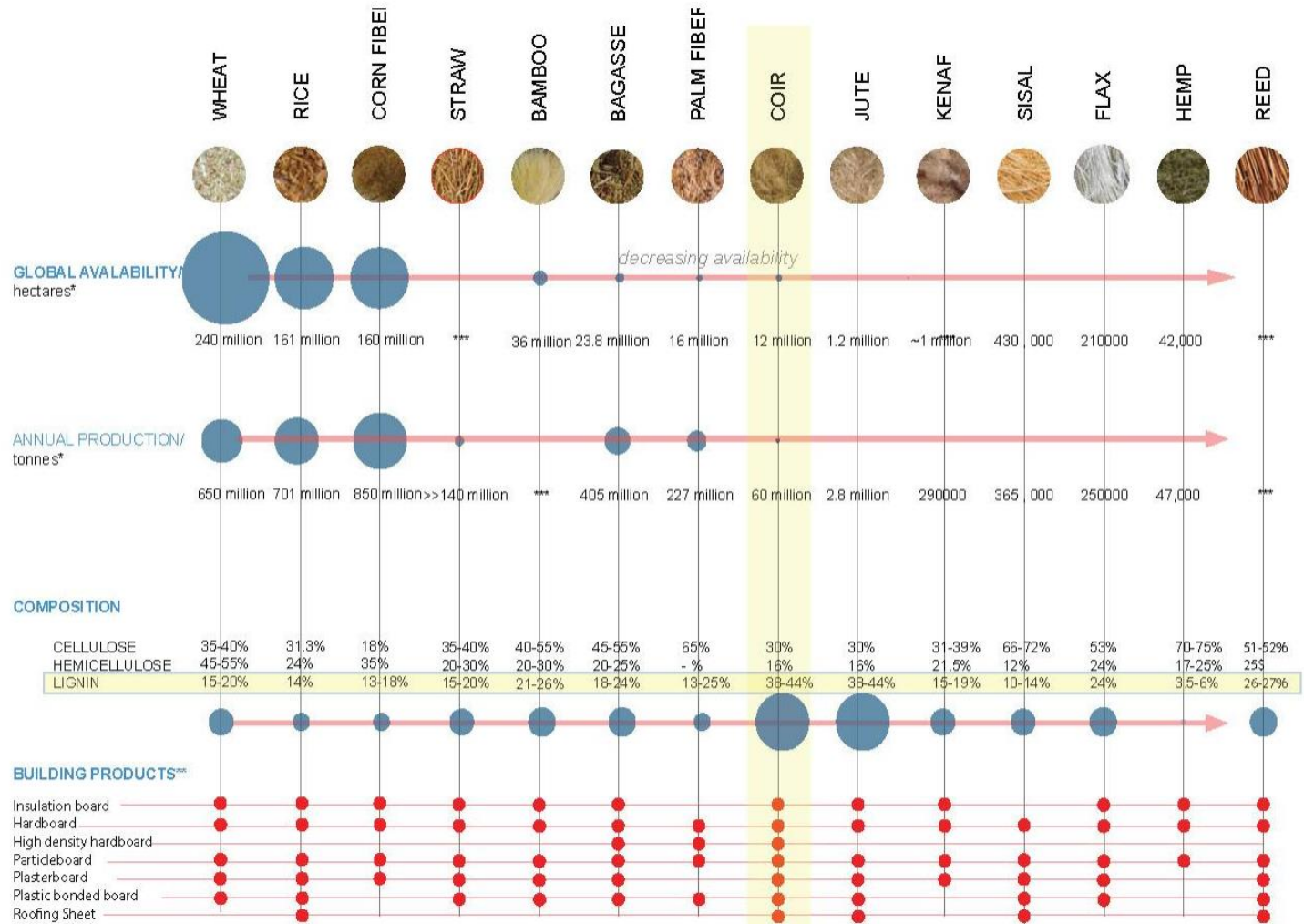
GLOBAL POPULATION GROWTH DRIVING PRODUCTION OF RENEWABLE HYGROSCOPIC AGROWASTE MATERIAL RESOURCES

+ 140 - 350

Billion Tons of Agrowaste Generated Annually

- Lack of distributed ecomanufacturing infrastructures for agrowaste building technologies

- Deeply-seated social / cultural negative perceptions of using 'low-tech', waste materials.



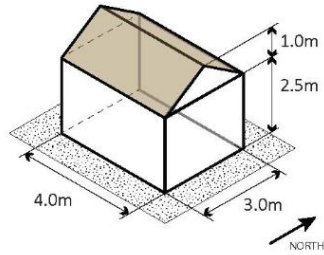
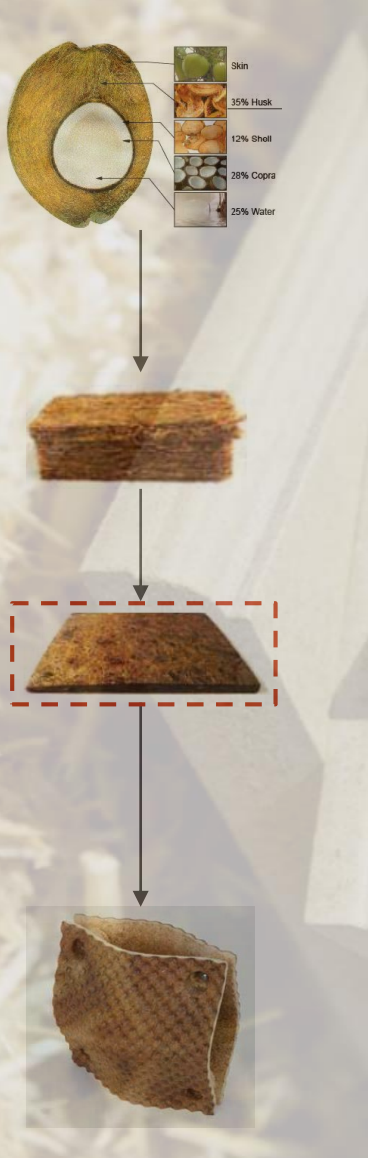
*Based on Food and Agriculture Statistics 2010 (FAO 2010)

**Based on 80 year survey of agro-based products done by the Forest Products Laboratory of the USDA Forest Service and the Department of Forestry at the University of Illinois, Urbana-Champaign.

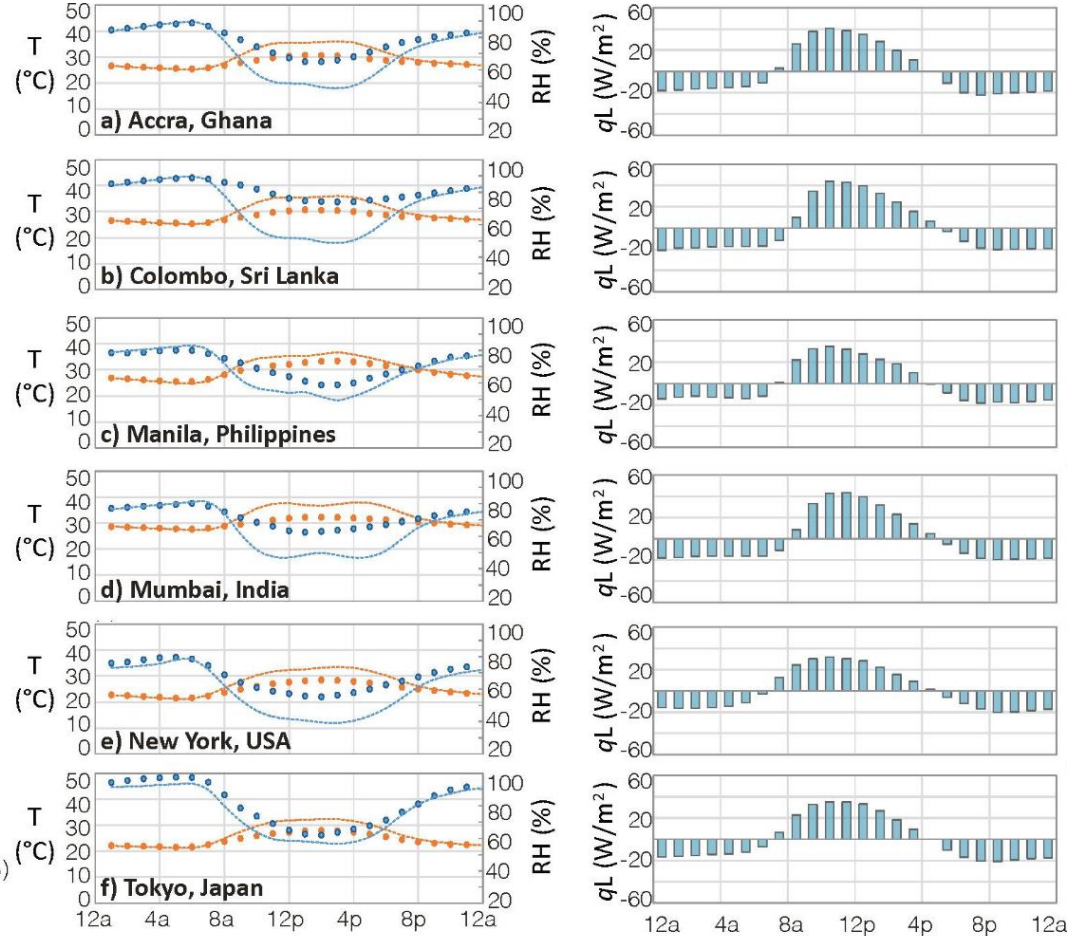
***difficulty in estimation of quantity due to unmonitored and undocumented wild growth of agro-resource

LEVERAGING AN EXPANDED AGROWASTE CHAIN FOR COOLING APPLICATIONS

INTRINSIC EVAPORATIVE COOLING PERFORMANCE OF COCONUT FIBERBOARD ROOF ACROSS HOT-HUMID CLIMATE TYPES



- Outdoor DBT (°C)
- Outdoor Humidity (%)
- Indoor Relative Humidity (%)
- Indoor DBT (°C)



1. Rempel, A. R., & Rempel, A. W. (2016). Intrinsic evaporative cooling by hygroscopic earth materials. *Geosciences*, 6(3), 38.
2. Lokko, Mae-ling Jovenes. *Invention, design and performance of coconut agrowaste fiberboards for ecologically efficacious buildings*. Rensselaer Polytechnic Institute, 2016.
3. Lokko, Mae-ling, and Alexandra Rempel. "Intrinsic Evaporative Cooling with Natural Ventilation and Shading for Adaptive Thermal Comfort in Tropical Buildings." (2018).