European Water Utility Expert meeting at EEA 2012

Target setting for energy efficiency

from global and European to utility level

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Outline

- **Target setting for a global action plan on energy efficiency (World Water Forum / IWA)**

- **Benchmarking on energy efficiency in Suez Environnement's water operations**

Global action plan for energy efficiency : on going process

6th World Water Forum : The Forum of Solutions" (march 2012)

Thematic component structured around 12 Priorities for Action

Priority 2.3 : "Harmonize Energy and Water", including 8 targets, notably :

Target 1 : Improve energy efficiency of water and waste water services (target leader: IWA)

Target 2 : Implement Best Available Technologies in Desalination (target leader: IDA)

Target 3 : Link access to water and access to energy for poor isolated communities (target leader: Electriciens Sans Frontières)

…

Target 8 : Establish a network of water and energy policy makers (target leader : Norwegian ministry of Petroleum and Energy)

Progress on each target will be monitored by the World Water Council, and reported at the 7th World Water Forum (Korea 2015)

Target set up for water utilities at the 6th World Water Forum : consistent with the EU energy efficiency overall target

Target *2.3.1: Measures are implemented by public authorities and water utilities in cities totalling 500 million inhabitants, aiming at a minimal improvement of 20% of energy efficiency of municipal water and wastewater systems by 2020 compared to 1990 level*

Coordinator : International Water Association (IWA)

Members of the Target and Solutions Group : European Environmental Agency, ICLEI , World Bank , DANVA , Water Supply and Sanitation Technological Platform, Lund University, Suez Environnement

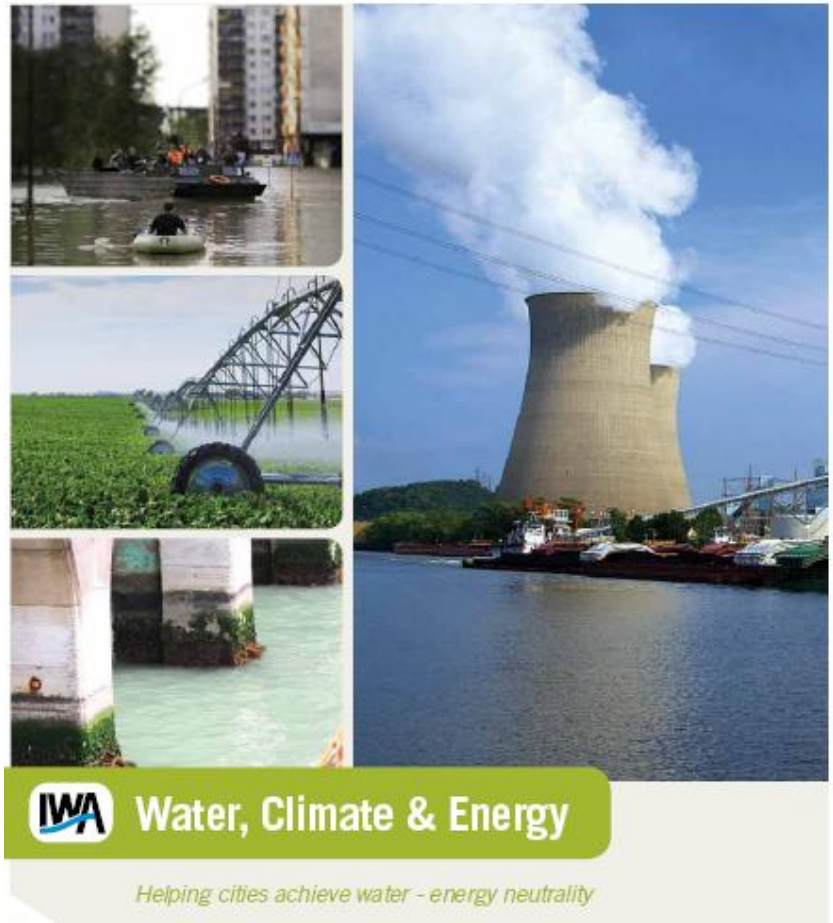
Link to Target documents
http://www.worldwaterforum6.org/en/library/detail/?tx_amswwfbd_pi2[uid]=642

Link to Solutions http://www.solutionsforwater.org/objectifs/2-3-1-energy-efficiency-of-urban-water-systems

Follow up : within IWA's programme "Water Climate and Energy"

The WCE programme includes 4 components:

- Urban water-energy information and frameworks
- Demonstration of urban water-energy neutrality in utilities and cities
- Technologies to achieve urban water-energy neutrality
- Policy and communication to promote water-energy neutrality



What indicators for progress monitoring at city (system) level ?

Prerequisites for the choice of a indicators (1)

- All the terms of energy consumption are site specific ; they depend :
  - either of geographic conditions (relief , distance to water source , population density)
  - or of (local) environmental constraints that determine the level of waste water treatment

- Therefore **horizontal** benchmarking (comparison between sites) is not very relevant

➔ **The major objective should be vertical benchmarking (measurement of progress over time)**

$$I = \frac{\text{current\_performance}}{\text{baseline\_performance}}$$

What indicators for progress monitoring at city (system) level ?

Prerequisites for the choice of indicators (2)

- The performance should refer to **net energy consumption** (energy in less energy out) → « Energy out » means energy generated from the process and used for useful purpose (be it thermal or electric)
  - *E.g. power produced by a windmill installed on the site of a treatment plant is not generated from the process*

- The indicator should reflect intrisinc efficiency and not be influenced by variations in population coverage , or expansion of the systems
  → Use of ratios between energy consumption and physical units (m^3 …)

- Some public authorities or operators do not cover the full urban water cycle
  → The indicator must be **disaggregated into four terms** :
  1. Efficiency in water production
  2. Efficiency in water distribution
  3. Efficiency in waste water collection
  4. Efficiency in waste water / sludge treatment

Proposal of aggregated progress indicator (to be discussed)

- $$I = \left(\alpha \frac{W_{prod}(t)}{W_{prod}(t_0)} + \beta \frac{W_{dist}(t)}{W_{dist}(t_0)} + \gamma \frac{W_{coll}(t)}{W_{coll}(t_0)} + \delta \frac{W_{treat}(t)}{W_{treat}(t_0)} \right) \times 100$$

with I = energy efficiency progress indicator (100 for baseline year)

$\alpha\ \beta\ \gamma\ \delta$: weighting coefficients representing the weight of the 4 terms for the baseline year ($\alpha + \beta + \gamma + \delta = 1$)

$W(t)$ = net energy consumption of the process for the current year in kWh/m^3 (or kWh/kg of BOD for waste water treatment)

$W(t_0)$ = net energy consumption of the process for the baseline year in kWh/m^3 (or kWh/kg of BOD for waste water treatment)

→ **weighted average of the progress on kWhe/unit for each of the 4 activities (present value / initial situation)**

Consolidated indicator for a set of heterogeneous systems (to be discussed)

- Proportion of sites where the indicator I is improved by more than 20% (?) since the baseline year

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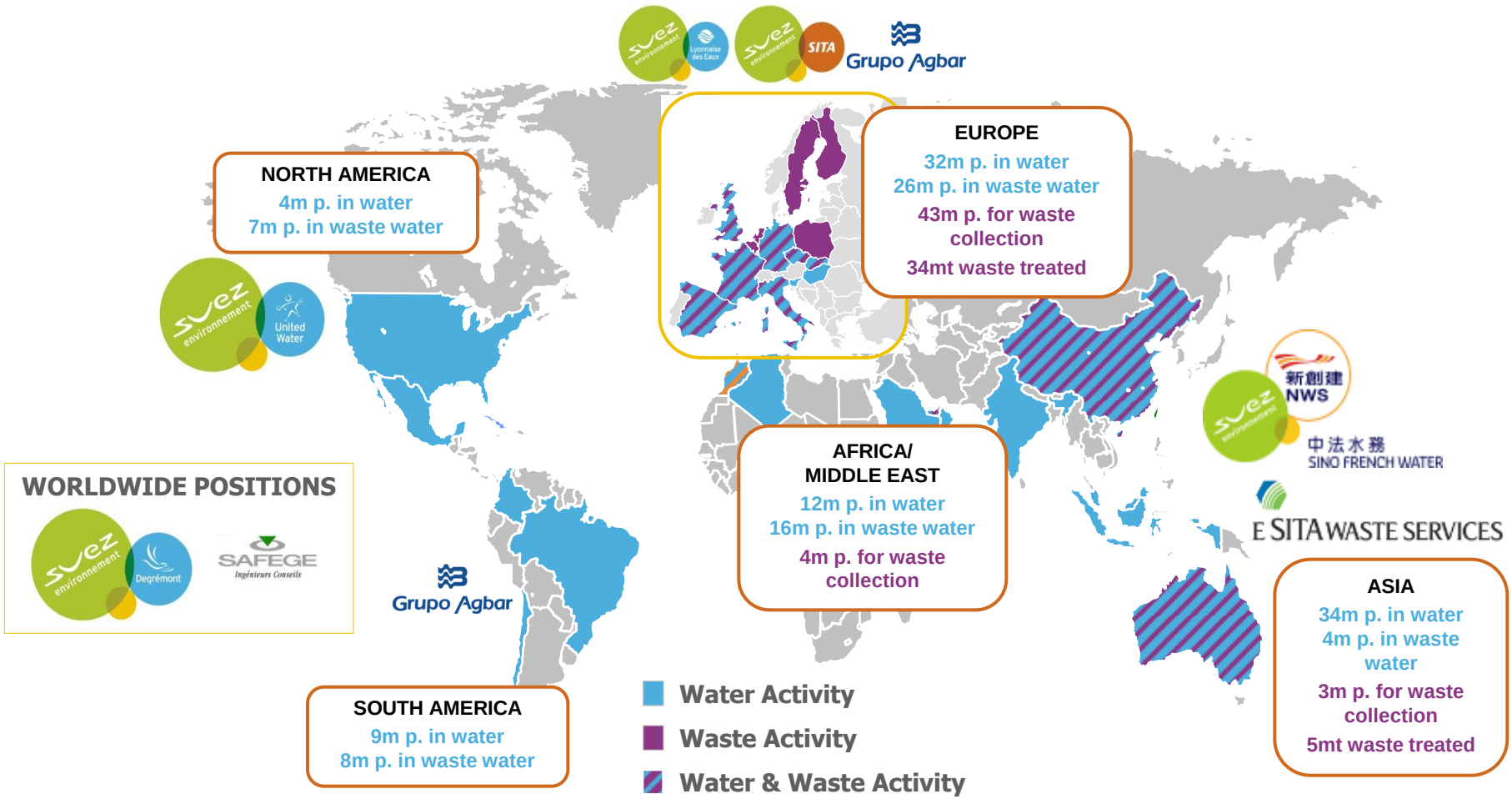
- **Benchmarking on energy efficiency in Suez Environnement's water operations**

SUEZ ENVIRONNEMENT : A GLOBAL PLAYER (2010 FIGURES)



- **91 million** people supplied in drinking water
- **61 million** people served in wastewater collection & treatment

Suez Environnement's internal benchmarking process

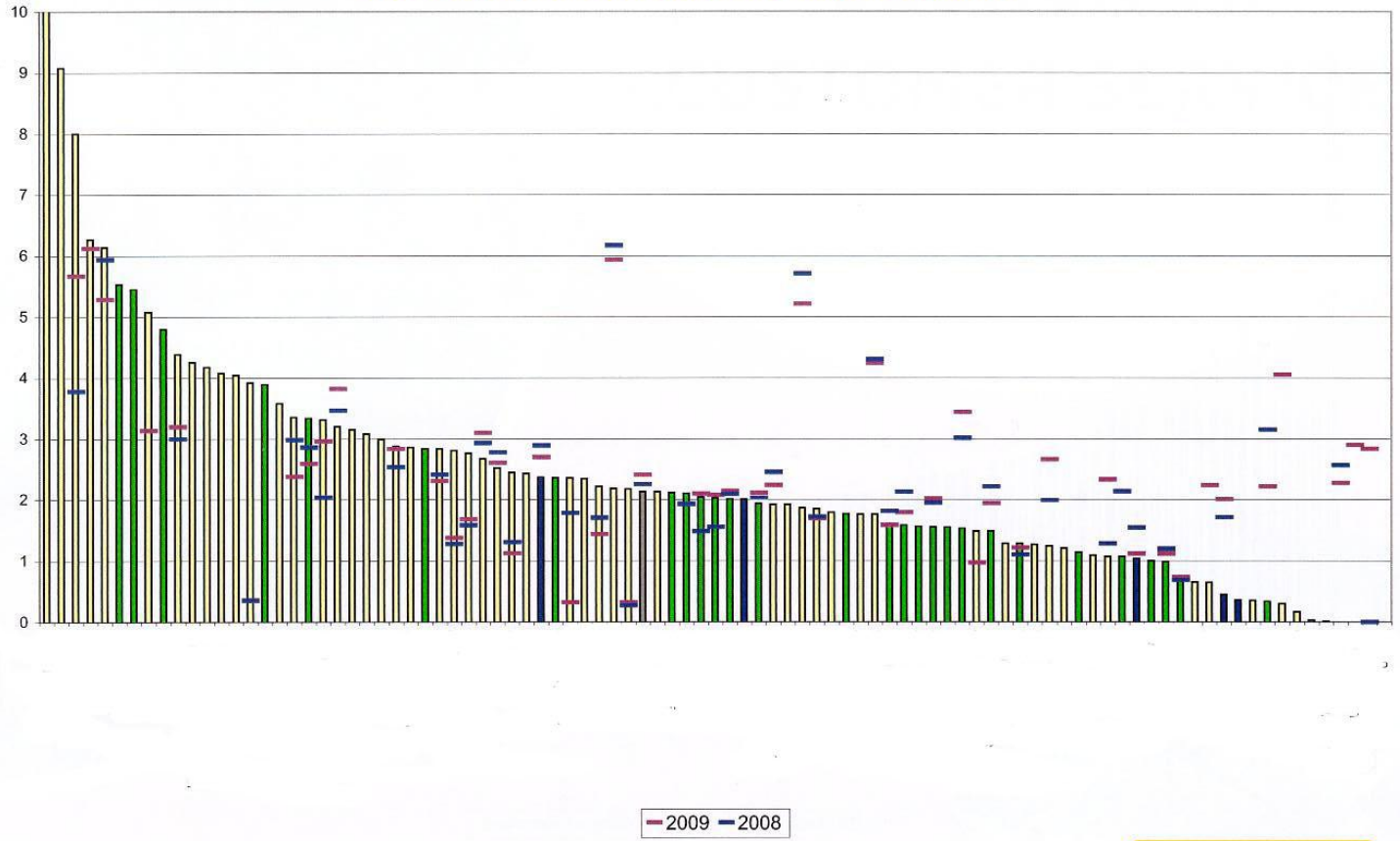
- **Suez Environnement is applying a common reporting framework on Environment and Performance for its 160 largest water contracts worldwide**
- **A tool serving multiple purposes:**
  - Economic performance management
  - Consolidation of data for corporate reporting
  - Internal benchmarking, identification and correction of anomalies
  - Progress monitoring
- **9 Key Performance Ratios on energy**

(+ 1 Environmental indicator on CO_2 emissions avoided through energy recovery):

	Energy cost/total costs	**Energy consumed/unit 1**	
Water production	**%**	**kWh/m³**	
Water distribution	**%**	**kWh/m³**	
Sewage collection	**%**	**kWh/m³**	
Sewage treatment	**%**	**kWh/kg BOD removed**	**kWh/kg BOD+N removed**

How the results look like

Graph D56 - SEWAGE TREATMENT
Electricity consumed / BOD removed (KWh/Kg BOD)



Electricity consumption varies widely from one site to another. Lowest and highest values may require a review. This includes electricity consumption for both BOD and nitrogen treatments indistinctly.
Since 2009 the average tends to slightly decrease from 2,4 down to 2,1 kwh/kg BOD on average. There is a general downward tendency.

A theoretical approach enables us to isolate the energy fraction associated to nitrogen removal treatments, as presented in graph D62.

	Ratio value
Good	From 1 up to 3

Average figures for Suez Environnement worldwide (for year 2010)

- **Scope (population sample / total population served worlwide) :**
  - Drinking water : 67 million / 91 million
  - Waste water : 39 million / 61 million

- Average energy consumption :
  - Drinking water production : 0.39 kWhe/m^3
  - Drinking water distribution : 0.11 kWhe/m^3
  - Waste water collection : 0.07 kWhe/m^3

  } site specific

  - Waste water treatment : 2.38 kWhe/kg BOD removed (including 20% of extra consumption for nitrogen removal where relevant)

  process specific

- Average energy generation from waste water : 66 000 t CO_2 equivalent

Average figures for Suez Environnement in the EU (for year 2010)

- **Scope (population sample / total population served in the EU) :**
  - Drinking water : 22 million / 32 million
  - Waste water : 18 million / 26 million

- Average energy consumption :
  - Drinking water production : 0.52 kWhe/m^3
  - Drinking water distribution : 0.12 kWhe/m^3
  - Waste water collection : 0.07 kWhe/m^3

  } site specific

  - Waste water treatment : 2.2 kWhe/kg BOD removed (including 20% of extra consumption for nitrogen removal where relevant)

process specific

Thank you for your attention !