

# **Integrated Energy Conservation Policies from the Ground Up: Lessons from the Eco-living Program of Singapore's South West District**

He Hengzhao, Harn Wei Kua (PhD)

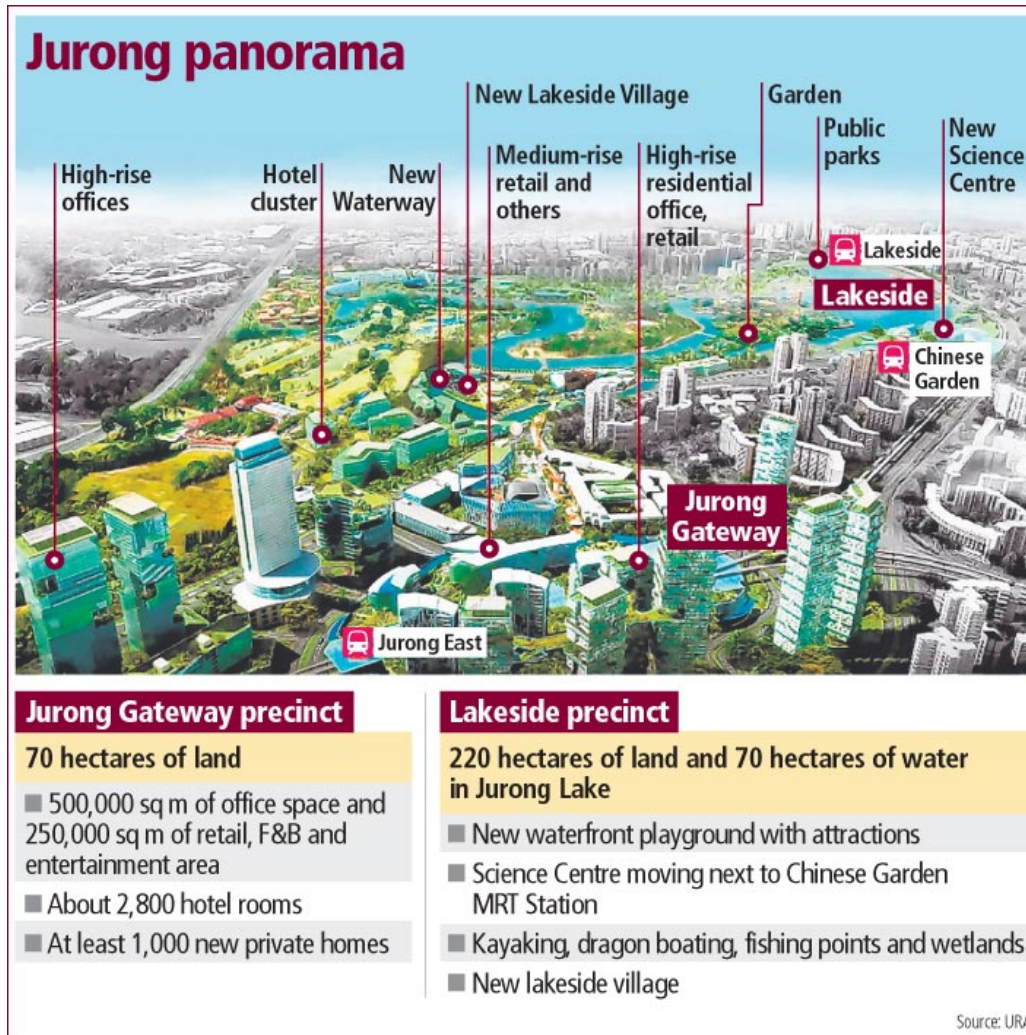
Assistant Professor, National University of Singapore (NUS)

Principal Investigator, Center for Sustainable Asian Cities, NUS

District Council Member & Sub-committee Chairman, South West Community Development Council

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# SUSTAINABLE JURONG



<http://lakefrontres.webs.com/>

# DISTRICT GOVERNANCE IN SINGAPORE



[http://en.wikipedia.org/wiki/File:Map\\_of\\_the\\_CDC\\_Districts\\_of\\_Singapore.png](http://en.wikipedia.org/wiki/File:Map_of_the_CDC_Districts_of_Singapore.png)

# RESEARCH QUESTIONS

- What is the baseline life cycle environmental footprint of Jurong in terms of resource consumption, waste generation, etc. if we are to develop as normal?
- And, how does Jurong compare with internationally-recognised sustainable districts?
- What kinds of new technologies can we implement to create more sustainable districts?
- How are these technologies worthwhile investments? What are reasonable standards (in terms of recycling rates or material consumption) we can meet within Jurong if we implement the recommended technologies?



# KEY IDEAS BEHIND INDUSTRIAL ECOLOGY

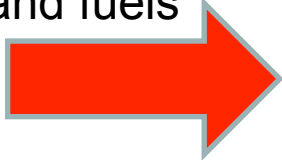


- Shifting of industrial processes from **linear (open loop) systems**, in which resource and capital investments move through the system to become waste, to **a closed loop system** where wastes become inputs for new processes (“wastes equal food”);
- Key approaches are usually:
  - **Material and energy flow analysis, and urban metabolism;**
  - **Lifecycle assessment.**



# SUSTAINABLE JURONG

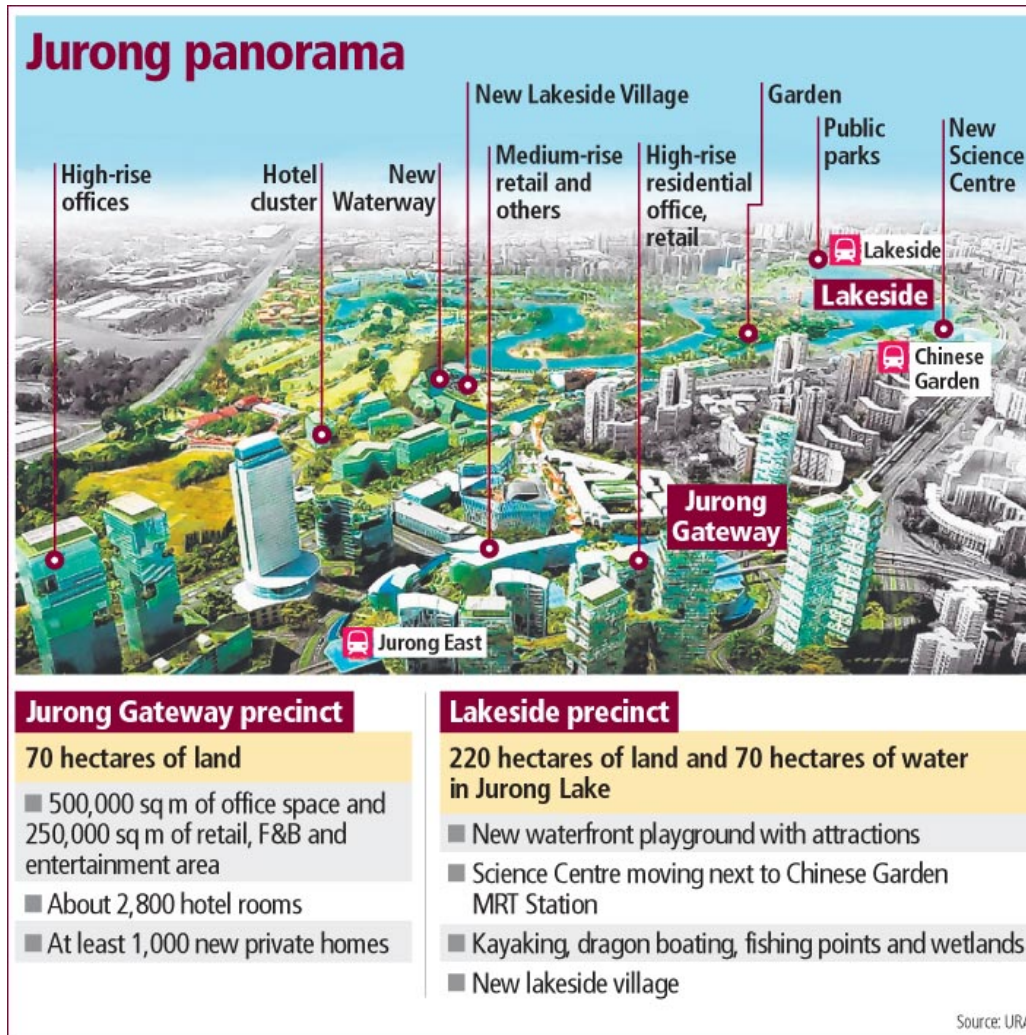
Energy and fuels



Water



Materials (building materials, food products etc.)



GHGs



Wastes



# Southwest ECO-LIVING PROGRAM



[http://www.southwestcdc.org.sg/index.php?option=com\\_content&view=article&id=94&Itemid=210](http://www.southwestcdc.org.sg/index.php?option=com_content&view=article&id=94&Itemid=210)

- Community-initiated household energy conservation project.
  - Designed by NUS and ECO Singapore.
  - Supported by Institute for Technical Education College West.
- Assisted by national government agencies
  - National Environment Agency
  - Public Utilities Board
- Financed by local government, South West Community Development Council.



# METHODOLOGY OF STUDY

- Objective: to assess effectiveness of different types of intervention methods to promote energy conservation.
- 151 households in Hong Kah North precinct.
- Experiments ran from Oct'10 to July'11.
- Households divided into 3 groups, each given different treatment.



# METHODOLOGY OF STUDY

- Tested out 2 types of intervention instrument:
  - Leaflet AND stickers, with monthly visits.
  - Monthly face-to-face counseling.
- Correlate energy conservation with:
  - Situational factors
    - E.g. age, income.
  - Psychological factors
    - E.g. “encouragement makes my perform the recommended measures”
  - Value factors
    - E.g. “Quality of life” factors, including “enjoy nature” and “being in good health”.

Most effective in reducing consumption (e.g. 15.8%)

# RESULTS

Period	Time period compared	1 & 2	2 & 3	3 & 4	4 & 5	1 & 5
Leaflet/ sticker	Mean	1.38	0.50	-1.96	1.77	2.21
	Significance (2-tailed)	0	0.015	0.005	0.025	0
Counselled	Mean	1.17	0.29	-1.37	0.48	0.84
	Significance (2-tailed)	0.001	0.263	0	0.197	0.034
Control	Mean	2.05	-0.19	-1.45	1.08	1.79
	Significance (2-tailed)	0.009	0.663	0.003	0.035	0.027

Positive values indicate reductions of electricity, while negative values indicate increase in consumption.

Period 1 represents October and November, 2010. Period 2 represents December and January, 2011. Period 3 represents February and March, 2011. Period 4 represents April and May, 2011. Period 5 represents June and July, 2011.

**\* Won the ASEAN Environmentally Sustainable Cities Award 2011**

# LESSONS

- Leaflets and stickers can be effective in reducing consumption, provided it is coupled with monthly visits. This can be achieved by most “semi-specialized” volunteers.
- Households living in large apartments (but are not in the control group) are most likely to change their energy consumption behavior.
- As revealed by our wrap-up interviews, the three most important reasons given for adoption of energy-saving measures are:
  - Ease of implementing the measures,
  - Prospect of reduction electricity bills, and
  - Concern for the environment.

## KEY POINTS ON LONG TERM TREND/GOAL

- In striving for sustainable future, there is a need for new engagements.
- Public should NOT JUST be engaged to learn about science and accept policies.
- Public should be ENGAGED IN THE PROCESS of scientific studies – to “**become part of the socio-technological innovation**”. i.e. “**Community Science**”.
- Some other examples:
  - Community water conservation programs;
  - Technological try-outs and feedback schemes.

# CONCLUSIONS

- There is a need to develop and embrace “Community Science”.
- Different stakeholders can be engaged to play active roles in integrated energy conservation program. “Semi-specialized” volunteers can be engaged to communicate with households, with the help of leaflets and stickers.
- Volunteers should be better trained in future to:
  - Facilitate the implementation of conservation measures.
  - Relate conservation to possible reduction in electricity bills, and
  - Relate conservation to mitigation of adverse environmental effects.

**THANK YOU VERY  
MUCH!**



# METHODOLOGY OF STUDY

- **Group 1 (“leaflet + sticker”):**
  - Oct-Nov 2010: Introduction. Surveyed behaviour. Measured consumption.
  - Dec-Jan 2011: Surveyed behaviour. Measured consumption.
  - Feb 2011: Leaflets and stickers were distributed. Surveyed behaviour. Measured consumption.
  - Mar-Jul 2011: Surveyed behaviour. Measured consumption.
  - Jul 2011: wrap-up interview also conducted.
  
- **Group 2 (“counselled”):**
  - Oct-Nov 2010: Introduction. Surveyed behaviour. Measured consumption.
  - Dec-Jan 2011: Surveyed behaviour. Measured consumption.
  - Feb- July 2011: Surveyed behaviour. Measured consumption. Counselling was provided monthly to encourage residents to implement more energy-saving measures.
  - Jul 2011: wrap-up interview also conducted.