Towards a deeper integration of urban services

An operator point of view

VEOLIA
ENVIRONNEMENT

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Foreword

"If you do not have knowledge on sustainibility issues, you should not be a Mayor"

Vice-Minister Qiu Baoxing, Ministry of Housing, Urban and Rural Development, China, May 2009

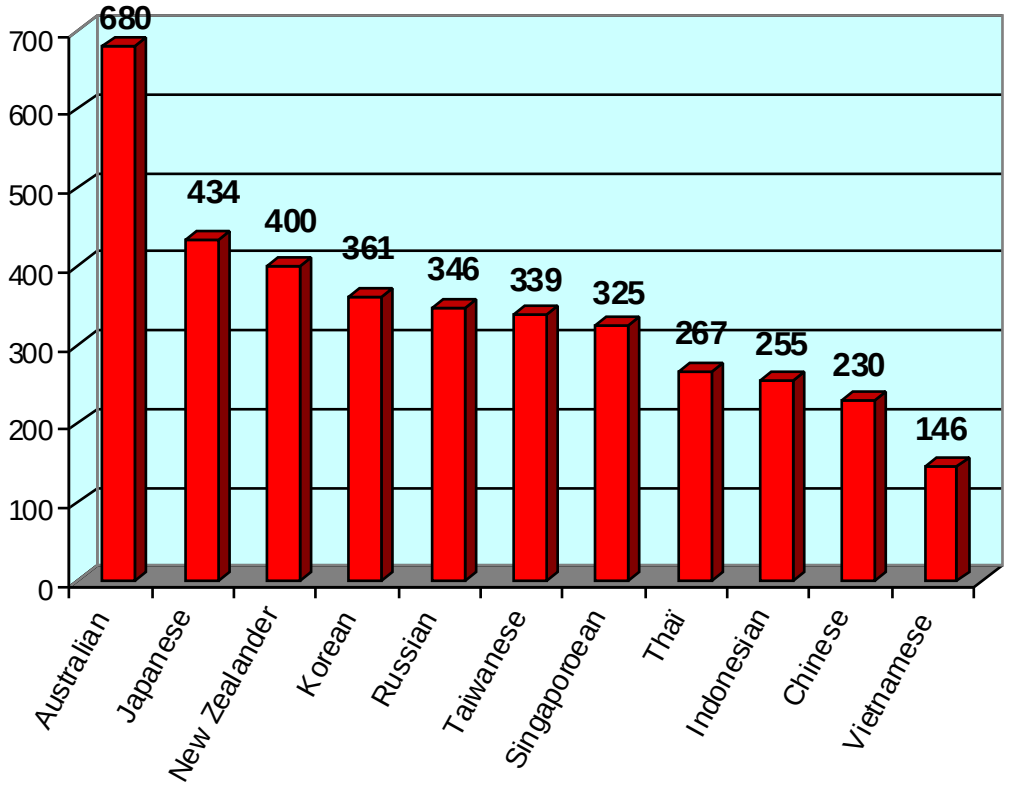
Part I - Overview of urban challenges

Services operators are « flows' managers »

- **Cities have to manage flows:** flows of water, waste, materials, energy, air, passengers and the like. **Put this way it seems very simple, but in an increasingly urban world, it isn't.**
- There will soon be 4 billion city dwellers on the planet, each of them producing, consuming and traveling. We have to supply them with drinking water and energy, give them means of transportation, and collect and treat their wastewater and waste.
- Managing those flows, which are indispensable to *Homo urbanus*'s quality of life, while at the same time preserving the environment, requires know-how in many spheres, along with a very tight organization. **Making cities more fluid requires expertise and technology.**

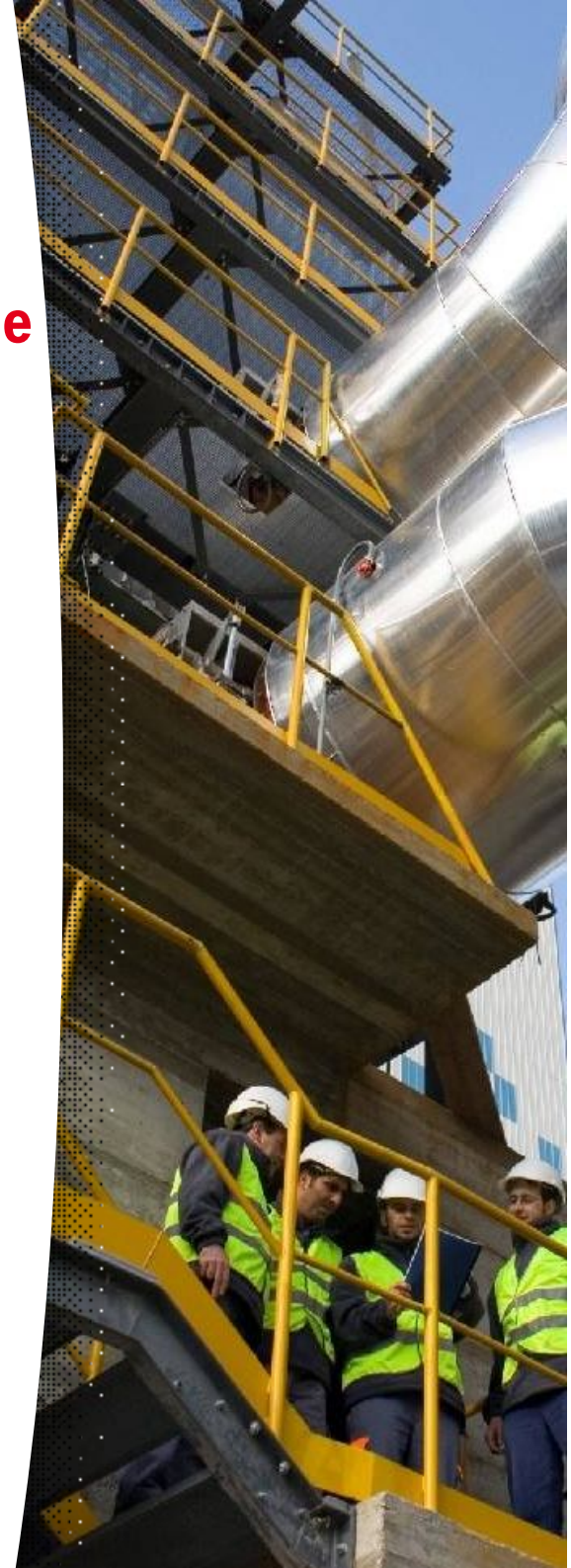
In urban areas, the demand for public services is continuously increasing

- **We may not know how the 21st century will unfold, but we do know that it will be the century of the city.**
- **Every economic growth point means one or several growth points in water consumption, public transportation,...**
- **The more prosperous a city, the more waste it produces. Although they only occupy 2% of the world's landmass, cities produce a total of 3 billion kilograms of waste a day.**



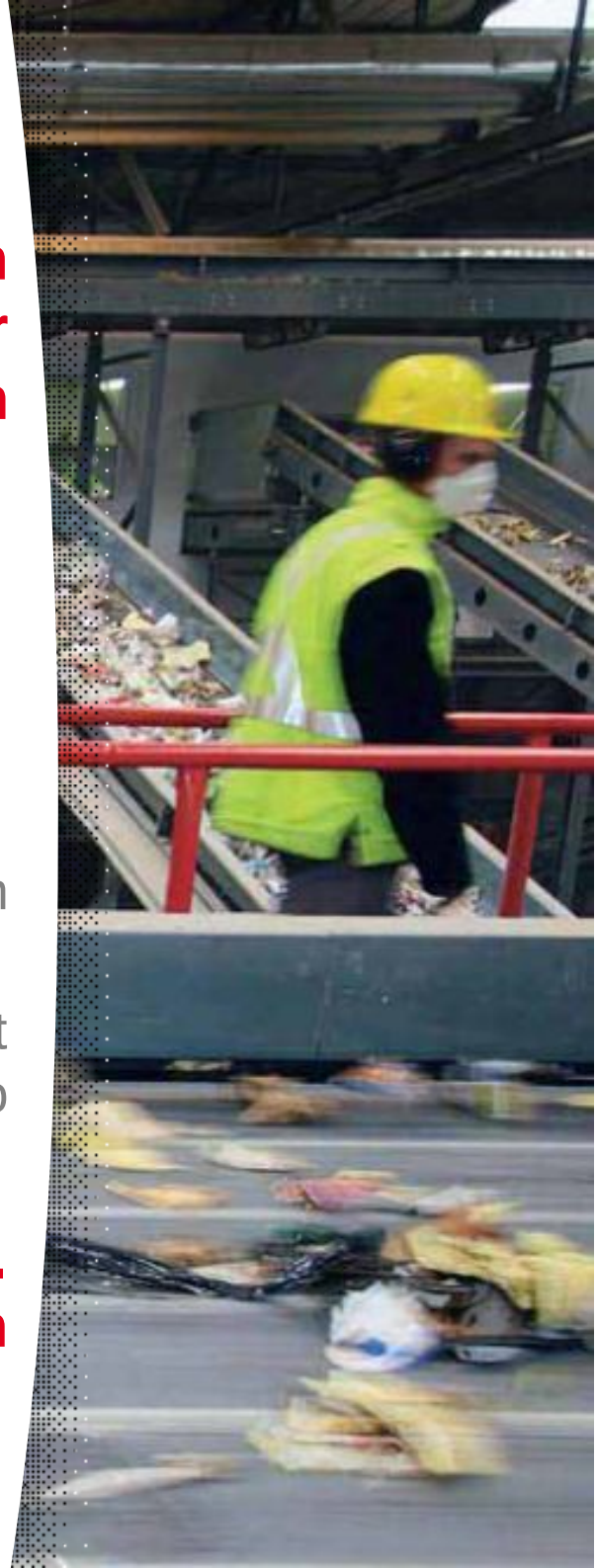
Cities, energy and global warming

- **Much of the battle against warming will be fought out in the towns and cities, those energy-guzzling islands of heat.**
- **Cities are responsible:**
  - for 80 % of GHG emissions
  - for 75% energy consumption.
- **Furthermore, current forecasts place Asian electricity consumption at an annual increase of 5-8 %.**
  (Source: Asian Regional Document, March 2009, 5th World Water Forum)
- **Oil reserves are steadily declining, yet less than 20% of plastic is recycled worldwide.**
- **The climate challenge is too serious for us to be able to afford the luxury of mismanaged urban services.**



The many « diseases » of cities

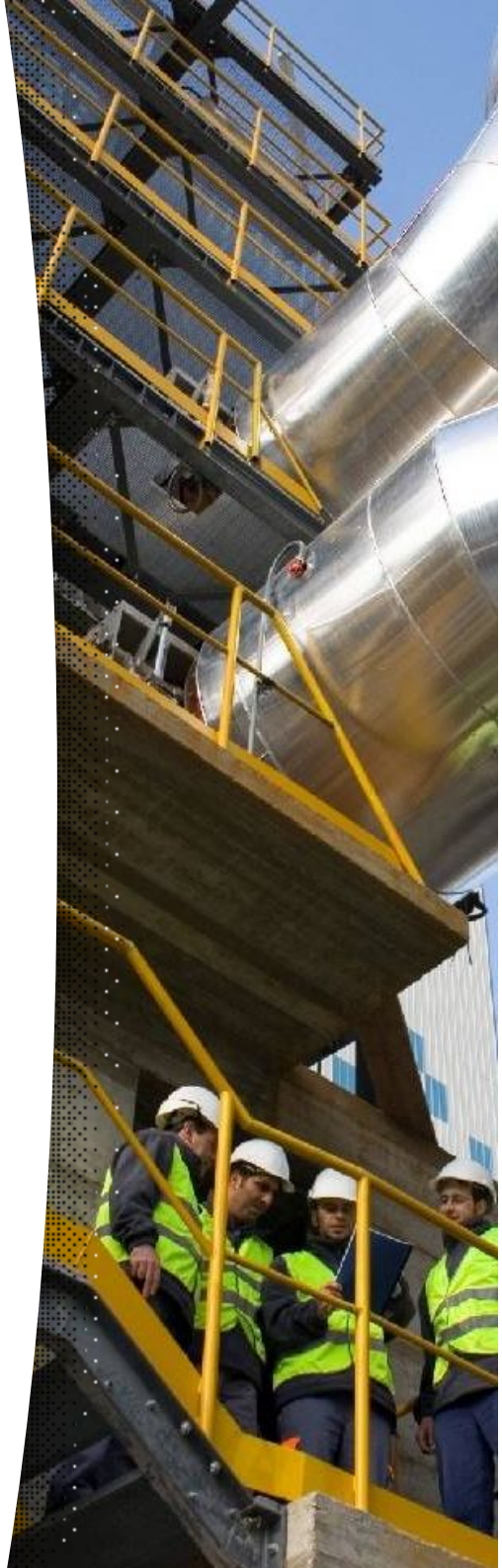
- **Cities suffer from a variety of disorders, including urban "*obesity*", natural resource bulimia, traffic clots in their arteries, contamination from wastewater, failures in vital systems such as electricity.**
  - Manila is collapsing under the weight of its waste,
  - Los Angeles is being asphyxiated by its traffic,
  - Beijing is suffering from drought,
- **Many metropolitan areas are living on ecological credit.**
  - In the long term, no city, no country, no company can continue expanding in a polluted environment.
  - On the other hand, when the environment is protected, it in turn protects human health and allows the economy to run smoothly.
- **The environmental challenges of cities are multiplying. How can we respond to them? One part of the solution is a deeper integration of their urban services.**



Part II – Toward low impact urban utilities through a better integration of them

The city of the future will operate with maximum integration of public services

- **At Veolia, we observe that our four businesses are interacting more and more:**
  - the heat from wastewater is being injected into district heating systems.
  - we are converting byproduct energy produced in steelworks into a source of heating for the town.
  - we are producing biodiesel from used oil that will run a city's bus fleet.
  - we are transforming non-recyclable waste into electricity, which we sell to urban electricity suppliers;
  - We are recovering potential energy and producing electricity with turbine in water networks
- **These synergies are technical, economical and environmental.**



Integrating local and networked solutions

The many possibilities of integrating urban services

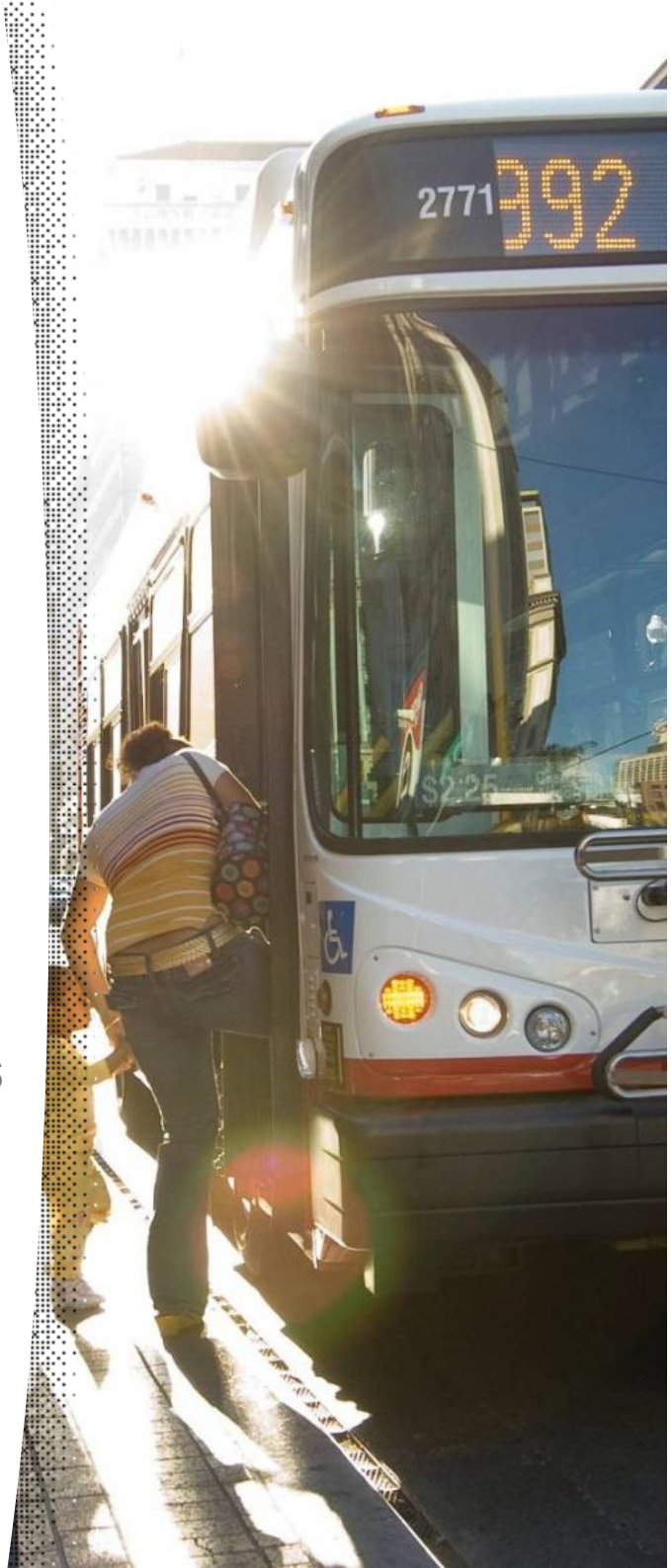
Provides to... / *(except usual relationship)*	**Water service**	**Solid waste service**	**Energy service**	**Passengers transportation**	**Parks**
Water service		• Recycled wastewater for washing the vehicules of waste management services • Recycled materials in the future wastewater treatment plant	• Recovery of heat produced by wastewater and reinjection into urban heating network • Biogas and electricity generated in WWTP • Hydroelectricity generated in water networks	• Recycled wastewater for washing bus, metros and urban trains	• Transformation of sludge generated by the WWTP into enriching agents for soils
Solid waste service			• Biogas production in solid waste landfills • Heating and electricity produced in incinerators	• Production of biodiesel from waste edible oils, in order to fuel bus	• Production of fertilizer by composting organic waste and green waste
Energy service	• Combined energy plant and desalination plant for optimizing heat-electricity-water production		• Converting byproduct energy produced in industrial areas into a source of heating for the town • Cogeneration	• Fast recharge system for electric vehicles	
Passengers transportation					
Parks		• Green waste used for fertilizer production	• Biomass production for alternative source of energy		

Integration is perticularly appropriate for energy recovery

- **The cities want to capture the many sources of energy gushing in their midst rather than ignore them as they did in the past.**
  - In Guangzhou Likeng, the waste-to-energy plant can produce 21 MW of electricity.
  - In Ho Chi Minh City, optimizing street lighting has reduced energy consumption by 30%. The greenest kilowatt-hour will always be the one that isn't consumed.
  - In Sydney, hydroelectricity is produced thanks to 250 m difference in level between the water resource and the 2 drinking water production plant. Hydro-electricity produced amounts to 75 % of the needs of these 2 plants.
- **Integrating urban services helps produce energy locally, as close to the needs as possible.**
- **It is by managing and integrating together their various urban services than cities will capture their internal source of energy.**

Complementary advantages of urban services' integration

- **Optimization of Customer Relationship Management**
  - Homogenous Quality standard for clients of electricity service, water service,… (e.g. call outs, response times, warnings when work on the network may affect service…)
  - Savings generated by shared Call Centers
  - Remote automatic reading of electricity and water meters
- **Optimization of maintenance and renewal operations on networks**
  - Reduction of damages caused to nearby residents (such as noise, waste generated by works)
  - Savings made on the costs for opening and closing trenches
- **Optimization of the maintenace of municipal vehicles (for passengers transportation, waste management or parks management)**
  - Time-saving and labour-saving process
  - Reduction of components stocks for repairs



In the future, urban services will be designed and managed two by two, three by three...

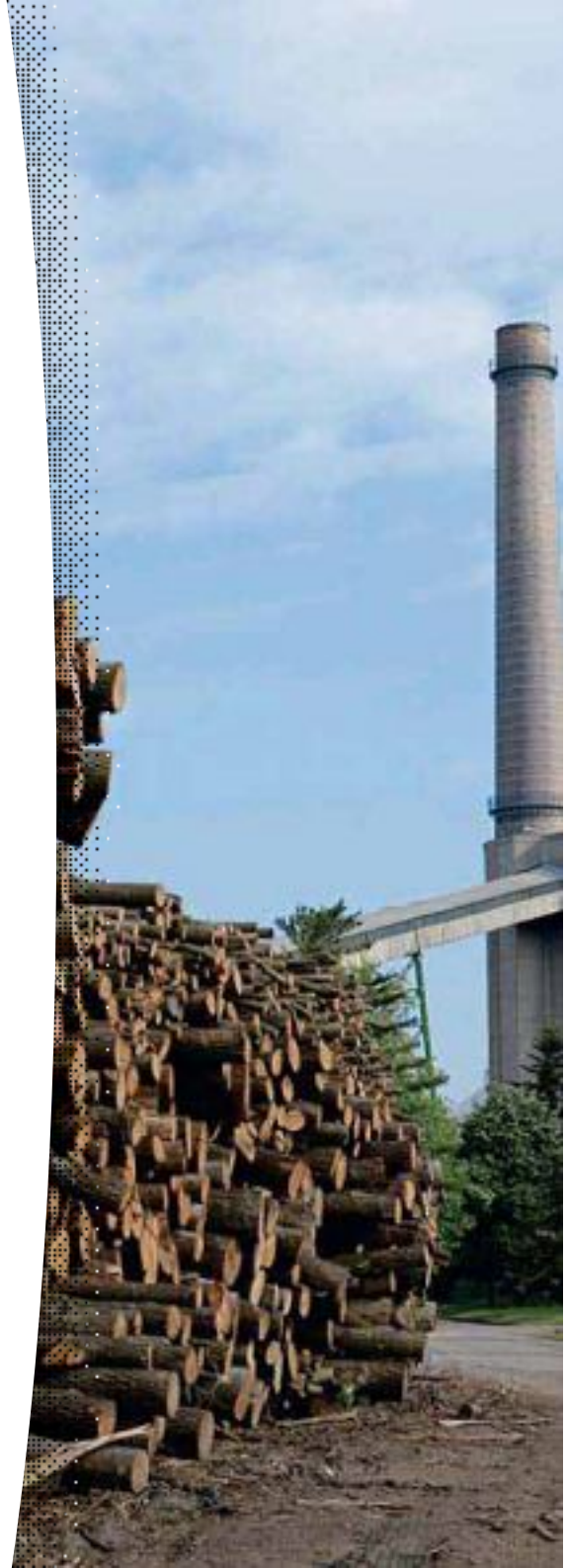
- **Major gains results from the integration of urban services at the very beginning of their design and construction:**
  - All networks installed in the same Utility tunnel
  - Networks and major installation are localized so that as to facilitate and maximize their interconnections
- **Looking at water, waste, public transportation, energy... services simultaneously generate valuable insights that do not arise from separate policy. This is a prerequisite for building ecocities.**
  - On the contrary, by being limited to each service, a separate management of urban services deprive the municipality and the population of the environmental advantages and savings they could derive from their joint management.
- **If cities want to reconnect with the environment, their services have to be better connected together.**

The issue of integration between individual and collective solutions

- **Another issue related to service integration consists in finding the optimal economic and environmental balance between:**
  - area-specific solutions (such as recovery of rainwater, solar panels, etc.), which are often implemented on an individual scale;
  - collective systems (such as public transportation, district heating fueled by biomass, etc.).
- **The example of low consumption buildings:**
  - They comprise high energy efficiency equipment, altogether compact and multipurpose (i.e. simultaneously producing heating, ventilation and domestic hot water), so as to reduce costs and seek synergies
  - Buildings will become energy local production sites, thanks to photovoltaic and micro wind power. The million urban energy **consumers** will change into just as many **producers.**
- **In order to optimise the way this multi-source/multi-use network will operate, a smart management system, based on telecommunications, will have to be implemented.**
  - The IT ‘s revolution will hurry up the integration of urban services

Toward low impact urban utilities

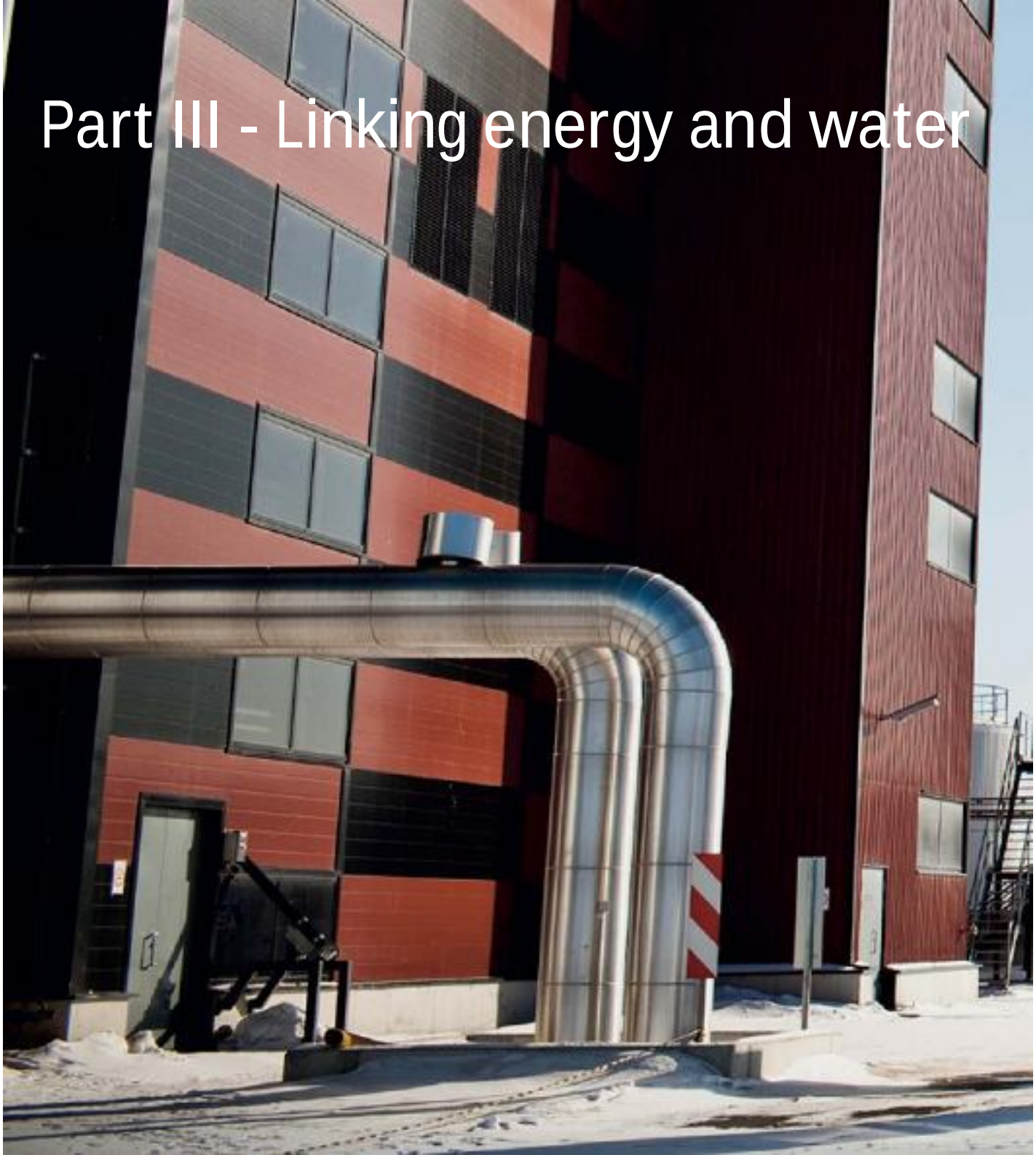
- **It is urgent to mitigate and control the ecological impact of cities and to improve the quality of urban life:**
- **The ambitious objective of carbon-neutral cities won't be rich without integrating urban services.**
- **Decisions-makers have various levers at hand to act:**
  - Urban design defining the functionalities of urban space;
  - Optimization of networked solutions: water, wastewater, solid waste collection, power grids
  - Cross-energy recovery between urban services
  - Energy efficiency of buildings and equipements
  - Development of adequate public transit networks
  - Deployment of local sustainable solutions of wastewater recycling, solid waste treatment and recycling, alternative energy generation



However, there are various obstacles to a greater integration of urban services

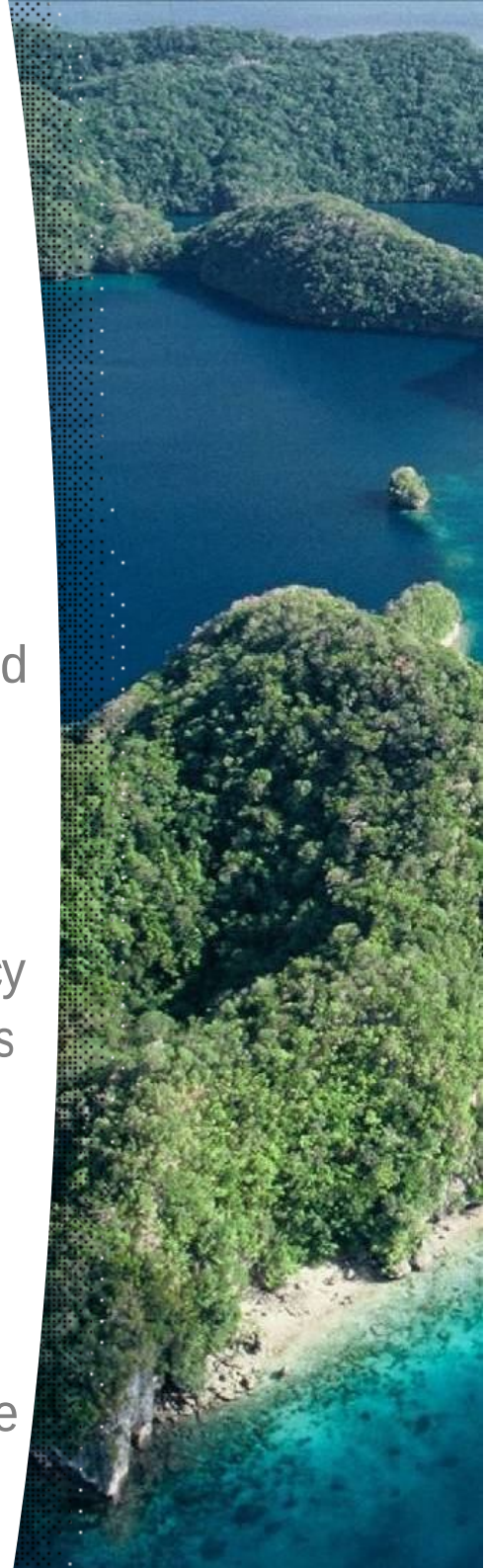
- **Lack of local outlets:**
  - For instance close heating networks for heat produced by cogeneration or recovered from wastewater networks;
  - Markets for secondary raw materials,...
- **High investments costs for creating new connections or local outlets** (e.g. creation of underground heating networks)
- **Technical difficulties, large distance between networks**
- **Integration limited or prohibited by laws or standards:**
  - How to promote the integration of urban services when existing laws are organizing their separated management?
  - It's not just a matter of inventing sustainable services and then making widespread use of them: they first have to be accepted by lawmakers.
- **Service users' reluctance to direct upstream-downstream integration** (e.g. wastewater recycling in Toowoomba).

Part III - Linking energy and water



The nexus between energy and water is a critical issues for ecocities, and thus the integration of these two services

- **A combined approach is all the more necessary since energy security may be conflicting with water security:**
  - Water and energy are competing for the same resource. For instance, American energy production is very much at the mercy of water availability
  - The dilemma is that energy enable us to reduce water scarcity and that water enables us to reduce energy scarcity…
- **Due to the give and take relationship between the water and energy systems, it is necessary:**
  - to look at the same time for energy efficiency and water efficiency
  - to move towards an optimum between low energy water systems and low water energy systems.
- **Water efficiency should be given a priority by energy planners and energy efficiency should be given a priority by water planners.**
  - The objective is to save water in order to save energy, and to save energy in order to save water.



Examples of synergy or combined approach

- **Combining desalination plant and power production plant:**
  - as for new thermal desalination projects, desalination plants are increasingly being installed in conjunction with energy production installations;
  - the heat produced (when hydrocarbons are burnt to produce electricity) is used to vaporise sea water;
  - these hybrid solutions allow optimal use of thermal power stations.
- **Sewage and wastewater heated apartments in the former Olympic Village of Vancouver in 2010.**
- **South Korea aims at improving energy independence of public sewerage facilities from 0.8 % in 2007 to 45 % in 2030** *(Chong Chun KIM, Korean Ministry of Environment – Incheon Water Forum, August 21rst, 2009)*

Jiamusi, China: a winning heating network

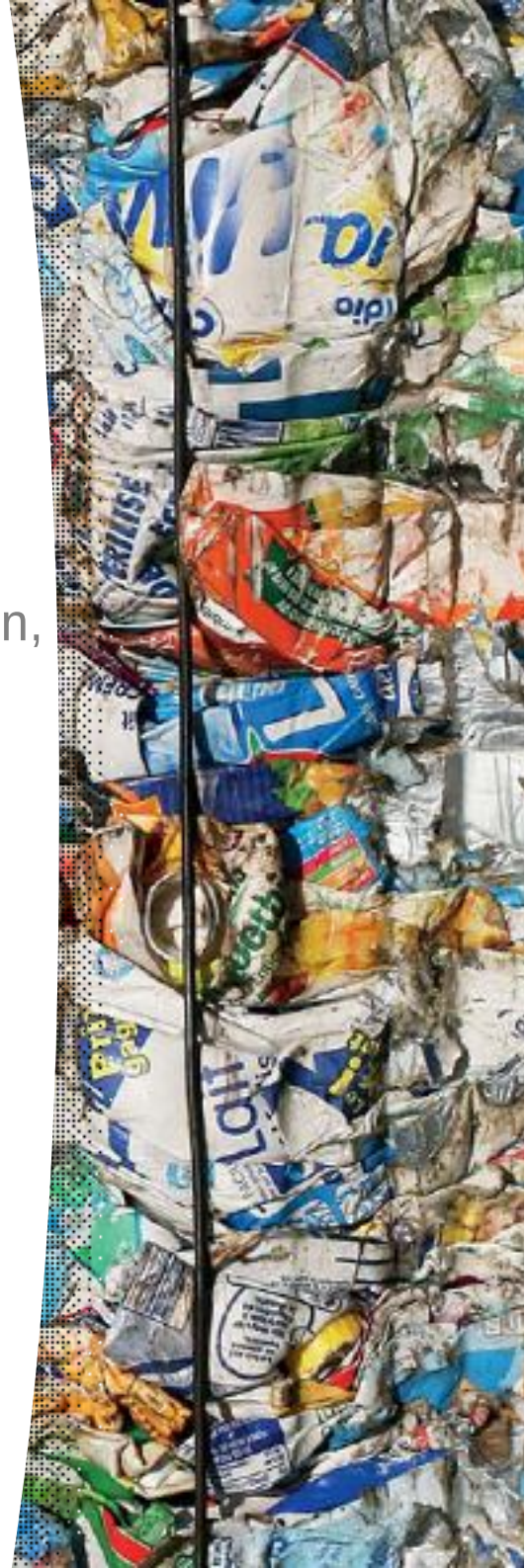
- Operated by Dalkia since 2007.
- **Following a large-scale initiative to update the network's facilities:**
  - **water loss has been cut by 30%, energy consumption has fallen 13.5%, and yearly CO_2 emissions have been reduced by 65,000 tonnes.**
  - The network has been extended by 56% to total 8.6 million sq.m, and work has started to expand it still further, to 14.5 million sq.m.
  - A customer support centre is now available 24 hours a day, and access to information has been expanded via an Internet site and local media.
  - By improving service quality, Dalkia has gained its customers' trust and reduced the bad debt rate from 7% to 2%.
- **Honoured with an award from the International Energy Agency at the international heating network summit held in Copenhagen in 2009.**

Jiamusi, China

Part IV – The future of R&D

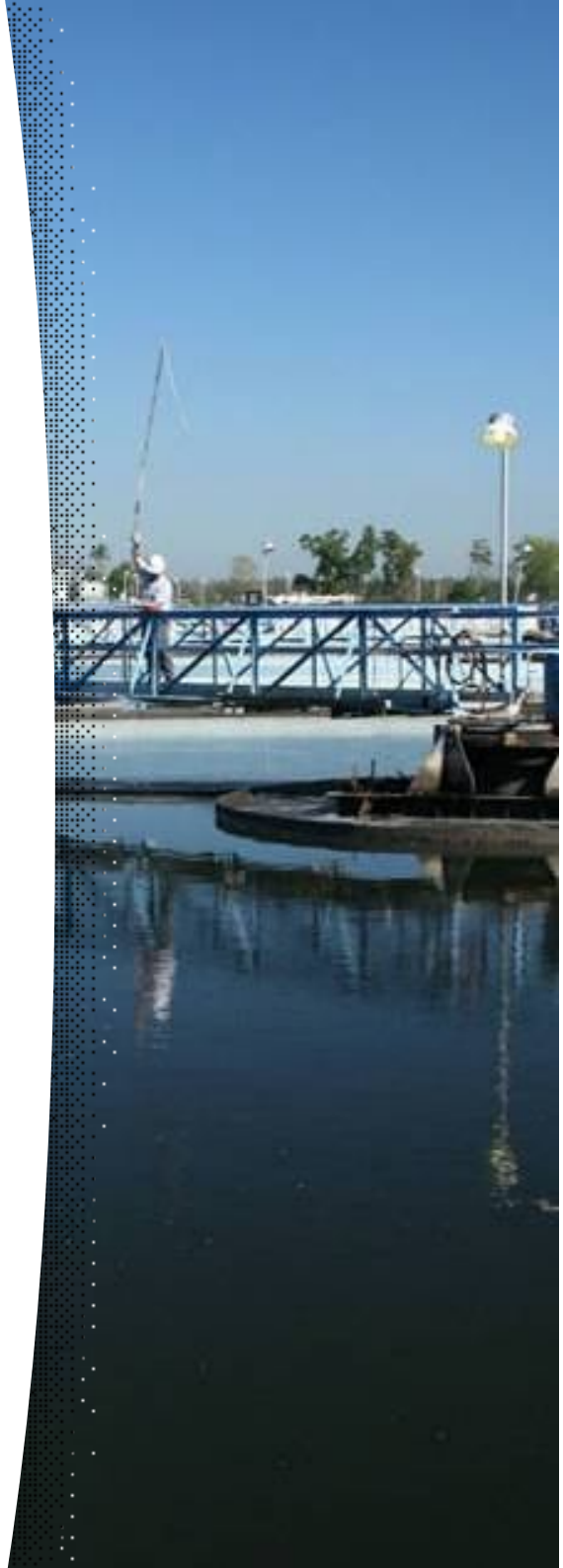
The crucial need for innovation

- **We will not overcome the urban environmental challenges without investing heavily in research.**
  - It is an illusion to think we can address the climate upheavals and pollution in the absence of major innovations.
  - How can we get out of the "*business as usual*" mold if we stick to our usual technology? How can the economy, high on carbon, be detoxed without new production methods?
- **If we had to build the future with the same old technology, the war on pollution and climate change would be lost in advance.**
- **It is by innovating that we will make the economy more economical ant the city eco-friendly.**
- **Ecocity will require better system engineering, more and seamless interconnections, less-polluting energy,... In other words, it will require innovation to create sustainable solutions that fit together perfectly.**



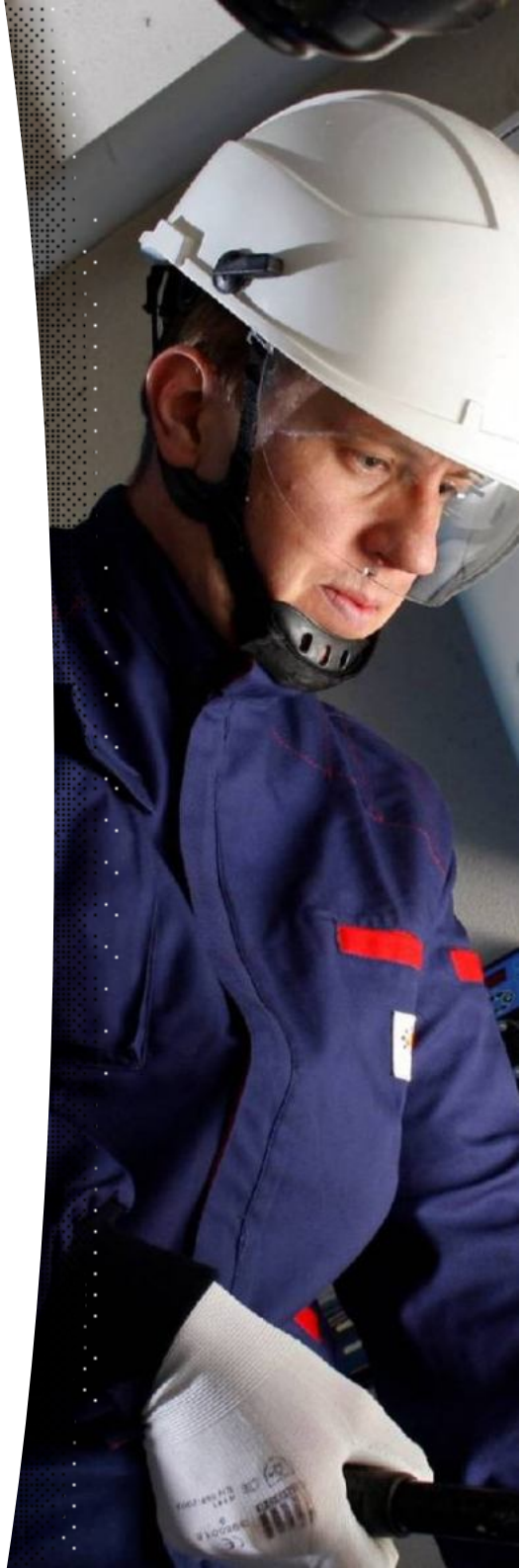
The close association of many types of urban services and expertise is a driver for progress.

- **In the future, most of our inventions will not come from each of our activities, but rather from their interfaces.**
  - For instance, tomorrow's wastewater treatment plants will emerge from 3 activities: water, solid waste management and energy.
  - They will be "*energy-positive plants*" and genuine biorefineries, producing clean water, generating energy instead of consuming it, and manufacturing biofertilizers and bioplastics from the organic material in wastewater.
- **One of the keys to future advances is close association of expertise in a variety of fields. That is why we have opted for pooling knowledge.**



The need for a professional management of new technologies

- **No matter how much R&D you do, it will amount to nothing if the technologies invented are not used in a professional manner.**
  - What good would the cleanest technology do if it were not properly applied?
  - If poorly designed or poorly managed, a building complex, a cooling network or a transit system becomes an energy guzzler.
  - When properly operated, they save energy.
- **Even the most efficient technologies will disappoint if they are used unprofessionally.**
- **In that sense, combating environmental pollution and "*curing the climate disease*" are an industrial challenge.**
  - Especially since tomorrow's technologies will be more complex and the energy mixes more varied.
  - Employing disparate energy sources, combining them ingeniously and operating them efficiently will demand organizational refinement and greater expertise.



Conclusion

The sustainibility of the globe will be decided by our cities perform.

- **« *Trans-sector* » services are the services of the future.**
- **Therefore we need to move towards an urban planning of services' linkage:**
  - This implies modifying the organization of cities, urban planning, services operation and industrial engineering.
  - This means that the architecture of all urban services' networks must be studied at the design stage of block plans by the town planner, the landscape designer and the various urban services' managers.
  - This imposes innovations in terms of processes as well as in the overall way the urban territory is structured (construction law, connection obligations to networks, Energy Performance Building standards, architectural regulation, choice of materials,...)

Strengthening connectivity is a key element to reinvent cities.

- **The 20th century saw the triumph of large infrastructure. The 21st century will in addition see a proliferation of decentralized, local solutions:** solar panels, geothermal installations, biomass power plants, waste recycling centers, wastewater reclaming plants,
  - It is these "*local energies*," these "*local materials*" and this "*local water*" that will enable cities to establish an urban model that preserves nature while making use of it.
- **The ideal of an environmentally neutral, zero footprint city is not unachievable.**
  - Many projects are springing up: Phoenix, Singapore or Rizhao in China aim at achiveing carbon-neutrality (≠ becoming energy autonomous cities).
  - In China, 200 new cities are expected by 2020: many will incorporate the principles of sustainable development in their design.
- **For *Homo urbanus*, it is a necessity, but it's also a dream, since a city with no dreams is a city without a future.**

Thank you for your attention