ASK THE EXPERTS

Resilience to the global freshwater crisis: Desalination of salt and brackish water for drinking water supply

30.08.2022

Development of Water Industry in West Africa Using Unconventional Sources of Water

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AfWA/AAE

African Water Association

GAPWAS
German-African Partnership for Water and Sanitation

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German Water Partnership

About me ...

2006 : Bachelor in Physic and Chemistry, UCAD, Dakar, Senegal

2007: Bachelor in Water and Environmental Engineering, International Institute for Water and Environmental Engineering (**2ie**), Burkina Faso

2009 : Master in Water and Environmental Engineering, 2ie, Burkina Faso

2010 : Research Engineer, 2ie, Burkina Faso

2013 : PhD in Environmental Engineering, **H**okkaido **U**niversity (HU), Japan

2012 : Certificate of International Environmental Leadership, HU, Japan

2013 : Certificate of Sustainability 'Meisters', HU, Japan

2015: Founder & CEO of SenEngineering International SA

GAPWAS
German-African Partnership for Water and Sanitation

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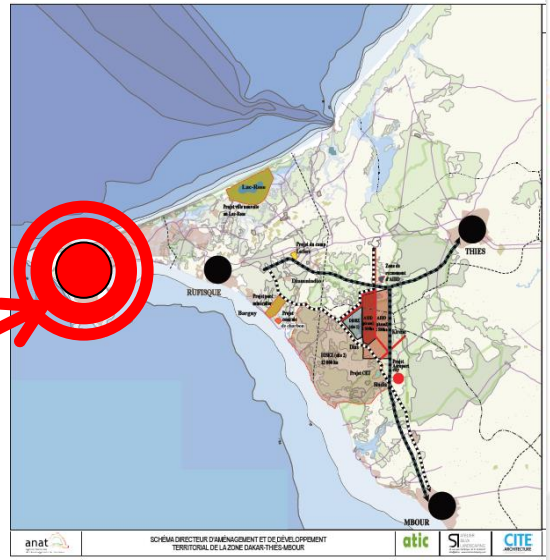
SenEngineering International SA's Profile

- An International Engineering consulting firm in the field of **Water, Sanitation, Environment**, **Energy** and **Agriculture.**

- We provides sound and sustainable **engineering Services** and **Solutions**

Dakar, Senegal
(Hann Mariste)



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Development of water industry in West Africa using unconventional sources of Water

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Shift in the Paradigm of Municipal Water Ressources Management ?

97% of Earth water is in the ocean

2.5% is Earth fresh water

< 1% is available for drinking

- **Water scarcity**
  - Surface/Groundwater depletions
  - Seawater intrusion to aquifer
  - Water pollution
- **Changes in global Climate pattens**
- **Rapid Population Growth / Urbanization**

Integrated Water Mangement framework :
Use of Conventional/non-conventional water ressources

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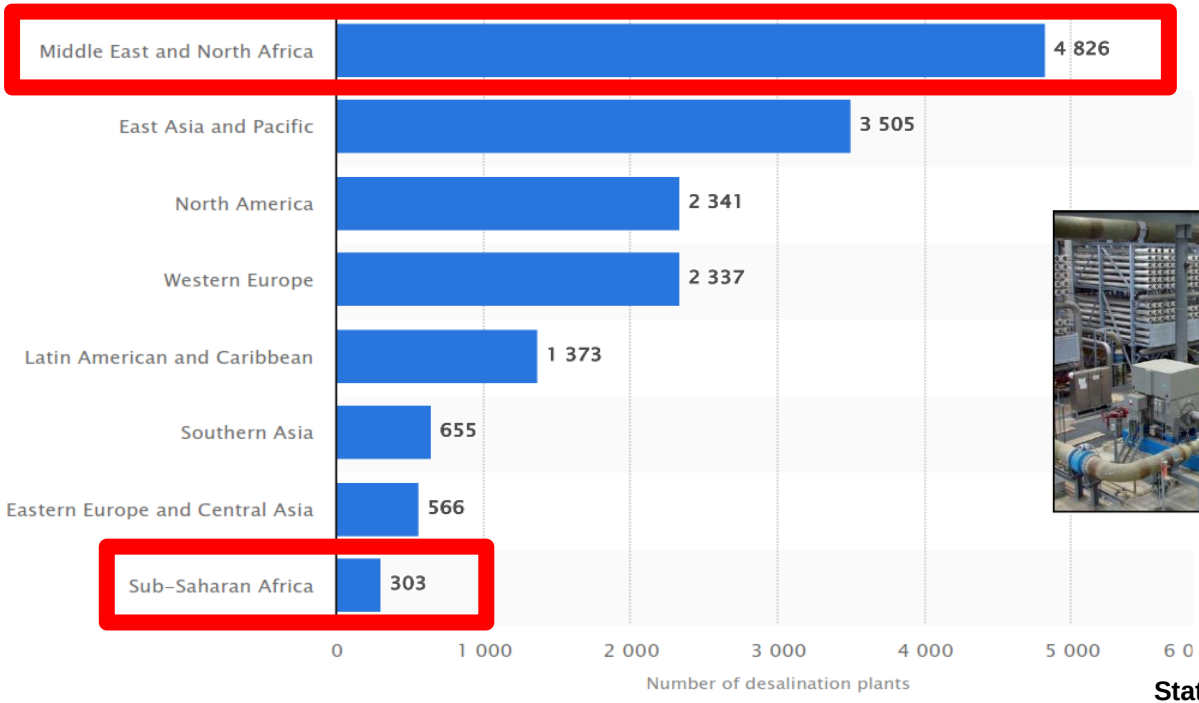
Global operational desalination plants by region 2018



Statista, 2019

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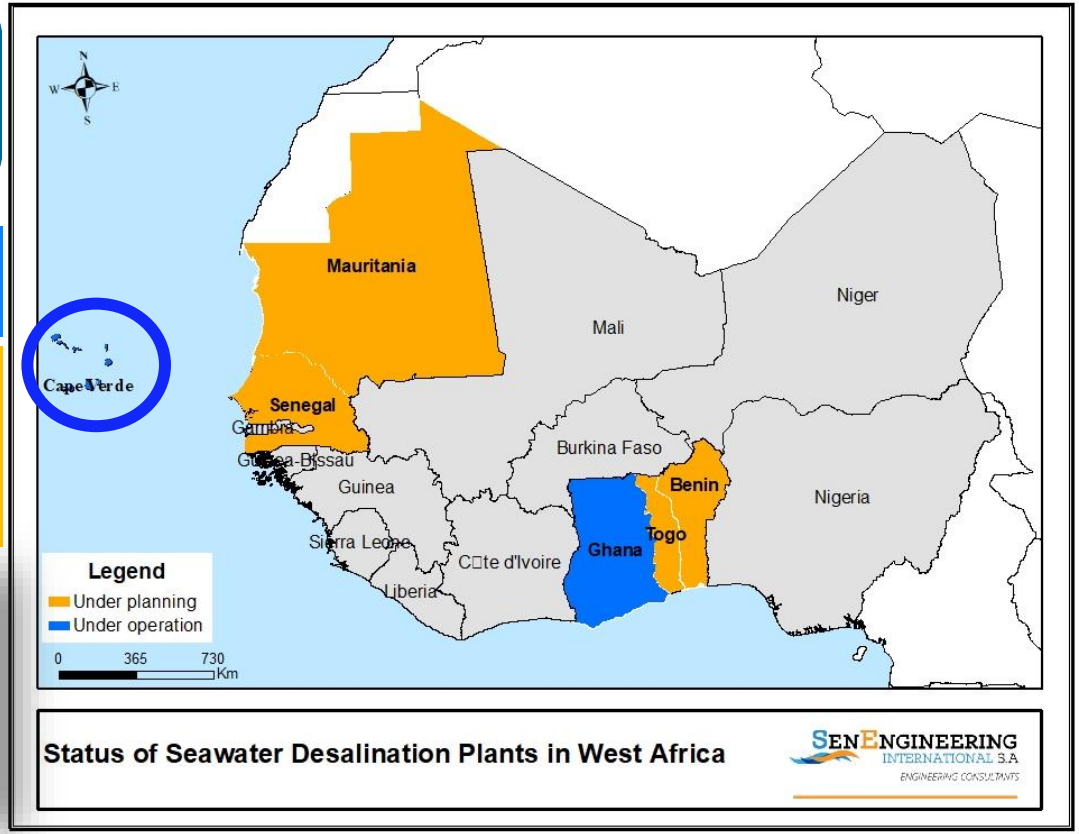
Operational and planning Seawater Desalination plants in West Africa

- Santiago (Cap-Vert): 10 000 m3 /day (02 plants)
- Accra (Ghana) : 60 000 m3/day (2015)

- Dakar (Senegal) : 100 000 m3/day
- Lome (Togo) : 60 000 m3/day
- Nouadhibou (Mauritania): 50 000m3/day
- Coutonou (Benin) : ?

Source : Photos Seawater desalination of Accra (Ghana)



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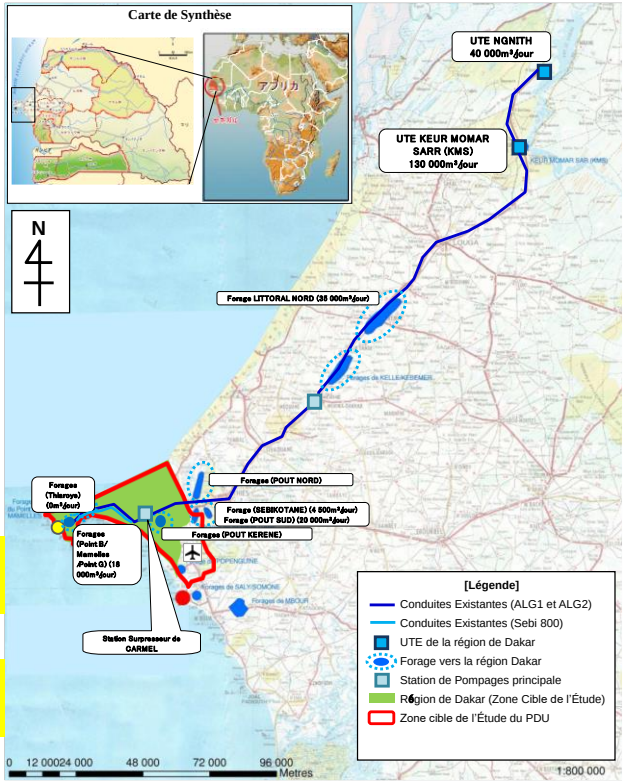
Mamelles Seawater Desalination plant construction in Senegal

- Water production from 250 Km away from Dakar : 33 0728 m^3/day
- **Over exploitation** of ground water leading to salinity

- **Diversification of production water sources**
- **Production of water near to the point of use**



Source : Nippon Koei

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Mamelles Seawater Desalination plant construction in Senegal

- **Seawater desalination plant** of **100,000-m³/day** (Design, Construction, Operation and Transfer scheme)

- **Pipelines network renewal** in Dakar 1 (Long: **316 km**)

Source : Nippon Koei

Pipeline network very old > 80 years

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Compact desalinations systems for small communities for the treatment of brackish water potables uses

- Containirized membrane treatment for potable use (**nexus Water – Energy – Food**) powered in dual national grit and /or **solar without batteries** to reduce operating cost ;
- **Delovelopment of Water kiost** / Water business services ;
- Equipments supply services ; and
- Operation and maintenances services .

Somes limitations in the water industry: Production lines/ Capacity building /Partnerships / Finance / etc….

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SUMMARY

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- Promote the development of water industry in Africa
- Fostering integrated water management by increasing non-conventional water usage (desalinated water and treated wastewater)
- Educate users to saving water for a sustainable future
- Building partnership and strengthening capacity of water actors in Design – Build – Operate and Management of unconventional water ressources projects
  - Facilitate /Accelarate access to finance for small and big projects (innovative financial mechanims)
    - Put clear policy and regulation in place (building an Instiutional framework)

Thank you for your attention!

Any Question?

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Coût général des systèmes de déssalement

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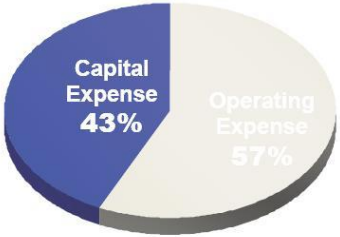


ASSUMPTIONS	
Power Cost USD/kWh	0.09
Debt Equity Ratio	80/20
Debt Interest Rate	8%
Equity Return on Inv	18%

Figure 1-5: Desalination Plant Capital & Operating Costs

Perth Seawater Desalination Plant 2008

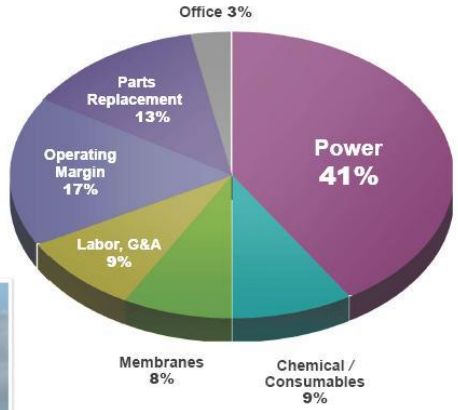
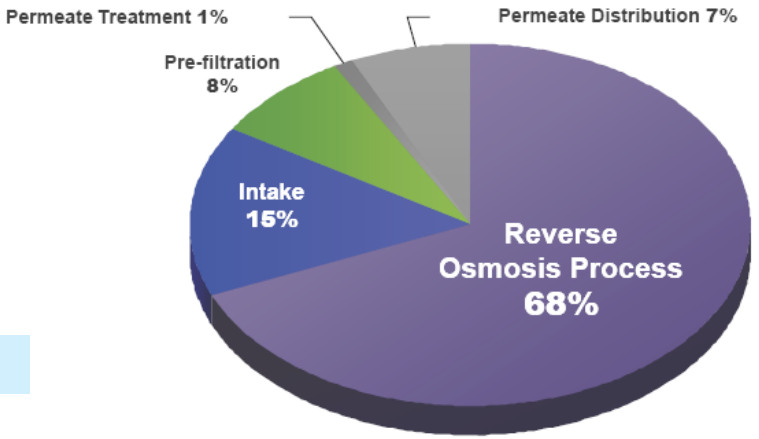


Figure 1-6: Operating Expenses—Breakdown



RO power consumption is approximately 20% (up to 45%) of total SWRO cost

Figure 1-7: Power Use—Breakdown (Seawater RO)

Source: Affordable Desalination Collaboration, 2008

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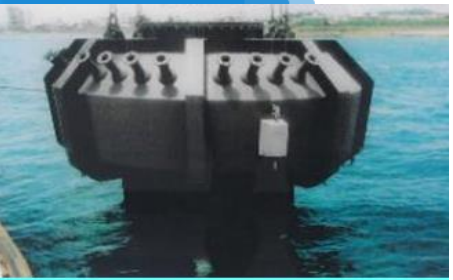
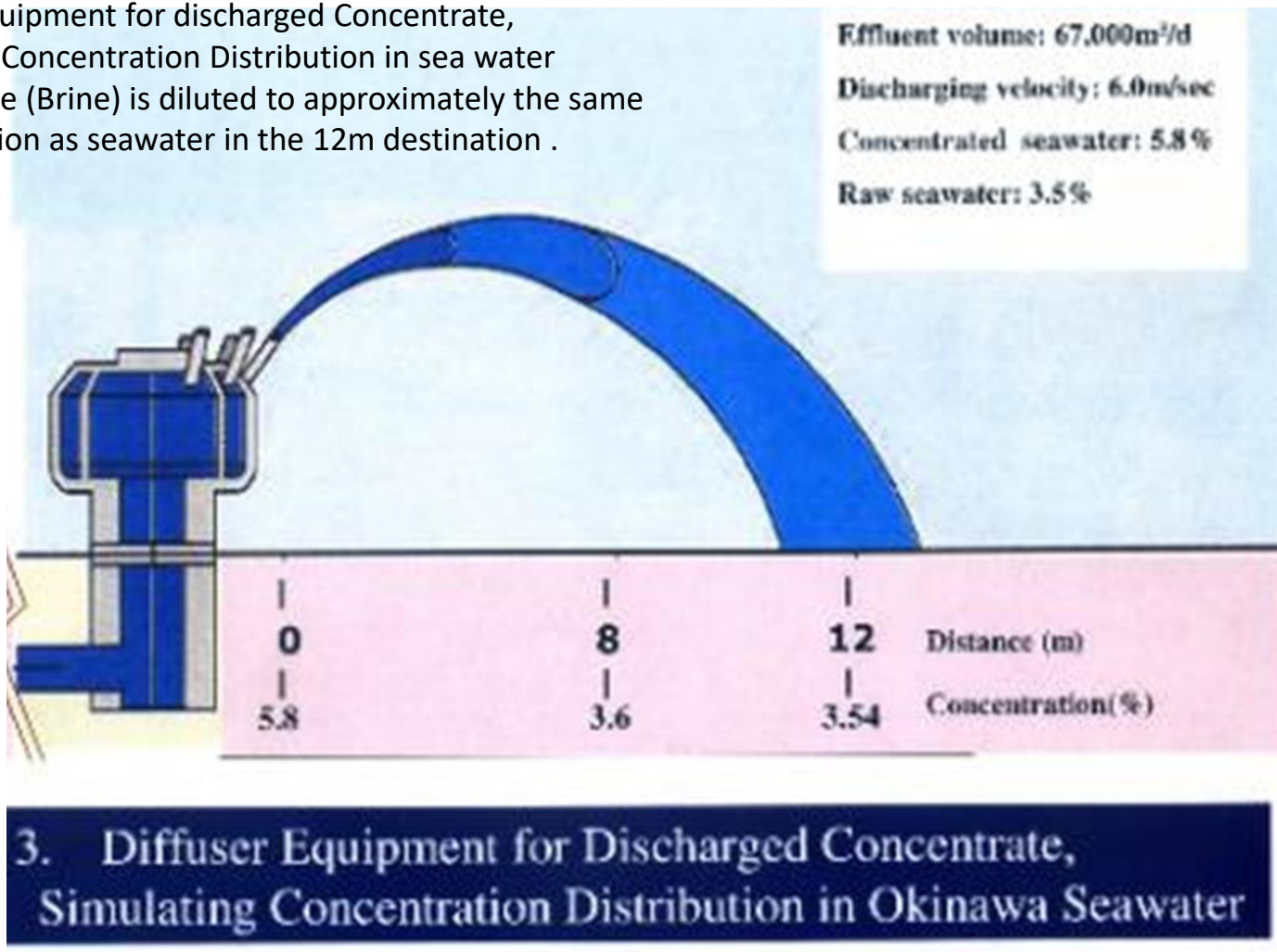
- ✓ Diffuser Equipment for discharged Concentrate,
- ✓ Simulating Concentration Distribution in sea water
- ✓ Concentrate (Brine) is diluted to approximately the same concentration as seawater in the 12m destination .



Discharge tower for concentrated sea water



3. Diffuser Equipment for Discharged Concentrate, Simulating Concentration Distribution in Okinawa Seawater