



# SUSTAINABLE URBAN TRANSFORMATIONS IN THE ASEAN REGION: An infrastructure & Resource Perspective

**Anu Ramaswami**, Professor of Engineering & Public Affairs  
University of **Minnesota**, USA

Member, International Resource Panel (**IRP**), UN Environment

**Ainhoa Carpintero**, IRP Secretariat, UN Environment

**Sam Tabory**, Research Associate, University of Minnesota

**Ashly (Spevacek) McFarlane**, Research Associate, University of Minnesota



# Critical Natural Resource Issues in the 21<sup>st</sup> Century

- Do we have enough land to house and feed 9 billion people by 2050, and support critical ecosystems?
  - Worldwide, urban land is expanding on prime agricultural lands and critical ecosystems



Chiang Mai, Thailand  
(CNBC.com)

- Coping with water stress and water scarcity
  - Water supply to just 100 world cities impacts 40 of the world's largest watersheds



- Material requirements for infrastructure and the economy
  - More cement was used in ten years in China than in the past 100 years in US due to the scale and pace of urbanization



- Fossil fuel use → Air Pollution & Climate Change
  - How can we stay within the 2C warming target?



# The United Nations' International Resource Panel

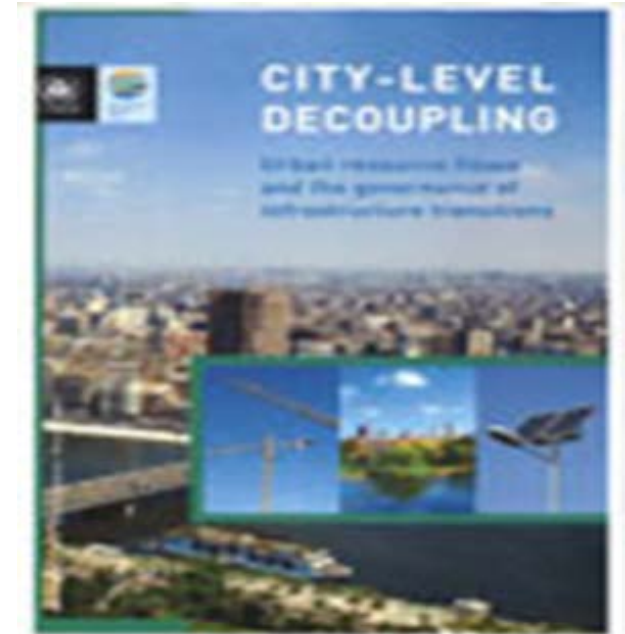
- The United Nations Environmental Programme's International Resources Panel (IRP) was launched in 2007 to build and share the knowledge needed to improve our use of resources worldwide, through synthesis and dialog among science-policy experts.
- The IRP has developed two major reports on cities, resources and sustainability:

## *City-Level Decoupling*

(UNEP, 2013)

## *The Weight of Cities: Resource Requirements of **Future Urbanization*** (REFURB)

(UNEP, 2017a)



# Key Findings: DRAFT ASEAN Urbanization Report: Important Trends & Opportunities (1)

- **66% increase in urban population** in only 35 years (year 2040)
  - 212 million new urban residents will join current 316 million urbanites
- Much future growth likely to occur in more than **200 small cities** over the next 35 years (population > 500,000)
  - In addition to fast growth in present Tier 1 & Tier 2 cities.
- Stable ASEAN economic growth → Large growth in **urban middle class**
- Because of such fast growth rates, **without advance planning**,
  - city growth can be patchy resulting in poor infrastructure for all residents,
  - High inequalities, and rise in informal settlements
  - High urban-rural inequalities
- Without advance planning, cities vulnerable to **climate change, and air pollution**


# Key Findings: Important Trends & Opportunities (2)


- Resource and infrastructure requirement
  - Electricity demand to **nearly triple from 2013 to 2040**, due to energy access, urbanization and rising middle class,
    - Electricity demand dominated by cooling in hot ASEAN climate
    - Opportunity to leverage energy efficiency in buildings and use ASEAN's rich renewables assets in cities
  - Housing and transport needed for **526 million urban dwellers including current and new**
    - Opportunity to leverage both housing and transportation with compact and livable city land use planning
  - Need for **waste management** in cities → Innovation opportunity leveraging local skills
- **Industrialization + Urbanization**: Significant industrial growth expected in sectors like petroleum, cement, power, wood, pulp and paper, and food processing
  - Promising for reusing waste heat and materials to save money, resources and reduce pollution and support urban infrastructure



# Key Findings (3): Existing Unique Assets to Leverage


## Natural Systems

 Renewable Energy Assets: Solar, Geothermal


 Oceans and Sea Breezes for cooling


## Built Environment in Cities

 Cities with high social interaction, mixed use and density

 Region inspired vernacular efficient buildings

## Economic & Cultural Assets

 Inherently conserving culture; leads in shared economy practices

 Strong economy, enabling land value capture for infrastructure financing in cities

 Diversity of governance experiments across ASEAN & Asia to learn from

# Key Findings: Solution Strategies (1)

## Land Use & Transportation Planning



Source: TransJakarta



Source: ITDP-Indonesia.org

### National Level Urbanization Plans

- Urban economic & corridor planning
- Urban Growth & Eco-preservation policies
- Infrastructure financing w Cities

### Urban-Regional Long Term Planning

- Regional development authority
- Compact growth with guided infrastructure development
- Land pooling for rural-urban equity

### City Land Use Planning

- Plan for strategic intensification
- Accessible density for efficiency, health & livability
- Mixed use w avoidance of slums

### Diverse transit strategies in different sized cities

- Active transport, Bus, Rail

### New Vehicle Technologies: Electric and Shared Autonomous Vehicles

# Key Findings: Solution Strategies (2): Resource Efficiency through Buildings and Energy



Diamond Building,  
Malaysia. Source: Le  
and Mar, 2013



Heritage  
shophouse,  
Malaysia.

Source: Omar &  
Syed-Fadzil,  
2011

## Establishing Regionally Relevant Energy Efficiency Buildings Standards

- Standards/Guidelines for high rise buildings
- Guides for Vernacular + Innovations in Mid Rise buildings
- Consider occupant behaviors, culture

## Standards are not enough – real time monitoring of buildings energy use

- Performance based incentives for builders
- Recognize ordinary buildings may use less energy due to usage patterns (to reward)

## In Situ Slum Rehabilitation

- Within city, recognising economic contribution
- Best practices for participatory rehabilitation in mid and high-rise buildings

## Diverse opportunities for renewables

- Buildings, districts, micro-grids (institutions)



# Key Findings: Solution Strategies (3)

## Cross-Sectoral “Waste” to Value Projects



*Rice Husk Gasification to Electricity Generation, Cambodia*

Industrial symbiosis where more than 3 industries profitably exchange “waste” materials and energy

- Through informal industry networks
- Through planned eco-industrial parks

Urban-industrial symbiosis where material and energy are exchanged between industries and urban infrastructure

- District energy with waste-heat recovery
- Municipal solid waste to value & local livelihood
- Construction with reused/recycled materials

Rural-urban symbiosis where waste to value urban markets are developed

- Prevent burning of agricultural waste in rural areas surrounding cities to improve air quality

# Overall – Key Messages

- ASEAN cities are important to national economy & sustainability at local, regional and national levels
- Several resource efficiency strategies are available that leverage existing assets and meet ASEAN urbanizing needs: In particular, planning for 200+ smaller cities
- The strategies can broadly be categorized into Land use & Transportation, Buildings & Energy; Urban-Industrial Symbiosis
  - Must be implemented together for maximum benefit
- Given strong economic forecast in the ASEAN bloc, all strategies can be net revenue generators in the long term.
- Sound policies, incentives and infrastructure financing to meet first costs are needed.
- Regionally relevant design standards and performance monitoring are needed to support implementation.
- Multi-level Multi-Sector policy coherence & capacity building needed
- ASEAN Cooperative Research Centers may be strategic: Ex: On Vernacular-Hybrid Building Designs, On Small City Planning

# Thank you!

[Anu@umn.edu](mailto:Anu@umn.edu)

[www.sustainablehealthycities.com](http://www.sustainablehealthycities.com)