

66th Cairo Climate Talks Experts Workshop:

The Water-Food-Energy Nexus: A Promising Challenge

Session 1: The Nexus in Science

“The Role of Academia in Sustainable Development Using WEF Dynamic Nexus”

Prof. Dr. Rasha Elkholy, Vice President, Heliopolis University

Dr. Rasha explored in depth the different programs offered at the Heliopolis University for Sustainable Development; the first university in the Middle East to declare sustainable development as its guiding principle. Dr. Rasha referred to the water-food-energy nexus as a dynamic process that’s influenced by internal and external factors such as booming population and rapid urbanization.

For Heliopolis University, touching on the arts is just as important as the sciences. In addition, the university’s curricula incorporate social consciousness into technological training to teach students about economic solidarity, social justice and environmental sustainability as they are not usually incorporated into ‘common education’. The students are hence encouraged to look at the world from the sustainability lens.

Heliopolis University projects addressing the nexus include campus photovoltaics and thermoelectric solar power, reusing wastewater from desalination process to achieve zero liquid discharge cycle and solar powered water lifting for irrigation. It is key to the students’ development to gather hands-on experiences by being in charge of the implementation and maintenance of those projects, as well as create graduation projects in collaboration with local communities to ensure their relevance and sustainability.

“Sustainable Solution for Climate Change Mitigation in Arid Regions by Promoting Nature-Based Techniques”

Prof. Dr. Mohamed Abu-Hashim, Assistant Prof. Soil and Water Management, Zagazig University

Dr. Mohamed shared some statistics about Egypt’s annual rate of population increase (1.9%) and the failure of the agricultural production to meet the increasing demand. Regarding the Soil Organic Carbon density (SOC), the Middle East is characterized with low SOC. This low SOC could be attributed to organic plant removal during harvesting, low precipitation rate and high temperatures.

In his study on the effect of land-use changes and site variables on surface soil organic carbon pool in the Mediterranean region, it was concluded that losing crop-land has been highest between 1990 and 2015 due to rapid urbanization. Moreover, due to land degradation in the middle delta, non-cultivated soil has drastically increased.

Dr. Mohamed then moved on to explain how nature-based solutions have an essence of conservation and enhancement of the natural ecosystem. Constructed wetlands are some of

the nature-based solutions to wastewater treatment; they are designed to utilize natural processes. Physic-chemical processes and biological activity in soil, roots and plants react with the pollutants and turn them into byproducts or nutrients. Dr. Mohamed gave examples of constructed wetlands in Sekem farms and El-Manzala oasis.

“Access to Energy and its Role in the WEF Nexus”

Prof. Dr. Boris Heinz, Head of Programme at Hudara gGmbH / Head of the Chair for Energy Systems at TU Berlin

Dr. Boris started his presentation explaining energy accessibility. Accessibility includes duration and availability, legality, convenience, affordability among other parameters and how they can be measured. He proceeded to explain the importance of the nexus approach in reducing sectoral trade-offs and promoting sustainable development in each of the respective sectors.

Diving into the details of the nexus, Dr. Boris explained how the interdependencies between the three resources is not only in processing, distribution and use, but also in chemical and physical processes. Even further, the distribution and interactions of these resources are all dominated by institutions, markets and the infrastructure. External factors affecting the Water-Energy-Food Nexus (WEF) include climate change, demographics and user behaviour.

Agent-based modelling, the model used by Hudara (an independent and impartial organisation working in locations where people's lives are impacted by poverty, conflict and climate change), is a bottom-up approach. This model puts each agent, their goals and actions within a particular social context as an independent entity. Therefore, it enables planning that is based on the reality of the communities addressed and allows for diversity, flexibility, decentralization, reduced cost, efficiency, sustainability and resilience. Dr. Boris hence sees the nexus as key in increasing communities' resilience, allowing solutions to pre-emptively secure resources in case of environmental shocks like droughts or flooding.

Discussion outcomes:

- Soil needs to be addressed more often within the nexus because it's a very integral part of the equation that goes undressed.
- In some places in the Delta e.g. Kafr ElSheikh, the water is used without any treatment and while the use is out of necessity and lack of alternatives, treatment processes are a must to ensure crop viability. Nature-based solutions could offer a feasible solution.
- Sustainable land-use is essential for soil quality. Land use switching from agriculture to fish farming and then back to agriculture has destroyed feddans in the Delta.
- Some projects in TU Berlin, Heliopolis University and Zagazig University are some of the academic hubs that are experimenting with using mangroves and other sustainable water treatment methods.

- Indigenous knowledge is very precious. Existing knowledge and approaches in local communities not only ensure the community's involvement, it also offers a guide to the possibilities and the limitations that might exist within the local context.
- Despite community involvement being a prerequisite of many projects, a participatory approach extends beyond the needs and performance assessment of projects. It's an ongoing mission that also tests the sustainability of the project.
- More resources need to be allocated to personnel and capacity building (especially to ensure maintenance) rather than being exclusively allocated towards equipment.
- Top-down and bottom-up approaches work best when combined.

Session 2: The Nexus in Society

“Community-based Approaches to the Water-Energy-Food Nexus-Experiences from Upper Egypt”

Dr. Ithar Khalil, Programme Officer and Resilience Expert, World Food Programme

Dr. Ithar referenced the second sustainable development goal; zero hunger, when talking about Egypt's food strategy. This entails ensuring food security, supporting sustainable agriculture processes and promoting economic opportunities and investments. However the challenge lies in the status quo, Egypt imports wheat, yellow corn feed and oil. This dependency on imported goods alongside the increasing population creates an immense pressure on the country's resources.

Dr. Ithar continued describing the conditions of farmers. 90% of the farmers own areas less than 0.4 hectares. They have limited access to technology and finances. Moreover, they are subject to external factors including stressed resources, land degradation and the instability of pricings.

WFP interventions are numerous. Some of them increase the water efficiency like irrigation efficiency through laser leveling of soil and canal lining. Some interventions are aimed at maximizing the sustainable productivity of the agricultural land including early warning systems, introduction of heat tolerant variety of crops, promotion of high income crops and fertilization schedules. Other interventions are aimed at capacity building and they include documentation and experience sharing, building the capacities of local governments and integration of solutions in university and secondary school curriculums.

“The Water-Energy-Food Nexus in Egypt: Community Examples and Social Issues”

Dr. Tina Jaskolski, Assistant Professor, Institute of Global Health and Human Ecology, AUC

Dr. Tina gave a detailed account of the different nexus projects which have been implemented in several agricultural communities in Egypt. Solar drinking water purification projects in Egypt's Western Desert are some of the prime examples, they exist in El Heiz and El Kefah. Solutions in these two oases are designed differently to better fit their respective realities.

Some projects aim to address gender issues include solar-powered egg incubators, solar battery charging stations run by women and capacity building for women in agriculture. Integrated farming systems incorporating renewable energy, aquaponics and livestock components are one of the best ways to apply a nexus approach in agriculture, model farms have shown to be very successful.

Dr. Tina concluded with a few take away messages including stressing on the importance of community work, the importance of appreciating and incorporating each community's local reality, and addressing challenges pertaining to gender. Finally, she highlighted the importance of policy, its flexibility to fit the local context and the importance of cooperation between local governmental and non-governmental entities.

Discussion outcomes:

- In community projects, it's very important to derive solutions from the existing culture. For example, tuktuks and mosque microphones were used to disseminate information from early warning systems.
 - In some many of those projects, the farmers' ability to use certain technologies were a matter of concern. However, in some farming communities 25% of the farmers were already using smartphones. In other communities, the young people in the communities supported the farmers in accessing the information on their smartphones. Some of the farmers started using social media platforms for coordination.
 - Wells and other resources are usually shared through informal arrangements. Taking these arrangements into consideration is essential for the success of projects.
 - Mobile solar pumps are being developed; these pumps can act as a sustainable alternative to diesel pumps.
 - Agro-processing projects are most successful when they're based on the local crops to ensure there's an added value to the production process.
 - Since many locations in which communities use wells are not suitable for wind energy, incorporating batteries or other energy storage solutions with the solar pumps could increase the productivity.
 - Even though a lot of these solutions are framed as adaptation projects, they also contribute a great deal to mitigation efforts in Egypt.
 - The World Food Programme carried out many partnership projects between the government and NGOs that were very successful.
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