

Legal Statement

The purpose of the information in this presentation is to guide ICA programs and provide members with information to make independent business decisions.

Antitrust Guidelines



Antitrust Guidelines for Copper Industry Trade Association Meetings

The following guidelines with respect to compliance with antitrust laws of the United States, Japan and European Community¹ are intended to govern the conduct of participants in copper industry trade association meetings, both at the meeting itself and in informal discussions before or after the formal meeting.

Price: Competitors should not discuss future prices (including terms of sale) of their products. There is no blanket prohibition against the mention of or reference to current or past prices but limits must be observed. Such references or mentions should occur only when necessary in connection with the development of association programs. For example, reference to a particular price level in comparing the cost of a copper product to a competing product is permitted. Whenever possible, such references should be discussed in advance with legal counsel.

Competitive Information: Competitors should not discuss the market share of a particular copper producer or copper fabricator's products. Furthermore, nothing should be said at a meeting which could be interpreted as suggesting prearranged market shares for such products or producer production levels. The overall market share of copper products may be discussed with regard to competition with non-copper products and general market acceptance.

New Products: Competitors should not encourage or discourage the introduction of a new product by another competitor or reveal a particular copper company's plans to change the production rate of an existing product or to introduce a new product. No company should disclose to another company whether it is in a position to make or market a new product. New products may be discussed in a technical manner or from the standpoints of competition with non-copper products and general market acceptance. In addition, proposed methods for and results of field and laboratory testing can be considered.

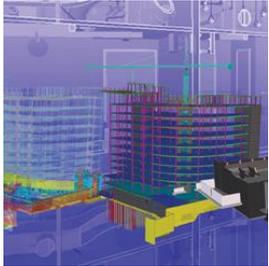
The Role of Legal Counsel: Legal counsel attends association meetings to advise association staff and other meeting attendees regarding the antitrust laws and to see that none of the matters discussed or materials distributed raise even the appearance of antitrust improprieties. During the course of a meeting, if counsel believes that the discussion is turning to a sensitive or inappropriate subject, counsel will express that belief and request that the attendees return the discussion to a less sensitive area.

A paper entitled 'Copper Industry Trade Associations and Antitrust Laws' is available upon request.

10/92, 5/93, 10/10

1. Other foreign competition laws apply to International Copper Association, Ltd. (ICA)'s activities worldwide.

Making buildings better



Opportunities for Copper in Water and Waste Water Treatment

Krystyna Dawson

Director, BSRIA WMI



- Challenges in water supply
- Water and waste water management requires changes
- What does it mean for copper?
- Main products of interest
- Market forecast and drivers for growth
- Ancillary applications & Conclusions

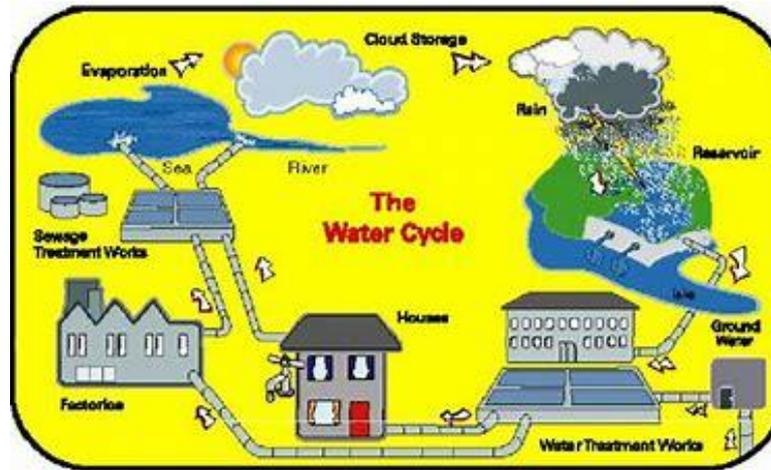
Water industry – brief overview

Provider of drinking water & waste water services



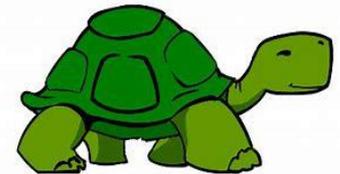
residential, commercial and industrial sectors of the economy.

- Publicly owned
- Privatised
- Co-operation & NGO structures



Source: ccuart.org

Average annual growth in the past:
3%



Source: clipartbest.com



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International

Powerful global drivers prompt change

- Population growth
- Climate change
- Industrialization



Pressure on water supply is growing

to ensure

- People's health
- Food security
- Energy supply
- Industrial production

“We used to think that energy and water would be the critical issues for the next century. Now we think water will be the critical issue.”

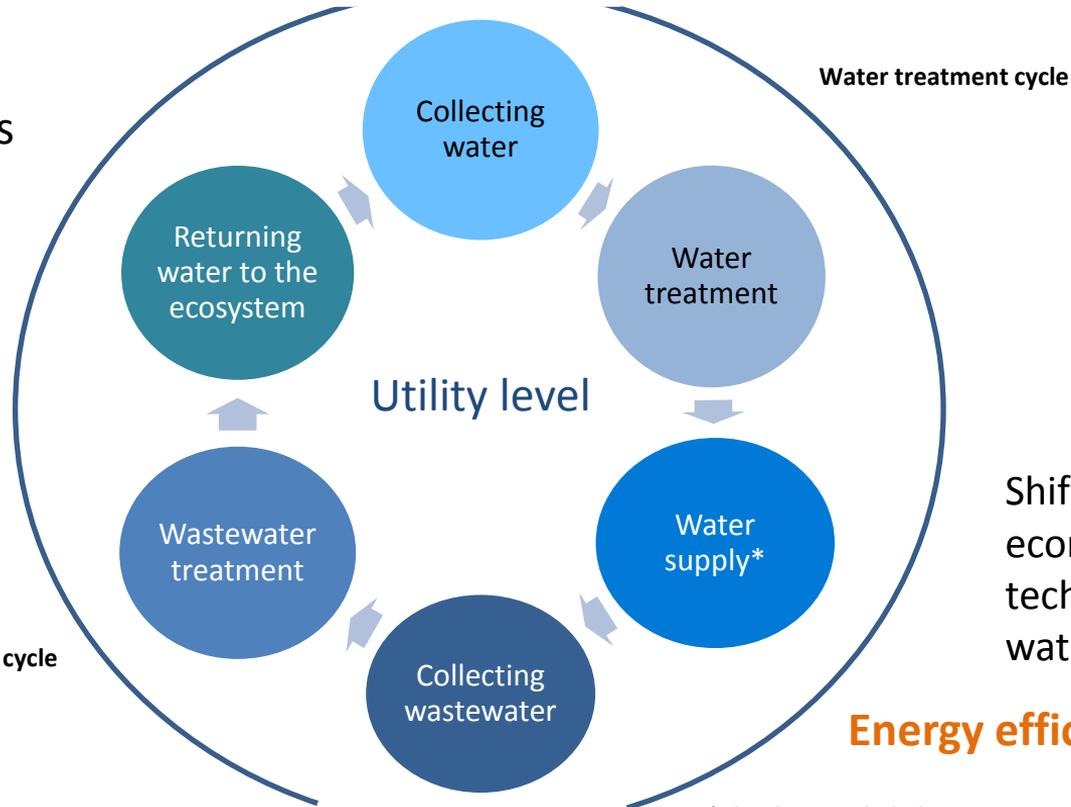
Mostafa Tolba, former head of the UN Environment Programme



Industry forecasted
annual growth:
7.4% – 11.4%*

**Sources: GWI; FMI*

Water & waste water processes are energy consuming



Shift to low carbon economies impacts technologies used in water supply processes

Energy efficiency comes to focus

**Plumbing excluded*



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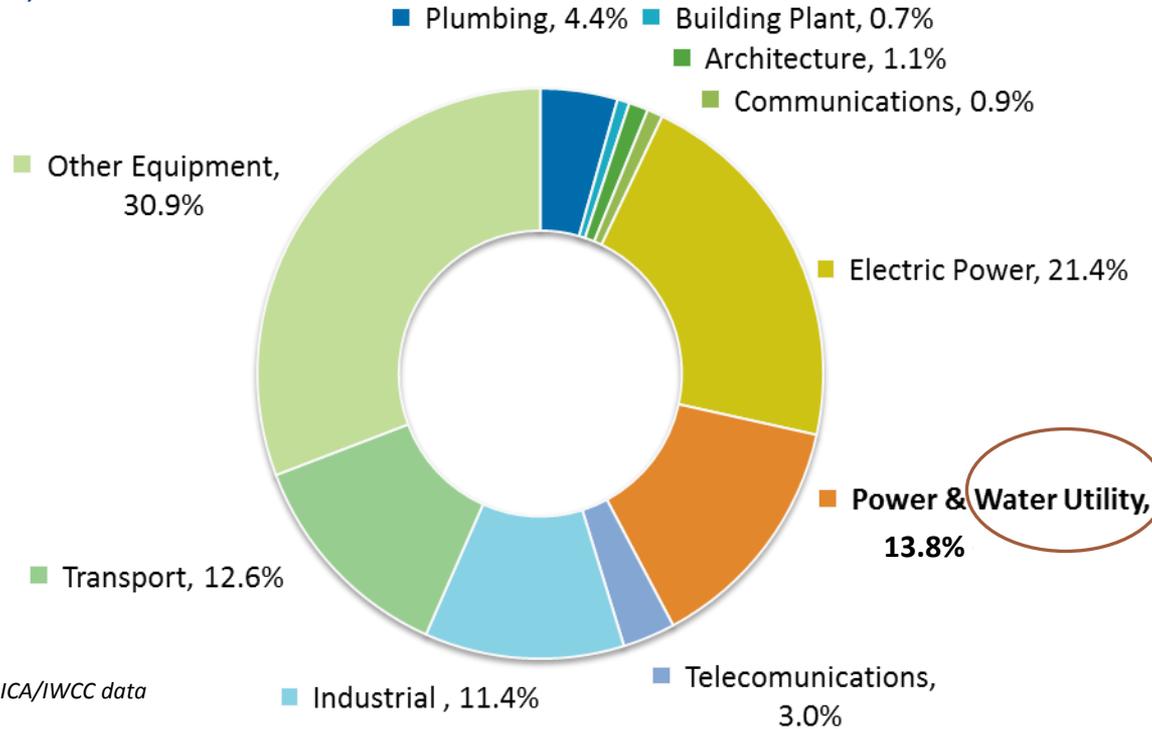
What does it mean for copper?



Global copper demand



2016: ca 27,419K tonnes

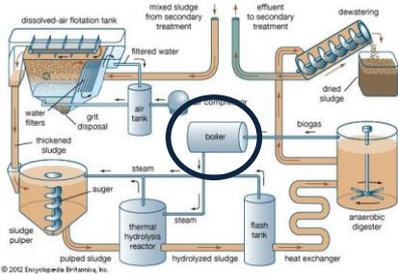


Source: Adapted from ICA/IWCC data

Thermal

Electrical

Heat exchangers (HE)



- HE in boilers and in anaerobic sludge digestion process

- HE in MSF desalination (copper-nickel alloy)

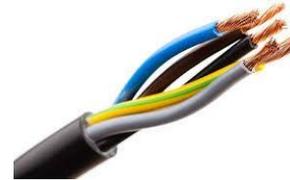
- HE in water harvesting and re-use



Motors (in pumps * & CHP units), wires, etc



- Motors for a range of applications of which water pumps represent almost 90% of typical installed capacity



- Electrical wiring and other ancillary electrical equipment such as switchgears

**Pump casing, valves etc. made of brass are excluded from the research*

Main and ancillary applications open up for more copper use

Main applications

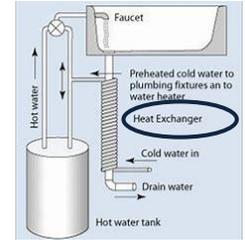
- **Water treatment**
- **Waste Water treatment**

Desalination is gaining importance

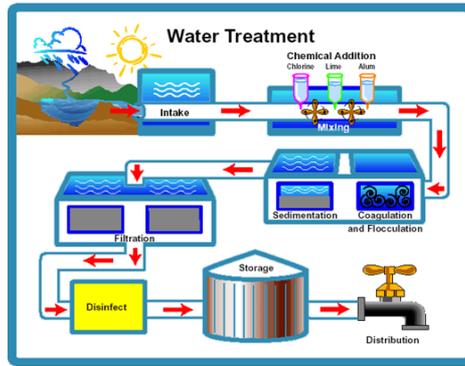
Ancillary applications

- **Energy generation**
- **Heat exchange in grey water recovery**
- **Water reuse**
- **Heat exchange in solar preheating**

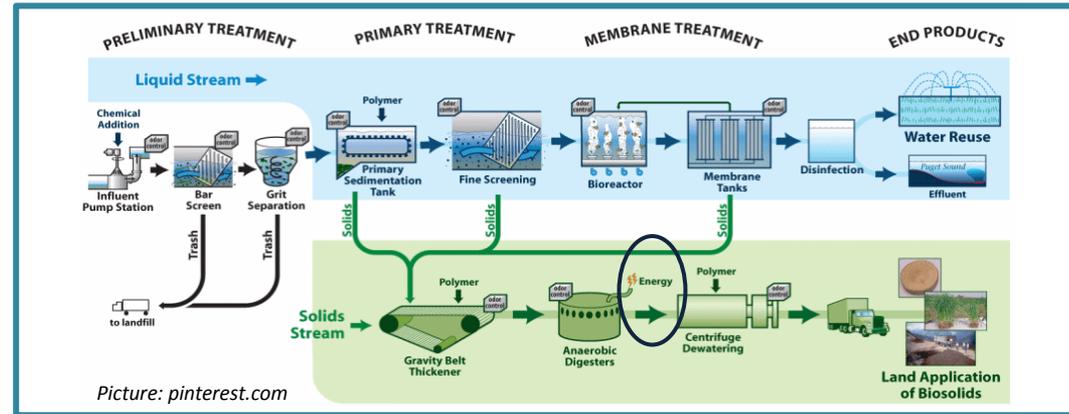
Grey Water recovery



Source: ecohome.net



Picture: jzcacayuran.wordpress.com



Picture: pinterest.com



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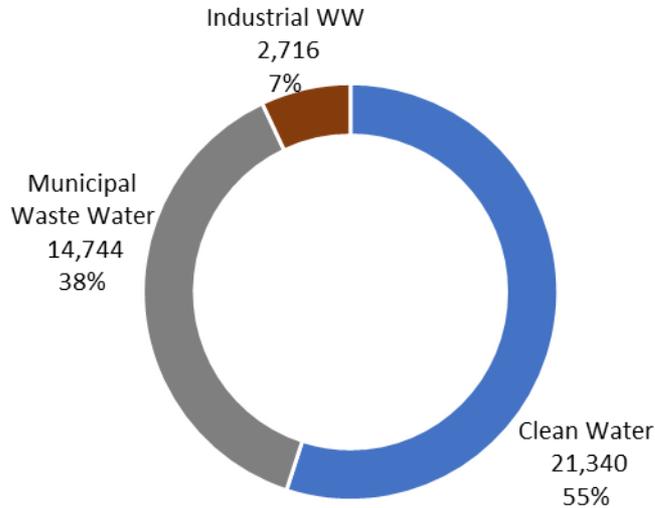


International

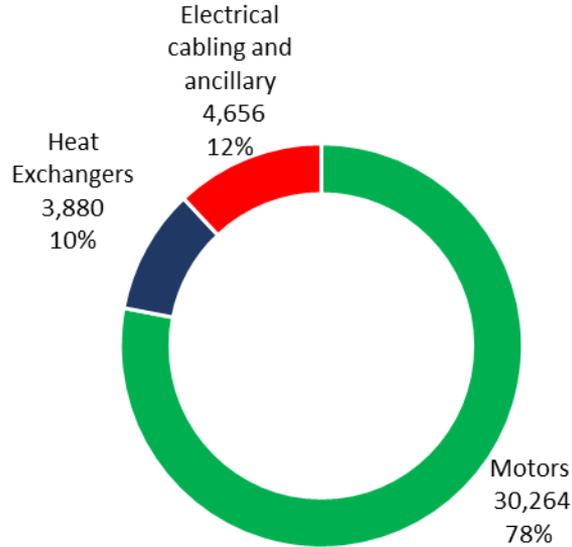
Focus on Copper Demand in Water Utility



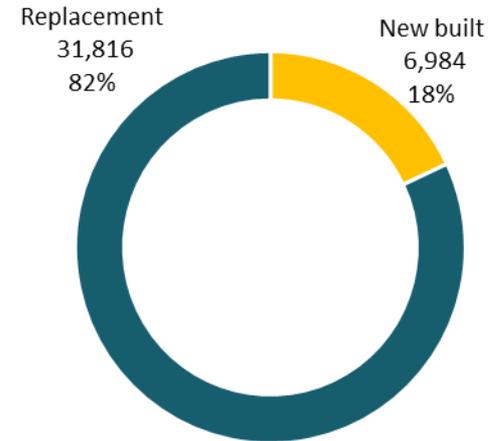
2017 (including Cu-Ni alloy), ca 39,000 tonnes



By segment



By equipment type



By application



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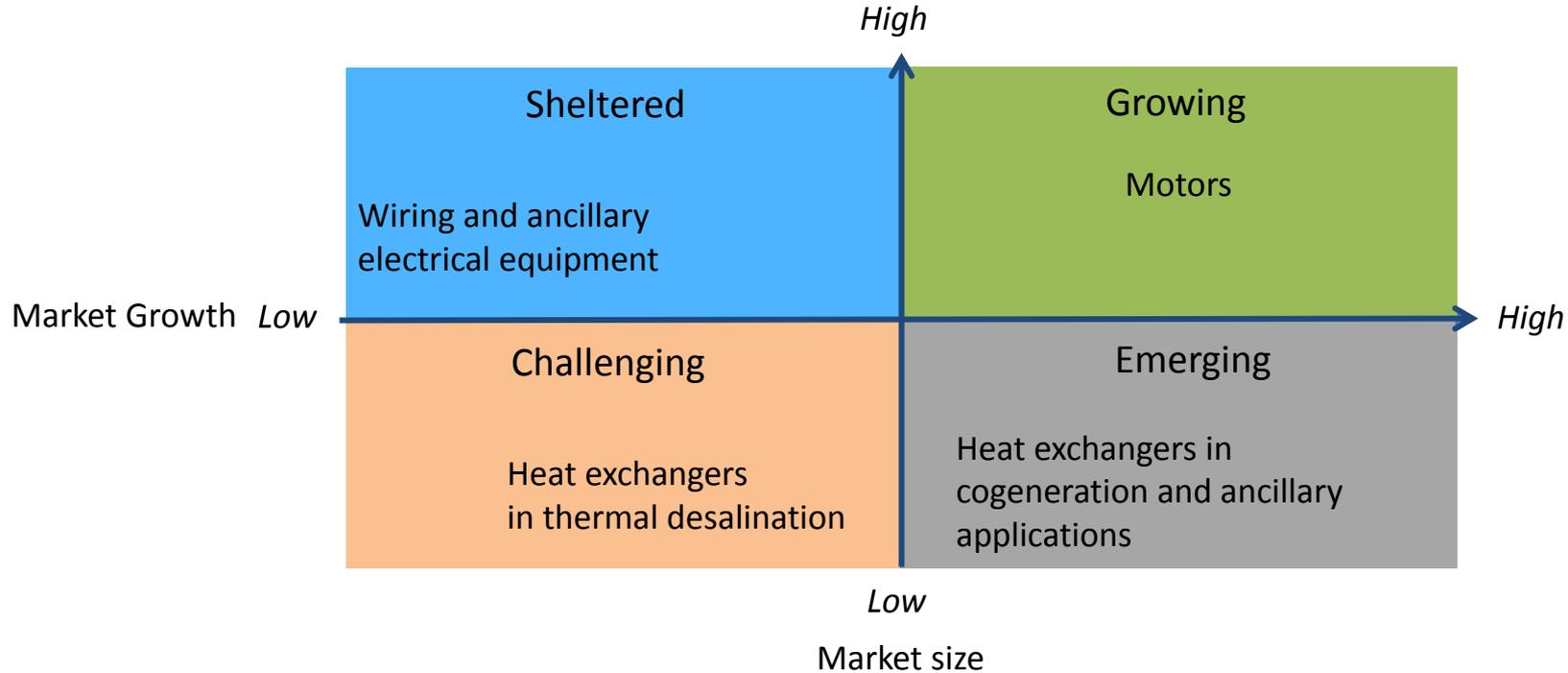


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Market assessment by type of product





Efficiency

- Motor efficiency (IEC 3)
- On site energy generation
- Efficiency in most energy demanding processes such as aeration and sludge treatment

**Up to +50%
of copper per unit**



Industry Growth

- Global economic growth
- Urban population growth
- Ageing infrastructure
- 3.6 billion live in water scarce areas at least one month/year

**Copper Demand CAGR
minimum +16% in next
10years**



Climate change

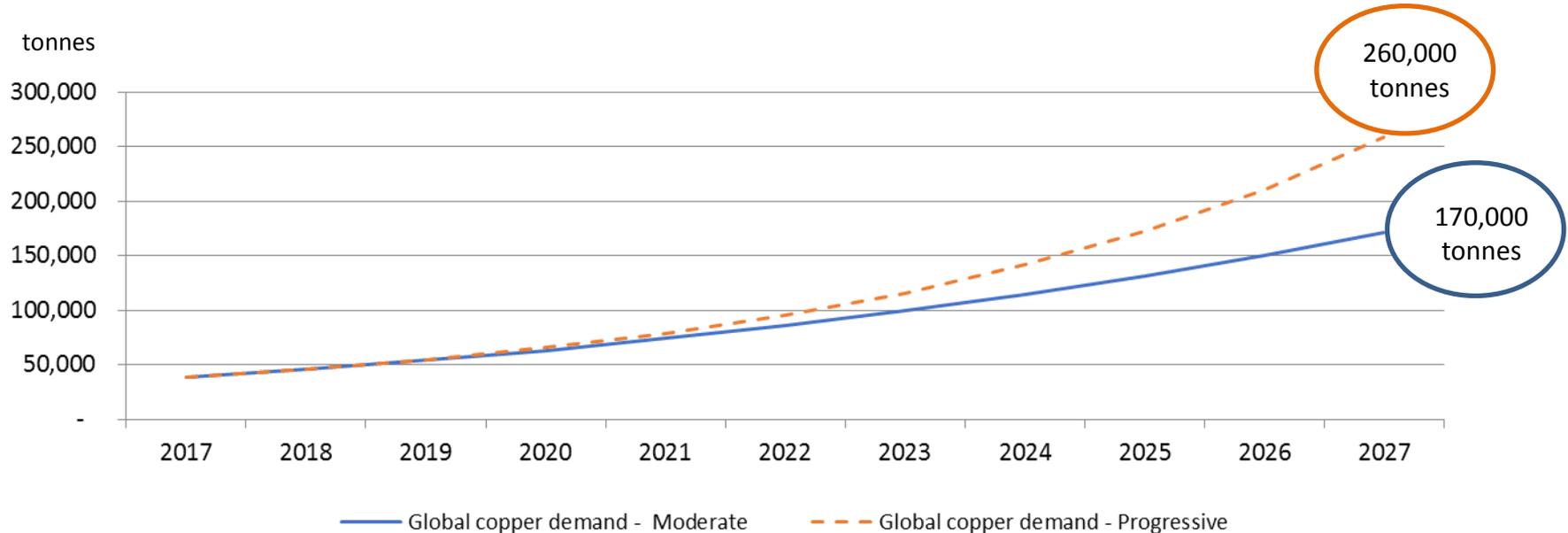
- Water scarcity, drought and storm management
- Desalination growth
- Water waste reduction and remediation

**Investment growth:
+ 100% in next 10 years**

Copper demand in Water Utility – progression scenarios



Forecast of global copper demand * (including Cu-Ni alloy), 2017 – 2027f



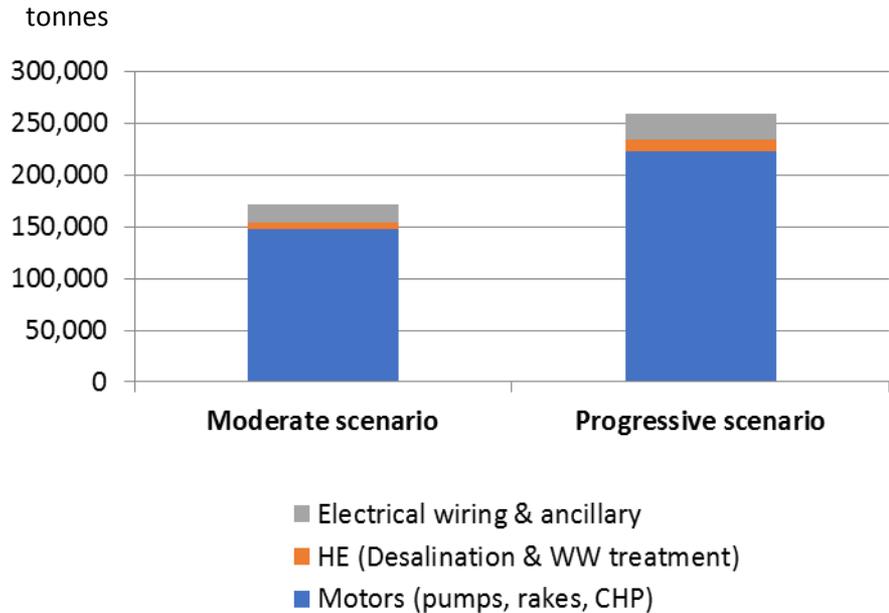
* Includes clean water, municipal waste water and industrial waste water



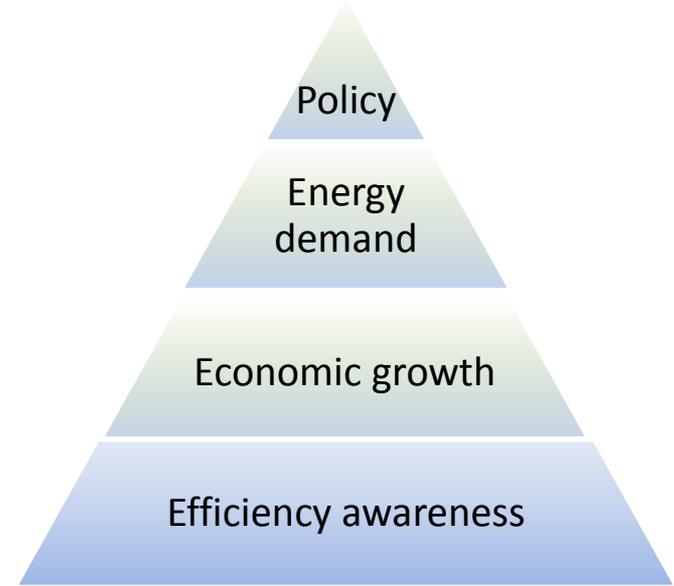
Motors will account for lion's share of growing demand



Forecast demand for copper (including Cu-Ni alloy) by equipment type, 2027f



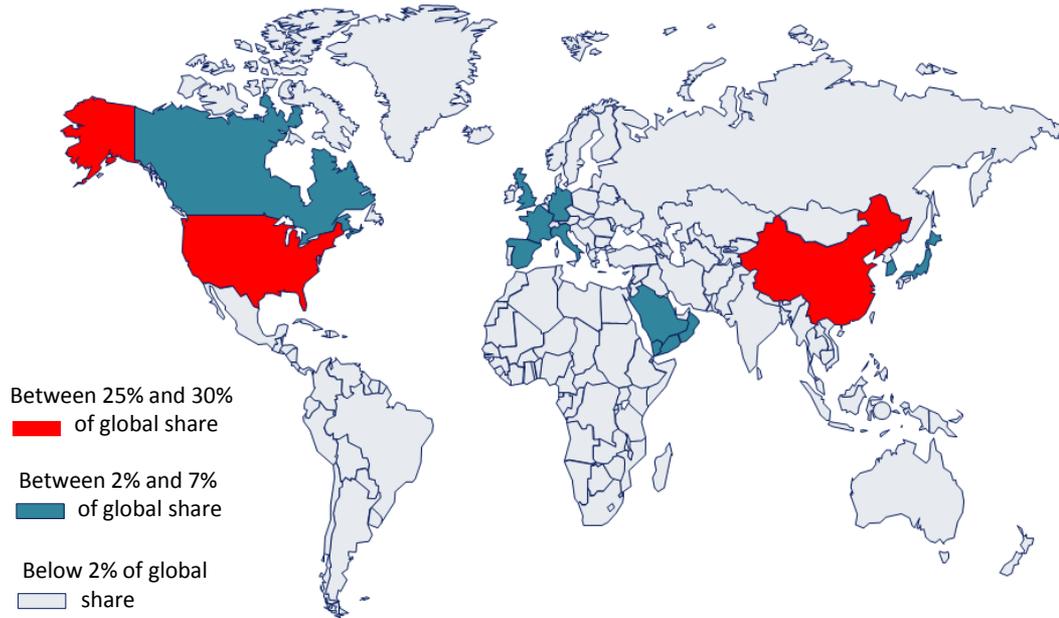
What will drive progress?



North America and China – the main current markets



Current demand for Copper Use in Water and Waste Water



- US & China – over 50% market share

Bulk of current demand is in replacement & energy retrofit

New build is slow and financing is challenging

Strong demand from aging infrastructure

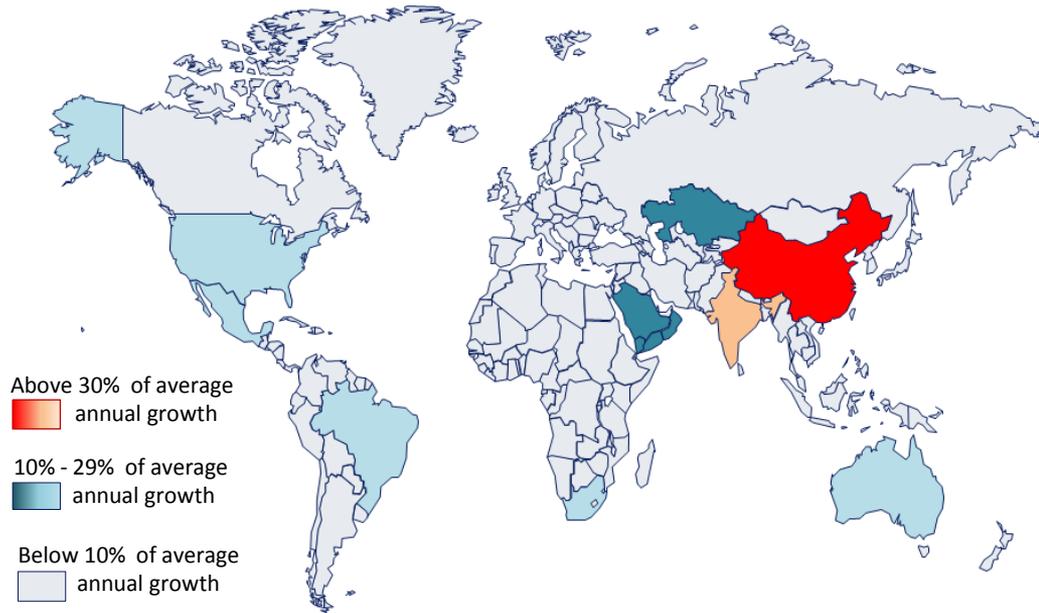
- Arabian Peninsula strong market for desalination
- Europe strong market for retrofit



China, Kazakhstan and Arabian Peninsula – strong growth potential



Demand by forecast growth rate, 2017 - 2027



- China policy is pulling the market in new and retrofit applications
- India's economic growth support the market but governance is weak
- Desalination investments are driving the market in Kazakhstan and Arabian Peninsula
- US will face investment backlog in retrofit
- Water shortage drives investments in LatAm, South Africa and Australia

Colour shade indicates how fast growth will occur with darker shades indicating growth starting in first five year and lighter shades later growth from 2023 onward



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- Estimated copper demand growth 2017 – 2027 : 35%
- Currently 2nd biggest market, set to overtake the US in 2019
- IEC 3 market still small (less than 10%) but strong governance will support it;

Drivers: urbanization, industrialization, pollution & efficiency focus



Government expected to invest an equivalent of 300 US\$ Billion to 2020 (+35%) with special focus on municipal and industrial Waste Water improvements

In 2016, the Chinese Government admitted that over 80% of groundwater in China is heavily polluted and unsuitable for human consumption



- Estimated copper demand growth 2017 - 2027: 25%
- Largest desalination capacity in the world with almost 90% of MSF market;
- Growing market for new water and waste water plants

Drivers: Fast growing population, replacement of aged infrastructure, shift towards efficient processes



Centralized governance:

US\$ B 53 investments to 2020 in SA



New Fresh Water Investments

2,645 million m³D of new desalination capacity (RO) by 2020



New Waste Water Investments

2,800 million m³D of new municipal waste water capacity by 2020



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- Estimated copper demand growth 2017 - 2027: 17%
- Relatively small market but large potential
- Large desalination market and large O&G producer

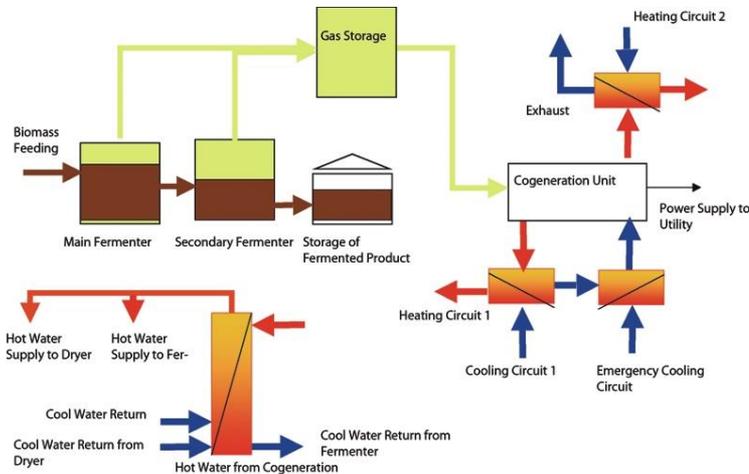
Drivers: Replacement of old infrastructure, expansion of water provision



Utility fund of Kazakhstan in partnership with EBDR:
10 US\$ Billions investments until 2026

Flagship desalination project in 2018 in Kuryk for 50,000 m³D
and an investment of around 200 US\$ millions

- Waste water plants with cogeneration units



- Harvesting HVAC condensation water (pumps / motors)
- Harvesting hot sanitary waste water (HE)
- Use of solar thermals for desalination processes



Source: Mage Water Management
Desalination installation in Al-Hail in Oman
www.bsria.com



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The price of water is low



The ROI in modernizing is long

How much will it cost
not to have water ?



Photo: erietvnews.com



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- Increasing need for water supply and waste water treatment will result in growing energy demand in this area.
- Energy efficiency will come into focus across the sector paving way for increased use of copper in electric and thermal side of the processes.
- Preliminary research results show that overall demand for copper in water and waste water treatment can grow between 16% and 21% per year in the next decade.



Thank you



Krystyna Dawson

Director – BSRIA Inc. & WMI

Worldwide Market Intelligence

Old Bracknell Lane West, Bracknell, Berkshire RG12 7AH
D : +44 (0)1344 465638 F : +44 (0)1344 465626
M : +44 (0)7990 595836 E : krystyna.dawson@bsria.co.uk
W : www.bsria.co.uk



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