Financing development cooperation through public-private partnerships: a case study on the Aqua for All-Hydroponics Africa collaboration

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Abstract

The late 20th century has seen a rise of debates on the real effectiveness of international development cooperation programmes, at least in the way they were conceived and implemented starting from the first post-WWII decades. The main outcome of these ongoing discussions has been the urgency of a "paradigm change" in development cooperation, in order to enhance its social impact and increase the resources dedicated to it. In chapter two, which is about my conceptual framework, I discuss this change more in detail. It implies shifting from a model based on unilateral actions from governments, public society organisations or private actors, in favour of multi-stakeholder collaborations between these three categories of actors, to pool together their specific resources and expertise towards the achievement of development goals.

Chapter three is dedicated to presenting the emergence of this new paradigm of development cooperation, as well as the historical reasons that led to it, and how it is presently being implemented in the form of cross-sector collaborations. Of the latter, we will focus on the case of public-private partnerships and specifically on their application as instruments of blended finance, explaining the origins and the definitions of the concept and its potential advantages – as well as limits – compared to pure public or private development interventions.

Chapter four will present a case study of a public-private partnership established between Dutch development agency "Aqua for All", and Kenyan company "Hydroponics Africa", for the realisation of a development project in the area of Nairobi and its surroundings. After introducing the project, we will evaluate the strong points and the shortcomings of Aqua for All's approach to development cooperation in relation to the project at hand. This will be done by analysing the outcomes of interviews conducted with Hydroponics Africa's CEO, directly involved in the elaboration and implementation of the partnership, as well as the people targeted by the project, to assess its results in terms of social impact.

Table of contents

List of abbreviations

ADB	Asian Development Bank
AfDB	African Development Bank
BOP	Bottom of the pyramid
KCIC	Kenya Climate Innovation Centre
MDG	Millennium Development Goals
OBA	Output-based aid
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
PPP	Public-private partnership
SAP	Structural adjustment programmes
SDG	Sustainable development goals
SIFI	Set it and forget it
SME	Small and medium-sized enterprises
UNCDF	United Nations Capital Development Fund
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
USAID	United States Agency for International Development
WASH	Water, sanitation and hygiene
WEF	World Economic Forum
WFP	World Food Programme

I: Introduction

The goal of this work is to analyse and obtain a better understanding of a particular approach to international development cooperation, namely one that revolves around the so called "Public Private Partnerships", or PPPs. This approach sets itself apart from the "conventional" development cooperation strategies, meaning those which were introduced and adopted throughout the second half of the 20th century. These relied, for the most part, on disbursements of financial grants and technical from governments or international financial institutions (such as the World Bank and the International Monetary Fund), directly to the state coffers of the newly independent developing countries. Instead, this emerging development approach relies on PPPs to create meaningful relationships between the public and the private sector, in order to achieve to effectively achieve social goals in an economically and environmentally sustainable way.

To gain additional insights on how this approach works in practice, I have conducted a three-month research internship (January 7th - April 3rd) in Kenya for the Dutch development organisation Aqua for All, which implements this public-private approach in their programmes.

Aqua for All, is a non-profit organization established in 2002 by the Dutch government water sector[1]. Their mission is to support the implementation of projects that show the potential to deal with water-related issues, such as scarce access to clean water and to good sanitation. To reach these goals, Aqua for All focuses on offering funding and other support (mainly technical and business development) to upscale breakthrough ideas and technologies, by collaborating with local and international stakeholders such as governments, development organisations, entrepreneurs, utilities etc. They work in several African countries[2] and focus on a number of key services, namely:

- Setting up public-private partnerships that focus on water governance, by linking private sector actors, grassroots organisations, governments and service providers, while relying on the expertise of experienced enterprises and knowledge institutions (both from the Netherlands, where Aqua for All is based, and from the target countries);

- Developing business opportunities, by providing both funding and know-how to support innovative ideas and businesses in contexts which are otherwise considered economically risky for investments and which therefore do not attract sufficient resources from conventional investors (such as commercial banks or international funding institutions);

[1] Homepage of Aqua for All: https://aquaforall.org (accessed 15/04/2019).
[2] Database of Aqua for All's projects: https://aquaforall.akvoapp.org/en/projects/ (accessed 15/04/2019).

- Promoting a "hybrid" financing structure, where Aqua for All's funding is meant as a stepping stone to support the projects in their first stages of development, so that they can grow enough to attract other investors and partners to scale-up, meaning increasing the projects' reach and impact[3].

This internship allowed me to conduct hands-on research on a number of development projects carried out by Aqua for All, which were implemented in the framework of their PPP approach. My goal was to understand are the strong points of such approach, as well as its shortcomings. My aim was further to try assessing the feasibility of this "business mentality" in development cooperation (at least for the projects that I analysed), to gain a better understanding of it and possibly point out some potential points of improvement, based on the field research I conducted.

More importantly, during my research I was interested in studying the "human factor" behind this kind of development projects. By this I mean both the entrepreneurs that are developing their innovations and social businesses with the support of Aqua for All, as well as their clients, those people that should benefit from such innovative solutions.

For the first group, my purpose was to understand their goals and motivations, as well as what it means to be a small entrepreneur in Kenya, and in Nairobi in particular, by studying accounts of personal experiences from active entrepreneurs. The main factors that I set out to analyse from these experiences are matters such as the economic feasibility of developing socially impactful innovations through public-private partnerships in an emerging economy, or the hardships that an entrepreneur encounters when requesting the official authorisations to start a company.

Concerning the second group instead, I interacted with the people that have started using the innovative technologies developed by the businesses that have received support by Aqua for All. The goal here was to understand to what extent the collaboration between the firms and Aqua for All has been successful in achieving the organisation's mission of improving access to clean water and sanitation. In practice, this meant getting in contact with those who have started using the WASH[4]-related innovations developed by such social companies, and analysing what impact these products have had in their lives, and how successful were the companies in reaching out to them.

Specifically, I focused my research on one of the many projects that Aqua for All is implementing in Kenya, "Hydroponics for urban low-income groups, Kenya"[5]. The project involves a collaboration with Hydroponics Africa, a firm specialised in hydroponic farming technologies that operates in Eastern and Central Africa.

[3] Source: https://aquaforall.org/services/ (accessed 15/04/2019).
[4] WASH stands for water, sanitation and hygiene.
[5] Link to the project: https://aquaforall.akvoapp.org/en/project/4019/ (accessed 15/04/2019).

Hydroponics farming entails growing crops in a "growing medium", instead of planting them in conventional soil. This medium is the material where the roots of the plants will settle and grow, and is usually a sponge-like material made of substances such as mineral wool, perlite, vermiculite, coconut fibre, gravel, sand. Because these materials do not inherently contain any of the nutrients the plants need to grow, the media are regularly soaked in a solution of water and nutrients. This makes it also easier to control the amount and type of nutrients the plants receive, and to balance them according to need[6]. Some hydroponics systems allow for the roots to directly dangle in a body of water, where the mineral nutrients are added. Another advantage of hydroponics is that the roots of the plants can access the nutrients they need more easily than in soil, as they are directly soaked in the nutrient rich solution. This means that the plants will need a smaller root system, allowing them to divert more energy to growing the leaves and the stems. A smaller root network also means that more crops can be planted in a given area compared to a soil setup, so crops can be grown even where there is scarce availability space, such as in urban environments. In addition, hydroponics plants have been shown to grow faster and to require less use of pesticide since most pests are soil-borne, reducing the occurrence and spreading of diseases[7]. Overall, hydroponic techniques offer many systems that can improve the cost-efficiency and sustainability of farming[8].

Hydroponics Kenya specialises in manufacturing, installing and marketing a variety of fodder and vegetable cultivation systems that use hydroponics techniques, targeting small and medium farmers. Enhancing access to this kind of technology could have significant implications in terms food security, especially in urban areas, by reducing dependency from cultivations lots located far away from the cities. In the specific case of Kenya, this also has the potential to ease the problem of scarce availability of irrigation water and cultivable land, as most of the country's territory is composed of barren arid and semi-arid regions (UNDP, 2013a).

Overall, my aim was to study how this project was initially conceived and implemented, while simultaneously evaluating its socio-economic impact in connection to the issues it set out to solve. In particular, I wanted to determine whether it has reached its key objective, namely making hydroponics agriculture available to low-income groups. The other goals were evaluated as well, such as the extent to which the initiative has succeeded in reaching financial independence (meaning that products are successfully sold to private or public users and therefore that the company does not need to rely on external funding anymore) and determining its environmental sustainability in terms of resources saved and recycled materials used.

[6] Source: https://www.simplyhydro.com/whatis.htm (accessed 15/04/2019).
[7] Source: https://www.explainthatstuff.com/hydroponics.html (accessed 15/04/2019).
[8] A few examples of hydroponic systems can be found at: https://www.fullbloomhydroponics.net/hydroponic-systems-101/ (accessed 15/04/2019).

Ultimately, I would like to determine to what extent this approach to international cooperation, built around public-private partnerships that are established directly with individual or small groups of entrepreneurs, is successful in kick-starting a virtuous process of local economic development.

II: Research question

What are the main factors that define the "public-private" approach to international development cooperation adopted by Aqua for All? Which strong points and shortcomings does it present, specifically in relation to the "Hydroponics for urban low-income groups, Kenya" project?

III: Conceptual framework: a shift in the paradigm of development cooperation[9]

3.1: Historical context

Development cooperation has had a significant impact on international relations since the birth of the first development programmes in the years immediately following the end of World War II. One of the most evident examples of this is the influence these plans had on newly decolonised states during the Cold War, as their alliance ties were for the most part decided on the basis of which of the two sides was transferring them the most development aid. With the Cold War coming to an end, this strategy of buying loyalty with financial grants could not be justified anymore. Indeed, it had become evident that instead of being a stepping stone, development aid rather exacerbated the political and economic dependency link between the so-called "third world countries" and the "rich north".

The prevalence of *laissez-faire* economic policies in western societies during the '80s further worsened the situation, as development assistance shifted towards conditional aid and structural adjustment programmes (SAPs), which required that the receiving countries adopted free-market policies in order to receive development grants (Carrino, 2016). Therefore, a strong emphasis on fiscal balance and price stability prevailed in international economic policies, which focused on economic stabilization and market liberalisation at the expenses of Keynesians approaches based on

[9] Some parts of these sections are taken from the final thesis that I wrote for my previous master programme in "International Relations and European Studies", at the "*Scuola di Scienze Politiche, Cesare Alfieri*" in Florence, Italy. The title of the thesis is "International cooperation between local governments and communities: a case study on the Oasis of Loiyangalani in Kenya", and was submitted on 12/11/2018. For transparency reasons, in this section I have mentioned the same publications and authors to which I referred to in that thesis.

real economic activity. The mantra was: reaching low inflation rates, reducing budget deficits, and cutting social expenditures and public investments in infrastructure. Ultimately, these austerity policies had a negative effect in several contexts where they were applied on growth, wealth distribution investments and employment, and worsened social services like health and education (UNDP, 2013b).

The most critical flaw that is attributed to the system of international development cooperation, in the way it has been traditionally structured during the second half of the 20the century, is the top-down approach that has often been adopted in the elaboration and implementation of development aid plans. This refers to the fact that these strategies, which should allegedly support the receiving countries in their quest to escape "under-development" are conceived in contexts which are often greatly distant and different from those where they will be applied, in terms of geographical, economic, cultural, social and political differences. This top-down approach can result in plans which are destined to fail right from their drafting stage, as they are not correctly tailored to the recipient countries (Cereghini & Nardelli, 2008).

This has raised the challenge of how to gradually shift from a paradigm of development cooperation according to which aid is disbursed indiscriminately (with the risk of creating serious dependency ties), to one based on international partnerships where local stakeholders are equally involved in the development process. Such development programs, by focusing on capacity building, empowerment of civil society organisations and promotion of private sector initiatives (and specifically on local entrepreneurship and promotion of innovations), are one of the solutions that have been proposed to counter the previously mentioned issues. The main challenge is how to implement new ways of using development cooperation resources and private financial flows, while simultaneously enhancing the mobilisation of domestic resources in order to gradually reduce dependency from foreign inflows of aid (AfDB/OECD/UNDP, 2017b). This concept of revitalising development cooperation on the basis of a combination public and private investments has been reiterated in several international agreements, such as the Addis Ababa Action Agenda[10] and the 2030 Agenda for Sustainable Development[11].

3.2: The "new" approach to development cooperation

The newly emerging concept of "inclusive business" is an example of this revised approach to development. It refers to business strategies that do not limit themselves to solely generating financial returns, but take into account societal and environmental factors (Lashitew & van Tulder, 2017).

[10] Available at: https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf (accessed 21/04/2019).
[11] Available at: https://sustainabledevelopment.un.org/post2015/transformingourworld (accessed 21/04/2019).

In this framework, "development" is not only seen as sterile increase of economic indicators caused by a never-ending transfer of aid. It is instead centred around enhancing the social and economic competitiveness that result from the specific advantages of each territory. This entails for example that priority should be given to locally obtainable raw materials and resources, to processing them *in loco* (instead of exporting them), and to using local (and sustainable, when possible) energy sources. Similarly, productive systems should bring the most benefits to domestic communities, in terms of job numbers and stability, import substitution, social investments etc. The territory is therefore reinterpreted as a multidimensional resource, which reflects the interdependence between environmental, economic, social and cultural factors. The role of local communities here is to appropriately channel such wealth, generating development paths that are better tailored to their needs, by promoting exchanges between universities, research institutes, entrepreneurs, development agencies etc. to bring out the potential of every setting. This bottom-up paradigm of development has the potential to address the aforementioned shortcomings inherent in the structure of development cooperation, namely the failure to help building sustainable and inclusive growth (Boisier S., 2008). In the specific case that I will be studying, this approach is applied to deal with pressing water-related needs, by relying on local entrepreneurs and their capacity to propose innovative solutions on the basis of their knowledge and involvement in the contexts where they directly operate.

3.3: Implementation of the new paradigm: cross-sector partnerships

As previously mentioned in paragraph 3.1, the late 20th century has seen a rise of debates on the real effectiveness of development cooperation programmes, at least in the way they were conceived and implemented starting from the first post-WWII decades. It became increasingly evident that sheer transferrals of grants and technical aid is not enough to ensure long-term and systematic improvements, in spite of the colossal amounts of resources dedicated to such projects[12]. The main outcome of these discussions was that to improve the effectiveness of these resources, it is pivotal that the programming and implementation phases of the projects involve a broader spectrum of stakeholders, namely those from civil society (specifically NGOs and non-profit organisations) and the private sector (De Los Ríos-Carmenado, Ortuño, & Rivera, 2016).

Advocates of this "new structure" of development cooperation propose that innovative partnerships are created between these three macro-groups of actors (governments/international organisations/development agencies, civil society organisations and private sector), with the aim of

[12] Official data on development aid distribution can be consulted at: https://tinyurl.com/y23hy5tg , or https://tinyurl.com/y59v2wqw (accessed 23/04/2019).

sharing resources, knowledge and capabilities in the common pursuit of both economic and social goals.

The synergies that can potentially sprout from such collaborations are specifically meant to improve the three conventional models of unilateral intervention in development, namely cooperation programmes conducted exclusively by governments, by private companies or by civil society. Indeed, unilateral action in this sense can potentially generate three "failures", respectively:

- "governance failure", referring to the main flaw that has been attributed to the conventional model of international development cooperation programmes, that of being conceptually and practically detached from and oblivious of the defining characteristics of the contexts where they were applied. This faulty mechanism can lead to the so-called "aid curse", the phenomenon where recipient countries end up becoming dependent from foreign development aid, which is not used as a tool to deal with structural problems but instead considered as regular budget income;
- "market failure", where private companies lack the incentive to act "ethically", outside of a strictly commercial framework, to address social issues;
- "good intentions" of non-profit organisations, which instead adopt a bottom-up approach in development cooperation, but often lack the means to efficiently and effectively implement such ideas (Kolk, Van Tulder, & Kostwinder, 2008).

To counter these failures, development cooperation interventions are increasingly relying on and incentivising multi-actor initiatives, instead of unilateral ones. Such collaborative efforts have been given the name of "cross-sector development partnerships", and defined as "commitments between and among public, private, and non-profit institutions (any combination), in which individuals from partner organizations commit various resources and agree to work cooperatively toward common development goals" (Kindornay, Tissot, & Sheiban, 2014, p. 4). Another tentative definition comes from Waddock (1991, pp. 481-482), which summarises cross-sector social partnerships as: "the voluntary collaborative efforts of actors from organizations in two or more economic sectors in a forum in which they cooperatively attempt to solve a problem or issue of mutual concern that is in some way identified with a public policy agenda item".

They can be classified in four broad categories: business/non-profit, business/public actor (government or international organisation), public actor/non-profit, and lastly tri-sector collaborations, which bring together each of these three subjects. It must be noted that in reality it is not always easy to classify each project under one model or the other, as there are no strictly defined boundaries between them, and agreements can be modified throughout the life-span of an

intervention. Cross-sector social partnerships can be created to address challenges in several sectors, such as economic development, health care, poverty alleviation, education, community capacity building and environmental sustainability (Selsky & Parker, 2005). The "indivisible" nature of such issues, which often tend to overlap between themselves, renders them much more complex to deal with by a single organisation, requiring instead a joint action (Waddock, 1991).

For example, recent years have seen an increase in private companies that pursue specific social causes, in addition to their economic goals. Similarly, non-profit organisations are reaching out to private actors to improve and extend the resources and tools at their disposal. These collaborations, which have been renamed "social alliances", can become long-term, mutually beneficial partnerships, where the parties involved share resources to reach both economic and non-economic objectives (which generally involve improving welfare and well-being in a specific context) (Lagarde, Berger, Cunningham, & Drumwright, 1999). As pointed out by van Tulder and Pfisterer (2008), the resources pooled for such partnerships are not limited to financial and material ones. For example, non-profit organisations benefit from the companies' wider network of technical, management and marketing expertise, as well as increased visibility for their campaigns and activities. In turn, private actors gain access to the non-profit's specialised knowledge of a context and of its challenges, as well as getting in contact and interacting with local stakeholders and hearing their needs, while improving their credibility and legitimacy. When this collaboration is successfully put in action, the non-profit organisation is able to expand and improve its work, and the company adapts and tailors the services they provide to meet the same social goals through its commercial activities (Kolk et al., 2008).

Nonetheless, it must be noted that while this type of collaboration is increasingly gaining attention in researches and policy making concerning development cooperation, its real-life applications are still limited. The challenge of establishing a successful partnership between civil society organisations and private firms (and also governmental agencies), especially for development interventions, stems from the fact these bodies are often markedly different in terms of internal structure and organisation, goals, operational and decisional processes, approaches etc. In circumstances where these differences are exacerbated, the frictions they create between the participants to the partnership can become unsurmountable, and one (or more) of the parties might end up leaving (Hahn & Gold, 2014). In addition, Ashman (2001) highlights how in this type of partnerships private actors can sometimes tend to become the stronger partner, in virtue of the fact that they generally dispose of more resources compared to their civil society counterparts.

3.4: Public-Private Partnerships

In the previous paragraph we have explained how cross-sector partnerships can assume four "forms", notwithstanding the fact that the boundaries between one model or the other are often times opaque

and therefore hard to define. For the purpose of this work we will focus on the case of partnerships between public (national and international) actors and private ones, the so-called "public-private partnerships" (or PPPs), as the case study that will be presented in the second half of the dissertation fits best under this category. After presenting a brief outline of the origins, definition and applications of such concept, we will discuss the implications of its increasing application in international development cooperation frameworks.

3.4.1: Origins and definition of the concept

The term "public-private partnership" was first elaborated and used during the 1970s, during the wave of neo-liberalism that swept Europe and the US in particular. This decade and the following one saw a rise of criticisms towards Keynesian economics of active government participation in economic matters. Indeed, inadequate State-led economic interventions were increasingly believed to be the main reason for the suffering economic scenarios and weak growth (Okun, 1975). The immediate consequence of this was a strong promotion of the privatisation of enterprises and services owned and managed by the State, which were criticised for being inefficient and heavily burdened by an excessive amount of bureaucratic red-tape, or to at least contract out such services to private actors. During this time, PPPs were established for the most part to undertake construction projects and requalification of urban areas. Later, during the 1980s, the concept was further developed in the UK, as a way to direct private capital to public ends and finance infrastructure expansion without incurring in an excessive rise of public debt (Kwame Sundaram, Chowdhury, Sharma, & Platz, 2016).

Since the concept of PPPs itself is quite generic, and finds new connotations and characteristics depending on the legislative asset in which it is implemented[13], it is not possible to give a single, uniform definition of it. Nonetheless, it is possible to point out a number of key features that are common to most PPPs. According to Yescombe (2007, p. 3) these are:

- "a long-term contract (a 'PPP Contract') between a public-sector party and a private-sector party;
- For the design, construction, financing, and operation of public infrastructure (the 'Facility') by the private-sector party;
- With payments over the life of the PPP Contract to the private-sector party for the use of the Facility, made either by the public-sector party or by the general public users of the facility; and

[13] For additional details and examples of PPP laws and regulations in place, please refer to: https://ppp.worldbank.org/public-private-partnership/legislation-regulation/laws/ppp-and-concession-laws(accessed 04/05/2019).

- With the Facility remaining in public-sector ownership, or reverting to public-sector ownership at the end of the PPP Contract."

Here the public-sector party is either the central government of a country, or one of its decentralised administrative bodies (federate States, regional governments, provincial or municipal administrations and in general any public agency or entity) (Yescombe, 2007).

Another tentative definition of PPPs comes from the World Bank (2014, p. 18) which summarises the concept as "A long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility and remuneration is linked to performance".

These broad definitions encompass a great variety of potential agreements, which can vary depending on the characteristics of the partnerships themselves. These are the main elements that can vary from one contract to the other:

- Type of asset: the partnership can either be established to finance the creation and management of brand-new public infrastructure and services, or to transfer from the public to the private sector the responsibility of upgrading and managing existing assets;
- Which functions are assigned to whom: this defines which competences are transferred to the private actor(s) and those that remain to public ones. The phases of the project that are generally "contracted out" are: design, building and/or rehabilitation, financing, maintaining, and operating;
- Payment mechanism: whether the private party involved in the PPP gets its revenues from fees collected from the users of the service, from the government, or a combination of the two.

Focusing on the last point, it is important to note that while the source of income is different between the two types of payment mechanism, they both share a common, fundamental characteristic, that of being contingent on performance. In the first case the private actor charges the users a fee to benefit from the service it is providing, based on its utilisation. These tariffs can be subsidised by the government, usually for social purposes such as ensuring greater accessibility to the service for lower-income groups. Similarly, in the case the government provides output-based payments to the private actor for it to provide the service/asset, so that the users do not incur in tolls (ADB, 2014).

In summary, in a logic of cooperation and mutual benefit, PPPs are set out to reach specific social and commercial goals through the pooling of resources and competences, by sharing between public and private actors the costs, risks and profits of providing public goods, where the latter take on the

role of providers of certain services that are conventionally managed by public utilities and bodies, with the consent and the support of the government itself (McQuaid, 2000).

3.4.2: The added value

There are several reasons why this model can be preferable to an entirely public management of utilities and infrastructure. To understand why this is the case, it is first useful to focus our attention on the concept of public goods and on how this applies to utilities and infrastructure. Indeed, these usually take the form of what economists call "public goods" (or at least of quasi-public goods). Public goods are goods that are non-rivalrous (their consumption by one person does not exclude others from doing the same), and non-excludable (nobody can be excluded from benefitting from them). The classic example of a public good is a dyke: the fact that one person benefits from its protection against floods does not reduce the same benefit for others, and at the same time it is not possible to exclude someone from benefitting from such protection. In reality, very few goods can be classified as purely "public". Indeed, in most cases their consumption is indeed rivalrous, but nonetheless non-excludable (especially when dealing public infrastructure such as roads, sewages, etc). This can lead to a situation of "free-riding", meaning that the goods are not only consumed by those that have contributed to their realisation, but also by those who haven't, since it is generally difficult to exclude people from benefitting from these kinds of goods. Ultimately, this means that public and quasi-public goods are usually managed and provided by governmental bodies, which can control free-riding behaviours through systems such as taxation. Also, the provision of these goods often implies extremely high initial capital costs, especially for infrastructure, which again explains why they are generally considered a competence of governments (Bouma & Berkhout, 2015).

Notwithstanding this reasoning, this purely public model can present a number of shortcomings. First of all, public utilities may not always have the necessary funds required to provide their services and/or reach certain areas of a country certain segments of its population, due to the scale of investments needed to cover the entirety of the demand. This problem is particularly felt in developing countries. For example, the World Bank (Briceno-Garmendia & Foster, 2009) has estimated that to reach its infrastructure needs (in terms of electricity generation, land, water and air connections, WASH, internet and phone access etc.), the aggregate expenditure for the countries in the African continent will be of about US$93 billion a year. At the time of the publication of the estimate, the existing spending on infrastructure in Africa amounted to around US$45 billion a year (including government budget spending, user fees and external financiers such as the private sector and official

development assistance[14]), leading to a gap of US$ 48 billion in infrastructure funding. Lack of sufficient funds to carry out investments in infrastructure is among the most common motivations for governments to resort to PPPs, as these agreements have the potential to increase the budget available for such investments (ADB, 2014).

Another shortcoming is inefficient management of funds by public administrations. Taking again into consideration the case of African economies, it has been estimated (Briceno-Garmendia, Smits, & Foster, 2009) that out of the total capital allocated for infrastructure needs, in the end several countries manage to successfully spend only one third of what had been initially budgeted. While there are significant differences between the countries in this regard (for example, Benin showed the lowest budget execution rate at 28%, whereas Madagascar, which had the highest, scored an 80%), the average for the whole continent sat at about 66%. This results in a colossal waste of resources, which as we have seen are already scarce. The main responsible of this are weak planning of expenditures (when benefits are over-estimated and costs are under-estimated), poor project preparation and selection, corruption, delayed public procurements etc. In the framework of a PPP, there is a higher number of stakeholders whose financial returns depend on the outcome of the project. This means that every party involved, both from the public or private sector, will contribute with their own cost/benefit analysis, which when put together will ultimately help in selecting the projects that are expected to be the most successful and profitable.

The third problem stems from the fact that a centralised public administration and provision of public goods makes it more challenging to correctly represent local interests and effectively target local issues, particularly when dealing with poorer contexts (Bouma & Berkhout, 2015). One example of this is the management and provision of WASH services in developing countries. While these services are indisputably considered as basic human rights, they are still today out of reach for a consistent share of the world's population, with severe implications on health and welfare. In Kenya, for example, as of 2015 only about 30% of the population had access to proper sanitation facilities, and the figure lowers to only about 14% for basic hygiene. In addition, the data show that these numbers are considerably lower for rural areas, as they generally tend to be even less accessible for the provision of these services from the central utilities[15]. In addition to the negative health consequences, this emergency has a disastrous impact on the economic growth and human development of the

[14] Official development assistance, or ODA, is defined by Development Assistance Committee (DAC) of the Organisation for Economic Cooperation and Development (OECD) as: "government aid that promotes and specifically targets the economic development and welfare of developing countries". Note: military aid, including most peacekeeping related expenses and non-civilian use of nuclear energy, are excluded. Source: http://www.oecd.org/dac/stats/What-is-ODA.pdf (accessed 08/05/2019).

[15] Source: https://washdata.org/data/household#!/ken (accessed 08/05/2019).

countries where access WASH is neglected the most, especially in terms of access to education (Sanctuary, Haller, & Tropp, 2005). At the very basic, water and sanitation related diseases severely hinder the time that people can dedicate to both educational and economically productive activities, ultimately hindering the short- and long-term evolution of a country (Sachs, 2001). Similar considerations can be made in relation to other types of infrastructure, such as access to adequate transport systems and routes, or to proper buildings for education.

On the contrary, PPPs have the potential to better represent local interests and therefore tackle issues specific to each scenario. This is of crucial importance in contexts where central governments tend to have poor reach and influence, as in the case of WASH services in rural areas in Kenya. By opening up to local stakeholders, such as private actors and civil society organisations, such partnerships, and especially those concerning development cooperation, will improve in effectiveness. The reason for this is the added context-specific information and expertise that can be gained by such open collaborations, which can contribute to developing breakthrough technologies and innovative solutions that are tailored for each context (Bouma & Berkhout, 2015).

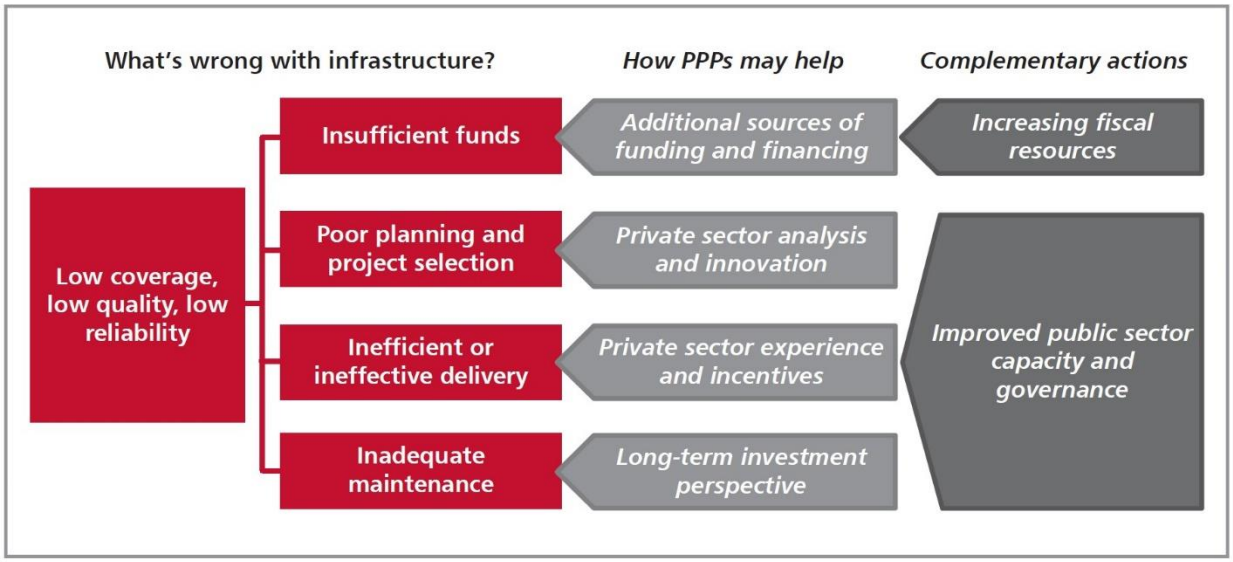

Fig. 1: What's wrong with infrastructure and how PPPs can help (ADB, 2014).

In terms of successful examples of performance-based maintenance contracts, two cases worth mentioning are those of Chad and Argentina. Both countries suffer from diffused weak road maintenance, mostly due to financial constraints and poorly designed maintenance contracts established with private actors. In the early 2000s they switched to output-based agreements,

according to which the private contractors only receive payments upon proper completion of the task. Thanks to these new contracts the two governments have been able to improve road maintenance and ensure that it meets specific pre-established standards. For example, in terms of cost effectiveness, a reduction of almost 30% in capital expenditure has been estimated in the case of Argentina, in comparison with previous arrangements. For the case of Chad, while no cost-saving assessments have been made yet, the output-based payment scheme and the mechanisms set in place to monitor the contractor's compliance have ensured that the private party is pressured to consistently meet the quality standards required by the government (Hartwig, Mumssen, & Schliessler, 2005; Liautaud, 2001).

In summary, the potential advantages of establishing PPPs in the provision of infrastructure include:

- Promotion of innovation. Since PPP contracts focus on specific targets that are required to be met, private investors bidding for the public procurement will be incentivised to compete between themselves and therefore to develop innovative proposals and solutions;
- Pooling of resources from multiple sources to sustain the projects and provision of additional financing solutions in alternative to solely relying on public funding;
- Accountability of the private party towards the public actor, as government payments are usually tied to a number of contractual conditions such as quality, quantity and timeframe of the outputs. This means that if the private party does not meet such performance requirements, the public party may suspend its payments (ADB, 2014).

3.5: Financing development through PPPs: the concept of blended finance

In the previous sections we have summarised the concept of PPPs and its applications, and described how these agreements have a strong potential to enhance the provision of public services and infrastructures that are crucial for human development and well-being. Indeed, as we have already hinted at with the example of WASH utilities, the quality of infrastructure and services in a country is closely linked to the quality of life of its population, in terms of medical treatment, educational facilities, decent working environment, travelling etc. The social importance of such assets is one of the main reasons why governments can decide to resort to PPPs and output-based contracts.

In addition to being an increasingly adopted instrument of national policy-making, in recent years PPPs have also been increasingly implemented in international development cooperation programmes. Similarly to the other forms of social cross-sector partnerships, in recent years public-private partnerships have been introduced in development cooperation policies in a number of

countries, most notably Germany, Denmark and The Netherlands (although at a global level these are still isolated examples) (Kolk et al., 2008).

The growing inclusion of PPPs in development cooperation, and generally the increasing reliance on actors from the private sector, is in line with the shift in development cooperation paradigm that we have previously outlined, from unilateral actions by national and international development agencies to a multi-stakeholder, cross-sector approach. This change seems to be all the most important when considering the issue of how to find the funds to successfully meet the global development challenges, such as those listed in the Millennium Development Goals (MDGs) and later in the Sustainable Development Goals (SDGs)[16].

Indeed, it has become increasingly evident that public budgets and ODA flows alone cannot provide the gargantuan amount of resources that are needed to deal with all the challenges posed by SDG-relevant sectors, especially in vulnerable economies and fragile states. According to United Nations (2014) estimates, the public finances of developing countries are missing annually about $2.5 trillion to achieve the SDGs. The growing international consensus is that in order to fill this gap, private sector investments will have to be incentivised alongside public ones, particularly in the sectors of public service provision and infrastructure.

This new framework of financing for development has been renamed "blended finance". This concept does not have a single definition, as its features can vary significantly according to the context where it is applied. The most widely accepted definition is that of the OECD (2018b, p. 4), according to which blended finance is "the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries". For the purpose of this definition, "additional finance" refers primarily to financial resources coming from the commercial sector which are not currently being directed towards development-related investments.

On a wider scope, blended finance refers to financing tools, including PPPs, that present three defining characteristics: they rely on public development funds to channel private financing ("leverage") to pursue social, environmental and economic goals ("impact") while sharing the risks of such ventures and providing risk-adjusted financial returns[17] to the private investors in line with

[16] The MDGs were a set of development goals established by the United Nations, to be achieved by the year 2015. They included, among others, the eradication of hunger and poverty, promotion of gender equality and empowerment of women, promotion of environmental sustainability policies etc. In 2015, the importance of reaching said goals was reiterated (for the year 2030) and their collection was extended to 17, to include more specific target sectors such as education, WASH, decent work etc. Homepage of the MDGs: https://www.un.org/millenniumgoals/ , homepage of the SDGs: https://www.un.org/sustainabledevelopment/ (accessed 14/05/2019).

[17] Risk-adjusted return is defined as "how much return your investment has made relative to the amount of risk the investment has taken over a given period of time". It is and indicator used to compare the returns of two potential

market expectations ("returns"). The name comes from the idea that "blending" the different intents and resources of an array of stakeholders (development agencies, investors etc.) will help each of them in achieving their goals (commercial, financial, social etc.), compared to a situation where each of them acts alone. (OECD & WEF, 2015).

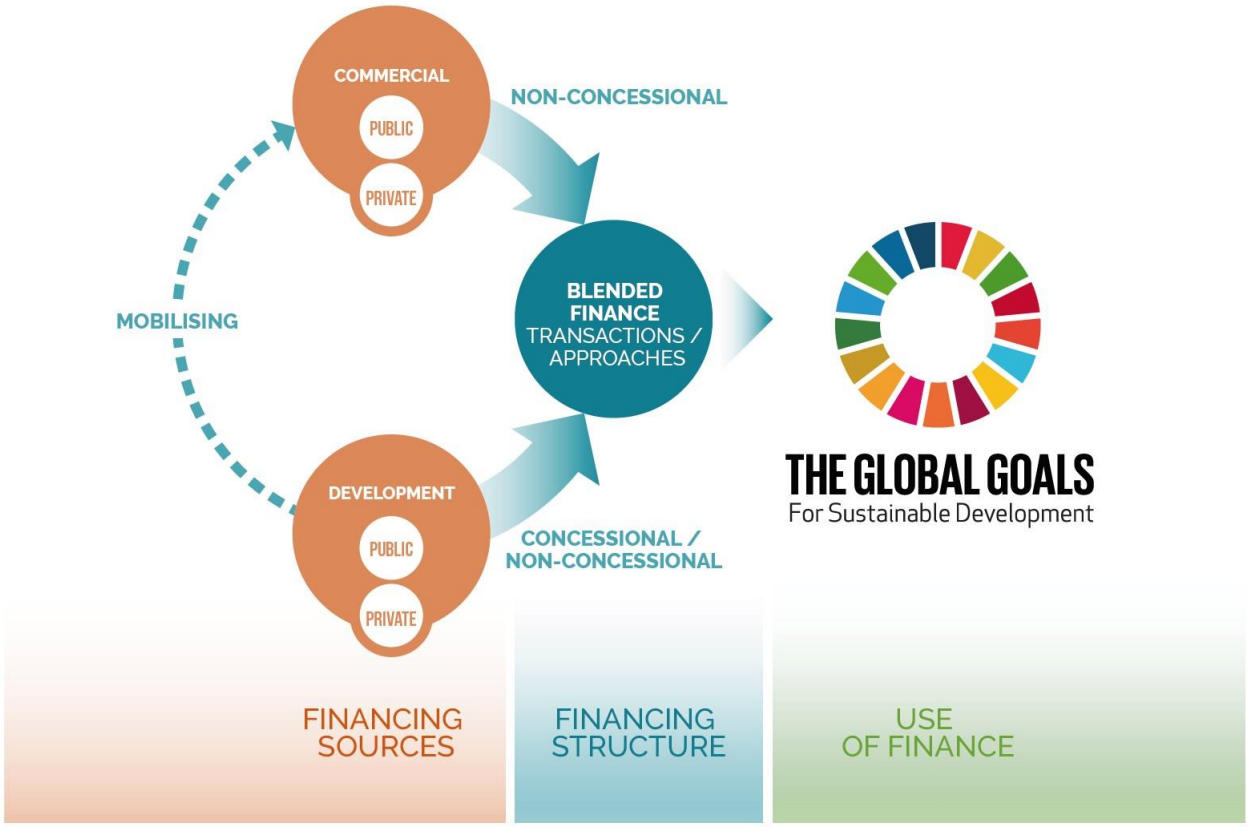

Fig. 2: The blended finance approach (OECD, 2018a).

3.5.1: International recognition of the concept

The concept of blended finance and mobilisation of private financing through PPPs for development has been also been recognised in international fora, particularly in conjunction with the demand of improved action to achieve the MDGs and the SDGs. For example, the Monterrey Consensus, which was the outcome agreement of the United Nations International Conference on Financing for Development held in the Mexican city of Monterrey in 2002, specifically addressed the issue of how to finance development programmes. It states that new partnerships will need to be established to

investments while also taking into account the risk factor of said investment. If two or more investments have the same return over a given time period, the one that has the lowest risk will have the better risk-adjusted return. Source: https://www.investopedia.com/terms/r/riskadjustedreturn.asp (accessed 14/05/2019).

mobilise (both at an international and national level) the resources needed to tackle global and local challenges. In this sense, what is recommended in the document is a "holistic approach to the interconnected national, international and systemic challenges of financing for development […] to ensure that resources are created and used effectively and that strong, accountable institutions are established at all levels.", by relying on a "collective and coherent action […] in each interrelated area of our agenda, involving all stakeholders in active partnership." (UN, 2003, p. 6). The document lists numerous sectors that should be improved to implement such approach, such as foreign direct investments, aid-to-trade programmes, microfinancing for small and medium enterprises and PPPs, the latter mentioned as a tool to enhance domestic financial markets.

The United Nations World Summit on Sustainable Development, also held in 2002 but in Johannesburg, reiterated the importance of PPPs as instruments to deal with the development challenges that are listed by the MDGs and SDGs. Similarly to the Monterrey Consensus, the agreement signed at the Johannesburg Summit mentions how multi-stakeholder approaches, and specifically agreements between public and private parties, can improve the effectiveness of development interventions by increasing the accountability of both sides for the results that are to be achieved (UN, 2002).

It is also significant that the importance of multi-stakeholder and cross-sector partnerships has been enshrined in the SDGs themselves, as goal number 17 urges governments, international organisations, development agencies, business sector, NGOs, civil society actors etc. to jointly collaborate to achieve the other 16 objectives. Again, the logic here is that such collaborative efforts have an added value, a "collaborative advantage", compared to the mere sum of the inputs that each single actor can bring when acting alone (Stibbe, Reid, & Gilbert, 2018).

Concerning the concept of blended finance in particular, a landmark endorsement is represented by the Addis Ababa Action Agenda, which was agreed upon during the United Nations Third International Conference on Financing for Development held in 2015. The conference was held as follow up of the 2002 Monterrey meeting, and the resulting agenda reinforces the commitments made during that event in relation to mobilising additional resources and actors for development. Specifically, the Addis Ababa Agenda reiterates the role that private investments can have in development funding through mechanisms of blended finance such as public-private partnerships, by combining concessional and non-concessional public funds with non-concessional private finance, as well as expertise from both the public and private sector, risk mitigation instruments and pooled funding structures. In addition, considerable importance is given to establishing a common regulatory framework for blended finance instruments (in terms of planning, contract negotiation, management,

budgeting etc.), to ensure both their effectiveness in reaching their objectives and fairness towards the actors involved. This refers in particular to fair sharing of risks and rewards, accountability, transparency, respect of environmental standards, inclusiveness etc (UN, 2015).

3.5.2: Purpose of blended finance

Blended finance is meant to mobilise financial resources that would otherwise remain untapped and allocate them in programmes and investments with impact on development. What defines blended finance is its purpose, rather than its source, as it is deployed by both public and private actors. In addition, financing does not have to necessarily be concessional (at lower than market interest rates) to be classified as "blended". The main investees that are targeted with such funds are generally:

- companies that provide services with a social impact, for which the initial finance surge is used to help the company upscale and therefore attract further funding;
- large-scale development projects that are too resource-intensive to be funded and realised by a single sponsor (OECD, 2018a).

In this sense, PPPs in SDGs-related sectors are classified as blended finance, as they bring together public development agencies and private actors for the provision of certain services and infrastructure that are usually under the responsibility of the public sector, under an agreed funding model. As explained in para. 3.4.2, PPPs can have several advantages compared to a purely public provision of services, most notably in terms of effectiveness, efficiency, innovation and inclusiveness of stakeholders. In addition, as an instrument of blended finance PPPs can help bridge the financial gap of resources that are needed to achieve the 17 SDGs.

One way in which this can be done is by focusing on socially-impactful entrepreneurial activities in developing countries, by using blended finance and PPPs to promote and scale what is called the "missing middle". This expression is used to indicate how in several developing countries the private sector is for the most part divided between micro or informal commercial activities and large or even multinational companies. It is defined "missing" because the small-medium enterprises (SMEs) that compose the "middle" section in between the other two are greatly underdeveloped and underfinanced. Indeed, these businesses face the problem of being too big to apply for funding at microfinancing institutions, while at the same time they are deemed to be too small or risky to be awarded commercial loans from mainstream banks or development financial institutions (UNCDF, 2018). Therefore, these businesses end up not having access to funds to scale up to self-sustaining medium-sized enterprises. It has been estimated (Alibhai, Bell, & Conner, 2017) that in emerging markets the share of unserved or underserved formal SMEs oscillates between 55 to 68 percent,

although they provide for the most jobs in said markets (between seven out of ten and nine out of ten jobs in some low income countries). There is a considerable untapped potential in these SMEs, and mobilising additional resources and supporting this "missing middle" through tools of blended finance could be a key manoeuvre towards the achievement of development goals such as the SDGs. Indeed, in addition to generating employment, a competitive SME sector can promote innovation, help diversifying local economies and deliver services in regions and to sections of the population that are often neglected.

3.5.3: Limits

It must be noted that there are a number of challenges that can stand in the way of the previously described model of private financing for development. In addition to the ones presented in fig. 4, two others in particular are worth mentioning.

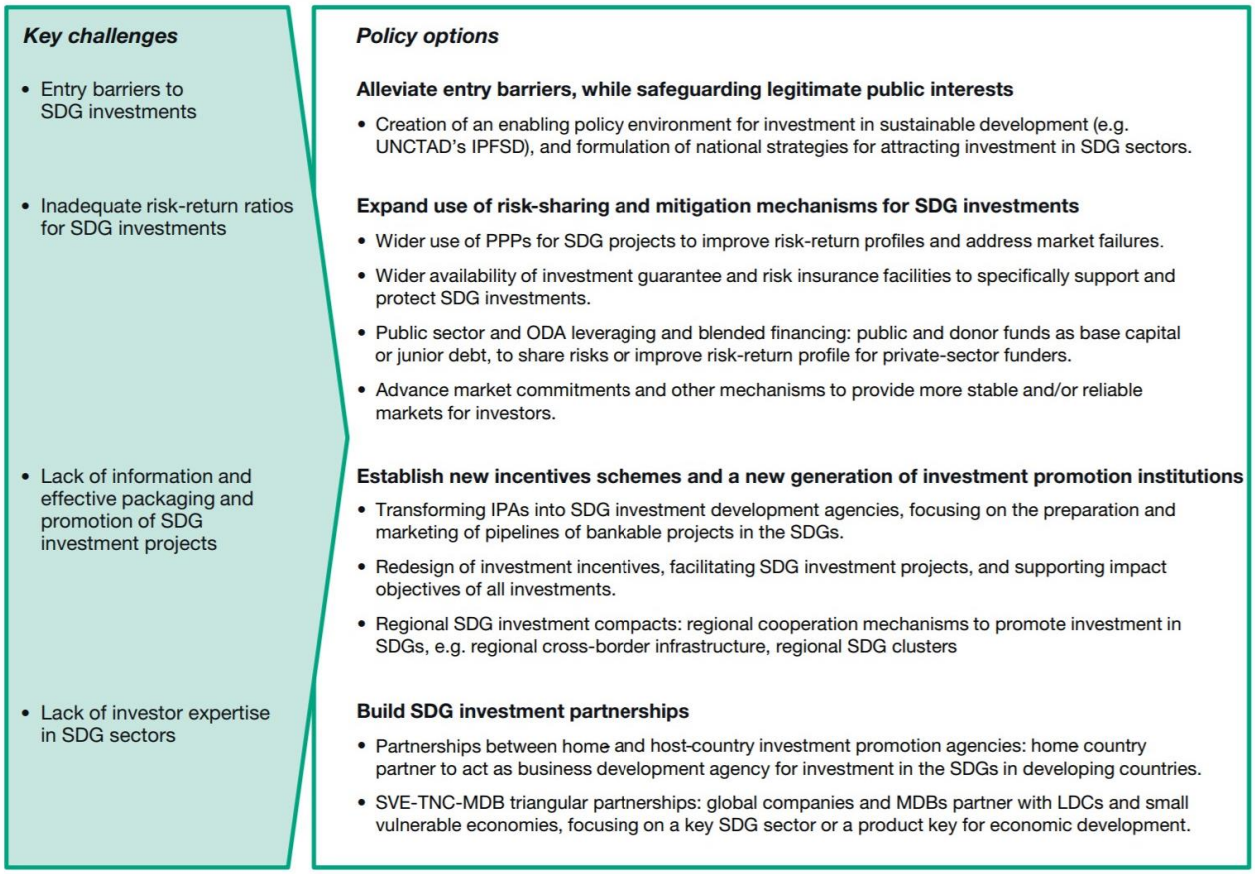

Fig. 3: Key challenges and policy options in channelling investment into SDG sectors (UNCTAD, 2014).

First of all, it is important that when PPPs are established for development cooperation, the "public" half of the agreement is not overshadowed by the "private" one. This means that appropriate regulations should be put in place so that the social objective(s) that are to be achieved through this

collaboration, whether they be improving access to proper sanitation or expanding the medical coverage of a rural area, are not neglected in favour or economic gains. One way to achieve this is through the so-called output-based aid (OBA). Under these contracts, which fall under the broader category of result-based financing, the provider of a service bares the performance risk of its activities, since it is only paid once a certain development outcome or impact is achieved (vaccinations for a certain number of people, instalment of a set amount of water kiosks or sanitation units etc.). To make sure that said contracts are still economically feasible for contractors to be willing to satisfy as much as possible the demand for these socially impactful services, and improve their affordability, OBA generally include subsidies that cover a portion of their cost for potential users (Mumssen, Johannes, & Kumar, 2010).

Secondly, PPPs should be designed in a way that promotes a development model that is not merely economic but culturally, socially and politically tailored to the specificities of each scenario. In this sense, it has been argued that governments should adopt a "decentralised" approach towards PPPs, meaning they should prioritise agreements that promote local solutions by involving sub-national stakeholders and directly addressing their needs. This model should reduce the risk of approving development projects that are thought to be efficient and sustainable in the long-run, but instead turn out to be excessively costly during the implementation phase, often times in terms of high maintenance costs (UNECE, 2018).

IV. Case Study: The partnership between Aqua for All and Hydroponics Africa

4.1: Introduction

In the previous chapter we have discussed the recent shifts in the leading paradigms of international development cooperation, and the emergence of new conceptual frameworks that advocate for a greater inclusiveness of stakeholders. In addition, we have presented the potentialities of cross-sector partnerships, and especially those between public and private actors, in contributing to the realisation of socially impactful interventions. Specifically, we have argued that models of blended finance – such as public-private partnerships – can be used to pool additional and previously untapped financial and technical resources to tackle development-related challenges in an efficient and economically sustainable way.

The internship I conducted in Kenya for Aqua for All gave me the chance to analyse a real-life application of this approach to development cooperation. Indeed, during my time there I researched a number of the projects that the organisation has supported in the country. Aqua for All's approach to tackling WASH-related challenges in developing countries can be classified as blended finance, and its collaborations with local entrepreneurs and businesses as quasi-PPPs. Indeed, Aqua for All's *modus operandi* is not to act as a public development agency that indiscriminately hands out grants, but instead to focus on empowering and boosting private-sector initiatives that show the potential to implement innovative, economically self-sustaining and socially impactful projects. The organisation does this by scouting for entrepreneurs or established companies that are developing innovative solutions and breakthrough technologies in WASH, and providing them with funding and technical support (mostly in the form of business training) so that they can successfully implement these ideas.

In particular, Aqua for All supports specific private initiatives in light of their potential social utility, even when they might be deemed too risky to invest in and economically "unattractive" by commercial investment companies. Nonetheless, this partnership is only meant as a "kick-start" and not as a long-term continuous funding, meaning that these companies should use Aqua for All's support to develop a successful business model that allows them to become financially self-sustaining, while also further developing and extending the reach and the social impact of their innovations. In this sense, the partnerships established by Aqua for All have the potential to unlock untapped resources and capacities from the private sector, and to "blend" them with those of Aqua for All, with the ultimate goal of financing and enabling firms that can provide products and services which would be otherwise missing, or perhaps solely concentrated in limited geographical area.

Although I studied several projects during the internship, the "Hydroponics for Urban Low-Income Groups" was the one at the most advanced state, and had in fact already been formally completed, which is why I decided to focus on it for my thesis research. The following sections will be dedicated to describing the project itself, analysing the collaboration that was established between Aqua for All and the Hydroponics Africa company for the development of the project, and finally trying to assess its results in terms of social impact.

4.2: Research methodology

For the research I relied for the most part on interviews and direct observations. The first interview I conducted was with Peter Chege, the entrepreneur that initiated and developed a company called "Hydroponics Africa" in collaboration with Aqua for All. Afterwards, I interviewed the people that had bought the hydroponic farms sold by Hydroponics Africa, to analyse the results achieved by the project and especially if using the services provided by the company has had a positive impact in their

lives. In addition, I tried to understand if information about this new technique is sufficiently diffused and what reactions and feedback it receives, in terms of effectiveness, sustainability and replicability. Regarding the methodology that I used to conduct such interviews, I adopted a semi-structured model, meaning that I combined elements from both the structured and unstructured methods of interviewing in a way that suited best for my research (Alshenqeeti, 2014).

I adopted a structured approach in the sense that prior to the talks I elaborated two sets of questions to be asked to each of the interviewees, depending on whether I was discussing with those from Hydroponics Africa, or with the farmers that are using their products.

Nonetheless, I also adopted a semi-structured approach as I maintained a certain degree of flexibility during the interviews. Indeed, even though I had previously decided which topics I wanted to cover and which questions to ask, I left some freedom to the person(s) I was interviewing to go beyond the fixed set of questions that I had prepared. This was particularly useful when interviewing the people using Hydroponic Africa's products, which were conducted in settings that were much more informal compared to the interviews with Peter, and during which the interviewees tended to digress more often. To deal with this challenge I took inspiration from Berg (2007), and resorted to using a checklist of main research questions I wanted to tackle during each interview, in order to avoid going astray from the central goal of the research, while also allowing for some additional space to discuss other relevant topics.

I also extensively relied on participatory observation when gathering data for the research (Kawulich, 2005). First of all, I used this method during my visits to Hydroponics Africa's headquarters, where I learnt about hydroponics technologies and the products that are being developed and sold by the company. Secondly, participatory observation was also useful when interviewing the clients that were using said innovations, as I could assess the effectiveness of these products as these people were using them. In the case of the hydroponics project I focused my research on meeting Hydroponics Africa's clients, to visit the rural or urban farms they had set up with the company's products. In this way I was able to observe them take care of the crops while hearing about their experience with hydroponics farming and about the advantages and disadvantages of these techniques. This was fundamental to assess whether the products developed and sold by Hydroponics Africa are actually as effective as the company says in terms of input-saving for agriculture, and therefore how economically accessible they are.

4.3: The "Hydroponics for Urban Low-Income Groups" project

The "Hydroponics for Urban Low-Income Groups" project[18] started in March 2016 and ended in September 2017, and was funded through "Via Water", Aqua for All's programme dedicated to supporting breakthrough solutions and technologies in the WASH sector in 8 African countries (Benin, Ghana, Kenya, Mali, Mozambique, Rwanda, Senegal and Ethiopia), by providing local entrepreneurs with funding and business training to upscale their innovative ideas[19].

The business partner in this project was the company Hydroponics Africa, founded by Peter Chege in 2013[20]. Hydroponics Africa provides tools (greenhouses, hydroponics media, nutrients etc.) and training for hydroponics farming, for both commercial and domestic farmers. Up until a couple of years ago the company was called Hydroponics Kenya, but now they have managed to extend their reach outside of the country and are trying to export their products across the continent.

After visiting the headquarters of the company in the outskirts of Nairobi (where they have several hydroponic farms and gardens themselves), I interviewed Peter to gain insights about hydroponics farming, to ask him about how the company was born and how it developed in time, about the collaboration with Aqua for All, and lastly about his experience as an entrepreneur in Kenya.

4.4: Interview with Peter Chege, Hydroponics Africa CEO (15/02/2019)

4.4.1: Background and evolution of the project

Peter studied at Nairobi university and graduated as a chemist in the year 2000. He worked for a pharmaceutical company for two years, and later for another company (Mineral Allied) between 2005 and 2013, where he was tasked with conducting soil analysis and creating fertilisers from the soil samples he collected. During this time, he started looking into developing a more efficient way of farming, and came across hydroponics in 2013. Intrigued by these techniques, he quit his job and started applying his academic knowledge and the experience accrued at Mineral Allied to start formulating nutrients that could increase the productivity of hydroponics farming. In 2013 Hydroponics Kenya was officially born, and started training farmers and installing hydroponics systems in the area of Nairobi and its surroundings.

One year later the company partnered with the Kenya Climate Innovation Centre (KCIC), an organisation devoted to developing and accelerating innovations connected to clean energy

[18] Homepage of the project: https://www.viawater.nl/projects/hydroponics-for-urban-low-income-groups-kenya (accessed 20/05/2019).
[19] Source: https://aquaforall.org/wp-content/uploads/2017/03/A4A-Showcase-VIA-Water.pdf (accessed 20/05/2019).
[20] Homepage of Hydroponics Africa: https://hydroponicskenya.com/ (accessed 20/05/2019).

technologies[21]. KCIC provided support in terms of strategies and access to marketing partners, in addition to $9K to develop their proof of concept and test their systems.

Around the end of 2015 Peter applied for funding at Aqua for All's Via Water programme, and after obtaining their grant, the company started three major pilot projects.

The first pilot project involved 15 farmers that were selected in the area of Nairobi to be trained on hydroponics farming, in order to test the effectiveness of Hydroponics Africa's products, and as part of their marketing campaign. The 15 farmers were chosen by a list of candidates provided by the Ministry of Agriculture. They were given a hydroponic system for free, as well as training at the headquarters of the company.

The second pilot also took place in Nairobi and its outskirts, where 400 women were gifted a vertical hydroponic system to start urban farming (the systems were 18 square metres and hosted approximately 720 plants each).

Lastly, a third similar pilot was conducted in Rwanda. As I am currently focusing on the Nairobi context, I will not analyse the Rwandan project, but nonetheless Peter mentioned how this is a very important project since Rwanda is a big importer of food, and therefore could benefit greatly by increasing their domestic food production through hydroponics.

In terms of financing, Hydroponics Africa received about $96K for the pilots in Kenya, and $117K for the one in Rwanda (the latter was more expensive as they had to bring all the hydroponics equipment and products from Nairobi).

The company also received a donation of $500K from the United States Agency for International Development (USAID) for a project in eastern Kenya, which focused on extending hydroponics farming to about 4K low-income farmers. This subsidy enabled the company to offer their products to farmers from the BOP[22] at a reduced price, which were able to repay the cost of the farm in instalments and starting after the first successful harvests.

Lastly, the company has recently partnered with the World Food Programme (WFP) for a project in the area of Lake Turkana, in Northern Kenya, to install vertical hydroponics farms (although this project does not address BOP farmers exclusively).

[21] Source: https://www.kenyacic.org/about/about-us (accessed 20/05/2019).
[22] "Bottom of the pyramid", an economic term referring to the poorest two-thirds of the world' population, approximately 4 billion people, which live with less than $2 a day (Prahalad, 2006).

4.4.2: Relationship with Aqua for All

Peter first approached Aqua for All around the end of 2015, when he applied for the Via Water grant. He found out about this opportunity through KCIC, who suggested him to apply for the grant to upscale his project. While he initially applied for another project that involved rice cultivation, he was eventually granted the funding for his hydroponics pilots.

Peter sent the teaser for his hydroponics project, and was extensively guided throughout the process of applying for the grant. The whole process took about 6 to 8 months, during which he wrote the proposal in collaboration with Aqua for All. Before receiving the grant, he also received training and advice on how to run and maintain a business. Peter mentioned how this formative period, and the overall interaction with the organisation, was very good and useful to ensure the success of his project. Even after receiving the funding from Aqua for All, he maintained a constant interaction with them, particularly in the form of follow up meetings and seminars in The Netherlands, to further boost his project. He also highlighted how important it was for him to meet other innovators through Aqua for All's network, and how useful it was to learn from their experiences.

In particular, Peter mentioned how Aqua for All's contribution helped him scale his project, most importantly by connecting him with consultants who helped him with matters such as staff recruitment, business advice and planning, finding new markets for his products and new partnerships, even outside of Kenya. Peter stated that he had no particular problems during the proposal writing phase, as the organisation's help made it very easy to refine his proposal until it was suitable to receive the grant. He also mentioned how Aqua for All always kept regular contacts with him during this phase, replying very quickly any time he faced difficulties.

While the first project in Kenya has ended in late 2017, and the one in Rwanda just few weeks before the interview, he still keeps regular contact with the organisation, and contributes to its community by sharing his experiences and acquired expertise on Aqua for All's website.

Overall, Peter's relation with Aqua for All seems to have been solid and successful, as he did not encounter any major issue. Therefore, the only recommendation that Peter has for them to improve is to make themselves more even more known in the WASH entrepreneurial sector in Kenya, as he believes there are many other innovators that could benefit from their support (he only found out about them through KCIC, and probably would have not otherwise). Other than that, Peter is confident in saying that they should continue working as they are doing now, maybe focusing even more on the business training activities, especially if conducted locally and not only in the Netherlands. Indeed, he recognises that developing innovations and implementing pilots can be quite

risky as they can easily fail if not properly managed, and a local network of specialised collaborators could help the entrepreneurs in avoiding these problems and risks.

4.4.3: Project/company now

Thanks to the first pilot projects, and to an extensive marketing campaign through media and social networks, Hydroponics Africa has become a well-established business, especially in Kenya, and now has hundreds of clients. In addition to the projects in East Kenya with USAID and the one in Turkana with the WFP, Peter has another big plan in mind to upscale his business. He is currently looking into selling his products in India, in partnership with Jatin, an Indian business consultant who has worked in the Indian agriculture sector for many years and therefore has good connections with the government and the local markets. In addition, Peter mentioned how the Indian government is currently providing copious subsidies for projects like his, especially in terms of funding for greenhouses, irrigation systems, nutrients, etc. Unlike with the project in Rwanda, the idea is to start a brand-new production unit in India, particularly in the northern regions. To do this, they will also rely on an upcoming USAID grant of $22K, that will help them develop their business model for this new project

4.4.4: Entrepreneurship in Kenya

After hearing about Peter's project and company, I wanted to know more about his experience as an innovator and entrepreneur in Kenya. He explained that it has been much more challenging than he had envisaged when he decided to start his own company. He mentioned several problems he had to face.

First of all, he reckons that when his new company started its activities, he had not spent enough resources in assembling a proper team that could help him set up the business. Having a specialised and trained team would have been crucial during the complex process of obtaining the official authorisations from the competent public authorities, and also when they finally approached the market to sell their products. Peter acknowledges that the team he initially assembled was not skilled enough, which eventually meant that he had to deal with these matters on his own.

He also complained that every time he actually managed to train his employees enough to delegate responsibilities to them, they would use this newly acquired knowledge and experience to find a job at bigger agricultural companies, in search for a higher salary. This meant that each time he had to start from scratch with a new group of employees, which was a time and finance consuming task. Luckily, and as the company started growing, it became easier to assemble a lasting team, and now

many of his employees and partners have been part of the company for several years (such as his financial advisor Paul).

The problem of finding a consistent group of collaborators also slowed down the development of the hydroponics products themselves, which required extensive testing to determine the best units, media, nutrients etc. Peter said that the very first time they approached the market to sell the initial prototypes, some customers were unsatisfied with the products, as they were not completely refined. Again, as time went by and as he managed to hire specialised employees, the hydroponics techniques have been gradually improved, and even now they are still working to improve their efficiency.

Concerning the necessary governmental documentation (licences, authorisations etc.), Peter explained that he initially had some trouble obtaining the licence to conduct his business when he applied to the Ministry of Agriculture, which eventually refused to guarantee it. What he did at this point was to approach the Ministry of Youth, as he knows this cabinet is "at a lower level" in the government hierarchy, and that they would pose less problems in granting him the authorisation. Indeed, Peter managed to arrange a meeting with the Minister himself, who immediately authorised his project as soon as he heard that Peter had received a grant from a Dutch organisation. According to Peter, "he is a political man, and was hoping to somehow also benefit from this grant".

Peter also explained how being an innovator brings the risk of someone else copying the innovative idea and starting to sell it with no intention of paying royalties. Although he has patented his products (especially the nutrients and the design of the greenhouses), if someone started selling them without his permission it would take a long time before a court decision could actually manage to stop them, and the whole process would be very expensive. This is why he thinks that the government should invest more on legal mechanisms that protect innovators and entrepreneurs against this kind of plagiarism.

Notwithstanding these challenges, Peter told me that the company quickly managed to sell their products right from the start, as there was much hype and excitement around these new farming techniques. Many people found out about them through the media or during conventions where Hydroponics Africa showed their units, and quickly became interested in trying them out themselves. This was especially true with Kenya, while in Rwanda accessing the market was more challenging. According to Peter, this was because there was less pre-existing knowledge and culture around agriculture there, and therefore it was much harder to explain how hydroponics works. This, in addition to the fact that the nutrients still cannot be produced in Rwanda but have to be imported from

Kenya (due to governmental regulations), made accessing the market in Rwanda more difficult, but as of now most of these issues have been sorted out.

4.4.5: Social impact

The last part of the interview concerned the potential social impact of Peter's company, in terms of making cheap farming accessible to low-income groups through hydroponics. Peter started off by saying that most of his clients are middle class commercial or small-scale urban farmers, a statement that I later verified to be true when I interviewed the farmers in the area of Nairobi. Nonetheless, as previously mentioned the company is involved in two major projects that target – at least in part – the BOP, namely the WFP and the USAID financed programmes. Indeed, Peter mentioned that thanks to their grants, they have been able to install hydroponics farms at a reduced price, and make them more affordable. This was also possible thanks to the loans provided to the farmers by the many micro-financing banks working in Kenya.

Overall, Peter mentioned that as of now 70% of Hydroponics Africa's clients belong to the BOP, and have been able to install farms at significantly reduced prices (100 USD instead of 3K USD for the most basic unit). Also, he said that many of their current clients are low-income urban farmers that live in Nairobi's slums, and that they plan to further extend this group up to 1600 households, through extensive training programmes, targeting women in particular. Nonetheless, he stressed how to external grants are essential to fully carry out such projects, which would not be feasible otherwise. In addition, Peter said that throughout the years the company has been working to simplify the hydroponics systems, in order to make them more accessible also to so-called "laymen", those who have little to no experience with farming in general. This includes installing units that require very little work to maintain them, in terms of watering, giving nutrients and pesticides, and also providing training and constant support to the farmers.

4.5: Interviews with Hydroponics Africa's clients (18/01/2019 – 08/03/2019)

After I had deepened my knowledge about hydroponics farming and interviewed Peter Chege about his company, I extended my research to the urban and rural farmers that have implemented hydroponics techniques through the services and products offered by Hydroponics Africa.

To do so, one of Peter's employees kindly compiled a list of their clients in the area of Nairobi and its surroundings, so that I could contact and interview them about their experience with the company and with their products, and specifically about the advantages and disadvantages of hydroponics farming compared to conventional methods. My goal was to determine whether these innovative products are actually input-efficient as they claim to be, and to what extent they manage to have a

positive impact on the agricultural activities of the farmers that use them. The pivotal issue was the amount of resources (and therefore costs) saving that hydroponics farming allows in each case, to determine whether these techniques could be more economically accessible to low-income groups than conventional soil-based methods.

I interviewed a total of ten farmers, which I divided in two categories, rural and urban, based on where they have set up their cultivations. The first group, consisting of four farmers, were scattered in the countryside around Nairobi, at various distances from the Central Business District (between 15km and 60km). The six urban farmers instead have set up their activities in various districts of the city, in a radius not higher than 8km from the centre. This division is relevant as the location of the farms greatly influences on one side the choice of hydroponics techniques that can be adopted, and on the other the different problems that the farmers encountered.

4.5.1: Rural hydroponic farmers

The four rural farmers I interviewed live in Nairobi city, but have set up their farms in the countryside region north-west of the city, known to be particularly lush and filled with tea fields. While moving towards areas such as Matimbei and Githiga, one can easily feel a change in temperature and humidity, going from the hot and humid city to the breezy and fresh countryside, where the numerous forests help maintaining a pleasant climate. This environment is more favourable for agriculture, also given the ample availability of space, but it also presents many shortcomings in terms of infrastructure.

First of all, the roads in these rural areas are significantly worse than in the city, especially because almost none of them are covered with tarmac. This means that any car trip, even short ones, will take much longer than it would take with a tarred road, and can deal serious damage to the vehicles. This is a critical issue for those farmers that live in Nairobi but have fields outside of the city, and it also greatly limits the range of markets they can be reached to sell their products, as the state of the roads makes transportation expensive and time consuming.

Secondly, there is also a problem of water distribution infrastructure, as the network is scarcely developed in these rural areas. This is challenging for farmers given the water-intensive nature of their activities, and has led many of them to rely on supplies from private companies, while many have also resorted to digging their own wells.

These two issues (the poor state of the roads connecting Nairobi and its countryside and the scarce availability of water for agriculture) are the main reasons why the four rural farmers I interviewed decided to try out hydroponics farming. Indeed, the main alleged advantage of these methods is that

they can reduce the amount of both labour and water inputs required to grow crops. This would allow the farmers to reduce the numbers of trips between their home and the farm, saving money and time. In addition, using less water would also reduce the need for refills, and therefore the overall costs of farming.

The farmers I interviewed told me that they were initially interested in trying hydroponics because of these alleged advantages. They contacted Hydroponics Africa and the company installed the greenhouses and the media systems to start their cultivations. The type of hydroponics installations in the case of the rural farmers were either grow-bags (fig. 4) or hydro-crates (fig. 5) installed in greenhouses, and the crops were tomatoes, capsica or a combination of the two.

Fig. 4: Tomato crops planted in “grow-bags”, one of the hydroponics products sold by Hydroponics Africa.

Fig. 5: The hydro-crate system.

The farmers were offered training sessions to learn how to grow crops with hydroponics, which can be quite different from conventional farming, especially in terms of watering, providing nutrients and crop rotation. The feedback I received on these training sessions was rather mixed. Indeed, some interviewees mentioned that the instructions they received from Hydroponics Africa's specialists were clear enough that they were able to easily switch to the new techniques. Some farmers even said that hydroponics techniques are actually much easier to apply compared to soil-based methods. According to others, the training was not sufficient to be able to successfully implement hydroponics, especially if one does not have any previous experience with farming. One farmer in particular mentioned that he had initially not been told to add the nutrients to the water, which resulted in his crops quickly starting to wilt.

Notwithstanding some initial difficulties, each of the four rural farmers I interviewed managed to successfully set up the hydroponics systems and start cultivating crops, although some mentioned that the yield in terms of produce was slightly lower than before.

One of the interviewees, which had already been working as a farmer (with soil-based farms) for ten years, said that he was initially very impressed with hydroponics, as it had allowed him to plant more tomato and capsica plants than before in the same plot of land (1200 compared to 900). Also, he mentioned how not having to rely on soil for nutrients reduced the need for yearly crop rotation, and said that he was able to plant the same crop up to twice or thrice in a row before having to replace them. In addition, others even mentioned how they had started researching on how to develop their own nutrients, which would allow them to greatly reduce the cost of their hydroponics farm.

4.5.2: Urban hydroponics farmers

The six urban farmers I interviewed had not set up their activity in a plot of land outside of the city, but instead in the gardens outside their houses in Nairobi. They were growing crops in a different setting than the other four, both in terms of climate (during dry season the temperatures are significantly higher in the city) and limited availability of space (especially in less wealthy districts).

For urban settings the hydroponics systems have to be much more compact due to space limitations, which is why the farmers were provided with systems that can fit in backyards such as SIFI ("set it and forget it", fig. 6), "grow-nets" (fig. 7), "vertical growing towers" (fig. 8), or even on walls like the "hanging bags" (fig. 9).

Fig. 6: The SIFI system.

Fig. 7: The grow-nets.

Fig. 8: The vertical growing towers.

Fig. 9: The hanging bags.

The drawback of these methods, compared to the grow-bags and the hydro-crates, is that they usually do not allow to grow enough produce to turn them into a fully-fledged and profitable commercial

activity. Indeed, for none of six urban interviewees farming is the main activity and source of income. Instead of growing tomatoes or capsica for commercial purposes, they mostly grew vegetables for domestic consumption, such as lettuce, spinach, kale etc. Just as the four rural farmers, the other six urban cultivators were attracted to hydroponics by its promises of reducing the space and the inputs needed to grow crops.

The six urban farmers also received training sessions on hydroponics farming, focused on teaching them the amount of water and nutrients each crop needs and how often they should be watered. Again, the feedback for this training was a mix of positive and negative, with some farmers being completely satisfied with it and others lamenting that it did not cover the entirety of the information needed to grow the plants. Also, these were not professional farmers, so they had less previous experience to rely on and required additional assistance during the starting phases.

Nonetheless, the urban interviewees did not mention any insurmountable initial difficulties (also because their systems are less complicated and easier to handle than the rural ones), and for the first months they all managed to grow more than enough vegetables for themselves.

The main advantages mentioned by the urban interviewees were that they were able to grow vegetables all year long (because with hydroponics there is no need for crop rotation, as nutrients are provided manually and not received from the soil), even in a small garden. One of the most interesting examples of this is Moi Avenue School, one of the clients of Hydroponics Africa, located in the Central Business District of Nairobi. I interviewed the school's groundsman, John, who told me about his experience with farming vegetables and fruits for the school's canteen. He explained that for many years the school has been growing crops with soil farming, but also that they often face water scarcity problems. Indeed, during dry seasons it is often necessary to buy water refills from private companies, as the amount provided by the public network is insufficient. Since these services are generally very expensive, they are used only as last resort and only for essential needs such as the sanitary services, and not for the gardens. Instead, the hydroponics system that Hydroponics Africa has installed at the school has reduced the consumption of water and therefore allowed them to cultivate vegetables also during dry months. The groundsman explained that this system was easy enough to use that also the students were able to contribute to taking care of the crops, and so efficient that it provided more than enough vegetables for the canteen, and even some excess that was sold at the local markets[23].

[23] Link to an article about hydroponics farming at Moi Avenue School: https://securingwaterforfood.org/innovator-news/sprouting-seeds-students-in-kenya-grow-their-own-healthy-lunches (accessed 29/05/2019).

4.5.3: Challenges

Each of the famers I interviewed was able to set up a hydroponics farm and start growing crops with these new techniques, notwithstanding some initial difficulties for some of them. Unfortunately, several interviewees mentioned how after a few months of hydroponics farming some problems started arising, and explained how their expectations for Hydroponics Africa and hydroponics farming in general were not always fully met.

First of all, in their experience these new techniques and Hydroponics Africa's products are not so resource-efficient as the company claims them to be. Even with these new technologies, the farmers still had to spend a great deal of time and resources to successfully grow produce. This was particularly problematic for water and nutrients: the farmers said they did not notice a significant decrease in the cost of inputs since the crops had to be watered and fed with nutrients much more often than what the company had initially told them. In addition to the fact that installing a hydroponics system requires a high capital investment (the greenhouse, water tanks, dripping systems, media etc.), the farmers have to also factor in the high cost of the nutrients. Also, these substances can only be bought through Hydroponics Africa, which currently is the only company dealing with hydroponics in Kenya, so their incentive to lower the prices is quite low.

Many of the farmers I interviewed told me that in the long-term the cost of maintaining their farms was much higher than they had initially budgeted, on the basis of estimates provided by Hydroponics Africa. One farmer for example said that the company had told him that it would have been sufficient to water the crops once a week, but in reality, he had to do it at least thrice, otherwise the crops would start to wilt and dry. This forced the farmers to decide whether to invest additional resources to repay the initial sunk cost of the greenhouses and growing media, or to abandon the farms. For the lower-income farmers I interviewed the latter was usually the only available option, as they could not sustain the cost of buying the high amounts of nutrients needed. This forced several of them to abandon hydroponics farming, as they had become too expensive to take care of in terms of nutrients, and this was especially a problem for the rural farmers that are financially dependent on such farms.

Another issue that emerged during the interviews was the poor post-sale support provided by Hydroponics Africa. Indeed, many farmers mentioned how the company rarely followed-up on the systems they sold, and how it was quite laborious to get in contact with them to solve the problems the farmers were facing. Some complained that after setting up the farms and providing the basic training, the representatives of Hydroponics Africa rarely contacted the farmers again to receive updates on the status of the crops. Others mentioned that they have been quite slow and reluctant to

provide technical support, which, in addition to the cost of the nutrients being prohibitive for some of the farmers, led to premature shut down of some of these activities.

One thing I noticed is that out of the people I interviewed, the lower-income farmers appear to have faced the most problems in terms of technical support from the company. This was particularly evident in the case of two urban farmers, Elizabeth and Ann, who live in Kawangware (one of the poorest districts in Nairobi). They mentioned how the agronomists who helped them start their garden never reach out to them again and that they were not helping them recover their farms, which were drying up due to the extremely hot and dry weather. On the contrary, the wealthier farmers had an overall better opinion of Hydroponics Africa's client support, and told me that were often contacted by their agronomists.

Overall, it seems that most of the farmers, both rural and urban, had a positive experience with hydroponics and Hydroponics Africa during the first months, and then started encountering several problems, which the company was not always able or willing to solve. While this seemed to be especially true for low-income farmers, the wealthier ones also faced similar problems. This is the case for example of Jepchumba, the farmer that was using the hanging bags system: when we met in early March 2019, she spoke highly of Hydroponics Africa, of their products and support, and her domestic garden was indeed doing quite well. Three months later (mid-June 2019) I received a text from her telling me that the garden had started drying and that the company was not providing her with enough support to help her recover the plants.

4.5.4: Outcomes of the interviews

As mentioned in the previous section, while each of the farmer I interviewed had initially been very interested in the hydroponics innovations sold by Chege's company, several of them also explain how their expectations were not quite met. This was mostly due to the fact that after a few months of using said products and techniques they started facing several problems, namely higher costs than budgeted and poor support from the company. In the end, these dissatisfied customers ended up not being able to fully benefit from the advantages of hydroponics farming, especially those related to reducing the cost of inputs.

While they all said that they see great potential in hydroponics to make farming less costly, and therefore more accessible to low-income farmers, they also mentioned how this is not the case with Hydroponics Africa, at least not in the current state of the company. Indeed, many interviewees complained about their products not being efficient enough to be more profitable than conventional soil-based farming, mostly due to the high cost of the nutrients needed for the hydroponics systems.

Another contentious point mentioned by several farmers was the lack of support when they started facing problems with the farms. Many of them complained that they did not receive and help in recovering their dying crops, and believe that as of now, Hydroponics Africa is too understaffed and its personnel unprepared to provide adequate support to all their customers. Indeed, some interviewees said that they had to call several times and wait several weeks before finally receiving assistance. Others instead highlighted the fact that the technicians that the company eventually sends are not the professional agronomists, but instead contracted workers that do not have specialised knowledge on these farming techniques, so their help ends up being rather lacklustre. Instead, having access to top-notch products and support from specialised agronomists seems to be especially crucial for hydroponics farming, due to the fact that for it to be profitable, or even just to recover the high initial sunk costs, it needs to be done on a large scale, which is also highly dependent on the quality of the services offered by the company setting up the farms. Many interviewees have repeatedly mentioned that this is not the case of Hydroponics Africa in its present state, ultimately discouraging many of them to further expanding their hydroponics farms.

The farmers explained that in their opinion Hydroponics Africa should further invest in developing their products and especially in improving their post-sale support, if they really want to make hydroponics profitable for the farmers. They also mentioned how they believe that as of now the company has little incentive to do so, due to the fact that it is presently facing no competition for their services and have a *de facto* monopoly, at least in the Kenyan market.

Nonetheless, they also believe that hydroponics farming, if properly developed and implemented, could be an effective solution to increase food security in areas that face serious water-scarcity challenges such as Kenya (its northern regions in particular). This is also why most of the farmers, even those whose farms failed, said that they would be willing to start again or extend their hydroponics activities, but with a different company that might offer better initial training and post-sale support (which is fundamental, especially during dry seasons where most problems arise), or even independently, on the basis of the expertise they have accrued with this first experience with hydroponics.

Significant improvements could also be achieved by further developing the hydroponics products, especially the growing media. Indeed, the different farms I visited showed a noticeable difference in terms of their efficiency and effectiveness. While the ones that were adopting the first prototypes that had been developed by Hydroponics Africa (such as the grow-nets or the hydro-crates) seemed to be the ones to fail more frequently, those using the latest technology, the grow-bags, were able to more easily retain humidity and nutrients, making them more effective at farming with little use of water.

It is ultimately not surprising that when I asked the farmers for their opinions about Chege's company, the "reviews" were quite mixed. Most of them praised Hydroponics Africa for developing products that could improve conventional agriculture methods, and even making them accessible to urban areas with limited available space. All the same, they also expressed the feeling that these innovative ideas still require much more research and development before the hydroponics products offered by the company achieve a level of efficiency sufficient to produce a significant impact in terms of input saving. This complaint also extended to the support services offered by Hydroponics Africa, which need to improve in order to correctly help their clients successfully maintain their hydroponics farms in the long-term.

V. Conclusions

The previous chapters have presented the theoretical framework of the recent shift in international development cooperation paradigms, in favour of a greater inclusion of private and civil society stakeholders in socially-impactful programmes and projects. We have also presented a case study and real-life example of this new approach, in the form of the partnership between Aqua for All and Hydroponics Kenya. This final section will provide a brief analysis of Aqua for All's approach to development cooperation, in relation to this shift in paradigm and to the outcomes of the interviews I conducted with the people involved in the "Hydroponics for urban low-income groups" project.

We have argued that the main starting point of the "new" paradigm of cooperation is to leave behind the idea of development aid as an endless stream of revenue for developing countries, to the point where they became dependent from such external aid. On the contrary, Aqua for All's approach is based on partnerships with the private sector to meet pressing needs in WASH, by fostering innovative projects and technologies in developing countries. This implies relying on local entrepreneurs and supporting them in creating and scaling up a company that can provide such innovations. Aqua for All's strategy as a development agency is to work in close collaboration with such entrepreneurs and business partners, by providing them a fixed amount of funding for socially-impactful activities. Although the collaboration between Aqua for All and their local partners might continue even after the completion of the project, the grants provided by Aqua for All are one-off payments. This means that they are meant not to endlessly sustain the private company, but instead as a catalyst to boost their activities and extend their reach, up to the point of financial independence. This strategy is closely related to the concept of cross-sector development partnerships, which are

created to achieve development goals (in this case efficient management of water resources) in an economically sustainable way. In the example of the hydroponics project, this private firm – development agency partnership relied on bringing together Aqua for All's and Chege's specific resources and expertise on water management to develop his innovative products. Thanks to this partnership, Hydroponics Africa was able to develop and test its first products through pilot projects financed with the help of Aqua for All's initial grant. This also enabled the company to grow to the point of being eligible to apply for other programmes, such as those of USAID and of the WFP, in order to start additional projects in other regions of Kenya.

The field research has shown how the organisation's collaboration with Hydroponics Africa has achieved its goal of promoting Chege's company and developing its innovative hydroponics products and techniques. Indeed, during the interview Peter clearly explained how Aqua for All's financial support and business training have been an effective catalyst to help the company scale and reach commercial success. In this sense, this "PPP" strategy was successful in blending Aqua for All's resources with those of a Hydroponics Africa for the realisation of this project.

On the other hand, the blended finance approach of Aqua for All – again in relation to this specific project and to my research on it – presented a notable shortcoming, related to the social impact that has been achieved through this project. The issue that emerged from the interviews with the farmers is that the type of innovation promoted and funded through this PPP has limited reach towards low-income groups and the BOP, and therefore a somewhat limited inclusiveness in solving WASH-related challenges. This appears to be related to the fact that as a private company, Hydroponics Africa has low commercial interest in reaching low-income groups, as they have less resources to spend on their services, in addition to facing no competition on the Kenyan market.

While acknowledging that these commercial ventures need to be profitable and financially self-sustaining in order to effectively and continuously provide their services, additional attention should be dedicated to the "public" side of the partnership, which in this case means ensuring that such services are also accessible to the BOP. Indeed, while some innovations can appear to be economically accessible to low-income groups during the elaboration phase of a project, achieving this in real-life scenarios can present unexpected challenges. In the case of Peter's project for example, during the interview he explained to me how his company developed its hydroponics products specifically to greatly reduce the inputs needed in farming, therefore allowing farming to consistently reduce costs. On the other hand, most of the hydroponics farmers I interviewed told me that these alleged benefits of hydroponics (reducing water and fertilising expenses in particular) have been difficult to reach in their experiences. Many farmers, especially low-income ones, explained

how they were forced to significantly reduce or interrupt their hydroponics farming activities, as the amount of nutrients necessary to grow the crops ended up being much higher, and therefore not affordable, than what Hydroponics Africa initially budgeted for them.

Ultimately, it seems that the hydroponics solutions provided by the Chege's company are presently not entirely accessible to low-income groups, due to the high initial investment and continued costs in terms of water and nutrients. This conclusion is based exclusively on the interviews I conducted during my time in Kenya. As previously mentioned, my research was limited to a number of smallholder farmers operating in the area of Nairobi and its surrounding countryside. A suggestion for future work could be to expand the geographical area of the research and interview more farmers about their experience with hydroponics farming, and with Hydroponics Africa's products in particular. This could be done, for example, by discussing with the farmers involved in the projects that the company is carrying out in Northern and Eastern Kenya. This could provide additional insight on the effectiveness and economic accessibility of these techniques to BOP farmers, especially since these regions present a much harsher environment compared to that of the Nairobi area, and are also economically less developed.

For its part, Aqua for All could make the innovations supported by its Via Water programme more economically accessible by expressly dedicating a share of its grant to subsidising their prices, making them more affordable to low-income groups while still being profitable for the companies. It must be mentioned that Hydroponics Africa is indeed already providing their products at reduced prices as part of its projects in Northern and Eastern Kenya, thanks to the grants provided by the WFP and USAID. Unfortunately, I did not have the time nor the means to research on these two projects, nor to interview their beneficiaries, and therefore I cannot provide any feedback about them.

In addition, conditionalities could be imposed on the grants provided by Aqua for All to ensure that specific development goals are met. Indeed, resorting to output-based aid could incentivise the business partners to dedicating a portion of their resources and activities to improving the social impact and inclusiveness of their services.

Lastly, Aqua for All could conduct additional field researches on the impact of the projects they have supported, evaluate their results and determine which goals have been achieved, which have not and why. The organisation already conducts follows up on the projects with the goal of improving the organisation's approach in their future programmes. It does this by meeting the innovators and visiting the sites of their projects, to assess the results they have achieved, the challenges they have faced, and to evaluate the success of the relationship between the entrepreneurs and Aqua for All.

What could be done in addition is to extend this kind of evaluation also to the relationship between the entrepreneurs' companies (the ones that Aqua for All has helped scaling) and their clients, to study the impact that their services are having on their lives. In the case of the Via Water programme, which focuses on innovative WASH technologies, conducting impact assessment studies on these innovations could help Aqua for All determine which ones are the most successful and impactful. For example, in the case of Peter's project this means interviewing the farmers that have started implementing hydroponics, to assess the accessibility and effectiveness of these new methods of farming. This kind of feedback could improve Aqua for All's future activities, as the organisation would have more information to determine where it is best to allocate their resources in order to reach their mission.

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