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# Bassmati Community: Innovating WASH and Climate Solutions in Jordan

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**ABSTRACT**

This paper presents a descriptive case study focused on developing a local model with global applicability for fostering innovative entrepreneurial and applied scientific research projects in the climate, water, sanitation, and hygiene (WASH) sectors. Our study examined the effectiveness of UNICEF's water, sanitation, and hygiene programs in mitigating disaster-related effects on human and environmental health at the Bassmati Innovation Community in Jordan. This study reveals significant advances in disaster mitigation strategies, including improved sanitation facilities, innovative water management strategies, and improved community engagement. These results provide a practical framework for similar initiatives in the future in addition to highlighting the crucial role that the Bassmati Community plays in the development of Jordan's water, sanitation, and climate response sectors. The study's innovative model, demonstrated through the achievements of the UNICEF Innovation Hub, provides a scalable and adaptable approach for universities and centers focusing on climate and water-related projects. As a result of this model, the Arab region and global communities will benefit from its addressing of pressing environmental challenges beyond local boundaries.

## 1. INTRODUCTION

Throughout history, various disasters, problems, and events have impacted the world due to both human conflicts and natural disasters. A few examples of the former are World Wars I and II, wars fought on the African continent, and ongoing conflicts in regions such as Syria, Yemen, and Iraq. In addition, natural disasters such as earthquakes, tornadoes, tsunamis, droughts, and pandemics, including the current Coronavirus outbreak, have had significant impacts on global health. This results in many negative and destructive effects, both on humans and the environment. As a result, the contribution of local and international organizations and institutions is crucial to providing innovative and continuous solutions for reducing and mitigating the negative effects of these disasters and events. UNICEF's programs and services provide a remarkable and wonderful example of this. Accordingly, a research question is formulated: How can local models, informed by global challenges and initiatives, effectively support disaster mitigation and sustainable development in the WASH sector?

In Jordan, the Water, Sanitation and Hygiene (WASH) and Climate program, provided by UNICEF, played a pivotal role in reducing and mitigating the effects of events and problems in the region on the population, particularly refugees and the Jordanian environment. The program is distinguished by the introduction and presentation of a number of innovative solutions, including the Bassmati Innovation Community, which is highly significant. This study aims to examine the effectiveness of these initiatives and develop a model that can be applied both locally and globally to enhance resilience and sustainability in the WASH sector.

This study seeks to identify a local model of a global nature for supporting, incubating, and developing innovative entrepreneurial projects and applied scientific research projects in the climate (WASH) sectors. Furthermore, the purpose of this study is to transfer and generalize these experiences to the local environment and to achieve the greatest benefit possible in the Arab environment and internationally. Also, it summarizes UNICEF's (WASH) programs and its role in them. Additionally, it provides an in-depth look at the Bassmati Innovation Community, its diverse tracks and components, and its vital role in the development of the (WASH) sector and the climate in Jordan. As part of the practical model, Jordan University of Science and Technology demonstrated the achievements of the UNICEF Innovation Hub and its various tracks (Figure 1). The present study is expected to provide the Arab region and the rest of the world with an innovative model that can be applied to many universities and centers that focus on designing and developing climate change and water-related projects.

Bassmati Innovation Community differs from other organizations that focus on different areas. It is closely aligned with Jordan's current situation and problems. Not only is it free, but it is also characterized by a high degree of flexibility and speed. Moreover, all services associated with this model are provided at a single location, contrasting with other models which distribute services across multiple locations.

Additionally, due to the model's location within a university, participants have access to university facilities and are able to gain insight from other participants as well. Thus, the program has brought together a range of stakeholders, including public, private, and external support, to address a problem that many organizations have not addressed, focusing on sustainability as one of its key objectives. As a pioneering initiative in the field, Bassmati model not only aligns with global sustainable development goals but also fills a significant gap in current practices and literature.


**Figure 1.** Wash innovation hub in Jordan university of science and technology
Source: Author

## 2. LITERATURE REVIEW

### 2.1 UNICEF and (WASH) program

Founded on 11 December 1946, UNICEF is one of the oldest and most widely spread international organizations. It is committed to promoting the rights and well-being of children worldwide. As UNICEF strives to provide quality healthcare, education, clean water, sanitation, nutrition, and protection to all children in 190 countries and territories, it works to reach the most vulnerable and excluded children. For more than 70 years, UNICEF has protected the rights of children in more than 190 countries and territories and improved the quality of life for them and their families. In order to make the world a better place, UNICEF believes that all children should be able to survive, thrive, and reach their full potential.

A key program of UNICEF at the international level is the "child survival" program. In this program, an important message is conveyed: every child has the right to live a healthy and fulfilling life. This program has contributed to the reduction of child mortality throughout the world in order to reach the most vulnerable children. The program's mission is accomplished through the implementation of several programs and events; however, the most important of these programs is (WASH).

According to the sixth goal of sustainable development, water, sanitation, and hygiene are considered to be essential sectors which should be supported and invested in in order to ensure the development and launch of the other sectors. These goals include: (ensuring that water services, sanitation, and sustainable management thereof are available to all for their benefit) [1]. It has been reported that water, sanitation, and hygiene provide numerous social and economic benefits, including improving health, preventing disease, and developing children. Numerous international reports [2] indicate that services related to water, sanitation, and hygiene have improved. However, more than two-thirds of the global population does not have access to improved sanitation services, despite this. As a result, several health, environmental, and economic issues have arisen.

In light of the World Health Organization report (Progress on household drinking water, sanitation and hygiene I 2000-2017) [3], the following facts are relevant to the water sector; for example, 71% (5.2 billion people) of the world's population consume safe drinking water. An accessible and free of contamination drinking water facility located on the premises. In addition to eight out of ten people (5.8 billion), three quarters of the global population (5.4%) use water that is readily available when required from improved sources located on-premises whenever required. Moreover, over three out of four people (5 billion) use water without contamination, but 844 million people do not have access to even basic drinking water facilities. It is estimated that 263 million people spend more than 30 minutes per round trip in order to collect water from an improved source (a limited supply of drinking water), while 159 million people continue to collect drinking water directly from surface water sources; 58% of these people reside in sub-Saharan Africa.

It is important to note that 39 percent (2.9 billion people) of the global population use a well-managed sanitation service. Thus, 27 percent of the global population disposes of their excreta safely in situ or off-site. Additionally, approximately 1.9 billion people used private sanitation facilities that were connected to wastewater treatment systems. According to available data, 13 percent of global populations (0.9 billion people) use toilets or latrines where excrement is disposed of in situ; however, there is insufficient information on the proportion of people using septic tanks and latrines; as well as 2.3 billion people worldwide still lack basic sanitation services, 600 million people utilize limited sanitation services, and 892 million people practice open defecation. A total of 70 countries, representing 30 percent of the world's population, had comparable data on handwashing with soap and water. 15 per cent of sub-Saharan Africans had access to basic handwashing facilities with soap and water, whereas 75 per cent had access in Western Asia and Northern Africa. Furthermore, 27 percent of the population in Least Developed Countries has access to basic handwashing facilities with soap and water. A number of high-income countries did not have adequate handwashing facilities to estimate their population.

Due to the lack of water, sanitation, and hygiene services, the global economy lost over $229.9 billion in 2015. A number of studies have indicated that investment returns for water, sanitation, and hygiene are 5-9 dollars per dollar [1, 4, 5]. Thus, UNICEF's (WASH) program is essential, serving over 100 countries, particularly developing and poor countries.

### 2.2 Water, sanitation, and hygiene (WASH) in Jordan

As a result of their interdependence, WASH stands for water, sanitation, and hygiene. Although these three core issues are separate fields of study, they are interdependent. Without toilets, water sources become contaminated; without clean water, basic hygiene practices cannot be accomplished. The focus of UNICEF's water sector efforts is to ensure that children have access to safe water, have access to high quality water, and are able to collect it safely. In terms of sanitation, UNICEF ensures that people have access to and use basic toilets and that human waste is separated from people's contact with. Water access and climate-resilient infrastructure are among UNICEF's top priorities. It is important to end the practice of "open defecation" and to facilitate community-led initiatives to build, maintain, and utilize basic toilets. In

Hygiene, UNICEF aims to foster good hygiene practices, specifically handwashing with soap. Although this seems a simple act, it is crucial to preventing diseases and ensuring children's health. The three areas of water, sanitation, and hygiene are deeply interconnected. Without one, the others cannot progress [6-9].

Jordan covers an area of 89,342 $km^2$ in the Middle East and is located between 29° and 34° N and 34° and 40° E. Saudi Arabia borders the country on the south and east, Iraq borders it on the north-east, Syria borders it on the north, and the Palestinian territories border it on the west. According to the United Nations High Commissioner for Refugees (UNHCR), Jordan had a population of 10,203,134 in 2020, with 51.63% of the population male and 49.37% of the population female. Additionally, Jordan has registered 2,902,420 refugees from a wide range of countries. A variety of Mediterranean and desert climates are predominant in Jordan, with southern and northern mediterranean climates dominating, while desert climates dominate the rest of the country. Also, approximately 580 millimeters of rain fall annually in the desert, ranging from 50 millimeters to 50 millimeters. During a few periods of year, the mountainous highlands of the Kingdom receive a prolific amount of snow [10, 11] (Figure 2).

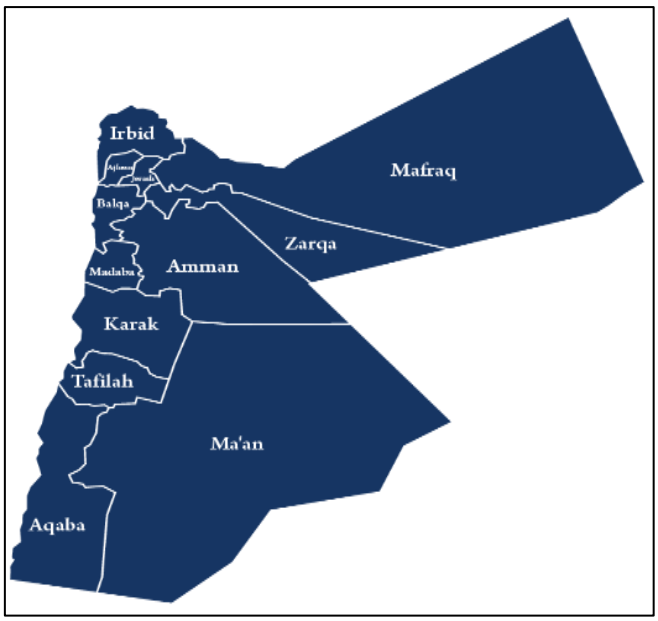


**Figure 2.** Governorates of Jordan [12]

There are many challenges and obstacles facing the (WASH) sector in Jordan, as reported by the Ministry of Water and Irrigation in 2014, 2016, 2017 and the World Bank in 2012, 2016 [13-17], listed below are the most significant indicators:

- According to UNICEF, Jordan is the second most water-poor country in the world, resulting in severe water shortages and limited access to clean water. As a consequence of population growth and climate change, this crisis is compounded. Insufficient funding to secure new sources of water, regional events, and the lack of water sources are among the factors contributing to the shortfall. Further, Jordanians have less than 100 $m^3$/year of water, which is less than 10% of the international poverty line of 1000 $m^3$/capita.
- A total of 1.5 billion cubic meters of water are consumed by Jordanian industry, agriculture, and tourism each year, as well as providing drinking water to over ten million people. Since Jordan receives only about 8 billion cubic meters of precipitation annually over 90,000 square kilometers, 90% of it evaporates, Jordan primarily relies on underground storage. In rainy years, approximately 325 million $m^3$ of water are harvested from dams, while in dry years, less than half are harvested.
- According to the Kingdom's statistics, approximately 69% of the population has access to sanitation services, which is a high percentage both on a regional and international level. However, only 77.3% of existing sanitation systems are managed safely, and only one third of schools have basic sanitation facilities. WASH faces a number of challenges, including a lack of energy, which consumes approximately 15% of Jordan's electric energy and accounts for more than 50% of its operating costs. Approximately 20% of these needs will be met by alternative energy projects [18, 19].
- As a result of water scarcity, Jordan's development accomplishments will be threatened, which is expected to worsen with climate change, which will result in increased evaporation and plant loss due to higher temperatures and reduced precipitation. By 2025, Jordanians are expected to consume 50-60% more water, further straining the nation's limited freshwater resources.

However, studies such as Abramovsky et al. [20] have provided conflicting results regarding the effectiveness of sanitation interventions at the community level. According to the findings of this study in Nigeria, such interventions had a significant and lasting impact in communities with lower levels of wealth, whereas they did not have any significant impact on wealthier communities, challenging the assumption that such interventions are universally effective when socioeconomic factors are taken into account. Therefore, there may be a gap in our understanding of the effectiveness of sanitation interventions in communities. As a result, water and sanitation projects often struggle to strike a balance between short-term relief and long-term sustainability, resulting in different perspectives on prioritization. Due to these differing opinions on priorities, finding a balance between short-term relief and long-term sustainability in water and sanitation projects can also be challenging.

### 2.3 UNICEF contributions and solutions to the (WASH) program in Jordan

Jordan launched the (WASH) program in 2012 with the objective of contributing and collaborating with the appropriate authorities in an effort to reduce the size of the challenges and problems faced by the sector, especially in light of the exacerbation and complexity of issues that have resulted from the multiple refugee operations and climate change. The most important aspects of the program are assisting in the development and management of water and sanitation services and focusing on immediate, sustainable and high impact projects, in collaboration with the Ministry of Water and Irrigation and related agencies in order to develop and implement policies and strategies aimed at improving the (WASH) sector in Jordan, as well as supporting vulnerable families with improved (WASH) facilities, developing water systems and sustainable wastewater infrastructure by improving hygiene behaviors in primary and secondary education in Jordan.

According to UNICEF Jordan, approximately 100,000 Syrian refugees have access to clean drinking water and

sanitation facilities that enhance their quality of life. The UNICEF program, in general, as well as the (WASH) program in particular, strives to identify and develop innovative and creative projects and solutions. It was Jordan's staff that developed a program that is considered the first of its kind on a global and local scale, based on innovation, development, and research, to aid in the development, construction, and resolution of many water, sanitation, and climate-related problems. Bassmati Innovation Community is the name of the program.

Despite exploring the community-based approaches to WASH programs and outcomes, it is evident that Jordan faces unique challenges, including the lack of government support, the large number of refugees, etc. As a result, the purpose of this study is to provide insights into how innovative, localized solutions can enhance the effectiveness of WASH programs by examining the Bassmati Innovation Community's approach in Jordan.

## 3. METHODS

A descriptive case study methodology was employed in this study to explore and document the characteristics of a particular phenomenon. Data collection and analysis for this study was conducted in a comprehensive manner using semi-structured interviews. To provide a variety of perspectives and insights, a diverse group of participants, including entrepreneurs, business owners, and project managers, participated in an in-depth interview. It was also intended that the interviews be varied and sequential in nature. A transcribed, coded, cross-referenced, and analyzed data was also performed using Nvivo 11. Further, insights gained from the interview were used to determine the feasibility and challenges of the study, where interviewees provided qualitative evidence that complemented other data sources, contributing to the study's findings and demonstrating that the findings were based on real-life experiences and perceptions of those directly involved.

## 4. RESULTS AND DISCUSSION

The purpose of this section is to discuss the development of local models with global characteristics to support and develop innovative projects related to climate, water, sanitation, and hygiene. The study examines UNICEF's role in mitigating disasters and events by examining the Bassmati Innovation Community in Jordan as an example. This report presents a practical model of UNICEF Innovation Hub successes along with an overview of its tracks, components, and accomplishments. In particular, it highlights the transferability of the innovative model to achieve maximum benefits in the Arab region and internationally, particularly in promoting sustainability and reducing the impact of disasters.

### 4.1 Bassmati Innovation Community: A new innovative model in (WASH) program

UNICEF innovation program collaborates with Jordan University of Science and Technology (JUST) and Hashemite University (HU) [21] to address major water, sanitation, hygiene, and climate change challenges. By providing assistance in planning, developing, technical construction, incubation, financial support, and networking, the Bassmati Innovation Community accelerates innovation and enhances effective contributions to (WASH) and climate change. In addition, it supports specialized academic research. In addition, Bassmati Innovation Community's mission is to enable innovators to develop world-class solutions to climate and water challenges. Furthermore, Bassmati Innovation Community's Mission is to (Figure 3):

- Promote the development of critical skills to meet the needs of priority sectors by ensuring the development of human capacity.
- Create: Contributing to the creation of new innovations, business opportunities, and added value in the sector of Climate and Water.
- Foster: Supporting entrepreneurship and incubating new ideas and projects.
- Link: Improving collaboration between industry, government, and academia.
- Attract: Establishing a space that attracts emerging businesses in the (WASH) and Climate sectors.


**Figure 3.** Wash innovation hub in Jordan university of science and technology
Source: Author

As part of the program, Jordan University of Science and Technology (JUST) and Hashemite University (HU) have partnered to implement it. Located in Irbid-Ramtha in the northern region of Jordan, Jordan University of Science and Technology is a public university supported fully by the Jordanian government. There are sixty-one departments within the university's colleges, and 45 bachelor's degrees, 98 graduate degrees, and two doctoral degrees are offered. Hashemite University was established in 1995 as a state-supported university within Zarqa, Jordan. The Hashemite University has a 300,000 square meter campus with an extensive built-up area. Additionally, the university offers an international admissions program for non-Jordanese students.

### 4.2 Bassmati program tracks

It consists of two main tracks: (a) Support for Innovative Projects and (b) Support for Research Proposals.

#### A. Support for Innovative Projects

In order to provide entrepreneurs with all the necessary activities, programs, physical equipment and others for the development of their entrepreneurial projects, Bassmati Innovation Community is a specialized program (Figure 4).

Through this program, entrepreneurs are escorted through the initial stages of ideation and design through the establishment of their independent businesses with innovative and creative ideas. As part of its partnership with academic and research institutions, the private sector, businessmen, and others, UNICEF identifies and addresses the needs of the (WASH) program through innovation and creativity. By introducing new technologies and methods to facilitate the provision of information, the access to basic services, and efficient resource use.

By conducting capacity-building activities to assist participants in developing their skills in starting and managing businesses, this program is designed to create awareness of the opportunities and services available to entrepreneurs and innovators through the Bassmati Innovation Community. Assist eligible startups with incubation services while facilitating networking, linkages, and experience exchange through the community-provided venue. The program also includes the following activities: generating, building capacity, and accelerating incubators.

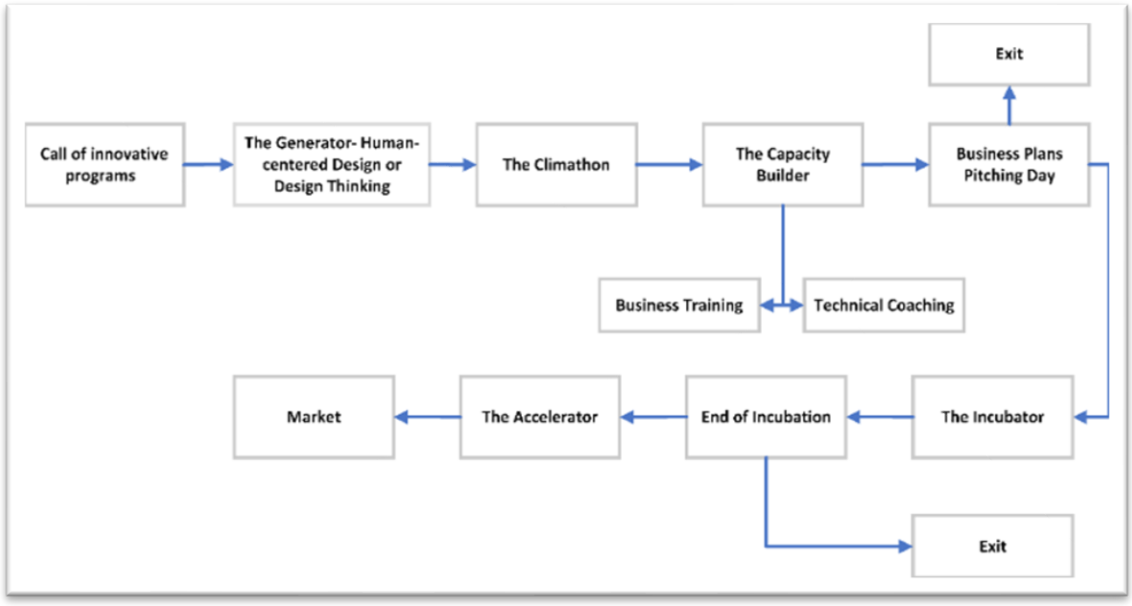


**Figure 4.** Local model for innovative solutions in water, sanitation, and hygiene (WASH) and climate

To achieve young entrepreneurs' dreams of achieving their own entrepreneurial projects, the participants in the program must pass several stages and workstations. These stages are:

**i. Call of innovative programs**

The program is open to young entrepreneurs who are passionate about entrepreneurship and have a high level of motivation (Figure 5).


**Figure 5.** The call of BASSMATI program

**ii. The generator- human-centered design or design thinking**

Developing successful initiatives and innovations requires understanding of the characteristics, challenges, and needs of users. As a result, applicants are encouraged to engage in brainstorming sessions, ideation sessions, design thinking sessions, and workshops aimed at creating human-centered innovations. A variety of media channels are utilized to advertise workshops and events, which are open to all participants.

**iii. The climathon**

As the first filtering process for applicants, this is designed to convert and translate innovative ideas related to (WASH) and climate change into tangible projects that are clearly defined and presented in a format that is specifically designed for this purpose. After an advertisement for the "Thematic Areas", entrepreneurs are invited to apply for innovative ideas based on the advertisements. As a result of evaluating applications based on well-defined criteria, only qualified candidates are moved forward to the next phase of the program.

**iv. The capacity builder**

This is a specialized stage where business experts and technical advisors present the knowledge and technical side to entrepreneurs who have passed the previous stage. Two programs are available at this stage:

- **Business Training**: In this program, entrepreneurs are taught how to develop business models in a world class manner. It runs for 12 weeks and includes a reference framework designed to help them launch their business and reach their ideal shape. Through the training

process, participants will gain knowledge and skills as entrepreneurs, conduct research and develop business concepts, learn how to plan a business using a step-by-step approach, and evaluate and test the business plan and concept at various checkpoints during the program.

- **Technical Coaching:** As part of this process, a group of experts and specialists provide technical and technological assistance so that the owners of innovative entrepreneurial ideas can convert their ideas from a theoretical to a practical state by developing prototypes. Furthermore, assisting with the presentation of these ideas to specialized intellectual property protection programs. In addition, the support will include progress monitoring, proof of concept and technical evidence generation, competency development, assistance in closing gaps, and prototyping and product development.

**v. Business plans pitching day**

In this stage, all entrepreneurial teams are required to submit their business plans and prototypes for evaluation by a specialized scientific and technical committee. After evaluation, the qualified teams will proceed to the incubator stage.

**vi. The incubator**

The business plan and prototype are transformed at this stage into a highly successful business venture. The incubator fosters entrepreneurial projects by providing them with incentives, training, financing, relationships, and other forms of support in order to implement and develop their projects by providing an integrated business environment in which adobe, institutions, specialists, supporters, and experts are integrated and exchanged. A 12-month incubation period is offered, during which the incubated projects receive extensive support. Examples include up to $20,000 in seed funding, one-on-one coaching, and networking opportunities.

**vii. End of incubation**

As part of this stage, startups are evaluated after they have acquired rich and diversified experience in the incubation phase, in order to provide them with support and assistance so they can establish their entrepreneurial businesses and grow.

**viii. The accelerator**

The Bassmati Innovation Community's Accelerator is the only accelerator program in Jordan that focuses on climate and water. The Accelerator provides startups with the opportunity to scale and commercialize their businesses. In addition to providing many services and support, the accelerator also provides knowledge, resources, tools, participation in fund raising events, continuous growth-wheel coaching, introduction to a global network of donors, partners, and businesses, as well as all the necessary requirements to ensure rapid growth and success.

### 4.3 Case study: Success story UNICEF innovation hub/ Center of Excellence for Innovative Projects (CEIP)

With the establishment of the Center of Excellence for Innovative Projects (CEIP), JUST University has distinguished itself at both the Arab world and local levels for its commitment to entrepreneurship and innovation. In order to provide a technical environment that would support entrepreneurs from the university and the local community, JUST Entrepreneurship Center was established. In CEIP, the process begins with an idea, continues with a prototype of the product or service and ends with the establishment of a small business. In addition to housing the UNICEF innovation hub and FabLab, this center comprises two buildings: CEIP, which contains a FabLab and 3D printers, and Technical Incubator, which contains FabLabs and 3D printers. UNICEF Jordan Country Office has signed an agreement with JUST to house the Bassmati Climate and WASH Innovation Hub at the Center of Excellence for Innovative Projects. This marks the start of the UNICEF innovation hub's mission and vision.

The Objectives and Goals are to provide 300 students with technical training, engaging 50% females, to offer seed funding to 10 research projects ($20,000 / research), to offer seed funding to 20 business ideas ($32 thousand / project), to reach a population of 100,000 individuals through various channels, and to support the surrounding communities through 200 students, including Makani entrepreneurs, and 75 students participating in incubation activities with 50 percent female participation. To implement the innovative projects program, several companies with expertise in media, marketing, and training were selected. The following are the most important stages and achievements of the project:

i. To introduce the Climathon program to the university and local community, a marketing plan has been developed, which includes its mission, goals, and how to apply, thematic areas, and eligibility criteria. Furthermore, Climathon has been promoted through a series of advertising campaigns and social media advertisements.

ii. Incubation legal contracts, regulations, instructions, and agreements have been prepared for the program and the CEIP.

iii. Planning, designing, and implementing the first Climathon program. The Implementation of the program consists of the following stages:

- A number of thematic areas have been identified, including water management and climate change. Climate change mitigation and adaptation strategies are increasingly important as global warming worsens. Moreover, as the world's population increases and water scarcity becomes more prevalent, conservation and management of water resources have become increasingly important. Further, innovations in humanitarian response related to climate change, water, and sanitation are essential to meeting the needs of vulnerable communities.
- 30 applications have been evaluated by a scientific committee, and ten teams have been selected for pre-incubation (The Capacity Builder).
- Team members who are qualified are required to participate in an international training program (specializing in entrepreneurship) in order to develop a business plan for their project, as well as receive technical assistance to construct a prototype. Training was conducted for a period of 12 weeks.
- Upon completion of the training period, the teams were again evaluated by a specialized technical scientific committee. Four teams were selected for incubation and entry as startups.

### B. Support for Research Proposals

The program supports discrete scientific research in the field of water, sanitation, and climate. By collaborating with specialized and academic research institutions, the program aims to create a research environment that promotes creativity and innovation as well as providing all the means and tools necessary to conduct experimental applied scientific research. The program also provides financial and technical support, with financial support ranging from approximately ($20,000) for each research project. Through this program, new innovative research strategies and applications will be developed based on decision-making and the establishment of policies and practices subject to social accountability, as well as the exchange of knowledge and experiential learning between government, academic and industrial institutions, international organizations, and civil society organizations. The Program Objectives are to connect expertise with resources and knowledge, assist sectors in overcoming information silos and knowledge gaps, reduce innovation risk by investing and supporting the most innovative ideas, cultivate the most innovative ideas, and apply scientific insights to commercial contexts.

A variety of beneficiaries include researchers and experts, faculty members, postgraduate students, and researchers in specialized research centers. In order to qualify, applicants must reside and work in Jordan (citizens or permanent residents). The research proposals are also reviewed by a specialized scientific committee and a peer review process, which generally takes one to two years to conduct and reach scientific conclusions. In collaboration with a group of media and marketing companies, UNICEF's innovation hub developed a general plan for the research project support program, followed by the implementation of an effective marketing campaign to inform researchers, faculty members, postgraduate students and local communities about the research program, including its mission, objectives, application process, thematic areas, and eligibility requirements.

### 4.4 Success stories in Bassmati program (JUST), tracks support for innovative projects (startups) and support for research project

- Fantasia (A-cope): founded in 2007, Fantasia (A-cope) is an environmentally friendly economic device equipped with a smartphone application that detects water leaks due to faults, detects water theft, determines water turbidity, and determines the level of water within the tank. This application allows users to determine how much water they require at the beginning of each month by measuring the amount of water used in residential and commercial properties. This will allow the application to monitor water expenses. By monitoring the water path, the application can identify places of leakage in the network, saving the user time and water.
- Smart Water Solutions (SWS) Startup: an innovative smart system designed for small-scale water desalination stations (SWDS) is the SWS, which measures both the quality and quantity of water available for drinking. An Arduino microcontroller board and several electronic sensitive sensors are included in this innovative smart system. On the one hand, these sensors measure basic water contamination parameters, while on the other, they measure water quantity per liter. In order to obtain accurate measurements, a liquid Crystal Display (LCD), a keypad, and instructions to control the Arduino Board are attached. As a result of paused water draining when affected by some polluted parameters, the proposed design was able to save 30 percent of water. In addition, an analytical mathematical model has been developed to verify the proposed design.
- eRecycler Startup: using eRecycler, users can participate in recycling in an accessible, convenient, and affordable manner through social media. With eRecycler, users are able to earn cash from their trash, thereby contributing to the solution of waste accumulation and preventing them from reaching landfills, rivers, and shorelines, while also benefiting from their solid wastes. Points earned can be converted into cash or vouchers by using a pointing system.
- Solvillion Startup: solvillion system is designed and installed to treat wastewater using local resources for the reuse of treated water in home agriculture by using decentralized wastewater treatment systems. For individuals who are unable to maintain sanitation and suffer from frequent exudation, water overflow, and pollution, this system provides an alternative to the traditional absorbance hole. Moreover, the project provides sanitation consultations and solutions to those with drainage problems and health problems related to cesspits, as well as training university students and new graduates in building sanitation capacity using the methodology of the challenge.
- Water Leak Management Using (IoT) Technology Research Project: in this project, water waste resulting from leaks in the national pipe system will be addressed. By utilizing Internet of Things technology, leaks can be detected immediately, the amount of leaks can be estimated, and the location can be determined. Upon completion of the proposed research, it is expected that a model for leak detection will be developed that can be readily applied to national water pipe networks. It is expected that, if the model is successfully implemented, it will assist in the development of a product that can be marketed both regionally and internationally.
- Limonene: with the use of polymer fertilizers, Limonene can remove mercury from water or reduce soil salinity by producing organic chemical polymers from citrus peels.

As a result of the findings of this study, several actionable insights and lessons can be drawn. Because the Bassmati Innovation Community has successfully stimulated entrepreneurship in the WASH sector, similar models can be replicated in other contexts, particularly those with similar socioeconomic conditions and those integrating academic and practical approaches to problem-solving. Furthermore, the findings emphasize the importance of targeted entrepreneurship support in sectors that are critical to sustainable development. Furthermore, this study emphasizes that in order to achieve substantial progress in the WASH sector, collaboration across various sectors, including public, private, and academic institutions, is necessary. Additionally, due to its focus on a single case, the study may have limited generalizability. In addition, future studies can address these limitations by integrating multiple case studies and employing qualitative and quantitative methods of data collection.

## 5. CONCLUSION

In this study, UNICEF's (WASH) programs are shown to be influential in developing and supporting innovative

entrepreneurial and scientific research projects related to climate, water, sanitation, and hygiene. This study presents a comprehensive overview of the Bassmati Innovation Community's various tracks, components, and role in the development of Jordan's climate and the WASH sector using the Bassmati Innovation Community as an exemplary model. The study also presents an innovative model that can be generalized and applied to the local environment, thus promoting the achievements of the UNICEF Innovation Hub. The study recommends promoting the Bassmati program among universities and centers specializing in climate and water-related projects, drafting legislation and investment guidelines, as well as conducting more research and evaluation studies to exchange knowledge. Following the completion of this study, several recommendations were made, including the development of supportive frameworks for policymakers to encourage entrepreneurship and innovation.

In addition, it will encourage policymakers to invest in projects that have been demonstrated to be effective in their area of expertise. Specifically, the study encourages practitioners to adopt best practices from successful initiatives such as the Bassmati Program, which will enhance practices that enhance the effectiveness of WASH programs. Additional research is also recommended to assess the effectiveness of programs such as bassmai. In addition, such studies may involve comparative studies in different contexts in order to identify the factors contributing to the success or failure of such programs. To ensure adaptability to various settings, it is important to examine several key elements within the unique approach of the Bassmati model, which promotes entrepreneurship and innovation in the WASH sector. The model can be tailored to local needs and can be applied in other contexts facing similar sustainability challenges.

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