Landscape Analysis for creating Water, Energy, and Food Nexus Driven Open Living Labs in Egypt

Original Article

Hamdy Abdelaty[1], Ekram S. Essawi[2] and Amr Radwan[3]

[1]Department of Business, Faculty of Commerce, Cairo University, Egypt

[2]Egyptian Center for Innovation and Technology Development, Egypt

[3]Graduate School of Management of Technology, Nile University

ABSTRACT

Living Labs is a relatively new concept in the Mediterranean countries that can create synergies between different Stakeholders in the water, energy, and food nexus ecosystem. This paper explores the landscape of the Egyptian WEF ecosystem in order to assess the need for WEF living labs and define the main potential areas of engagement and support. In this article, we conducted an extended analysis of the WEF ecosystem landscape using SWOT, SOR analyses. The findings underscore a flourishing Egyptian WEF ecosystem augmented by hosting the COP27 in Sharm Elsheikh in November 2022. Despite the positive aspects, such as the development of WEF high-level strategies and supporting funding programs, the availability of a solid knowledge base, and the burgeoning number of networks. There are many challenges, such as the lack of coordination and the mismatch between governmental strategies, insufficient public-private partnership, technical skills gap of human resources, and ineffective transformation of scientific outputs into innovation. The critical need for evidence-based strategy and actions affirms the necessity for establishing Egyptian WEF-Living Lab. WEF-Living Lab would help policymakers tackle WEF challenges by providing a space and methodology to bring all WEF ecosystem actors earlier in the innovation process, define a clear directionality of high-level strategies, develop innovative solutions, and test them in a real-life context before the actual implementation on a large scale. Building this living lab should follow strict principles of openness, inclusivity, participation, experimentality and scalability to ensure success.

Received: 01 May 2023, **Accepted:** 01 October 2023

Key Words: Living labs, nexus strategies, open innovation, WEF Nexus.

Corresponding Author: Amr Radwan, Egyptian Center for Innovation and Technology Development, Egypt, **Tel.**: +2 012 2564 3263, **E-mail:** radwan.amro@gmail.com

ISSN: 2682-4310, Vol. xxxxx, 2023

INTRODUCTION

Water, energy and food are the most important primary resources supporting the development of human society. 10 out of the 17 Sustainable Development Goals SDGs endorsed by the United Nations (***United Nations 2015***) are related to the three sectors (***Bieber et al. 2018***). The three sectors are inextricably interlinked, and this phenomenon is the NEXUS. Water is an input for producing agricultural goods; energy is needed to produce and distribute water and food. Water, particularly for irrigation, is recognized as the cornerstone in framing the WFE nexus (***Cai et al. 2018; Liu et al. 2019***). As the largest water consumer, irrigation accounts for about 70% of global water withdrawal and is responsible for 40% of total grain production (***Ringler, Bhaduri, and Lawford 2013***). Managing the three sectors in an integrated way is essential due to their inseparable relationship (***Okonkwo et al. 2023***). Therefore, the Water-Energy-Food Nexus (WFEN) concept emerged as a key concept to optimize such interlinked relations among the three sectors and improve the overall efficiency's usage of resources (***Okonkwo et al. 2023***). Facing the WEF Nexus' challenges cannot be undertaken by one organization or nation; it requires collective efforts at national, regional, or international levels (***Boersma et al. 2022***). In this regard, "Living Labs" approach was established in Europe to bring all stakeholders together on one specific problem. The approach was re-interpreted based on the advancement in open and user-centred innovation, and the EU policy support gave the movement a head start. Generally, the construct of "living labs" is interchangeably used with "citizen innovation labs," "GovLab," "Policy Sandbox," and "Urban Innovation Labs" in both mainstream and academic discourse. Living labs could be defined as "spatial and methodological infrastructures in which users enter into an open innovation process together with central stakeholders of the value chain in semi-realistic environments. In order to chart to main constituents of living labs, ***Leminen and Westerlund, (2016)*** underscored that literature variously portrays living labs as an approach, method, context, environment, experimentation, network, business model, and intermediary. They highlight key characteristics of living labs as i) real-life environments; (ii) stakeholders; (iii) activities; (iv) business models and networks; (v) methods, tools, and approaches; (vi) innovation outcomes; (vii) challenges; and (viii) sustainability. For instance,

DOI: 10.21608/ARABSTI.2024.386068
Print ISSN: 2682 - 4310 / Online ISSN: 2682 - 4078 *Volume 5, 2024*

Urban Living Labs (ULLs) is widely believed to provide a safe environment for experimentation, co-creation, and evaluation of innovations in real-life settings (***Afacan 2023***). In the innovation policy domain, living labs constitute an essential instrument in operationalizing pre-commercial procurement (PCP), public procurement of innovation (PPI), and Strategic Procurement (***Fuglsang and Hansen 2022***). Thus, the notion of "Living Labs" finds increasing adoption by Smart City Governments (***Nguyen, Marques, and Benneworth 2022***) as an institutional instrument that achieves the following goals

1. Space for participation and co-creation by citizens in cities
2. Lowered risk for trials of innovative urban solutions not possible in traditional channels of procurement

Context and Background

This paper is a part of the EU-funded project called NEX-LABS. NEX-LABS targeted territories, characterized by water scarcity/irregular rainfall/population distribution, reflect agriculture as the largest user of water (70-90%), while future global warming projections (≈2ºC) involve summer precipitation (-10/-30%) threatening water availability (-2/-15%) and agricultural productivity (-12/-40%). The latent conflict between energy efficiency (≈60%) and water production is also increasing the energy footprint/m3 of water used to produce food. The predicted future water/Energy/Food (WEF) shortfalls require a NEXUS approach. In this context, NEX-LABS aims to support the implementation of clean technologies for a sustainable and resilient increase of agri-food sector production based on more efficient use of energy (renewable/solar solutions) and water (wastewater treatment, water harvesting or reuse solutions) in MPC region thanks to the contributions of ICT such as blockchain technology, Internet or the Things (IoT), Artificial Intelligence (AI), Machine Learning and Big Data. Henceforth, adopting the living labs approach, the NEX-LABS project came with a main objective: establishing two cross-border livings labs around the WFE challenges in the Mediterranean countries (i.e., Nexus Driven Open Living Labs) referred hereinafter as (NDOLL). NDOLLs in European-Mediterranean Partnering Countries (EU-MPC) will serve as linking hubs for scientific-industry/business communities and society to interact and innovate by matching innovation demands and offering technological solutions for such issues (***Radwan 2019, Ramadan, Radwan et al. 2019***). This paper covers one activity that has been conducted to examine the landscape for NDOLL through identifying and validating the external and internal context in Egypt for better planning of implementing policies to support the technology transfer and commercialization of research results (***Radwan 2018, Motaz H. Khorshid and Mohamed R. Rezk 2019***).

Research Method

Establishing living Labs around a specific WEFN challenge is a strategic action that requires diverse and extensive information regarding internal and external environmental circumstances. This always includes running a strategic analysis of potential opportunities and threats from the external environment. Based on that analysis, organizations can develop the best possible scenarios that fit the surrounding conditions, considering the internal organizational strengths and weaknesses. We follow a mixed method approach in three phases, including exploratory documents analysis combined with qualitative and quantitative primary data collection steps (Figure 1). This paper presents the results of SWOT and SOR analyses applied in the Egyptian case. PESTEL survey results will be presented in another article.

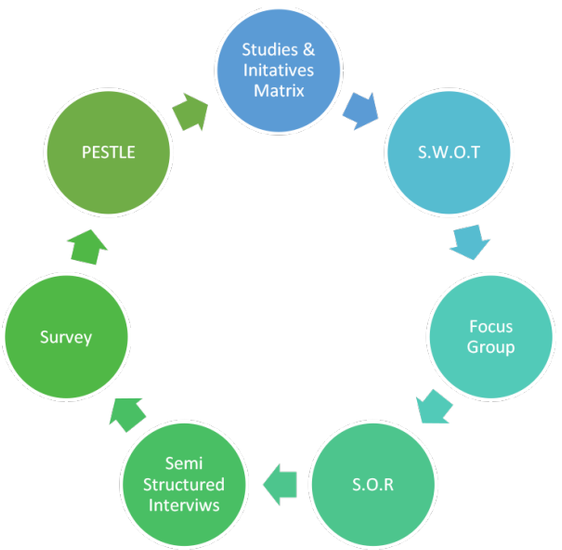

Fig. 1: Research Method

SWOT analysis (or SWOT matrix) is a strategic planning technique used to help organizations to identify strengths, weaknesses, opportunities, and threats related to project planning. The design, development and implement a SWOT analysis was carried out to identify, weigh and examine external (Opportunities & Threats) and internal (Strengths & Weaknesses) factors that influence NDOLLs' implementation and NEXUS stakeholder's ecosystem. Accordingly, identifying the best practices when facing NEXUS challenges to be proposed for optimal support to NEXUS-ecosystem's stakeholders. The gathered information will support the creation of a NEXUS Joint Action Plan. As a base for SWOT analysis, a set of topics has been advised through a detailed guideline to collect the following information.

- Current Inclusive growth support available in the country for the primary target group
- General characteristics of the inclusive growth services & practices identified
- Trends of the inclusive innovation process and the practices identified

Information has been extracted from the most promising studies and initiatives matrix. In this regard, each country has identified 20 different publications such

as case studies, initiatives, projects, white papers, and PhD theses, leading to a collective of almost 90 studies. These identified practices gave a broader and deeper perspective of the local WEF-NEXUS ecosystems in the EU-MPC regions.

Phase 2: Exploratory SOR Analysis

Based on the findings of the first phase, an exploratory research study was performed using focus group discussion with WEF ecosystem experts to validate and prioritize identified aspects of the SWOT analysis and perform the SOR analysis. The SOR acronym means "strengths, opportunities, and roadblocks," derived from the SWOT components (strengths, weaknesses, opportunities, and threats). The SOR Analysis is a hybrid of SWOT analysis usually used to assess the business positioning of an organization. SOR examines internal strengths (S) and external opportunities (O), and it combines internal weaknesses (W) with external threats (T) to formulate roadblocks (R).

ANALYSIS AND RESULTS

SWOT Analysis Results

The analysis was conducted with the research team relying on 20 articles and documents covering the recent developments in the Egyptian innovation system. As mentioned above, a set of topics has been advised through a detailed guideline to collect the following information.

- Current Inclusive growth support available in the country for the primary target group
- General characteristics of the inclusive growth services & practices identified
- Trends of the inclusive innovation process and the practices identified

Based on the collected information, an extended SWOT analysis is done (Annex A), and a summary version of the analysis is inserted here for the sake of space.

Tabla 1: Summary of the extended SWOT analysis

Strengths	Weaknesses
• Availability of good research and knowledge base • Well-educated human capital • Good scientific system infrastructure • Funding and partnerships • Evolving national recognitions of the negative impacts of climate changes	• Human resources system failures • Less infrastructure usage and discontinuous upgrading of the facilities • Poor private R&D infrastructure • Fragmentary funding system • Unclear strategic-technological directionality • Absent of innovation policy coordination • Challenges in policy implementation and innovation diffusion
Opportunities	**Threats**
• The potential positive impact of well-trained experts and better influence of accumulated knowledge base • Application of nation-pan WEF approach • Utilization of international knowledge and financial resources • Growing availability of financial resources • Toward more consolidating national innovation system through institutional rearrangements and political support	• Misuse and loss of qualified human resources • Continuous research system structural problem • Disability to internationally catch up • Failure in innovation system collaboration and alignment • Innovation policy failure

Current Inclusive growth support is available in the country for the primary target group

The recent dynamics following the Arab spring in the North African region implied further developments in the national science and technology system. Several countries in this region exerted a lot of effort in reviewing and revisiting current legislations, policies and strategies (***Etzkowitz & Leydesdorff, 2000***). An increased focus on the measures to optimize the research and innovation performance at the national level became a central component of national strategies (***Bermejo Ruiz & De Pablos-Heredero, 2013a; Ghinolfi et al., 2014***). Egyptian government pursued many strategic and institutional changes to improve the business environment:

Initiatives to encourage entrepreneurship and MSME success and competitiveness

Numerous legislative changes have recently taken effect, especially as regards company formation and operation. For example, the General Authority of Financial Investment (GAFI) has cooperated with the Industrial Development Agency and the Chamber of Commerce to reduce the “time to start” new businesses in Egypt. By automating and digitizing bureaucratic processes, the time required to register a business has been reduced to as little as one day (***Doing business, 2019***).

Entrepreneurs and Small and Medium Enterprises are recognized as economic growth and employment drivers. As such, a large number of initiatives and programs have been set up in the last decade to allocate financial and business support to self-employed Egyptians. MSMEDA, for example, allocated the equivalent of 11 million Euros in Egyptian Pounds to finance 14,000 micro businesses, creating in the process almost 20,000 jobs and providing just under 2 million Euros in community development grants and programs (***Radwan, 2017***).

An innovation support structure was built on the 2005 Industrial Support Strategy, spuring new mechanisms for

financial support, incubators and accelerators, coaching, mentorship, and training services, as well as incentivizing private investment and decreasing risk aversion among investors.

The last decade saw a surge of new Venture Capital (VC) funds, attracting a new wave of investments and encouraging a positive flow of FDI. In the last 5 years, at least 16 new VC firms have developed an interest in startups, providing equity finance, training, and other types of support (Ibid).

Ambitious High-Level Strategies

The Ministry of Trade and Industry Strategy endeavoured to create at least 3 million decent and productive jobs between 2016 and 2020 and increase the annual industrial growth rate to 8%. Despite significant gains, the Covid Pandemic has stalled the economic momentum gained since 2016.

Egypt's "Vision 2030 for Sustainable Development" means to place Egypt among the top 40 countries globally in terms of Research and Innovation (R&I). This is done by upgrading scientific research institutions' quality and capacity accordingly. The Vision also emphasizes the retention of innovative talents and capabilities—brain drain and off-shore patents being the operative norm—envisioning Egypt to be among the top 20 countries for the number of patents per year (***Radwan, 2018***)

The Egyptian Ministry of Investment and the International Finance Corporation (IFC) signed an agreement in 2018 to support entrepreneurs in Egypt, boosting the innovation economy and further driving economic growth in the country (***Hassan and Radwan, 2019***).

General characteristics of inclusive growth services & practices

Egypt's science and technology system was built a few decades ago as a static and linear system that doesn't allow quick adaptation to the current dynamics (***Radwan, 2015***). Some authors have indicated that the non-linear and dynamic national systems could facilitate technological development, allow better market uptake of research results, and boost product innovation capabilities (***Quitzow, 2015; Samara, Georgiadis, & Bakouros, 2012***).

One main recommendation concluded from this study emphasizes the importance of promoting evidence-based strategic planning at the level of research institutions in Egypt. Many previous studies underscored the importance of evaluation and monitoring systems of science and technology as an essential component of the development process (***Etzkowitz & Leydesdorff, 2000; O'Brien et al., 2013***). A continuous and effective evaluation and monitoring mechanism embedded in the national science and technology system is paramount for the effective utilization of existing capabilities and resources. The findings of the SWOT analysis of national systems would contribute to building the conceptual framework needed to further policy development.

However, there are general characteristics, such as the growing number of actors in the innovation ecosystem, including business competitions, venture capitalists, incubators and specialized civil societies.

Trends of the inclusive innovation process and the practices

- Political support in optimizing the local manufacturing and Egypt specialized industry like textiles, pharmaceutics and petrochemicals.
- An emerging number of national initiatives to support development in rural areas, such as the "Hayah Karima initiative", improves the standard of living of 60 million citizens through access to clean fuel in households
- A growing number of sustainability-oriented programs supporting green energy, food security, and reducing water consumption: such as the rehabilitation of 20,000 km of irrigation canals for agricultural climate resilience
- Promote green buildings by activating the energy efficiency codes for new buildings
- Increase green spaces and sustainable parks in new cities
- A significant number of international collaboration activities

Table 2: SOR Analysis Results

S vs O			
SO1. Spreading awareness of the emerging new private research centres (which enables higher accessibility and frees the market from the restrictive bureaucracy) and hence optimizing the IPR offices spread across most of the Egyptian universities.	SO2. Creating a shadowing system or very short-term exchange programs to engage thousands of Egyptian experts in the diaspora to efficiently transfer their info & technology and integrate it into the growing database of local researchers and those specializing in Science & Technology, especially under WEF Nexus domains.	SO3. Adopt the various public initiatives to transform research results into economic value; such initiatives should engage Egyptian experts abroad with high scientific capabilities and industrial experience, reinforced by the growing political support to science parks and new science cities.	SO4. Utilize the diversified mechanisms of public funding for R&D and raising awareness about the WEF nexus support to be the growing trend of public expenditure on R&D.
S vs T			
ST1. Mobilize the sizable number of excellence centres located across Egypt to support science parks and research facilities that are not equipped enough to perform the desired activities, laying out a roadmap for coordinating activities and incentivizing outputs.	ST2. Facilitating the engagement of more than 100,000 researchers would help restrict the continuous brain drainage and migration to the Gulf and surrounding regions. The facilitation could cover the facilities, more up-to-date policies, incentives system and IPR protection.	ST3. Improving STI policies with a focus on creating alignments between ecosystem actors, redirecting research activities towards industrial needs, focusing on direct and indirect SMEs support and creating a market for innovation	ST4. Using researchers in the diaspora as bridgers to raise more funds for R&D and increase the diffusion of domestically developed knowledge in order to fill out the technological gaps
W vs O			
WO1. Optimize on utilizing the cooperation capacities with Europe and North Africa to help alleviate the highly fragmented national funding of scientific research and fill in the business expenditure gaps in R&D, which is lower than average and insufficient. This should also create a wider funding platform for SMEs and entrepreneurs.	WO2. Create an inventory and adopt an ERP system to track the wealth of equipment distributed amongst research centres and universities. This will ensure a comprehensive inventory mapping of all available items with specific detailing on functionality, specs, maintenance log, lifetime expectancy, physical location and utilities...etc.	WO3. Create roadmaps, policies and procedures to best utilize the growing capacities of several actors in the innovation ecosystem, including non-governmental organizations and establish a clear technological, strategic goal coordinated and communicated well between all parties	WO.4 granting talented researchers access to opportunities through improving the promotion system as well as ensuring policy enforcement in practise
W vs T			
WT1.Create national programs with tracking mechanisms to continuously assess and upgrade the research facilities to avoid establishing research facilities that are not well-equipped to best serve their purpose.	WT2. Re-vamp the institutes' workflow that doesn't encourage research and innovation, which would free the sector of the public sector dominance and incorporate modern ideas and approaches into the mix.	WT3. Consider establishing specialized institutions for science and innovation policy to minimize the market being dominated by big enterprises along with a significant presence of an informal sector.	WT4. Incentivize the business expenditure in R&D to avoid the current disconnect between the industry, scientific research and academia.

DISCUSSION WEF NEXUS IN EGYPT

Results of the WEF nexus ecosystem landscape analysis demonstrated many positive developments in the Egyptian innovation system, such as the existence of high-level strategies supported by burgeoning innovation and collaboration networks on the national and regional level and growing business supporting programs and the existence of adequate knowledge and research outputs. As for STRATEGIC ORIENTATION, For the first time, the Egyptian 2030 strategy included knowledge, innovation, and technology pillars to drive all ministries' strategies and action plans toward a more innovation-based circular economy. Egypt was also the first country in the region to issue green bonds to finance sustainable green innovation activities in all sectors, including WEF. Between 2016 and 2020, Egypt aimed to create 3 million decent and productive jobs and to increase GDP growth by 8%. In 2016 the Egyptian GDP growth was 4.5%, and it grew to 5.6% in 2019, but due to the COVID-19 outbreak, it dropped to 3.6 in 2020, and it didn't reach the estimated 8% in the initial strategic plan. According to Forbes, the growth rate for GDP will rise by 6.6% in the 2021/2022 Fiscal year . Meanwhile, the government is about to release the new 2022/2026 industry and trade strategy, which might reflect on the achievements of the prior plan.

Substantial investments in research and innovation support this transition. According to the nationally determined contribution that the Egyptian government submitted to the UNFCCC in July 2022, Egypt is planning to invest USD$ 196 billion in climate mitigation actions and USD$ 50 billion in climate impact adaptation actions (Updated Nationally Determined Contributions 2022). Due to the financial limitedness of the country, like other developing countries, this planned investment is conditioned on receiving international support from developed countries which is promised according to article 9 of the Paris agreement (UNFCCC 2015) and should be applied through the "loss and damage fund" which international parties agreed on establishing it in Conference Of Parties 27 COP27 hosted in Sharm El Sheikh, Egypt 2022 (UNFCCC 2022).

As for BUSINESS SUPPORTING PROGRAMS, According to the National Strategy Climate Change

2050, Egypt is committed to Enhance Climate Financing Infrastructure (Goal 4 of the NSCC): Promoting local green banking and green credit lines. "The banking sector is one of the most important sources of project financing in the private and public sectors. The banking entity sets a set of requirements that the recipient of support must comply with before approving the financing. Those set of requirements can include environmental and social aspects to turn those investments into green ones. Following the example of the international banking community, such as The World Bank and other international sources of financing, giving adequate attention to micro, small and 32 Egypt National Climate Change Strategy (NCCS) 2050 medium enterprises (MSMEs) to benefit from financing opportunities". In the build-upon COP27, the Egyptian government has launched the "Nexus of Water, Food and Energy (NWFE)", an innovative and ambitious programme comprising nine projects with a total cost of US$14.7 billion. It is a transformational strategy that moves from a narrow sectoral approach to a more focused and structured model of linkages between sectors. The NWFE programme, which was officially launched on 8 November 2022 at the Egypt pavilion at COP27, has three main pillars: water, food, and energy. The Government of Egypt has called on development partners to channel their investments under a Water-Food-Energy nexus and has chosen three lead agencies: the African Development Bank (AfDB) for the Water pillar, IFAD for Food and Agriculture, and the European Bank for Reconstruction and Development (EBRD) for energy. The government is planning to streamline bureaucracy through digital and technological solutions and incentivize new business establishments (easy and fast digitalized procedures). Not only will MSMEs be supported, but also the self-employed. Egypt has established 16 new Venture Capital firms and plans to continue providing financing and training, which are key to supporting sustainable capacity building of its business ecosystem.

As anticipated in Goal n.5 of the NSCC, SCIENTIFIC KNOWLEDGE CREATION needs to be supported. Scientific research represents an essential element of preparedness to address the consequences of climate change and benefit from global experiences. The country is committed to establishing new private research centres and has allocated 1 million euros per annum for scientific missions abroad. As part of the solution, the country is also reactivating 85 qualified scholars in the diaspora. This talent acquisition and reshoring aim to help strengthen competency and productivity in the fields of Chemistry, Medicine, Material Sciences, Mathematics, Physics, and Agriculture. More specific investments will be made to research and develop water, food and energy issues. The main program called Jesor (bridges for development) was initiated by the Academy of Scientific Research and Technology (ASRT) in 2015 to build bonds with Egyptian scholars in the diaspora under the title "joint collaborative efforts of Egyptian Expatriates and Scientific organizations towards tackling R&D challenges".

The improvement of public and private funding to improve Egypt's position in the Mediterranean and the world for WEF couldn't happen without COLLABORATION AND NETWORKING. The country has established new schemes for public-private partnerships and technology alliances. It aims to support innovation in rural areas and link it to the centralized initiatives in main cities. The existence of technology transfer will be taken care of by the Technology transfer offices located in 50 most Egyptian universities and research institutes supported by a program called Technology Innovation Commercialisation Offices program financed by the Academy of Scientific Research and Technology (ASRT). These offices exist, for example, at Cairo University, Fayoum university, the national institute of oceanography and fisheries, and the Arab academy of science technology and maritime transportation. Academic research must be part of the solution for shared economic value. Energy, physics, nanotechnology, and nuclear research networks are joining forces to find better solutions for a just energy transition. As an example of what is being done, in 2017, the government established MSMEDA (Micro Small Medium Entreprises Development Agency to increase harmony and join efforts targeting MSMEs in Egypt. In 2020, the Egyptian government issued a unified law defining Micro-Small-Medium Enterprises (MSMEs) across industrial sectors (Law No. 152/2020). The new law aims to attract projects that are outside the Egyptian authorities' control (the Informal Sector of the Economy) and embrace them under its umbrella due to reduce the informal sector of the economy with a view to promoting employment in the formal sector and, in this way, ensuring the full enjoyment of economic and social rights by all workers. Moreover, it aims to legalize SME status under Egyptian laws.

RECOMMENDATIONS AND IMPLICATIONS

living labs are considered a relatively new concept that can generate many synergies activities between different actors in the ecosystem and can be extended beyond regions and even countries. Our analysis portrayed the critical need for implementing NDOLLs in Egypt. As a new ecosystem actor, NDOLL should work closely with the Egyptian government representative to develop a comprehensive evidence based-strategy targeting WEF challenges on the national level. NDOLLs should also improve human resources skills for those working in governmental bodies that lead the coordination and implementation of the WEFN strategy. A second domain of engagement of NDOLLs is to come up with various instruments to leverage the utilization of Egyptian researchers, innovators and entrepreneurs in the diaspora and changing domestic policies to attract more talents to engage in tackling WEF challenges. In this regard, NDOLL has to provide a space for collaboration and promote the culture of collaboration between WEF ecosystem actors. The recent advancements in the ICT sector in Egypt should be deployed for increasing knowledge transfer, information availability, digital innovation, connected networks and

clusters. While the Egyptian innovation ecosystem focuses on entrepreneurship activities, NDOLL has to advocate for more industrial policies supporting established SMEs. SMEs face different challenges, such as technological transformation, low-skilled labour, the fixed mentality of the first generation of the owner, as well as technological and technical barriers to catching up.

ACKNOWLEDGEMENT

This work is part of NEX-LABS project, an EU funded project under the ENI CBC MED Programme [B_A.2.1_0124].

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCE

1. Afacan, Yasemin. 2023. “Impacts of Urban Living Lab (ULL) on Learning to Design Inclusive, Sustainable, and Climate-Resilient Urban Environments.” Land Use Policy 124:106443. doi: 10.1016/J.LANDUSEPOL.2022.106443.
2. Bieber, Niclas, Jen Ho Ker, Xiaonan Wang, Charalampos Triantafyllidis, Koen H. van Dam, Rembrandt H. E. M. Koppelaar, and Nilay Shah. 2018. “Sustainable Planning of the Energy-Water-Food Nexus Using Decision Making Tools.” Energy Policy 113:584–607. doi: 10.1016/J.ENPOL.2017.11.037.
3. Boersma, Kees, Rinske Berg, Joris Rijbroek, Petra Ardai, Firoez Azarhoosh, Farnosh Forozesh, Stella de Kort, Anne Josine van Scheepstal, and Jan Bos. 2022. “Exploring the Potential of Local Stakeholders’ Involvement in Crisis Management. The Living Lab Approach in a Case Study from Amsterdam.” International Journal of Disaster Risk Reduction 79:103179. doi: 10.1016/J.IJDRR.2022.103179.
4. Cai, Ximing, Kevin Wallington, Majid Shafiee-Jood, and Landon Marston. 2018. “Understanding and Managing the Food-Energy-Water Nexus – Opportunities for Water Resources Research.” Advances in Water Resources 111:259–73. doi: 10.1016/J.ADVWATRES.2017.11.014.
5. Fuglsang, Lars, and Anne Vorre Hansen. 2022. “Framing Improvements of Public Innovation in a Living Lab Context: Processual Learning, Restrained Space and Democratic Engagement.” Research Policy 51(1):104390. doi: 10.1016/J.RESPOL.2021.104390.
6. Leminen, Seppo, and Mika Westerlund. 2016. “A Framework for Understanding the Different Research Avenues of Living Labs.” International Journal of Technology Marketing 11(4):399–420. doi: 10.1504/IJTMKT.2016.079731.
7. Liu, Wenfeng, Hong Yang, Qiuhong Tang, and Xingcai Liu. 2019. “Understanding the Water-Food-Energy Nexus for Supporting Sustainable Food Production and Conserving Hydropower Potential in China.” Frontiers in Environmental Science 7(APR):50. doi: 10.3389/FENVS.2019.00050/BIBTEX.
8. Nguyen, Huong Thu, Pilar Marques, and Paul Benneworth. 2022. “Living Labs: Challenging and Changing the Smart City Power Relations?” Technological Forecasting and Social Change 183:121866. doi: 10.1016/J.TECHFORE.2022.121866.
9. Okonkwo, Eric C., Sarah Namany, Jamileh Fouladi, Ismail W. Almanassra, Farhat Mahmood, and Tareq Al-Ansari. 2023. “A Multi-Level Approach to the Energy-Water-Food Nexus: From Molecule to Governance.” Cleaner Environmental Systems 8:100110. doi: 10.1016/J.CESYS.2023.100110.
10. Ringler, Claudia, Anik Bhaduri, and Richard Lawford. 2013. “The Nexus across Water, Energy, Land and Food (WELF): Potential for Improved Resource Use Efficiency?” Current Opinion in Environmental Sustainability 5(6):617–24. doi: 10.1016/J.COSUST.2013.11.002.
11. United Nation. 2015 “The Agenda 2020 for Sustainable Development Goals.” Accessed under this link https://sdgs.un.org/goals
12. Motaz H. Khorshid and Mohamed R. Rezk, H. H. I., Amr Radwan, Mohamed Wageih, and Mahmoud M. Sakr (2019). Assessing the Status and the Prospects of the Science, Technology and Innovation (STI) System in Egypt. Science, Technology and Innovation Policies for Inclusive growth in Africa- Human Skills Development and country cases. Bremen, Germany, Zürich : Lit, North America. 21.
13. Radwan, A. (2018). "Science and innovation policies in North African Countries: Exploring challenges and opportunities." ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES 6(1): 268-282.
14. Radwan, N. H. a. A. (2019). Supplementing the Science, Technology and Innovation Platform in Egypt. Science, Technology and Innovation Policies for Inclusive growth in Africa- Human Skills Development and country cases. Bremen, Germany, Zürich : Lit, North America. 21.
15. Ramadan, M., et al. (2019). "Foresight for sustainable energy policy in Egypt: results from a Delphi survey." Insights into Regional Development 1: 357-369.

External links

- Egypt - Integrated Water and Food Security
- The Water-Energy-Food Nexus in Libya, UAE, Egypt and Iraq
- WATER AND FOOD SECURITY, Arab development portal
- IFAD to lead the food pillar of Egypt’s Nexus for Water, Food and Energy (NWFE) November 10 2022

- Egypt Economy 2022 (GDP By Factor Cost & Percentage Distribution By Industry)
- ASRT The Academy of Scientific Research and Technology (ASRT)
- Egypt's National Strategy for the Development of Organic Clusters: 2019 – 2030
- Egyptian law concerning MSMEs
- Law 152/2020
- National Strategy for Climate Change 2050

الملخص العربى

تحليل بيئة الأعمال فى مصر بهدف انشاء مختبرات ابتكار مفتوحة لمعالجة مشكلات رابطة المياة والطاقة والغذاء

حمدي عبد العاطي[١]، إكرام عيسوي[٢]، عمرو رضوان[٣]

[١]قسم الأعمال، كلية التجارة، جامعة القاهرة، مصر
[٢]المركز المصري للإبداع والتنمية التكنولوجية، مصر
[٣]كلية الدراسات العليا لإدارة التكنولوجيا، جامعة النيل

تعتبر مختبرات الابتكار القائمه علي نظرية الابتكار المفتوح Innovation Living Labs مفهومًا جديدًا نسبيًا في الدول البحر الأبيض المتوسط، وبتطبيق هذ المفهوم يمكن خلق تآزرًا بين العديد من أصحاب المصالح فى منظومة الابتكار الخاصة بمشكلات المياه والطاقة والغذاء. يستكشف هذا البحث الفرص والتحديات في بيئة الابتكار فى مصر من أجل تقييم الحاجة إلى مختبرات الابتكار المفتوحة، وتحديد المجالات الرئيسية التى تحتاج الى الدعم والعمل التشاركي. في هذه المقالة، قمنا بتحليل موسع لمكونات منظومة الابتكار الخاصة برابطة المياة والطاقة والغذاء باستخدام تحليل SWOT وSOR. وتشير النتائج إلى الاذرهار الملحوظ فى منظومة الابتكار الخاصة برابطة المياة والطاقة والغذاء، هذا التحسن الذى تم تعزيزه باستضافة مصر للمؤتمر الدولي للمناخ COP27 في شرم الشيخ في نوفمبر ٢٠٢٢. على الرغم من الجوانب الإيجابية مثل تطوير استراتيجيات واضحة لمواجهة التحديات الخاصة برابطة المياة والطاقة والغذاء، وكذلك وجود برامج التمويل الداعمة، وتوافر قاعدة معرفية قوية لحل المشكلات الخاصة بهذه القطاعات، هناك تحديات كثيرة مثل نقص التنسيق بين الأطراف الفاعلة فى هذا المجال، وعدم التوافق بين الاستراتيجيات الحكومية المختلفة، عدم كفاية الشراكة بين القطاعين العام والخاص، وفجوة المهارات التقنية في الموارد البشرية، وعدم فعالية تحويل مخرجات البحث العلمي إلى الابتكار وحلول حقيقة. وتؤكد الدراسة على الحاجة الحرجة لاستراتيجية وإجراءات مبنية على الأدلة، وكذلك الحاجة إلى ضرورة إنشاء مختبر ات ابتكار مفتوحة لتناول مشكلات الطاقة والمياة والغذاء معا، وبشكل تعاوني بين الأطراف الفاعله في مصر. ومن شأن هذه المختبرات أن تساعد صانعي السياسات في مواجهة تحديات المستثبلية فى القطاعات الثلاثة معا من خلال توفير مساحة ومنهجية للتنسيق بين جميع الجهات المعنية بمشكلات هذه القطاعات في مراحل مبكرة من عملية الابتكار، وتحديد اتجاه واضح للإستراتيجيات على المستويات العليا، وتطوير حلول مبتكرة، واختبارها في سياق الحياة الواقعية قبل التنفيذ الفعلي على نطاق واسع. ولكن يجب أن يتم انشاء هذه المختبرات على مبادئ صارمة للشفافية، والشمول، والمشاركة، والتجربة، والقابلية للتوسع لضمان النجاح.