THESSALONIKI2021

8th International Conference on Sustainable Solid Waste Management

23-25 JUNE 2021

How Waste to Energy (WTE) may help Morocco to reduce landfill greenhouse gas emissions and increase renewable energy

Reda M. Kabbaj
Research Associate EEC-Columbia
Co-Chair WtERT-Canada

Current situation of Municipal Solides wastes in Morocco

For several decades, Morocco has experienced rapid urbanization and a development of the middle class. This situation has made the collection and disposal of MSW more challenging.

Today MSW is a major problem for all cities across Morocco. Waste ends up in vast non-controlled landfill sites and affect local environment and public health.

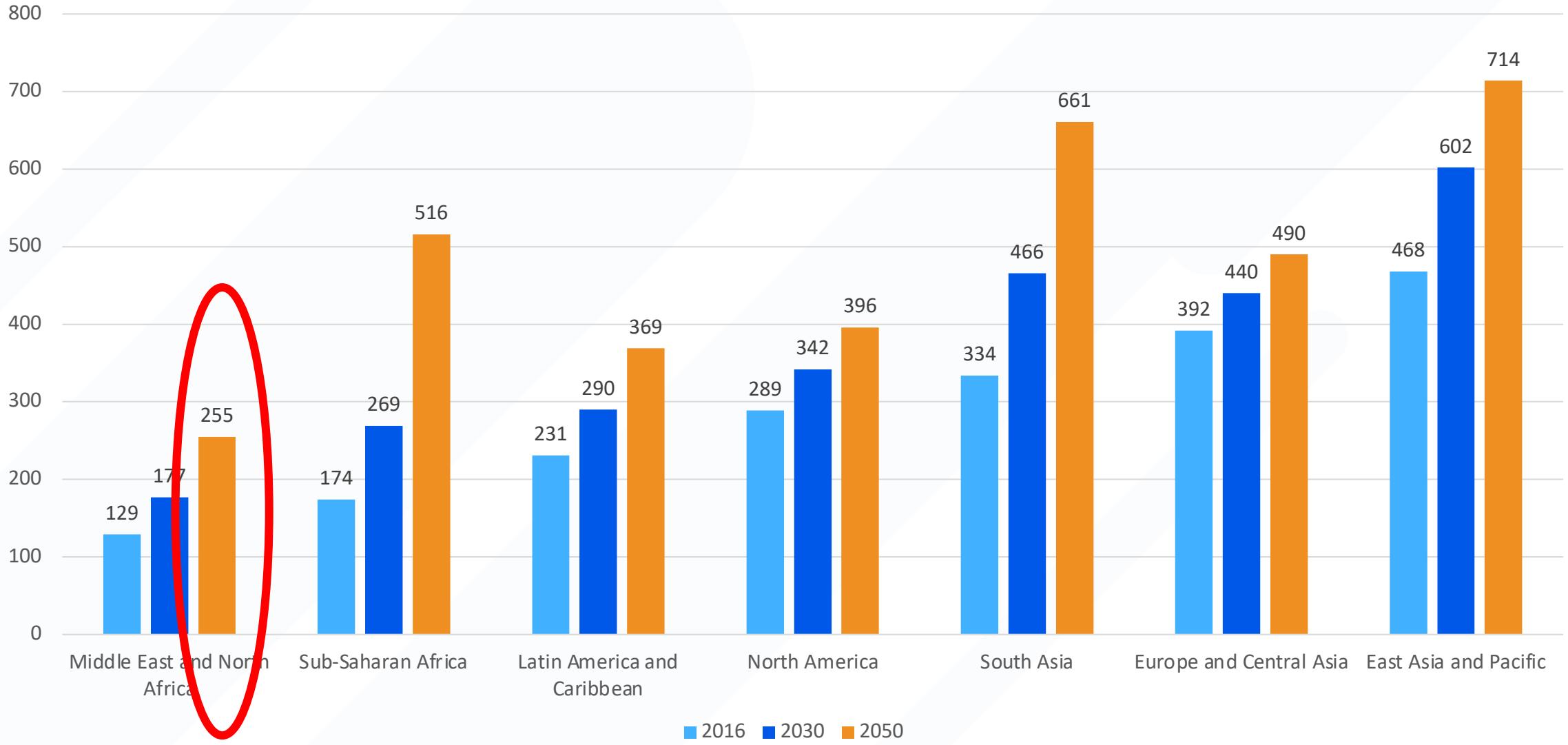
A 2003 World Bank study estimated the economic costs of environmental degradation in Morocco, related to the poor performance of the solid waste management system, at 0.5% of GDP (about 1.7 billion dirhams), one of the highest rates in the MENA region.

To remedy this problem, Morocco has initiated, with the support of the World Bank, the National Program of Household Waste (PNDM).

Post-recycling urban waste is a global problem

Projected waste by region

Source : World Bank report “What a waste 2.0”



Key Facts about waste in Morocco

- Population: more than 33 million inhabitants of which 20 million are urban, i.e. an urbanization rate of 60%;
- Production of 6.9 million tons per year of which 5.5 in urban areas, i.e. a ratio of 0.76 kg/inhabitant/day;
- Predominance of organic matter: nearly 70% of total weight;
- High moisture content: about 67%;
- Low calorific value: between 850 and 950 kcal/kg;
- Global quantities of recyclable waste: about 850.000 t/year.

Source Ministry of Interior, Morocco

The main objectives of the PNDM

- Ensure the collection and cleaning of household waste in urban centers and achieve a satisfactory collection rate of 90% by 2022;
- Establish landfill and waste recovery centers for all urban centers by 2022;
- Close and rehabilitate all unauthorized dumps (100%) by 2022;
- Support the communes in their efforts to professionalize their services;
- Organize and develop the "sorting-recycling-recovery" sector in order to achieve a 20% recycling rate for all waste produced by 2022;
- Raise awareness and train actors concerned by the issue of household waste;
- To generalize the master plans of household and similar waste management for all the prefectures and provinces of the Kingdom.

Cost of the PNDM program

The cost of the PNDM is estimated at 40 billion dirhams, distributed as follow :

- 67% for collection and cleaning services ;
- 17% for the creation of controlled landfills;
- 6% for the rehabilitation of existing landfills;
- 3% for studies, project management, control and monitoring;
- 5% for the development of the "Sorting-Recycling-Recovery" sector;
- 2% for communication, awareness and training.

The need of Waste-to-Energy facility in Casablanca

The metropolitan city of Casablanca (4.5 millions inhabitants, 1.5 million tons MSW) is looking for an alternative to non-regulated landfills (saturated at 99 percent), with shortage of land for sanitary landfill and public opposition to new landfills.

Therefore, a science-based review of the facts would argue that WTE is the only feasible solution for Casablanca. This offers the opportunity to increase a source of renewable energy to power the scheduled desalination plant in Casablanca. Also, it will reduce landfilling and the greenhouse gas (GHG) emissions of Morocco by at least one million ton per year, that is 'three birds with one stone'.

35% of Morocco’s MSW ended up in the landfill of Mediouna, 20 km close to Casablanca City

Instead it could be source of wealth by producing Energy and recovering metals and minerals!

Aerial photo from airplane of the Landfill of Mediouna

From environmental disaster to development: China's capabilities to build at competitive costs WtE facility in Casablanca City.

Courtsey of Waste-to-Energy plant in China from SUS Environment

Morocco's ambitious water & energy strategy

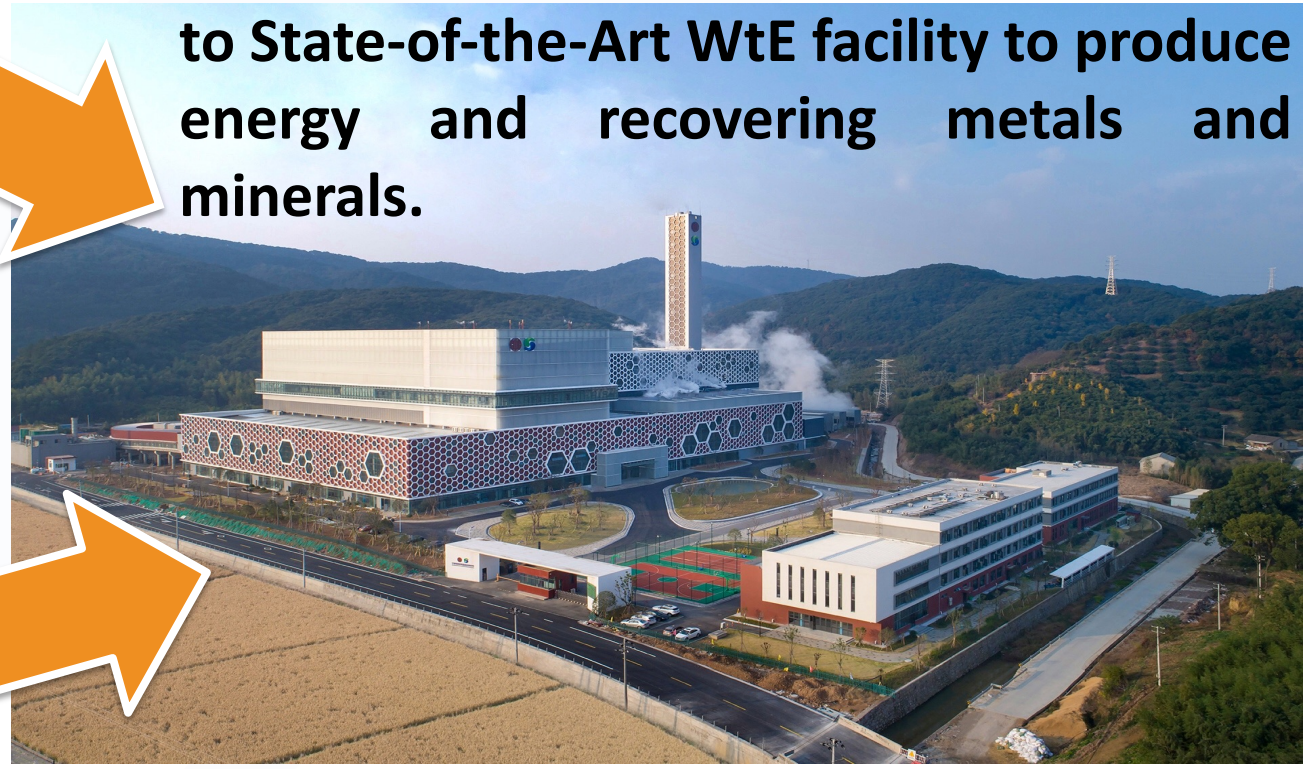
Morocco plans to build the world's largest seawater desalination plant in Casablanca, with a budget estimated at $1.05 billion. Planned to be operational by the end of 2027, the plant will produce around 300 million cubic meters of water yearly.

"During a working session, The King of Morocco stressed the need to adopt an additional integrated program to back all the scheduled water desalination plants with renewable energy production units to ensure their autonomy and energy saving, by relying primarily on the deposits available near the plants, like the wind power plant in Dakhla, or even the exploration of new sources of energy such as the waste energy transformation (Biomass) in big cities like the agglomeration of Casablanca."

https://www.mapnews.ma/en/activites-royales/hm-king-chairs-working-session-sector-renewable-energy-royal-office-0

From Waste-to-Energy-to-Water

Using WTE to meet water and energy challenges in Morocco



Courtsey of Waste-to-Energy plant in China from SUS Environment

The advantages of Waste-to-Energy

In Waste-to-energy facility residual waste is used as a resource

Energy drives our homes, our cities and our civilizations. As our population continues to grow, so the trail of trash that we leave behind, therefore cities should be equipped with the right Waste-to-Energy infrastructure that offers those advantages :

- Destruction of pathogens and hazardous components
- Conservation of lands (volume reduction : 90%)
- GHG emission reduction
- Recovery of energy turned into electricity, heat and steam, (reduce use of fossil fuel)
- Recovery of secondary raw material (Metals and minerals) re-injected in the economy

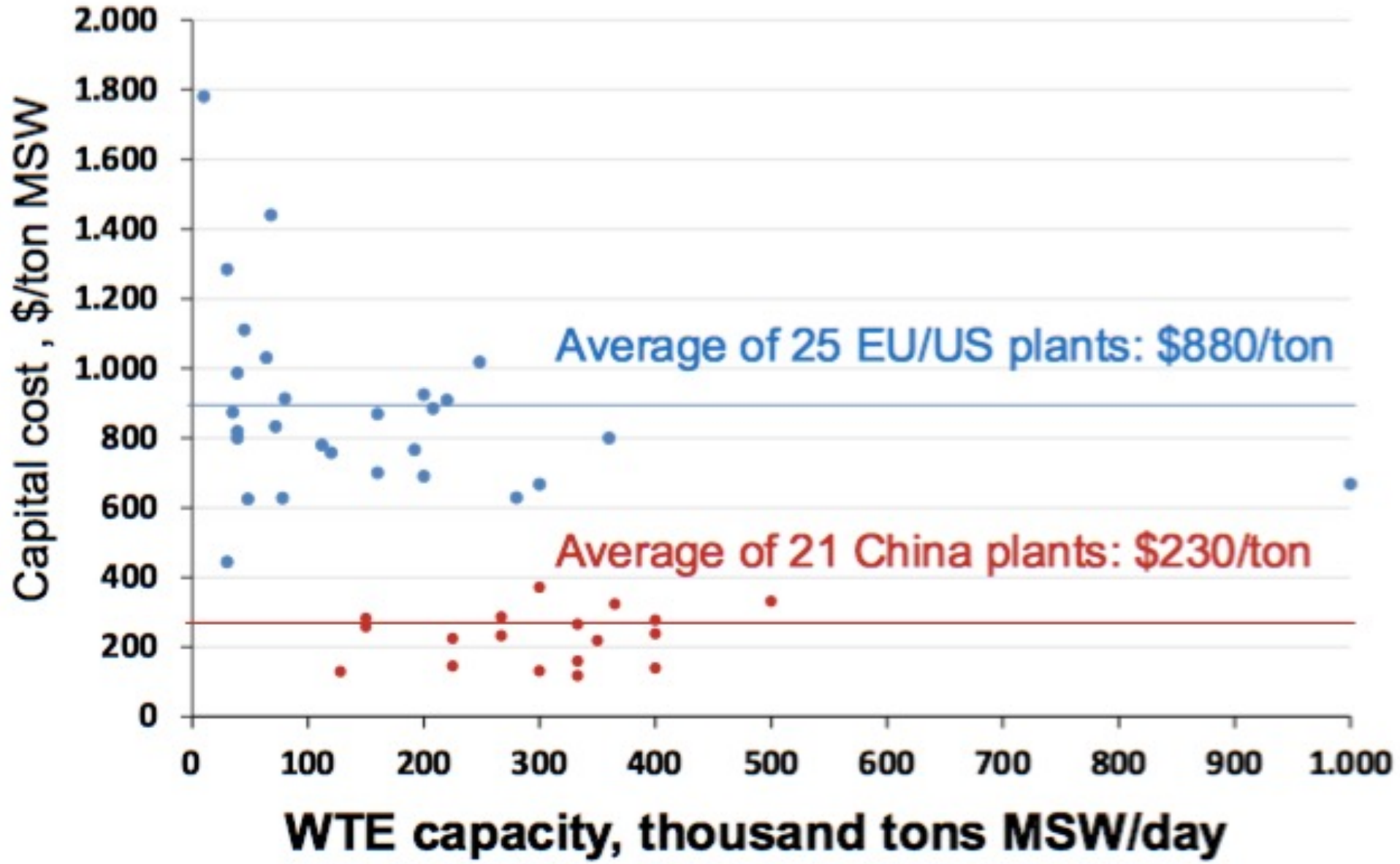
Waste-to-Energy is complementary to recycling. It treats waste that cannot be recycled or re-used. However, cities in the developing world can skip the sanitary landfill stage and move directly from **waste dumps** to **WTE power plants.**

How Morocco could benefits from China as an emerging world leader in sustainable waste management

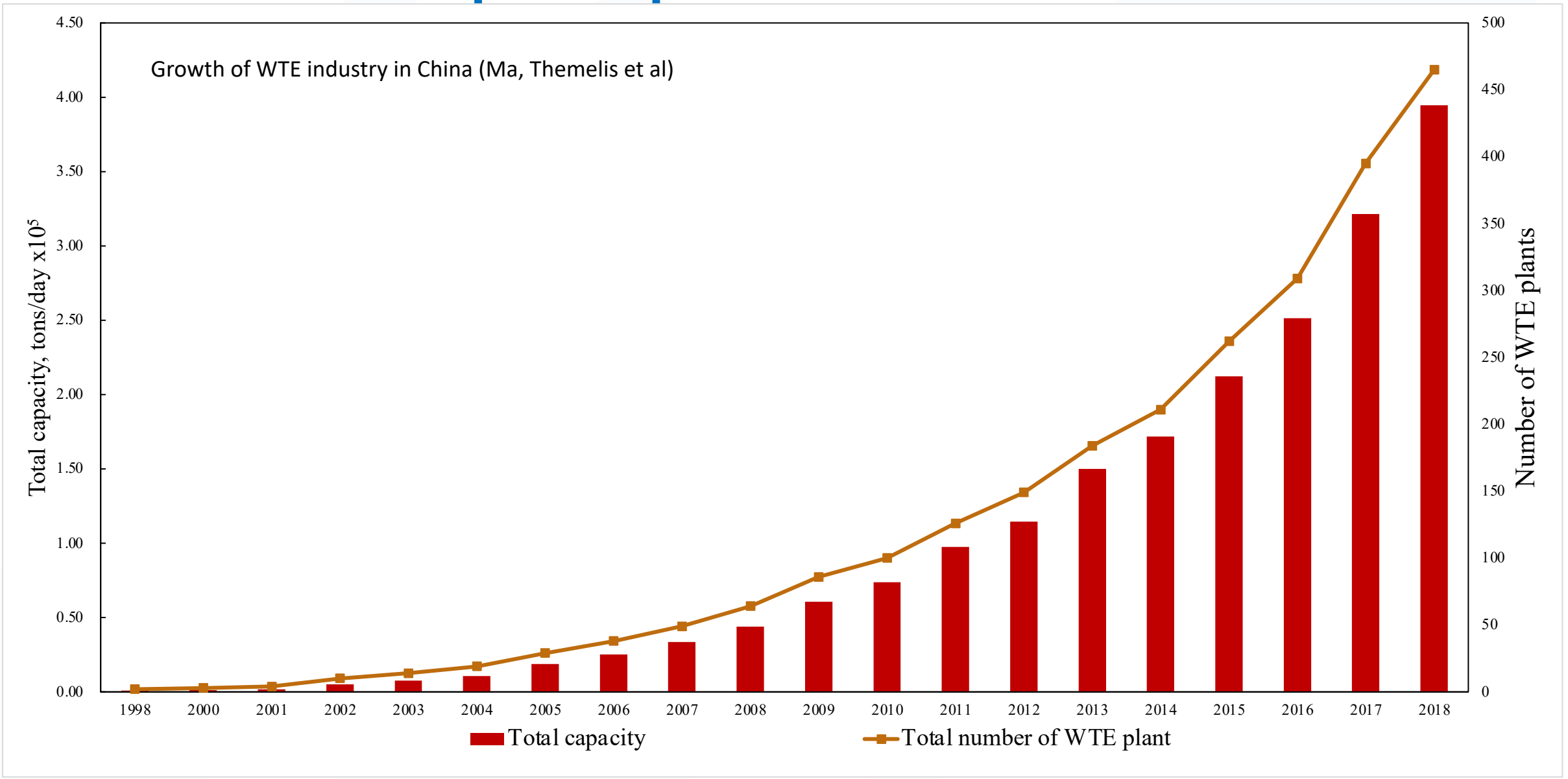
China has demonstrated that it is possible to reduce the capital cost of WTE plants by means of :

- Dedicted Industrial and academic R&D
- Rapid growth of industry, instead of custom building one plant at the time
- Assembly line fabrication of WTE equipment
- Favorable national policy (e.g., $30/MWh credit to WTE electricity)
- Place for WTE in Belt and Road Initiative (BRI) funding

All types of WTE are much less costly in China



21st century growth of WTE industry in China
2020: 470 WTE plants plus over 100 under construction



Addis Ababa, Ethiopia's 1st WtE Plant in Africa Thanks to China R&D that make dreams becomes reality

The Reppie WtE / Project Facts

- Capacity: 400 000 tonnes per annum
- Waste: Municipal Solid Waste (MSW)
- Furnace/boiler: 2 grate fired lines, vertical economizer section
- Energy production: 20 MW power
- Steam parameters: 60 bar/420˚C
- Flue gas treatment: SNCR, dry FGT system (lime milk in reaction tower), baghouse filter
- Commissioning: 2018

IRESEN and GWC to form WtERT Chapter in Morocco

The establishment of WtERT-Morocco in partnership with IRESEN, The Research Institute for Solar Energy and New Energies, will have a significant impact on the R&D ecosystem and Morocco renewable energy strategy.

It could play a pivotal role to bring together all Moroccan stakholders to address and tackle solid waste management issues by identifying the best available technology for the treatment of solid waste with support of Columbia to materialize all this effort by building the first Waste-to-Energy plant in Casablanca.

The importance of Creation of WtERT-Morocco

The mission of WtERT-Morocco Initiative is to:

- Bringing together key Moroccan stakeholders involved in Municipal Solid Waste (MSW) to create a collaborative approach in order to have one vision and one goal.
- Helping government members and technicians from Ministries and City councils in Morocco to improve their academic and engineering skills on the advanced technology and practical experience concerning Waste to Energy.
- Support the implementation of appropriate financial instruments to enabling environment for public–private partnerships in waste-to-energy projects.
- Conduct Pre-feasibility of Waste-to-Energy plant of 3,000 TPD for the city of Casablanca.
- Helping facilitate investment in Waste-to-Energy infrastructure and
- Preparation of a RFP (request for proposal) which gives all Waste-to-Energy developers chance to bid.

THANK YOU.

Reda M. Kabbaj
Co-Chair WtERT Canada
Research Associate, EEC
Columbia

+ 1 514 545 5837
+ 212 6 63 70 11 98

Wtert.ca
Gwcouncil.org
Wtert.net