

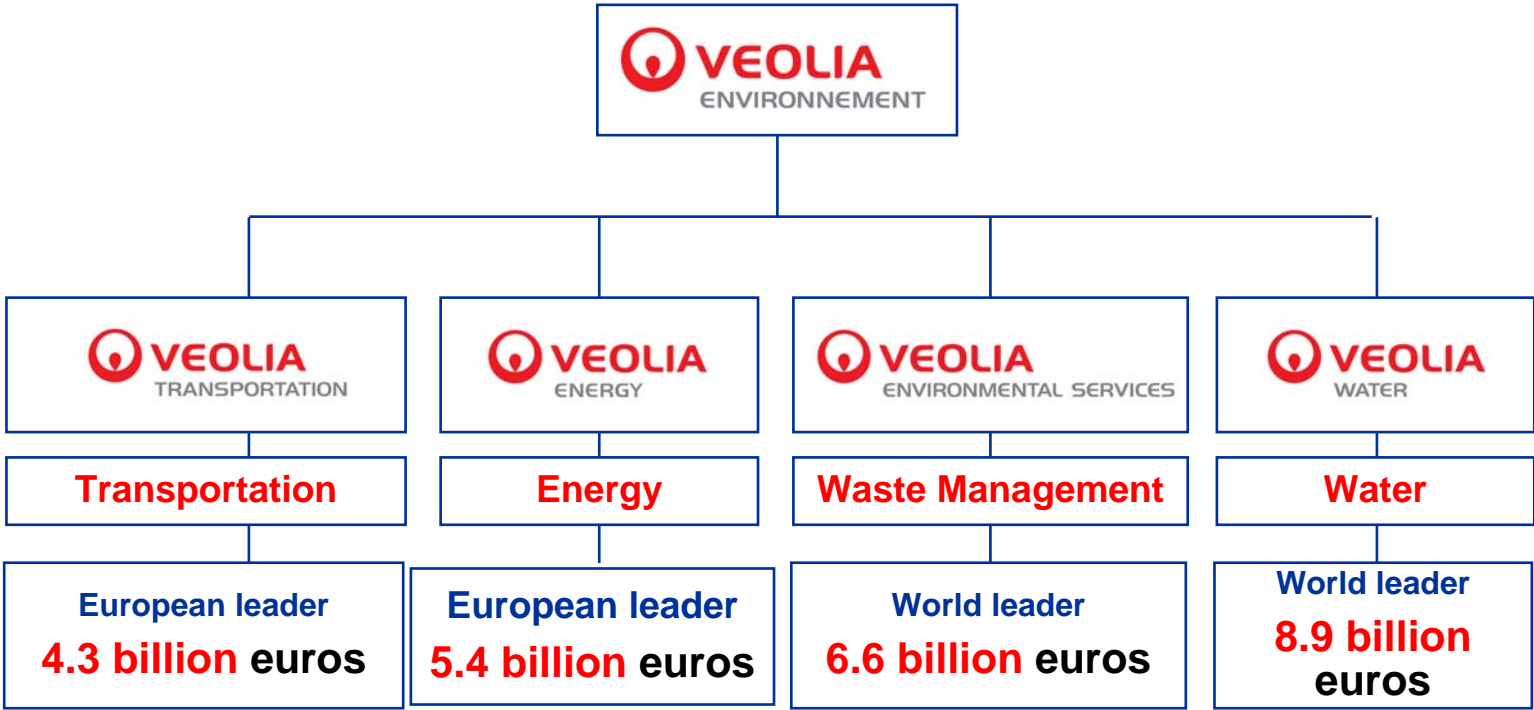


REUSE

A Water Scarcity Solution



Four divisions, one single business: environmental services



A Worldwide Presence in over 100 countries



- Veolia Water
- Onyx
- Connex
- Dalkia



Freshwater is a finite resource

✿ Balancing supply and demand

- 👉 Complicated and sensitive urban water cycle
- 👉 Climate change, shortages
- 👉 Water needs overlap and conflict



✿ Quality, but also quantity: regulations are changing

- 👉 Past issues: quality and wastewater treatment
- 👉 Today issues: water scarcity
- 👉 Practical, social and economic implications



✿ Environmentally sound water management

- 👉 Complexity of man's influence on the water cycle
- 👉 Deterioration of the local ecology

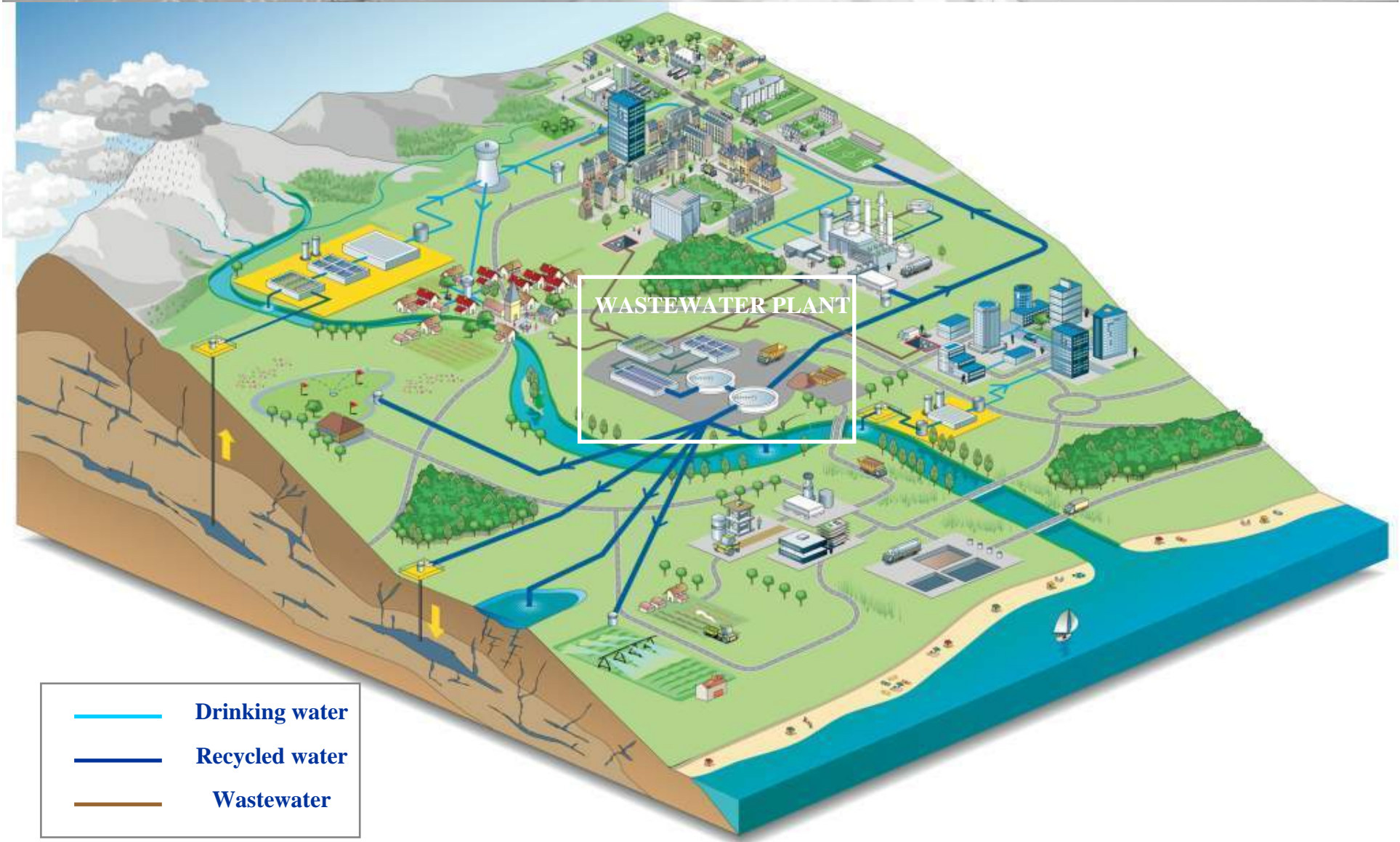
Water recycling benefits your community

- Thanks to recycling, used water is transformed into **a valuable resource**
- Recycled water is a **drought-proof** and **growth-enabling** solution
- Recycling of water leads to a **sustainable development of resources**

2 million m³/day
produced in Veolia Water 100 reuse
installations worldwide, enough
water for 14 million people

19 million m³/day produced
in all 3,300 water reuse
installations worldwide

The Water Cycle



Practical applications for local communities

🌸 Developing the local economy

- 👉 Attracting new industry
- 👉 Agricultural irrigation

🌸 Delivering reliable urban water supply

- 👉 Watering lawns and parks
- 👉 Street washing

🌸 Maintaining a tourist industry

- 👉 Facing increased summer demand
- 👉 Golf course Irrigation

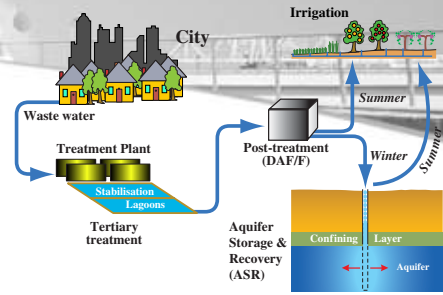
🌸 Preserving water resources

- 👉 Resource management
- 👉 Resource quality

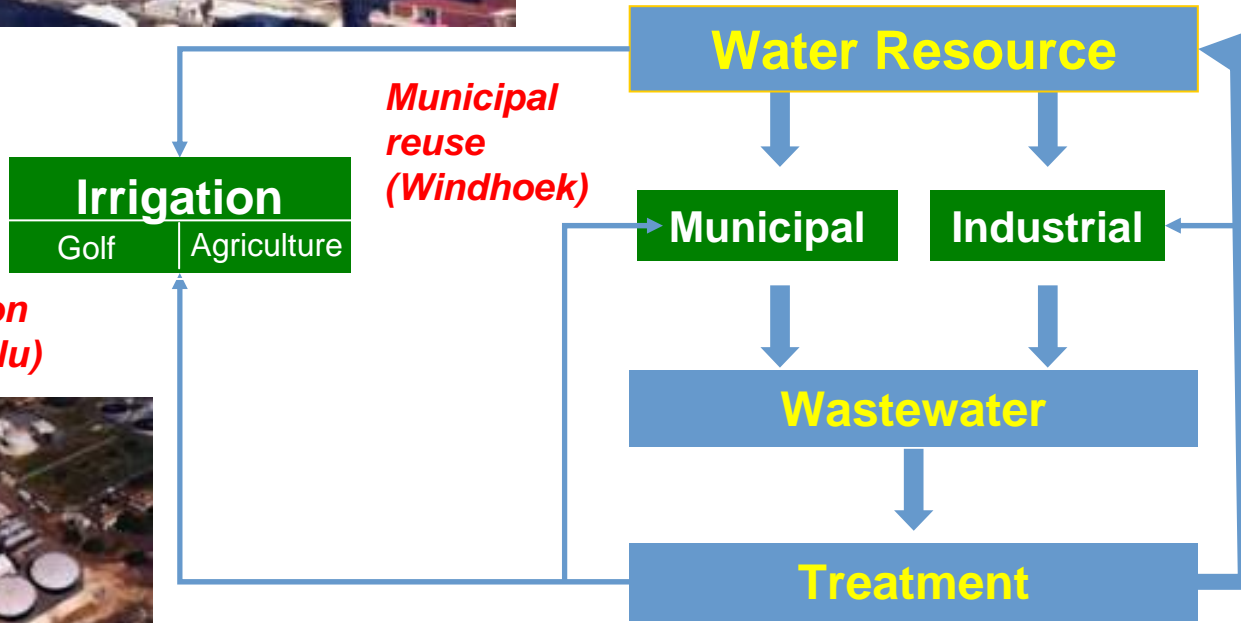
🌸 Better protecting the environment



Water reuse options



Reuse for aquifer recharge (Berlin)



Municipal reuse (Windhoek)

Industrial reuse (Durban)

Irrigation (Honolulu)





Reuse

🌸 Technologies

📌 Tertiary treatment:

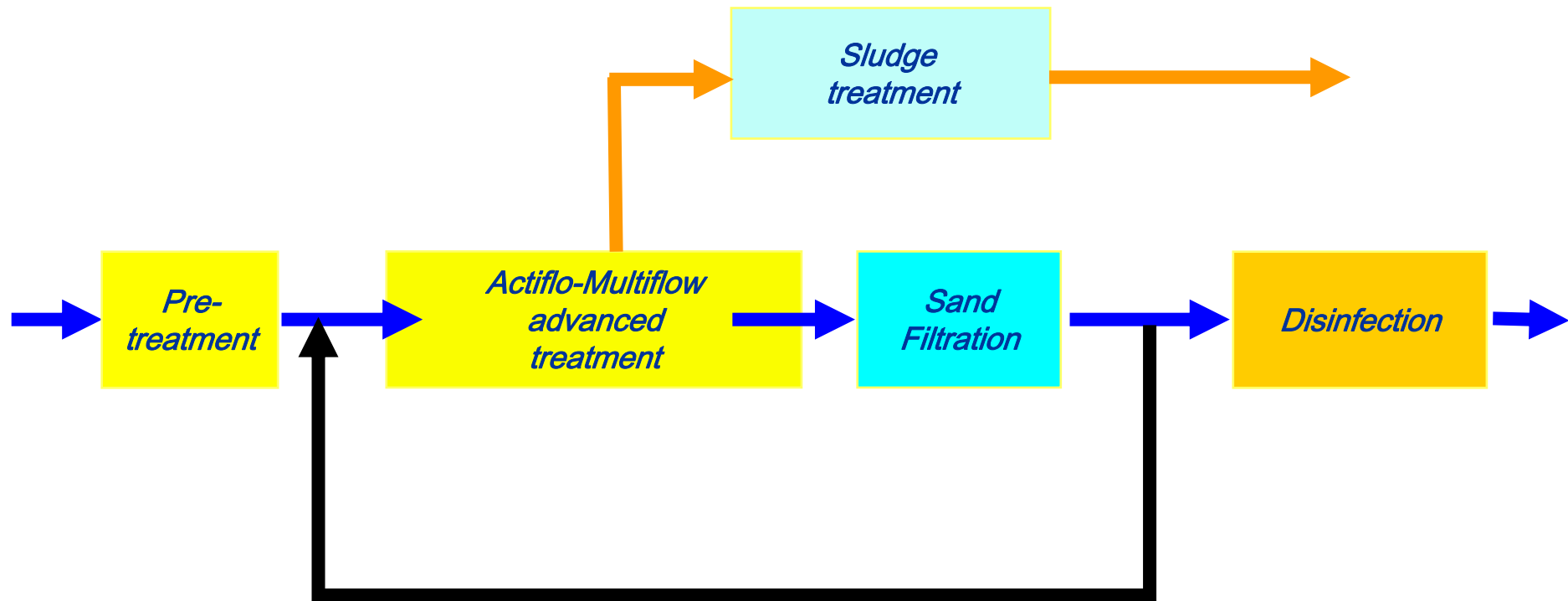
- 💧 **membrane technologies: Continuous Micro Filtration , Nano Filtration, Reverse Osmosis**
- 💧 **coagulation, flocculation, decantation: Actiflo for ex.**
- 💧 **filtration (sand filters ...)**
- 💧 **activated carbon**

🌸 Some References

- 📌 Durban – South Africa – Industrial Reuse (BOOT project)
- 📌 Berlin – Germany - Aquifer Recharge
- 📌 Honolulu – Hawaii, USA – Irrigation Reuse (DBOM project)
- 📌 Windhoek – Namibia - Municipal Reuse (Drinking Water – Mixing!)

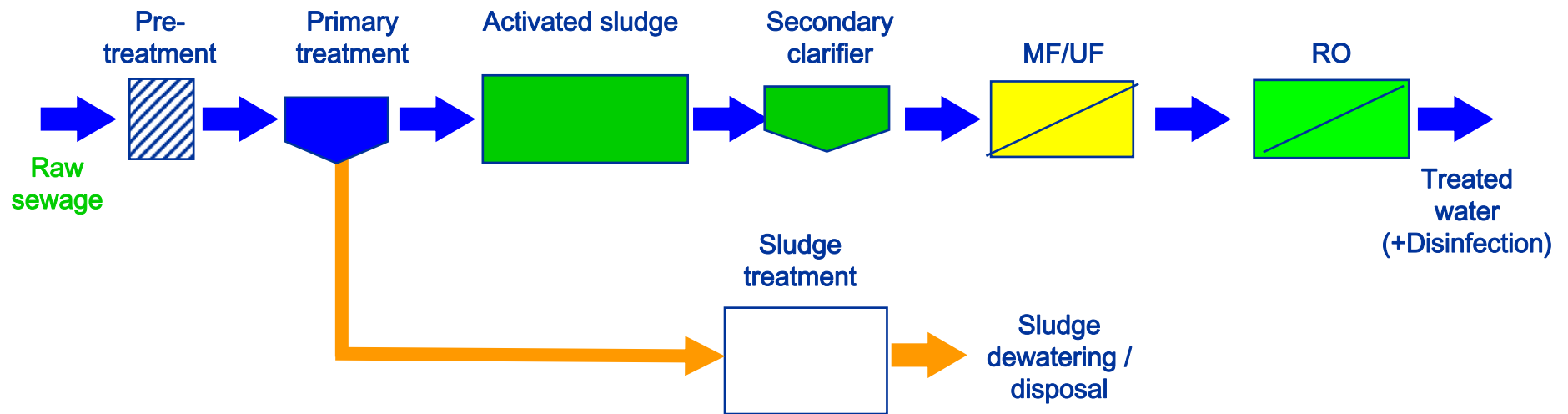
Reuse

Conventional wastewater Reuse Technologies



Reuse

Conventional activated sludge with MF/UF pretreatment to RO



Several VWS industrial references:

- > KRANJI, Singapore, 20 000 m³/day
- > ILLAWARA in AUSTRALIA

Several on-going developments within oil industry:

- > SHELL Qatar (GTL project)





Project Examples

Durban – SOUTH AFRICA

Reuse for municipal and industry

Situation

-  Abolition of apartheid
Metropolitan population: 1 million → 3 million
-  Water scarcity and overload long sea outfall



Needs







-  Providing basic services to the growing population, 26% live in townships
-  Increasing volumes of higher quality water to the industrial customers



Durban – SOUTH AFRICA



Reuse for municipal and industry

Veolia Water's solution

-  20 year BOOT contract, operation May 2001
-  A successful trisector partnership
-  Leading-edge technologies
-  Lower cost, high quality water supply to:
 -  The Mondi Paper Mill 37,000 m³/d
 -  SAPREF Refinery boiler feed 3,500 m³/d



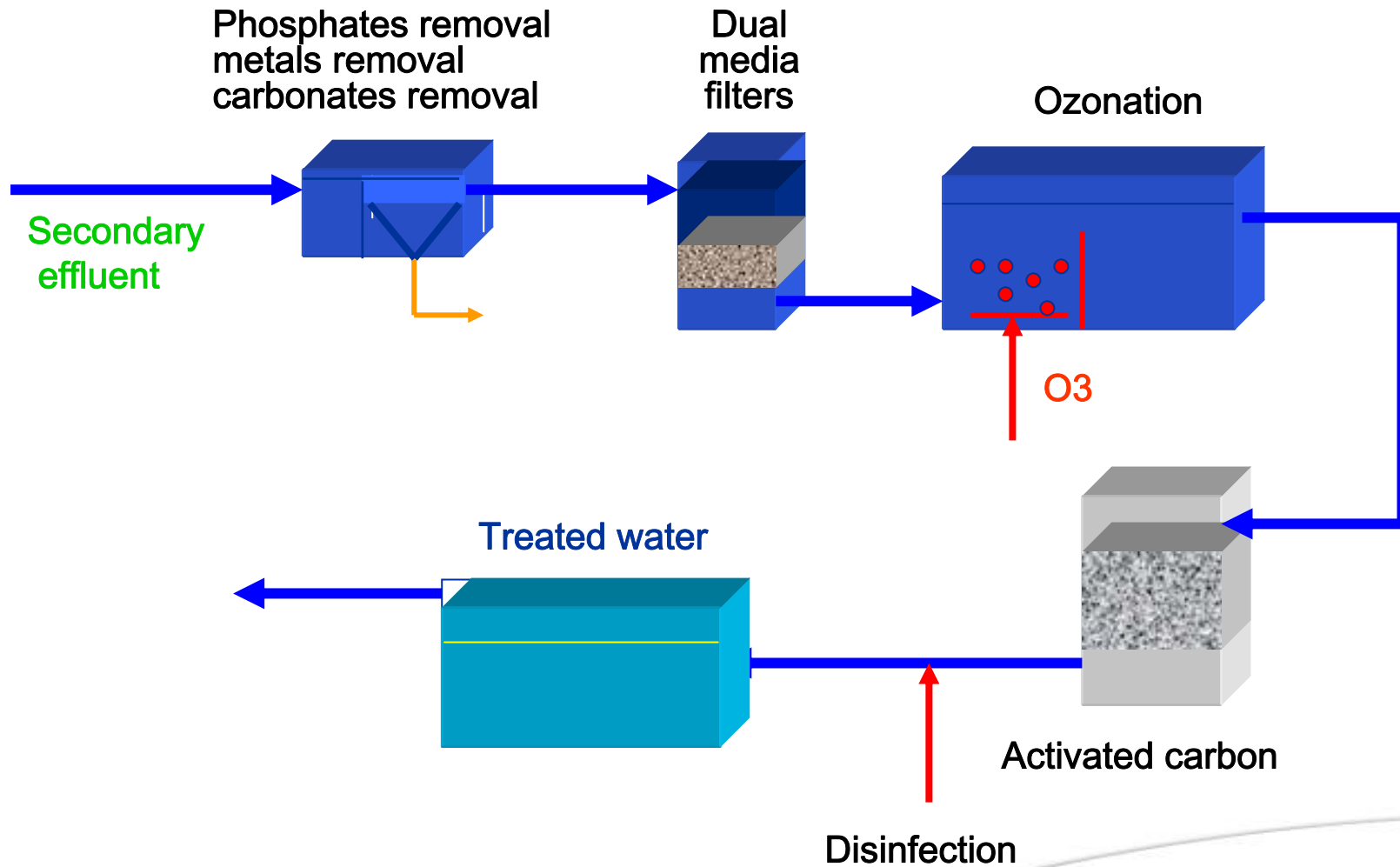
Results

-  Reduced water bill by 40%
-  Freed up potable water for people (8% demand)



Durban – SOUTH AFRICA

Reuse for municipal and industry



Honolulu – HAWAÏ

Reuse for municipality, power station and refinery

🌺 Needs:

- 👉 Increase drinking water availability
- 👉 Satisfy domestic, industrial and environmental needs
- 👉 Federal Consent Decree deadline

🌺 Veolia Water's solution

- 👉 20-year contract with the City of Honolulu:
 - 💧 DBO: 45,360 m³/d capacity
 - 💧 Upgrading the existing WWTP
 - 💧 Water marketing and distribution
- 👉 Reclaimed water for the power plant and the Chevron refinery



Honolulu – HAWAÏ

Reuse for municipality, power station and refinery

🌺 Results:

- 👉 High quality and less expensive boiler water
- 👉 Quality reclaimed water available for irrigation
- 👉 11,400 m³/d of drinking water now available
- 👉 Minimized costs for city taxpayers
- 👉 City avoided €0.40/m³ fine



**Largest island water
reclamation project**

Illawarra NSW, Australia 2005

- 🌸 20,000 m³/d for BHP Steel
- 🌸 50 mg/l TDS process water
- 🌸 Reduce
 - potable demand by >60%
 - sea outfall by >40%



Harquahala Power Project, Arizona, USA. 2003

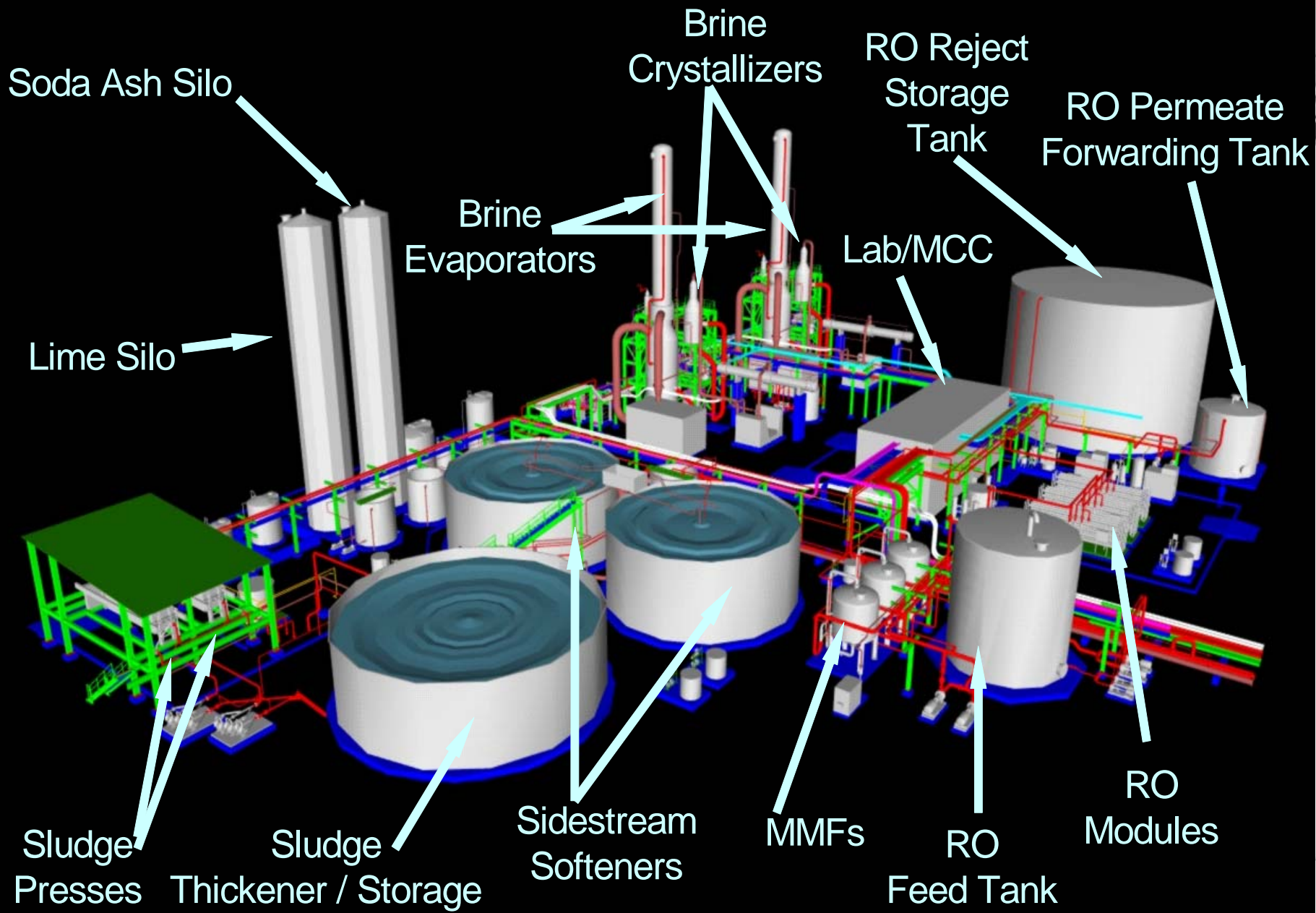
**100% water reuse
Zero liquid discharge**



1080 MW CCGT

HPD

VEOLIA
EAU



Kwinana – PERTH, AUSTRALIA

Water recycling, assist local industrial expansion

🌸 Situation

- 🚩 25% decrease in rainfall and runoff
- 🚩 Concentration of heavy industry
- 🚩 Industrial expansion demand > available capacity

🌸 Needs




- 🚩 Alternative water resources
- 🚩 Satisfy public demand for better quality effluent







Kwinana – PERTH, AUSTRALIA

Water recycling, assist local industrial expansion

Veolia Water's solution

-  DB Project
-  Municipal wastewater reuse after MF and RO
-  16,700 m³/day and upgradeable to 26,700 m³/day

Results




-  One of the largest reclamation plant in Australia
-  5.5 million m³/year high quality water
-  Helps to achieve 20% reuse by 2012
-  Environmental benefits





Kranji – SINGAPORE

Non drinking water reclamation, sustainable water supply





Situation

-  Rapid industrial, economic and social development
-  Sharp increases in water demand
-  1998: Joint Water Reclamation Study

Veolia Water's solution

-  2002: High Grade Water Reclamation Plant
-  40,000m³/d NEWater

Results

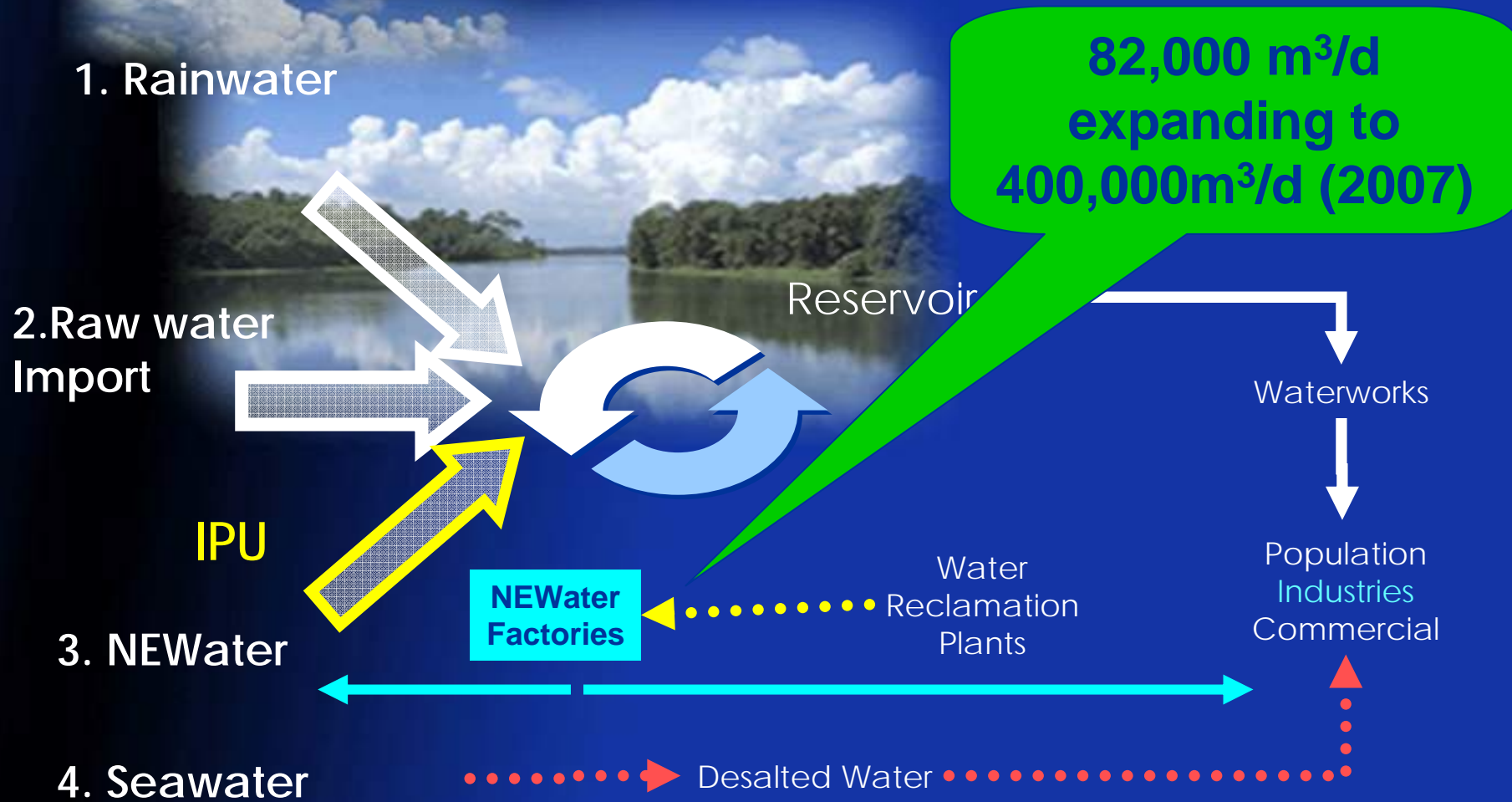
-  Reclaimed water for
 -  Industrial customers
 -  Catchment reservoir for IPU
-  Reduced need of imported/desalinated water



Kranji – SINGAPORE

Non drinking water reclamation, sustainable water supply

www.pub.gov.sg/NEWater



Barcelona – SPAIN

Municipal water recycling for agricultural industry



Needs

- Scarcely water resources
- Growing problems of dry seasons
- Conserve the ecology

Results

- A tertiary water reuse plant
- Ecologically sound river flow **170,000m³/d**
- Agricultural irrigation **65,000m³/d**
- Wetland recharge **35,000m³/d**
- Anti-salt barrier **2,500m³/d**

The biggest municipal wastewater reuse plant in Europe



Thank You