UNESCO-IWRA ONLINE CONFERENCE
17-19 JANUARY 2023
3RD IN THE IWRA ONLINE CONFERENCE SERIES

Emerging Pollutants: Protecting Water Quality for the Health of People and the Environment

Removal of emerging pollutants from urban water: Alternation of existing tertiary treatment process by using heterogenous photo-Fenton process

Dr. Yunus Ahmed

19 January 2023, 09:50 CET

unesco
Programme hydrologique intergouvernemental

IWRA International Water Resources Association

Global Water Scarcity

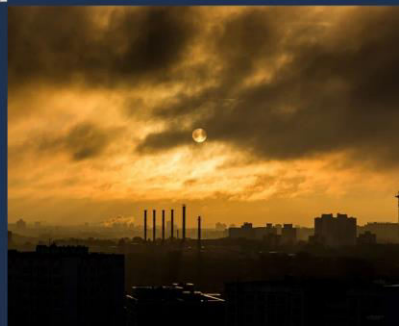
About 4 billion people experience water scarcity during at least one month of the year.
(Mekonnen and Hoekstra, 2016)

Over 2 billion people live in countries experiencintg high water stress.
(UN, 2018)

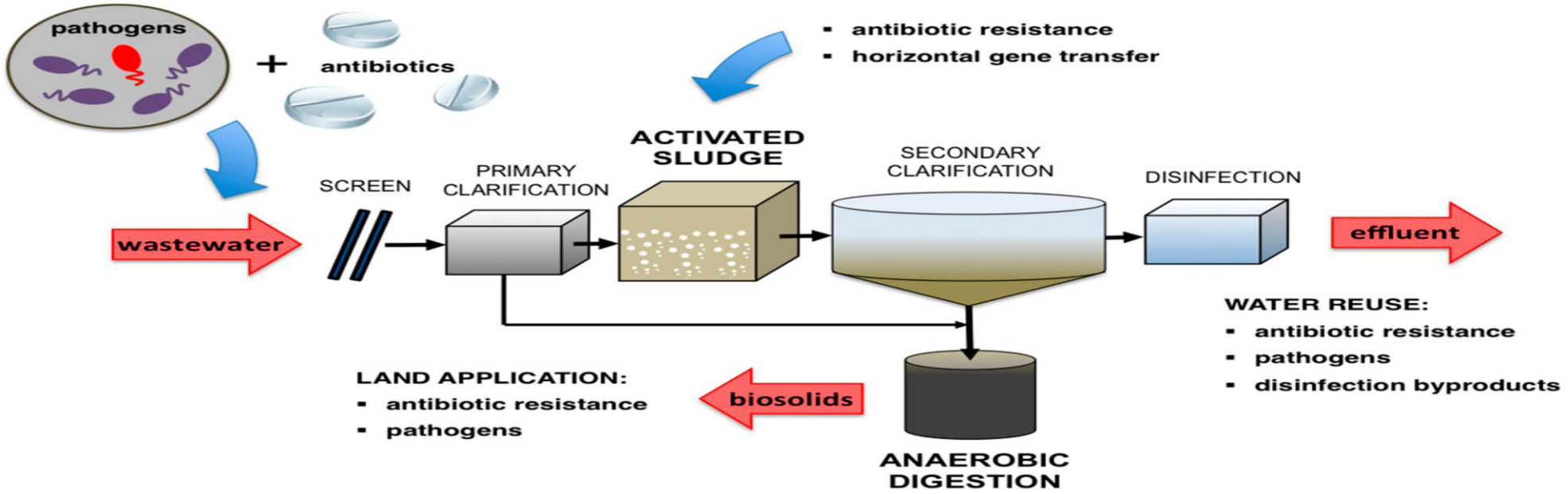
844 million people lack access to a basic drinking water source.
(UNICEF)

700 million people could be displaced by intense water scarcity by 2030.
(Global Water Institute, 2013)

Industrialisation and Urbanisation are changing the amount and quality of water resources.



Conventional WWTP Plants and Efficiency



Main process for contaminants removal		Performance
MPs	Activated sludge	Negative removal, (Average ~61%)
ARB and ARGs	Disinfection	Varies, (average 3.0 log)

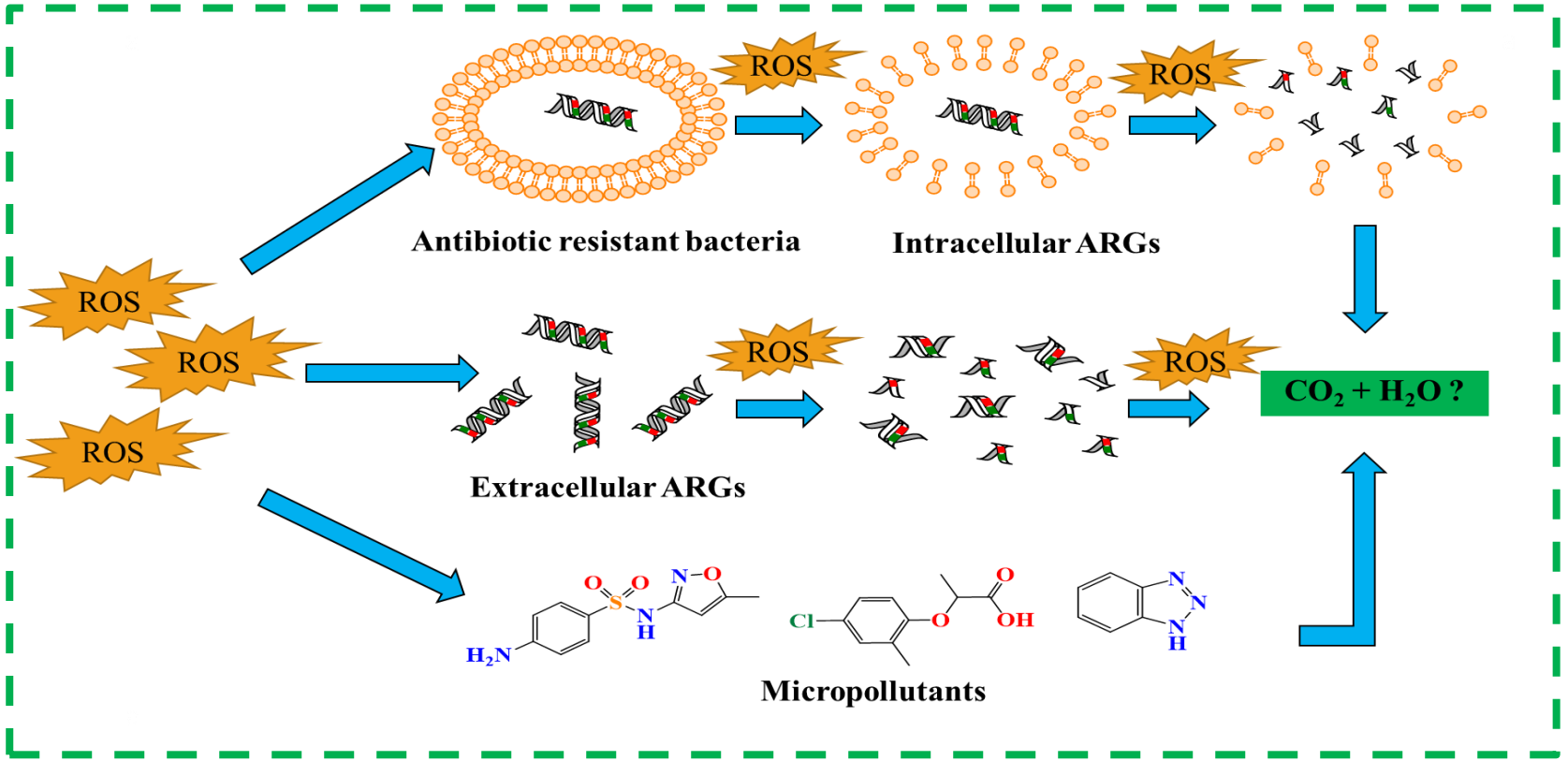
What Happens If not Fully Treated

- If ARB were not killed completely, the residual ARB could spread antibiotic resistance not only via vertical gene transfer, but also through horizontal gene transfer as the donor.

- If ARG were not damaged completely, the residual ARGs could be uptaken by a recipient through transformation, thus resulting in the dissemination of antibiotic resistance too.

- If MP were not degraded completely, it will affect the aquatic environment by increasing toxicity, endocrine disruption, and antibiotic-resistance development in microorganisms as well as human chronic diseases.

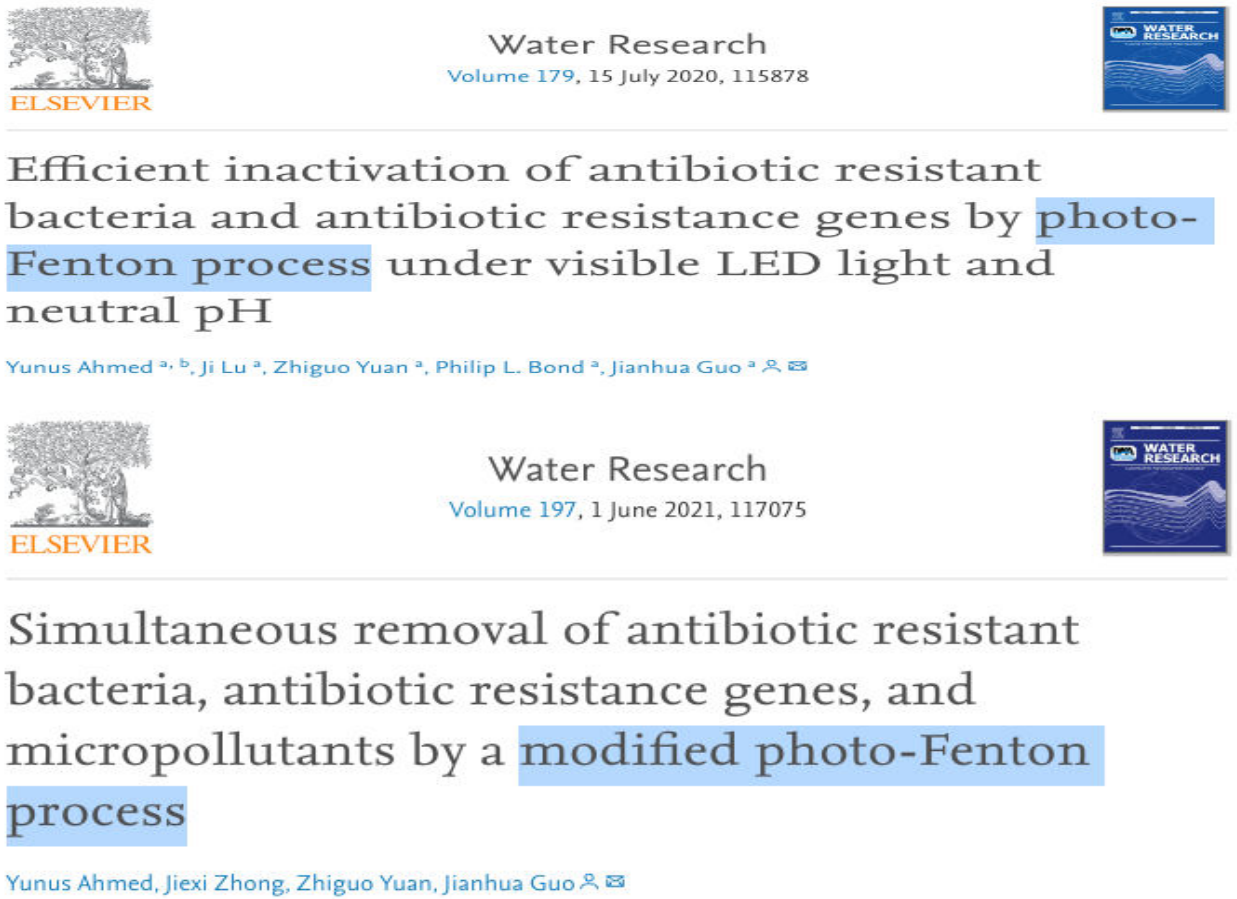
Which Processes Do We Expect ?



Not only inactivate ARB, but also degrade ARG and MP completely !

Research outcome of photo-Fenton process

- **Removed 6-log ARB and e-ARG**
- **Higher treatment time and doses are required** for i-ARGs than ARB.
- Faster degradation of **long amplicon ARG** than short amplicon ARG.
- **Simultaneous removed ARB, ARG, and MP.**
- >**6-log ARB** reduction occurs after 30 min, without further regrowth risk.
- **Extracellular ARG** was completely removed after 10 min treatment.
- The removal efficiency of five reprehensive **MP was up to 99%.**



Research outcome of heterogeneous photo-Fenton process

- Simultaneous **removal of ARB, ARG, and MP.**
- **>6-log ARB** reduction occurs after 30 min, without further regrowth risk.
- Extracellular **ARG was completely** removed after 7 min treatment.
- The removal efficiency of our **representative MPs was up to 99%.**
- This nanocatalyst has **photocatalytic and good recyclability**.
- The proposed process is an optimistic '**one-stop**' **solution**.

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3RD IN THE IWRA ONLINE CONFERENCE SERIES

Acknowledgements

Supervising team

Australian Government
Australian Research Council

Research Training Program (RTP) Scholarship