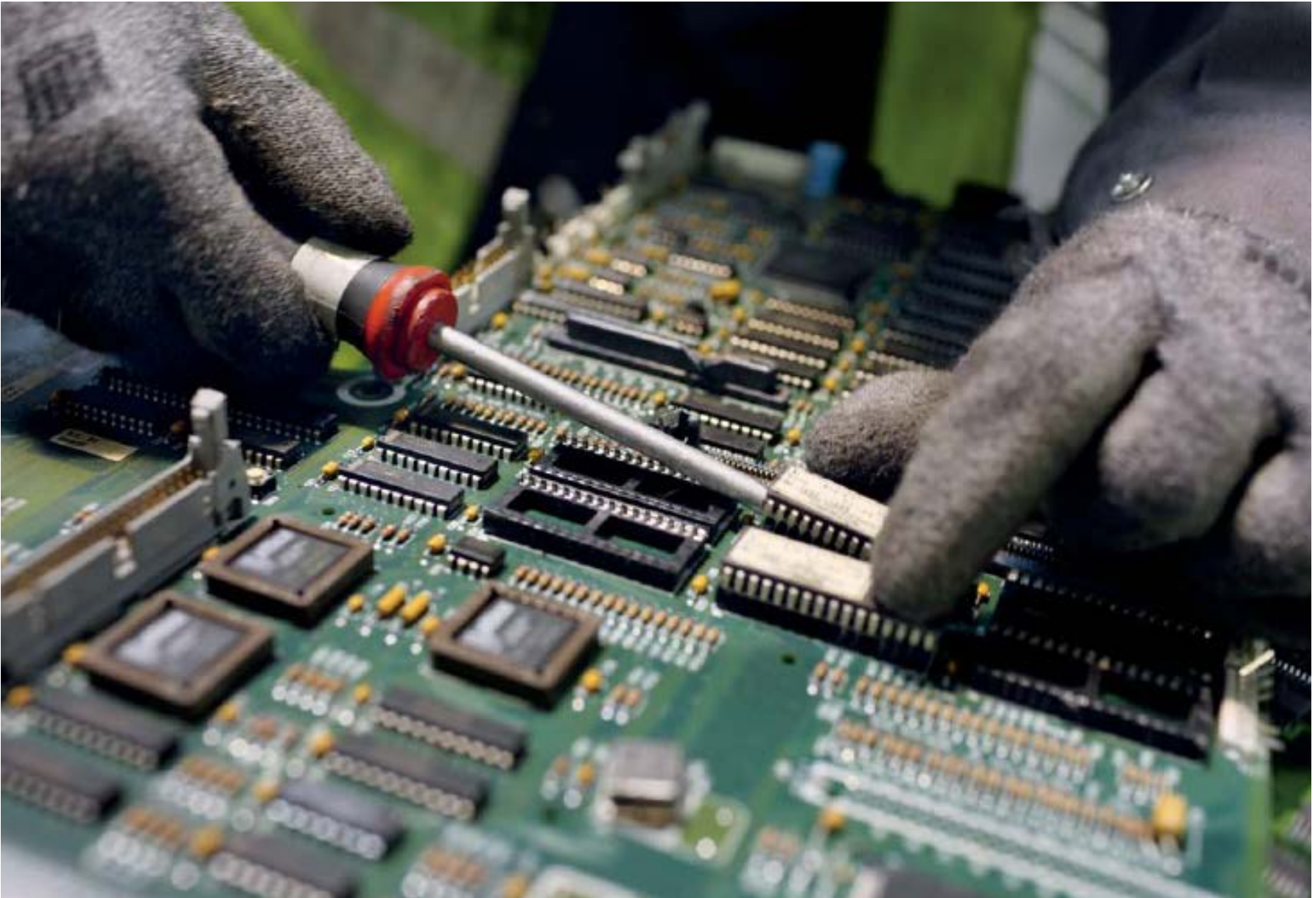
A large-scale industrial demolition project. The scene shows a massive, rusted metal structure being dismantled. Debris, including large pieces of metal and smaller fragments, is scattered across the ground. Two workers are visible: one in the center-left wearing a light blue shirt and dark pants, and another in the bottom-right wearing a red safety suit. The background features a concrete wall with a series of steps or a staircase on the right side. The overall atmosphere is one of heavy industrial work.

Recycling solid waste: a step ahead towards the circular economy

APEC, May 2017

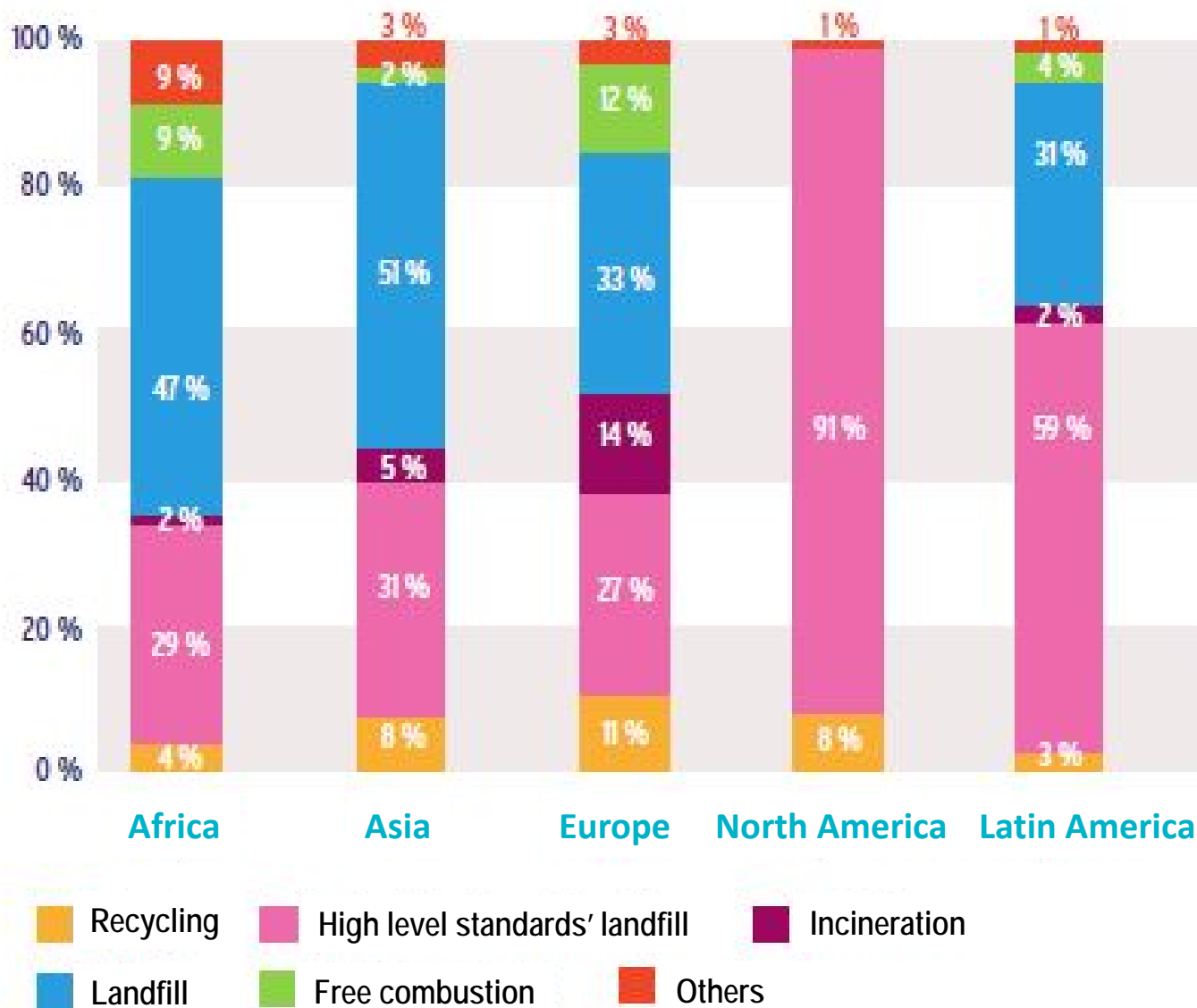
I – Decoupling growth and raw materials consumption



Major trends

- o **Waste productions is constantly increasing. The more prosperous a city, the more waste it produces.**
 - *In the world, the growth of Waste Electrical & Electronic Equipment (WEEE) amounts to 3 to 5% per year. It exceeds that of all other forms of waste.*
- o **Demand for raw materials is exploding, as a result of demographic growth and increasing standards of living.**
- o **Recycling is dramatically under-developed:**
 - *The circular economy is a reality for ferrous metals, paper and glass, whose recycling rates already exceed 90% in many places. But...*
 - *... of the 4 billion tons of waste produced worldwide every year, only 1 billion is recycled*
 - *At the world scale only 10% of plastics are recycled.*
 - *In APEC economies, less than 10% of solid waste are recycled.*
- o **The double cost of non-recycling: higher pollution and resource depletion.**
 - *Scarcity of raw materials, scarcity of water, scarcity of energy. Today, a number of shortages are making themselves felt.*

The treatment of municipal solid waste in APEC economies



Source:
World Bank,
2012

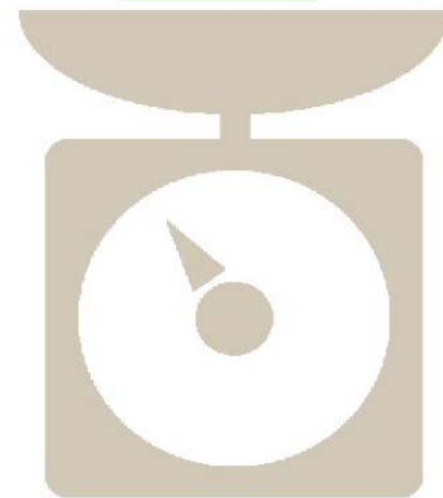
How to overcome the conflict between increasingly scarce resources and growing needs?

- By giving value back to things that were no longer worth anything! That is the whole point of recycling.
- The circular economy is based on a simple idea, but one that is complicated to put into practice: freeing oneself from the “Extract – Manufacture – Throw away” cycle, by organizing constant recycling of the same resources in an endless, or almost endless, cycle.
- Recycling gives “used” materials umpteen additional lives. In so doing, it multiplies the productivity of the resources extracted from nature.
- The potential of the circular economy is enormous.
 - *Thanks to the circular economy, the world could save \$1,000 billion in natural resources every year, according to the Ellen McArthur Foundation.*
 - *The waste from developed countries constitutes the 21st century's largest source of raw materials.*

In a smartphone,
there is:

30 mg of gold

300 mg
of silver



Turning noxious substances into resources, and recycling them back into the economy

o Waste recycling requires to assemble a broad array of know-how critical:

- *Technical expertise, to neutralize contaminants*
- *Sorting technologies. The secret to recycling is sorting. For recycling to be effective, the various types of materials must first be separated, and each then dealt with in a specific process.*
- *Recycling process, with high levels of efficiency, in order to obtain pure or very pure or ultra-pure (99.99%) material, directly usable in industry.*
- *Massifying volumes of waste recycled, in order to match the size of recycling markets.*
- *Trading in by-products and secondary raw materials.*
- *Accurate information system to ensure the traceability of materials flows.*



Recycling 1 metric ton of
plastics save 830 liters of oil

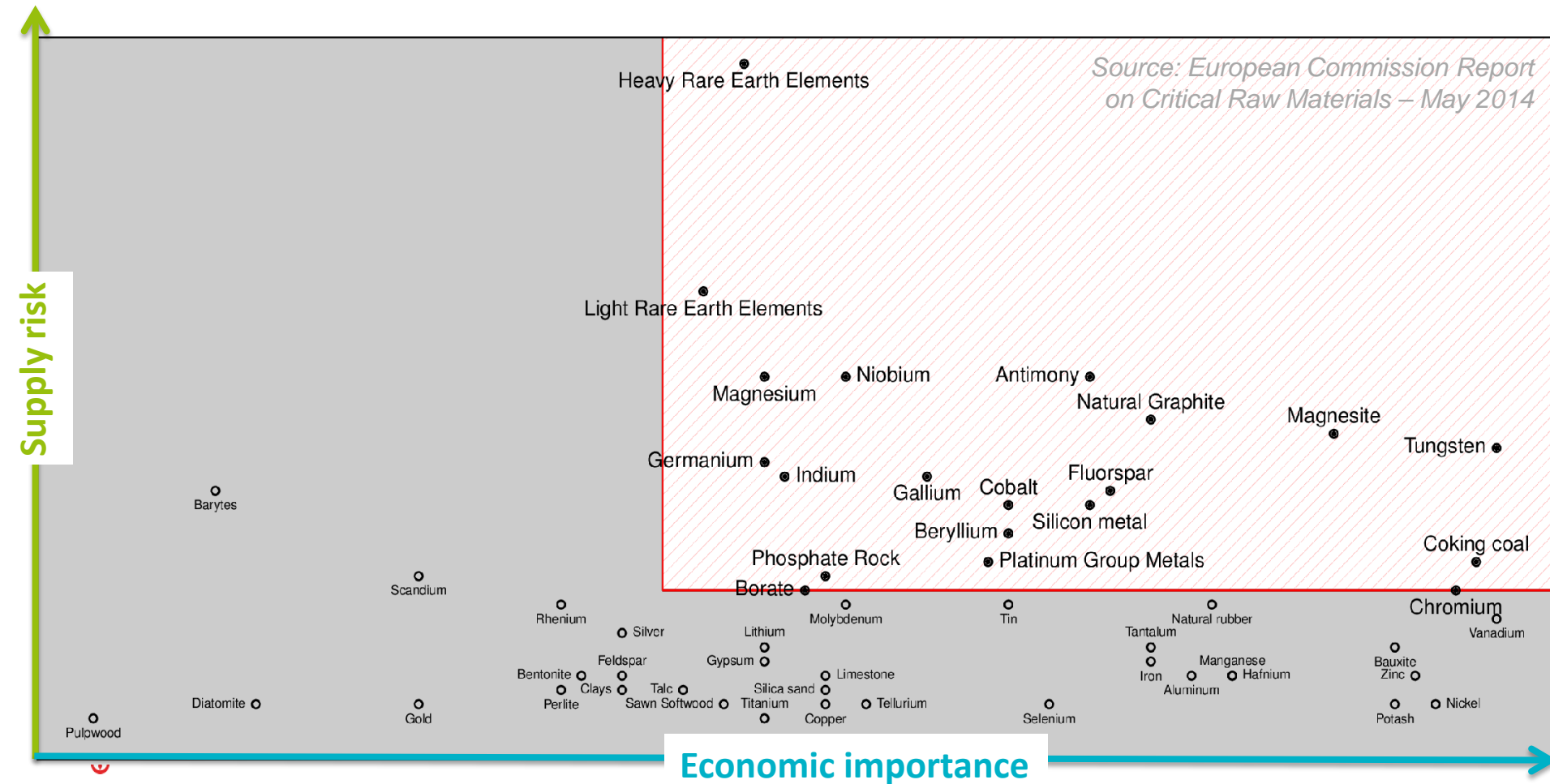
II – Transforming waste into new raw materials



Sorting treatment unit, Veolia

Critical raw materials for Europe

The EU has identified 20 metals the availability of which will become critical in the next decades, and which are essential for modern economies to function.



New scarcities and new economy: the example of strategic metals recycling

- 165,000 metric tons of dust are swept up from Britain's streets each year.
- After years of research, we have opened a plant in Ling Hall, capable of recovering particles of precious metals from the dust on the roads emitted from car exhausts, such as platinum, palladium and rhodium.
 - *The quantities collected are minimal, but they are found in the same proportions as in the ore containing these metals.*
 - *The substantial taxes on the waste dumping in UK and the high prices of these strategic metals ensure the operation's economic viability.*
 - *The price of platinum exceeds €30,000 a kilo; it is one of the rarest metals in the world, as it is found in only 2 geological formations on earth (one in South Africa and the other in Russia).*
- Thanks to this facility, 90% of the materials in street sweeping dust are recovered.



The many advantages of recycling and the circular economy

- By completing the cycles of materials, water or energy, recycling enables the real economy to grow, while reducing amounts extracted from the natural environment.
- The circular economy not only allows economic players to secure their supplies, but also to reduce their expenditure and to create additional revenue.
- It is not only an environmental issue;
 - *for the regions, it is a factor in their development,*
 - *for businesses, it is a source of competitiveness and wealth.*
- In some cases, the stakes are even higher, because it can increase the independence of countries with meager natural resources. It is then an issue of country's sovereignty.



III – Transforming waste into energy



*A methanization centre:
depolluting organic waste,
while producing electricity,
heat and quality fertilizer*

The promising future of waste-to-energy solutions

- **There are many sources of energy that are not exploited and remain to be recovered, in order to respond to the growing demand.**
- **Waste-to-energy plants offer a set of advantages:**
 - *Production of renewable energy*
 - *Diversity of energy produced: gas, electricity, heat*
 - *Stable and visible price in the long term, in particular for electricity*
 - *Reduction of waste volume and guaranteed pathogen destruction*
 - *A source of revenues, which reduces the cost of waste collection and treatment*
- **A great diversity of waste-to-energy solutions:**
 - *Industrial waste incineration (Guangzhou)*
 - *Domestic waste incineration (Leeds, Birmingham, Sheffield...),*
 - *Sludge incineration (Hong Kong)*
 - *Co-digestion or co-incineration of waste and sludge (Great Paris)*
 - *Methanization (Lille-Artois)*



The great diversity of organic waste convertible into energy

- **Solid waste:** in Britain, the waste-to-energy plants we manage can produce 192 MW of electricity and power almost 200,000 homes.
- Many large cities and industries are rediscovering the benefits of waste of parks, forest biomass or waste of wood industry, an “*old new energy*”, available in abundance and renewable.
- Sludge from urban wastewater treatment plants is another constantly available source of energy. Once dried, it has a heating power equivalent to that of wood
- By extracting the hidden energy contained in wastewater, we can heat private or public building (eg: public swimming pools).
- Used cooking oil is turned into biofuel for buses (in the Great Paris region).



Waste biomass, a fuel source to generate energy

Context

- *Canada, a country with very tough environmental protection standards.*
- *At Fort Saint James and Merritt, Veolia won 2 contracts to build and operate, for 30 years, 2 of the largest biomass-fired power plants of North America.*

Solution

- *A partnership with a project finance fund: Fengate Capital Management Ltd.*
- *British Columbia Hydro & Power Authority will buy the electricity under two 30-year contracts.*
- *For each 40 MW facility, a single contract for the client: a global response to answer to client needs, from financing and construction to maintenance and energy recovery.*
- *307,000 tons of biomass are burnt annually by each facility. They come from local forest industry waste (sawmill residue, forest pollarding...).*

Results

- *2 facilities of 40 MW capacity each one.*
- *The 2 facilities provide green electricity for 80,000 homes and avoid the release of 190,000 tons of CO₂ a year, equivalent to 90,000 private cars.*
- *250 jobs created during the construction phase for each facility and 80 direct and indirect jobs created during the operation phase.*
- *Contract revenue: € 600 million in Fort Saint James and € 540 million in Merritt.*

IV – Recycling wastewater



*Sludge thermal treatment plant, Hong Kong
(Atelier Claude Vasconi)*

Honolulu wastewater recycling plant (1)

o Objectives defined by the Public Authority:

- *To increase drinking water availability.*
- *To satisfy domestic and industrial water needs. This popular tourist resort in the Hawaiian Islands is undergoing rapid population growth and hosts many industrial operations.*
- *To find a cost-effective solution for wastewater treatment and disposal.*

o Veolia solution:

- *Honolulu city entered into a 20 year-partnership with Veolia to design, build, and operate a 45,000 m³/d water reclamation facility.*
- *Wanting the best available technology for the best market price, the authority selected the cost-and-time saving benefits of a DBO option.*
- *The PPP saved the city and taxpayers millions of dollars in construction, maintenance and operating costs.*



Honolulu wastewater recycling plant (2)

o Processes generate 2 qualities of water:

- *One is a high-purity water that is sold to the power and petrol-refining companies (Chevron).*
- *The other quality is for irrigation of golf courses and landscaping, in order to support the tourism industry.*

o Results:

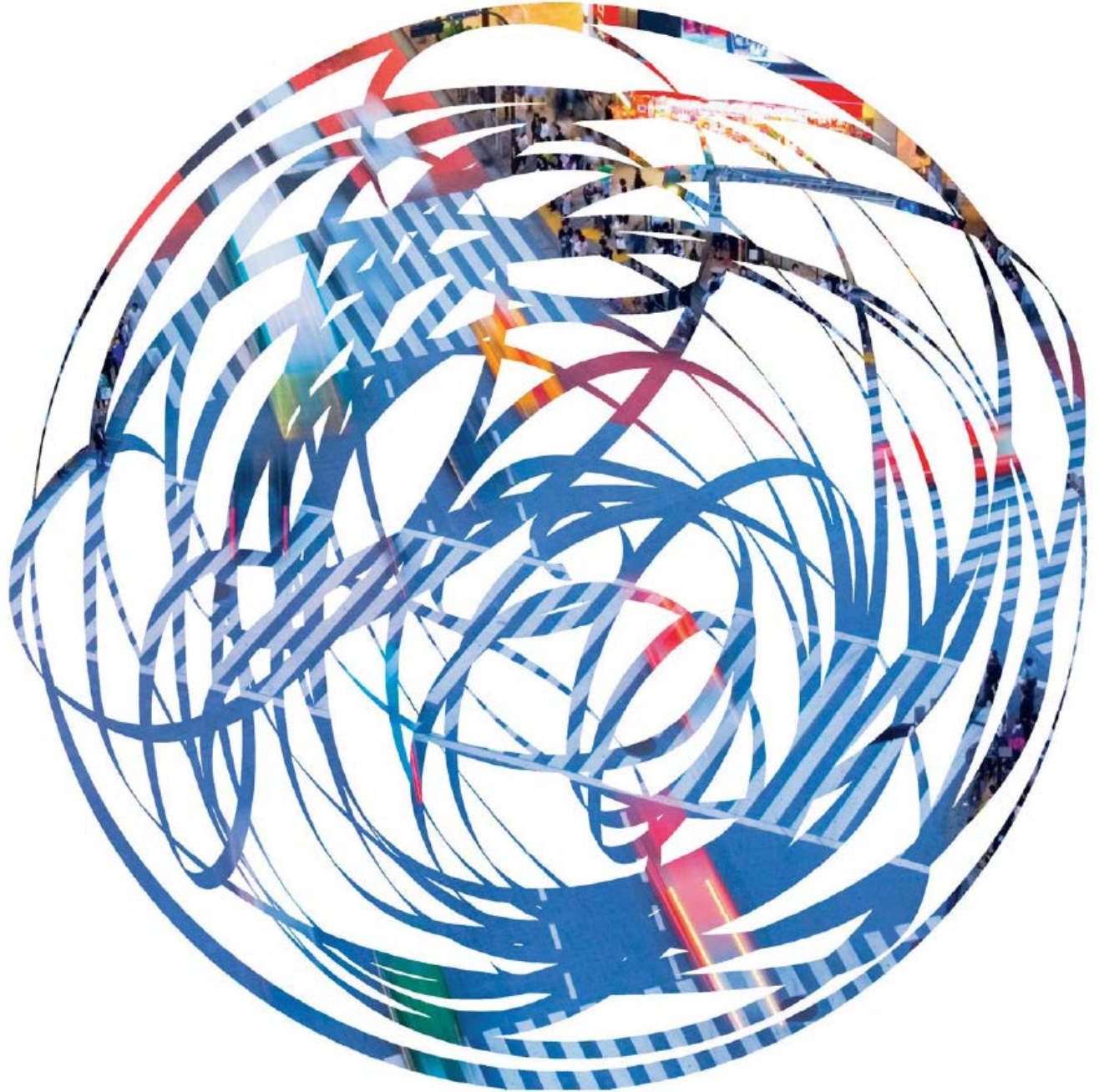
- ***For power and petrol-refining companies:*** *it provides an additional solution for satisfying their needs at a competitive price; actual price being achieved is lower than potable water.*
- ***For the residents:*** *it saves 45,360 m³ of drinking water a day. Wastewater re-used for industrial purposes freed up fresh water abstracted for the municipality.*
- ***For the city:*** *it creates a financial revenue stream from treated wastewater (with formerly no value) and it reduces the city's operating costs.*
- ***For the environment:*** *it reduces pollution from the sewage being discharged to the sea in this exotic holiday location.*



Recycling wastewater vs. recycling solid waste

- At the world scale, less than 3% of water are recycled vs. 25% for solid waste.
- Water can be recycled forever, in an endless cycle. It is not the case for many types of waste:
 - *Paper can only be recycled 7 times (which is already a lot).*
 - *Nickel lends itself poorly to recycling—in just 3 cycles, there is only 20% of the initial quantity of the metal left.*
- Recycling wastewater is always a local economic model:
 - *Water is heavy yet low in value, which makes transporting it over long distances uneconomical.*
- On the contrary, recycled waste can be used either locally or on the other side of the planet, depending on their nature, because recycling markets have gone global.
 - *While sources of secondary raw materials are located in countries with high living standards, demand stems mainly from emerging countries.*

IV - Towards new economic models



Evolution of environmental services: from depollution to new resources production

- o The role of Veolia is no longer simply to eliminate waste, but to reintegrate it into the economy. Our business has evolved from that of a depolluter to that of a producer of renewable resources.
- o For one person's waste to become another person's raw material, it must be transformed, but it is also necessary to ensure a connection with customers ready to buy them.
- o Finding a market for secondary raw materials is one of the key challenges.
 - *Our work is no longer simply to manage the waste from an industrial site, but to find other economic players interested in that waste as secondary raw materials or as energy source.*
- o The waste sector is gradually becoming a raw materials industry.



The circular economy is expanding, but not enough, and too slowly. How to promote it?

o Various obstacles must be removed to develop a circular economy:

- *the reluctance of industrial companies to use recycled materials, which they regard as the second choice.*
 - ❖ *In order to overcome their reservations, they must be given the same guarantees of quality, regularity of supply and durability as virgin materials. It is precisely the job of a professional intermediary such as Veolia to give them such guarantees;*
- *the price of the converted material, which is often too high in comparison with the raw material;*
 - ❖ *hence the necessity for initial financial aid and the need to increase the volume of treated waste, in order to bring down unit costs.*
- *manual sorting of waste: this is still expensive in developed countries.*
 - ❖ *Touchscreen system improves sorting without any direct human contact with the waste and recovers 6% more household packaging than with a conventional sorting process.*
- *the prohibitions on the use of recycled materials, which are too numerous and sometimes unjustified;*
- *the low cost of landfill in many countries.*

Conclusion

We are witnessing the dawn of an industrial revolution: that of the circular economy.

- o Natural resources have now become too rare to be used only once: when one thinks waste, one must automatically think resources.
- o The circular economy teaches us something that is not theoretical but is based on facts, it draws inspiration from nature, in which everything is a resource.
- o By converting waste into resources, the circular economy imitates the way ecosystems work, and like them, seeks to do away with the very concept of waste.
- o Seven centuries ago, Leonardo da Vinci gave us this advice:

***“Learn from nature,
that’s where our future lies”.***

Thank you for your attention

