



Hội thảo Ngôi **nhà xanh** Việt Nam - sự kết hợp giữa truyền thống và hiện đại  
Conference on **Green Housing** in Vietnam – Between tradition and modernity

**Demand-side Management of Energy:  
a prerequisite for green houses in Vietnam.  
Illustration through solar energy.**

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Universität Hamburg  
DER FORSCHUNG | DER LEHRE | DER BILDUNG



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ARTELIA, created by the merger of COTEBA and SOGREAH, offers a global, multi-disciplinary vision of **Engineering and Project Management** in the fields of Construction, Infrastructure and Environment

### Key figures

- 2,750 employees, 25% in international offices
- 300 million € turnover
- 30% of business conducted internationally
- 5,000 projects currently in progress
- 30 regional branch offices in France
- 40 permanent international subsidiaries in Europe, Middle-East, Africa, Asia, South America and Canada

**140** staff based in HCMC and HANOI

*A team dedicated to:*

- Construction projects as PM, CM and CS
- Water and environment
- **Clean energy and green building**

*Few local partners & clients:*



**AREP**



*ARTELIA is a member  
of the Vietnam Green Building Council*



## Energy and water context

- Water shortages in many areas; droughts will become more frequent and will only get worse...
- A growing problem for electricity supply
- An increase of incomes lead to a rise in water and energy consumption

*Solar energy can contribute to coping with these issues.*

## Hot water load

Trend observed in new buildings and houses in Vietnam:

- *Several* bath rooms (one per bedroom) per house
- *Bathtub*, or/and hi-class (*high flow rate*) shower
- *High flow-rate* tap
- *Systematic hot water* for the highest rank houses
- An increasing use of *air-conditioning*

→ high domestic hot water (DHW) energy use!

*In traditional housing*: hot water seldom used (or only when young or elderly people inside)

**= tensions between tradition and modernity.**

## Solar heating systems for DHW:

**Fair development** in Vietnam; “good business”

**Good country potential** (solar resource) and simple systems due to no freezing

Can cover 60 to 90% of the DHW energy use, replacing partly electric heaters.

Cost effectiveness of products

Reduce the peak power demand



→ **Solar energy is a good energy-efficient option for (green) houses in Vietnam**

*... However...*

## However,

- This sector could develop much faster **and better** (quality of products, design and implementation,...)
- Few environmental drawbacks:
  - materials (and origin)
  - may lead to additional electric load (auxiliary heater, air cond.)
- Still relatively **high investment** cost
- The higher your needs for DHW, the more expensive the (solar) heater.



## Reduce the energy use in order to facilitate the development of solar system

- Level 1: keeping the same service, by means of water efficient fixtures
- Level 2: avoiding the development of western habits in terms of hot water use; and by using water efficient fixtures

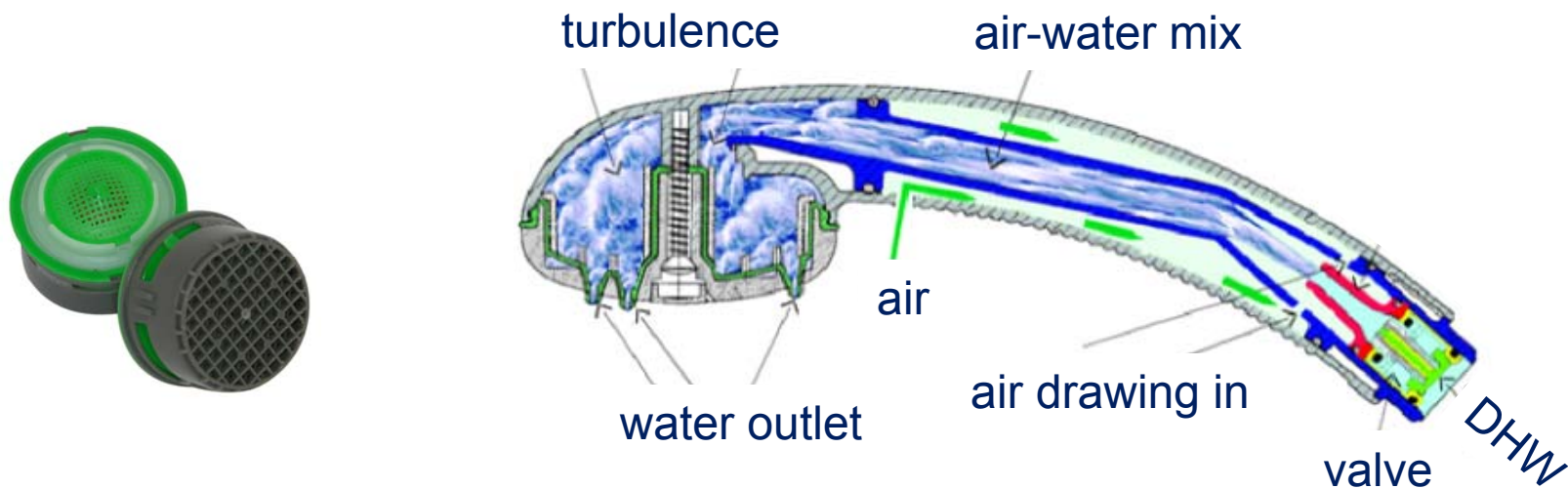
## Water efficient fixtures

- Often based on the Venturi effect, add air into the water, keeping the same feeling for users.
- Adapted to kitchen use (two-speed flow restrictors), for bathrooms (showers, taps).
- CFLs are widely used throughout Vietnam for many years ; **but why are water-efficient fixtures almost unknown?**

## Water efficient fixtures - limit for Vietnam:

- availability in the local market
- many different connectors for taps
- often: low pressure/flow rate or no pressurized water network, water quality

**But still, it can be developed without any major problem for almost all new green housing in Vietnam.**



### Case study:

- A modern house for a standard family with 2 children, in Hochiminh City
- Simplified computing (but with solar software)
- 3 scenario for DHW load:
  - **House A:** modern house with solar DHW heating system
  - **House B:** house A with water efficient fixtures
  - **House C:** improved modern house with solar system and water efficient fixtures

## House A

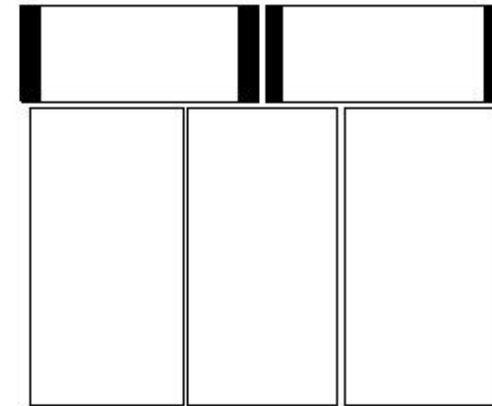
### Equipment for DHW:

- 3 bathrooms with hot water
- bathtubs with showers
- 4 taps with hot water

Hot water needs:  
**3,580 kWh/year**  
**110m<sup>3</sup>/year**



Tank: **300 litres**  
Solar panels: **6 m<sup>2</sup>**  
Cost: **15.5 Millions VND**



\$ Water: **1.4 Million VND/year**  
⌘ Electricity: **0.8 Million VND/year**



## House B

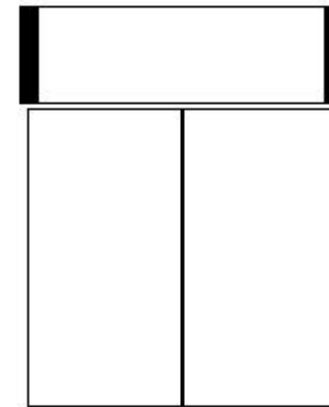
### Equipment for DHW:

- 3 bathrooms with hot water
- bathtubs with **water-saving showerheads**
- 4 taps with hot water, **with flow restrictors**

Hot water needs:  
**2,370 kWh/year**  
**72m<sup>3</sup>/year**



Tank: **200 litres**  
Solar panels: **4 m<sup>2</sup>**  
Cost: **12,5 Millions VND**



\$ Water: **0.9** Million VND/year  
⌘ Electricity: **0.6** Million VND/year



## House C

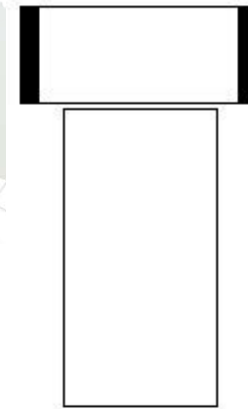
### Equipment for DHW:

- 2 bathrooms with hot water
- showers with water-saving showerheads
- 3 taps with hot water, with flow restrictors

Hot water needs:  
**1,310 kWh/year**  
**40m<sup>3</sup>/year**



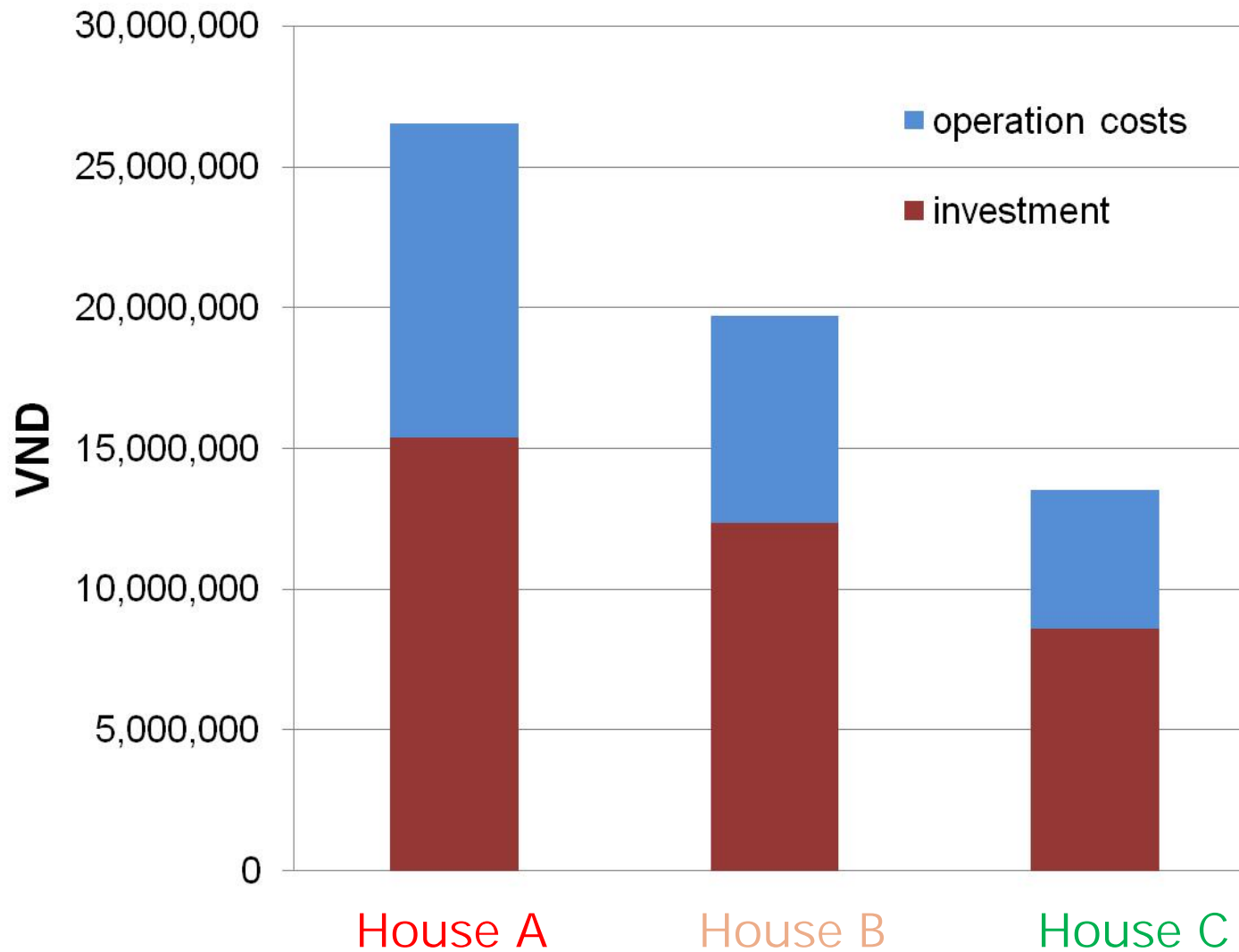
Tank: **100 litres**  
Solar panels: **2 m<sup>2</sup>**  
Cost: **8.5 Millions VND**



\$ Water: **0.5 Million VND/year**  
⌘ Electricity: **0.5 Million VND/year**



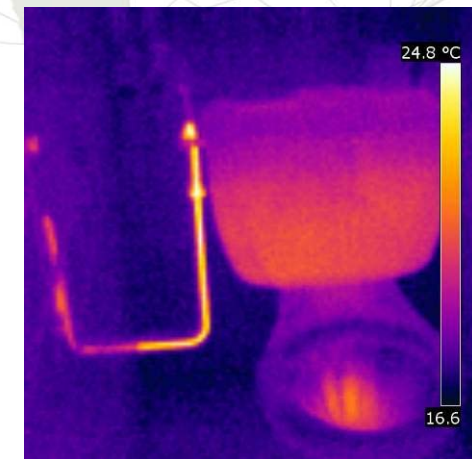
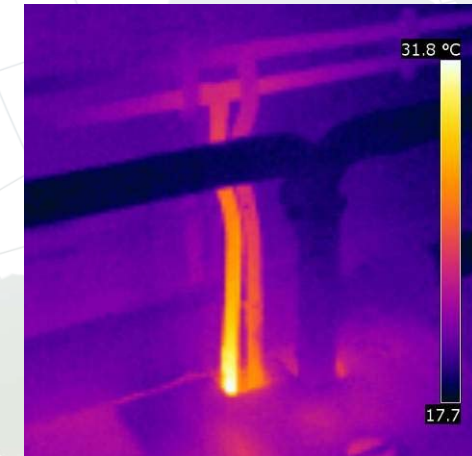
### Economics (5 years):



## Reduce even further the energy/water bill:

- Thermal insulation of pipes, efficient mixers/taps
- Heat recovery systems on showers
- Efficient auxiliary heater
- Low-flow flush and cold water taps
- Collecting rain water or reusing water
- ...

*Refer to Vietnam Green Building Council for a technical description of systems and a list of suppliers in Vietnam.*





## Benefits:

- **To the investor:**
  - Reduce investment
  - Positive aspects of green features for business
  - Potentially larger rooms – or smaller houses
- **To the users:**
  - Energy and water savings
  - Savings on investment; potentially larger rooms
  - Limit the needs for air-conditioning and healthier bathrooms
- **To Vietnam:**
  - Reduce power load
  - Saving of water resources; water-related energy issues
  - Help develop further the solar energy solutions
  - Possibility to develop a local offer: solar system incl. water efficient fixtures

## CONCLUSION

### Conclusion and development

- The positive impact of solar energy to meet hot water load can be enhanced by a proper energy efficiency approach, both in terms of economics and environment
- The same methodology is also true for a photovoltaic system: by reducing the electricity load (lighting, electric appliances...), the investment for a photovoltaic system that would meet the remaining electric consumption is significantly reduced and can become affordable
- This approach could participate in developing solar energy in a right and efficient manner for the benefit of the whole Vietnam.



ARTELIA

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