

2024 Tang Prize
**SUSTAINABLE
DEVELOPMENT**



Omar M. Yaghi

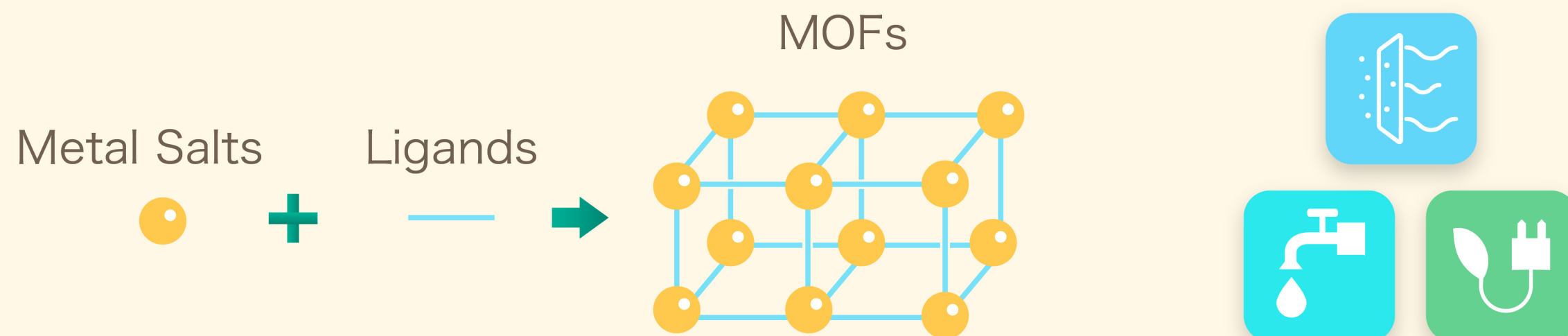
Omar Yaghi's contributions

For extraordinary contributions to sustainable development with his pioneering Metal-Organic and other ultra porous Frameworks that can be tailored for carbon capture, hydrogen and methane storage, as well as water harvesting from desert air.

These materials, MOFs and COFs, are known to possess record-breaking porosities, robust yet flexible crystallinity, scalability to multi-ton quantities.

Prof. Yaghi demonstrated how **hydrogen, methane, carbon dioxide** and **water** from air can be trapped, concentrated, and manipulated by these two extensive classes of novel framework materials, thus **opening up new solutions to current challenges to our planet, namely, clean air, clean energy, and clean water.**

He is also the first scientist to apply these materials in the field of Sustainable Development and achieved remarkable results.



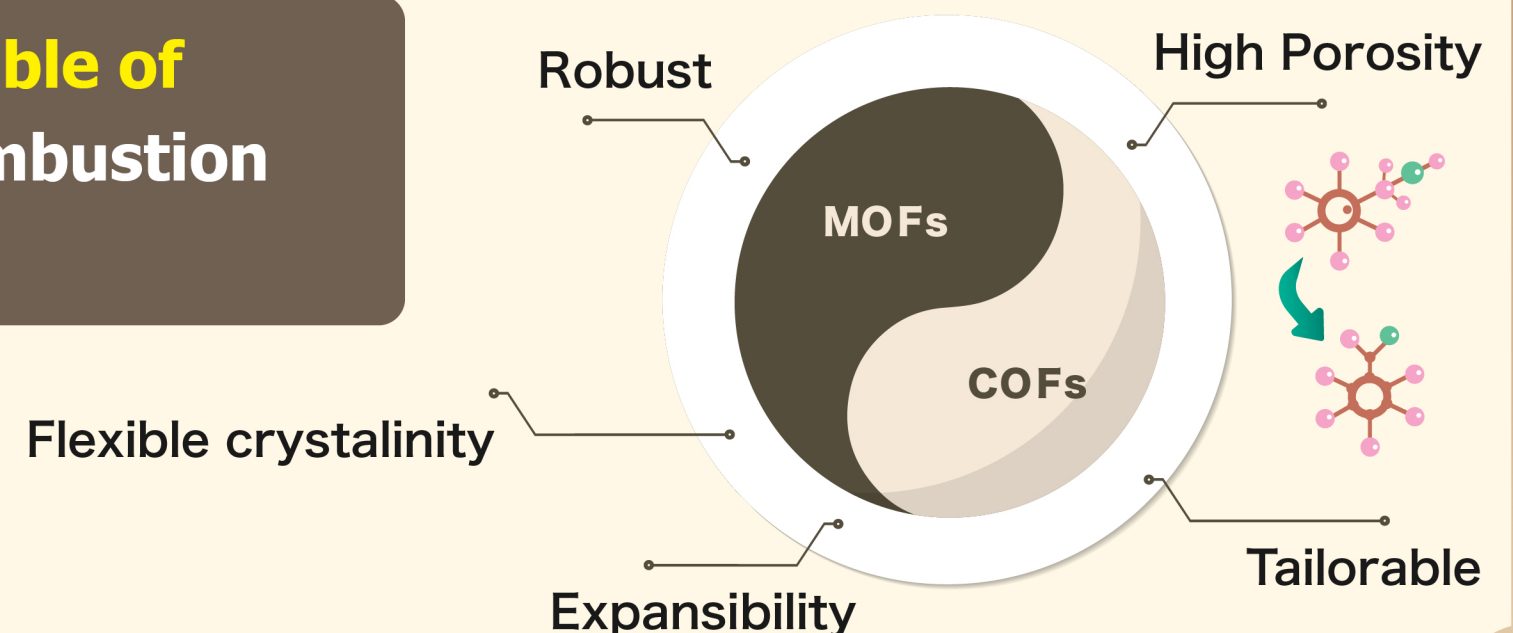
Unprecedented materials dramatically enhance the capabilities of energy storage

For Hydrogen, MOF and COF materials can store **twelve weight percent of hydrogen** at 77K and 100kb in a tank

For Methane, a fuel tank filled with MOFs can **triple the amount of methane** stored at room temperature and safe pressures compared to a tank without MOFs under the same conditions.

For Carbon Dioxide, at room temperature **carbon dioxide storage capability could be increased 18 folds**

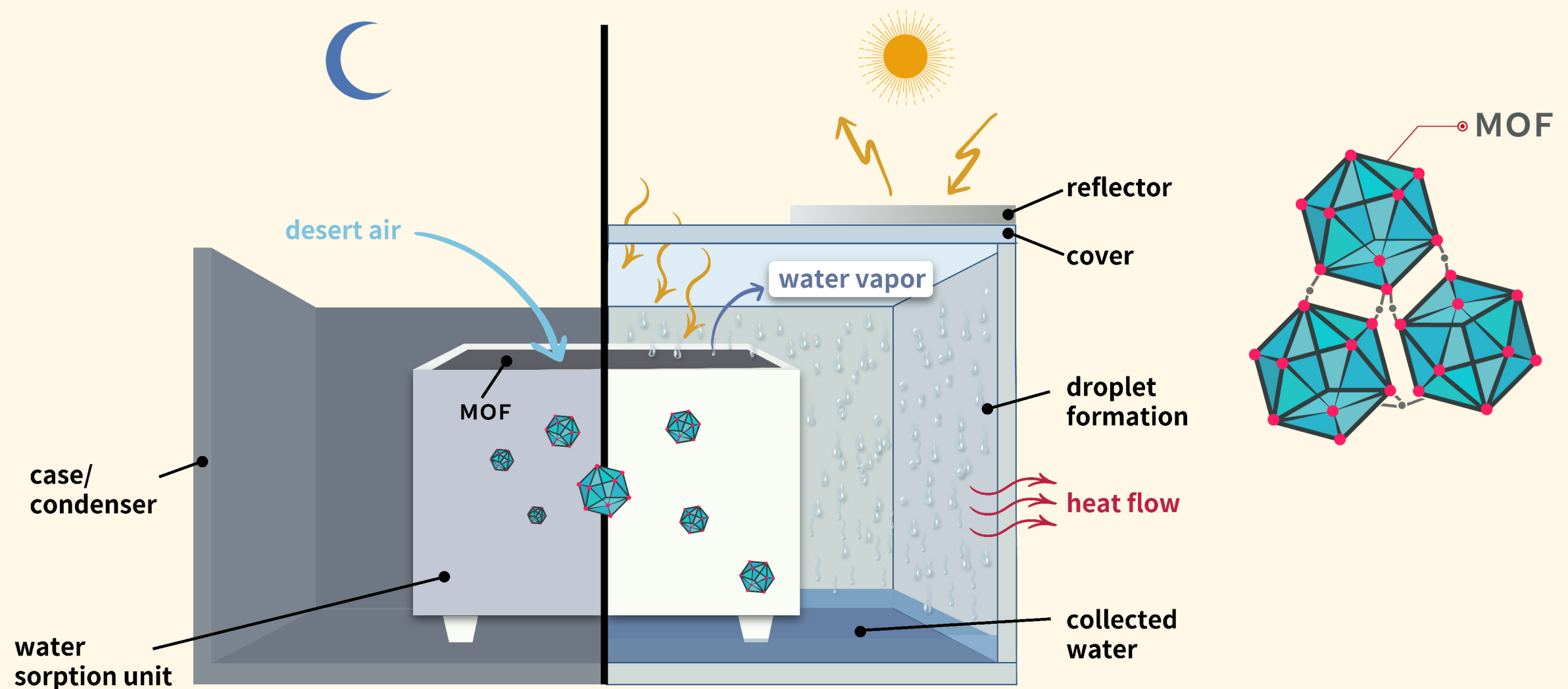
Chemically modified MOFs and COFs are **capable of selectively capturing carbon dioxide** from combustion gases in voluminous amounts.



Capturing water from the air

Prof. Yaghi discovered that **MOFs can trap water from low humidity air and concentrate it within their pores**. Using the reticular approach, he designed a **water harvester, the first of its kind, to deliver fresh drinking water** in desert and arid regions with no energy input other than the **ambient sunlight**.

Remarkably, his MOFs water harvesters have been found to maintain their optimal performance after testing for **over thirty thousand cycles**. The water harvested has been shown to be **ultra-pure exceeding U.S. FDA and EPA standards** for drinking water.



Achieving water independence

More recently, Prof. Yaghi teamed up with industrial companies, including the General Electric Company, to build portable MOFs water harvesters capable of delivering **hundreds of liters per day** in an **energy-efficient and economical manner**.

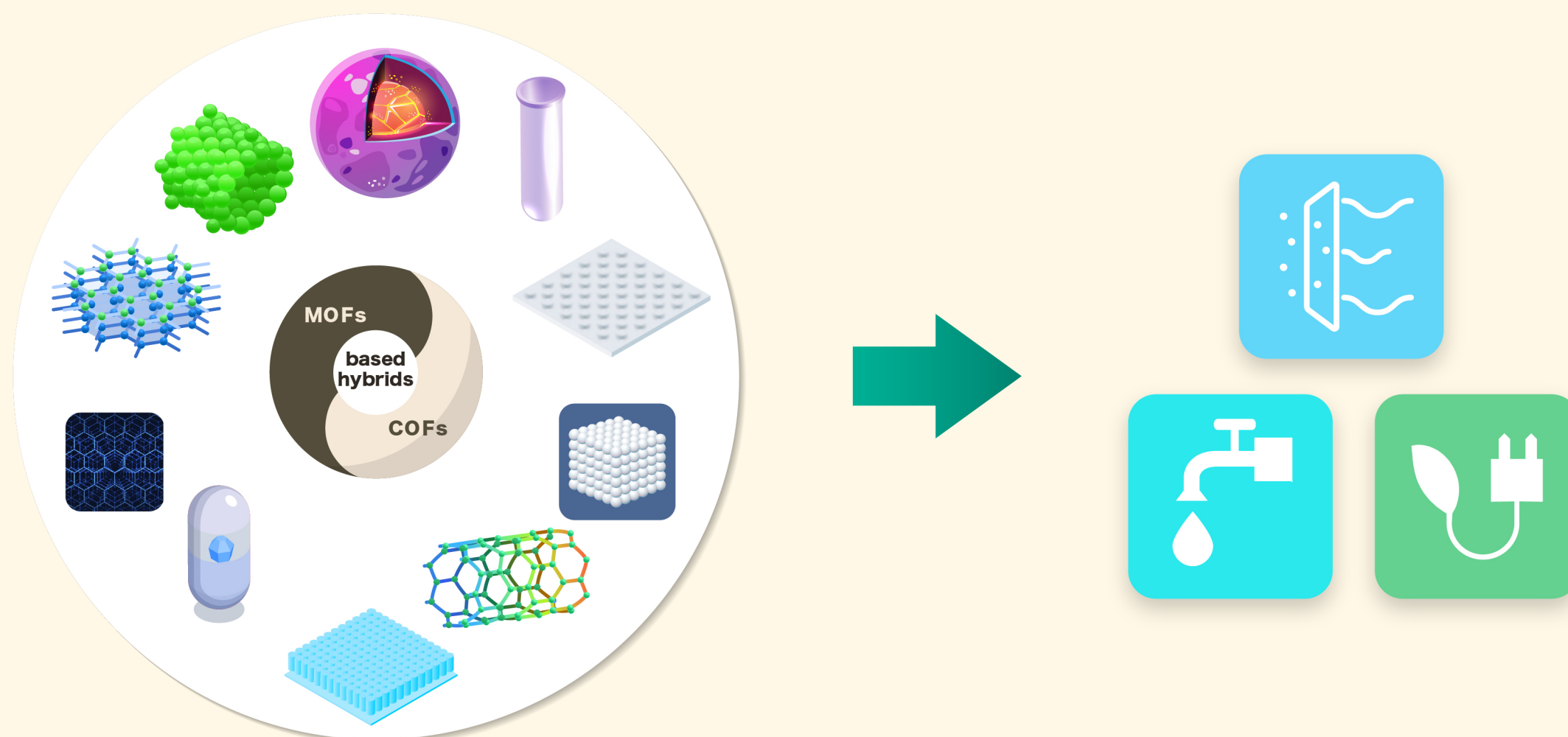
This innovative device brings hope for the people who live in the environment of limited water resources or have challenges in accessing clean drinking water.



MOFs and COFs: unlimited potential in the future

The applications of his technologies for **clean energy, clean air, and ultra-pure water** are now being pursued by hundreds of laboratories in academia and industry worldwide.

Over 100,000 MOFs and COFs have been made to date as a result of Prof. Yaghi's Reticular Chemistry. The global impact of Yaghi's technology was a subject of MarketWatch when it estimated that the MOFs and COFs market reached US\$ 351 Million in 2022.



Mentoring programs: providing opportunities for young scholars and researchers

Prof. Yaghi was born in Amman, Jordan to a refugee family, originally from Palestine. He grew up in the desert environment and understood very well the power of science and research in transforming lives in regions where opportunities are scarce. The widespread use of MOFs and COFs worldwide has provided Prof. Yaghi an avenue to engage emerging scholars from developing countries in research.

He founded the Berkeley Global Science Institute and established “**mentoring programs**”. **These programs provide opportunities for emerging scholars and researchers from developing countries** to engage more fully in scientific research, enabling them not only to improve their own lives but also to make meaningful contributions to the scientific community. Hundreds of researchers have already benefited from this global mentorship model, conducting essential research projects at research centers in Vietnam, Malaysia, Saudi Arabia, Argentina, Jordan, and other countries.



**Berkeley Global
Science Institute**

Bringing hope to the world with his unwavering dedication

It is extremely rare that people in their profession have created a new field, and at the same time given others the confidence that they can enter the area.

Prof. Yaghi has pioneered the development of a completely new class of highly important materials, and he has developed the concept of Reticular Chemistry to generalize the synthesis of such new materials. Those materials in turn have created new avenues and are at the forefront of solving the world's most pressing challenges of energy, environment and, in particular water sustainability.

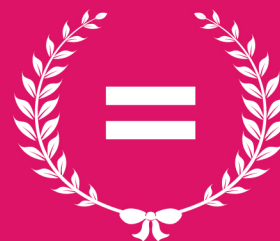
Clean Water
And Sanitation



Affordable
And Clean Energy



Reduced
Inequalities



Climate Action

