Technology for monitoring and evaluation of urban food security programs

Current use and future potential

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by
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"Dis-moi ce que tu manges, je te dirai ce que tu es." – Anthelme Brillat-Savarin

"A city is what it eats…" – Wayne Roberts

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Executive Summary

Despite the world producing enough edible calories to feed 9 billion people, food insecurity remains a major and chronic problem for a significant percentage of the world's population. Food insecurity is finally acknowledged as an urban issue that can be addressed in part through urban planning. The issue is compounded by the fact that the world is becoming increasingly urbanized, particularly in low- and medium-income countries (LMICs), and urban food insecurity will continue to grow in cities. Initiatives to address food insecurity need effective monitoring and evaluation (M&E) components to ensure their effectiveness. This report focuses on how simple and relatively inexpensive information and communication technologies (ICTs) can be used for M&E activities of initiatives designed to address food insecurity in rapidly urbanizing areas in LMICs. The audience for this report could include non-profits, foundations, and other organizations grappling with the issue of food insecurity.

This report draws from scholarly articles, grey literature, reports, white papers, and analyses published by foundations, non-profits, and other organizations. Three case studies are presented showcasing how ICTs are being leveraged for monitoring and evaluation activities in development initiatives. Various technologies will be presented and their application to food security M&E activities discussed. Using an evaluation framework proposed by the Food and Agriculture Organization of the United Nations, examples will be presented of how simple technologies could be leveraged to gather data for evaluation indicators.

While each context and initiative is different and there is no one-size-fits-all solution, the case studies provide some important lessons learned which include: gather data not as the ultimate goal, but rather use appropriate data effectively; take the time necessary to plan and implement M&E activities; leverage existing technologies and approaches—do not reinvent the wheel; place importance on partnerships, whether with active stakeholder groups or external partners; and finally, leverage the knowledge and expertise of the local communities.

Simple, inexpensive technologies are providing ever-increasing possibilities to organizations, companies, NGOs, governments, and others for faster, cheaper, and more accurate gathering, processing, and understanding of data. Before employing a technological

solution for data gathering, careful consideration must be given to the overall program objectives and design indicators that accurately measure the effectiveness of an initiative. The technologies come with their own challenges, and technology should not be used blindly and without careful consideration of their impact, disadvantages, and challenges. When used appropriately, with proper planning, consideration, and consultation, ICTs provide exciting opportunities for more effective policymaking, implementation, monitoring, and evaluation of urban food security-related initiatives in LMICs.

Résumé

Bien que le monde produise suffisamment de nourriture comestible pour nourrir 9 milliards de personnes, l'insécurité alimentaire reste un problème majeur et chronique pour une part importante de la population mondiale. L'insécurité alimentaire est enfin reconnue comme un problème urbain et peut être traitée en partie par la planification urbaine. En même temps, le problème est aggravé par le fait que le monde est de plus en plus urbanisé, en particulier les pays à revenu faible et moyen (PRFM) et que l'insécurité alimentaire urbaine continuera de croître dans les villes de ces pays. Les programmes et les initiatives visant à résoudre ce problème doivent comporter des éléments de suivi et d'évaluation (S&E) efficaces afin de s'assurer que les problèmes soient traités efficacement. Ce rapport se concentre sur la façon dont des technologies relativement simples et peu coûteuses peuvent être utilisées pour les activités de suivi et d'évaluation des initiatives conçues pour répondre à l'insécurité alimentaire dans les zones d'urbanisation rapide des PRFM. Le public visé par ce rapport pourrait inclure des organisations à but non lucratif, des fondations et d'autres organisations aux prises avec le problème de l'insécurité alimentaire dans les contextes d'urbanisation rapide des PFR-PRI.

Ce rapport s'inspire d'articles scientifiques, de littérature grise, de rapports et d'analyses publiés par des fondations, des organisations à but non lucratif et d'autres organisations, ainsi que de livres blancs. En outre, trois études de cas sont présentées, montrant comment des technologies simples et relativement peu coûteuses sont utilisées pour les activités de suivi et d'évaluation des programmes de développement international. Les technologies seront présentées et leur application aux activités de suivi et d'évaluation de la sécurité alimentaire sera discutée. À l'aide d'un cadre d'évaluation proposé par l'Organisation des Nations Unies pour l'alimentation et l'agriculture, des exemples seront présentés sur la manière dont des technologies simples peuvent être utilisées pour recueillir des indicateurs d'évaluation des données.

Bien que chaque contexte et chaque initiative soient différents et qu'il n'y ait pas de solution unique, les études de cas permettent de tirer des leçons importantes, notamment : ne pas collecter des données comme but ultime, mais plutôt utiliser efficacement les données

appropriées ; prendre le temps nécessaire pour planifier et mettre en œuvre les activités de S&E; exploiter les technologies et les approches existantes - ne pas réinventer la roue ; accorder de l'importance aux partenariats, que ce soit avec des groupes de parties prenantes actives ou des partenaires externes ; et enfin, exploiter les connaissances et l'expertise des communautés locales.

Des technologies simples et peu coûteuses ouvrent aux organisations, entreprises, ONG, gouvernements et autres des possibilités toujours plus grandes de collecter, traiter et comprendre les données de manière plus rapide, moins chère et plus précise. Avant d'utiliser une solution technologique pour la collecte des données d'un programme, il convient d'examiner attentivement les objectifs généraux de celui-ci et de concevoir des indicateurs permettant de mesurer avec précision l'efficacité d'une initiative. Les technologies s'accompagnent de leurs propres défis, et il ne faut pas les utiliser à l'aveuglette et sans examiner soigneusement leur impact, leurs inconvénients et leurs défis. Lorsqu'elles sont utilisées de manière appropriée, avec une planification, une considération et une consultation adéquates, les technologies simples offrent des opportunités intéressantes pour une élaboration de politiques, une mise en œuvre, un suivi et une évaluation plus efficaces des initiatives liées à la sécurité alimentaire urbaine dans les PRFM.

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Abbreviations

FAO – Food and Agriculture Organization of the United Nations

HIC – High-income country

ICT – Information and Communications Technology

LMIC – Low- and middle-income countries

M&E – monitoring and evaluation

MUFPP – Milan Urban Food Policy Pact

PM&E – participatory monitoring and evaluation

WFP – World Food Program

Positionality Statement and Personal Motivation

I feel it important to begin this report by making explicit my background and experience. Despite my best efforts, I acknowledge that I have biases that may shade my work and impact the way I view the topic I tackle in this report. I recently returned to the academic world to pursue a master's degree in urban planning after spending 25 years working in the private and non-profit sectors. In my different jobs, I was often required to justify resources used and was always keenly aware of the need to be efficient as well as effective in my work. In particular, in the non-profit world we learn to be creative and do a lot with a little. This approach has led me to my interest in monitoring and evaluation: figuring out how to ensure that initiatives are designed well; and to be effective and efficient in achieving the initiatives' goals. I appreciate the incredible nuances and complexities of the 'real world', and I hope that as a white, privileged male who has lived most of his life in high-income, Western countries, I can still appreciate how important context is to any situation: cultural, socio-economic, linguistic, philosophical. I do not pretend to have found the answers, but I do firmly believe I have stumbled upon some interesting questions that might help all of us make the world more equitable and livable for everyone.

In my position as an urban planning student, I believe that urban planning is more than about planning. I take exception with the term "planner", and prefer the term more commonly used in French or Spanish: urbanist. I see my training as allowing me to understand better the immensely complex context of cities, no matter their size nor geographical location. Urbanists do more than just plan where roads go, how tall buildings should be, or how many bus stops there should be. Our strength can also come from our ability to think holistically about issues in cities, and to approach potential ways to address the problems in an equally holistic manner. In addition, as a student and researcher, I am convinced of the need to see beyond the research, the academic papers, and intellectual debates, and keep the ultimate goal in sight of helping individuals to live better lives. All the research, writing, and "expert knowledge" is useless, in my opinion, if it ultimately does not help us to better the lives of our fellow humans and the planet on which we are guests.

This report focuses on the issue of food insecurity in rapidly urbanizing cities in the low- to middle-income countries. I have only visited cities in these countries and have never lived there. I have not (yet) had the opportunity to work for organizations that are grappling with the issue of food security in these contexts. What I know is based on over one year of research and reading. I hope what I can bring to this discussion is my outsider point of view, one that is practical, rational, wanting what is best for those most affected by this issue, and also the acknowledgement that ultimately they are the real experts. I just wish to play an assisting role.

Chapter 1: Context and Report Purpose

Context of the issue to be addressed

Food security is a complex issue facing people everywhere, not surprisingly given that food itself is a fundamental human need. Food security exists according to the United Nations, "..when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Food and Agriculture Organization of the United Nations, 2009, p. 1). The issue of food systems and security is receiving ever-growing attention. In the agreement signed at the Habitat III conference in Quito, Ecuador in 2016, known as the New Urban Agenda, food security was explicitly mentioned as needing to be addressed as an urban issue within the context of urban and regional planning (United Nations, 2017, p. 32). The UN held a World Food Summit in Rome in September 2021, where the importance of food systems was the focus (United Nations, 2021). The World Resources Institute Prize for Cities awarded the grand prize for 2020-2021 to Rosario, Brazil's urban agriculture program (*Prize for Cities 2020-2021 Winners*, n.d.). Food in the urban context is clearly receiving much-deserved attention.

The COVID-19 pandemic has only exaggerated the problem of food security and drawn more attention to the issue. According to a recent article in *Harvard Health Policy Review* (Welsh, 2021), one of the most dire effects of COVID-19 is on food security, and this is not just true for LMICs[1]. Nearly 11 percent of American adults reported food insecurity in October 2020 (Welsh, 2021).

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[1] In this report, I have chosen to use the term LMIC which stands for low- and middle-income countries. Finding terms to describe groupings of countries that when examined more closely are very diverse is part of a debate that has been ongoing for the past fifty-plus years, since the introduction by Frenchman Alfred Sauvy of the term *tiers monde* or third world in 1952. For this report I prefer to focus on the possible financial resources available in any given country. The reality today is that in some countries, the purchase of a tablet computer is not given a second thought and they are handed out in public schools along with books and pencils. In other countries, the purchase price of even the most basic tablet or smart phone can represent multiple months of wages for the average wage-earner. For this reason, I will use LMIC throughout the report. A list of countries that the World Bank considers low and lower-middle income can be found here: https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html.

Food security remains a central and important issue confronting cities and countries around the world as chronic undernourishment continues to grow (HLPE, 2021, p. 19). By one estimate, nearly 2.37 billion people (about one-third of the world's population) did not have access to adequate food in 2020 (FAO, IFAD, UNICEF, WFP and WHO, 2021, p. 8). With the link that food security has to poverty, increasing rates of urban poverty may portend an increasing rate of food insecurity in urban settings (Tacoli, 2019).

People are not immune from food insecurity despite living in an urban setting or in a high-income country (HIC). Food insecurity is an issue faced in urban as well as rural settings, although it is not an issue traditionally linked to urban planning and urban policy (Cabannes & Marocchino, 2018). There is a fundamental link between food and cities. "More than with any other of our biological needs, the choices we make around food affect the shape, style, pulse, smell, look, health, economy, street life and infrastructure of the city" (Roberts, 2001, p. 7). The rapid urbanization of cities in the Global South presents immense challenges for residents, governments, and urban planners (United Nations Human Settlements Programme, 2009). Among the many challenges are aspects traditionally associated to urban planning such as housing and transportation. However, according to the authors of a recent book entitled *Integrating Food into Urban Planning (Cabannes & Marocchino, 2018)*, food security should also be included and approached as an urban planning issue. Prior to this book, it had already been argued by several researchers that food security can often be a more serious issue in an urban context than a rural one, since in the urban context people are more reliant on money to buy food (Satterthwaite, 2003; Tacoli et al., 2013). In the UN's *New Urban Agenda* (United Nations Conference on Housing and Sustainable Urban Development (3rd : 2016 : Quito, Ecuador), 2017), food security is one of the core issues that urgently needs to be addressed. And if we listen to those suffering from food insecurity, we appreciate even better the urgency to confront food security. Somsak Phonphakdee, a community organizer in Cambodia, stated bluntly, "Eviction can't kill us, but hunger can. Food security is a bigger challenge for the poor than housing" (Boonyabancha et al., 2019, p. 524).

The speed, complexity, and size of the urban problems facing the Global South means that there is a strong case to be made for initiatives that are faster to conceive and implement

than the traditional top-down, comprehensive, or master plan approach, and that are easier to measure for efficacy (Bolay, 2020). Many approaches developed in the Global North have largely failed in the context of the Global South, with the argument being made that different frameworks are necessary (Watson, 2009).

Even with smaller-scale plans developed outside of the formal government framework, it is still essential to have mechanisms in place to determine if initiatives are meeting their objectives, and if not, how to adjust them to work better. While monitoring and evaluation has not been consistently used in urban planning even in the Global North, this does not mean that frameworks and methodologies could not be identified and used to monitor and assess the effectiveness of plans and programs to address food security in the Global South context. Bolay makes the argument to "translate these plans into actual urban guidance through the use of project and monitoring tools (GIS and planning software, databases, monitoring, control of procedures and processes, accountability, exchanges between actors, tools and technological innovations)" (Bolay, 2020, p. 60).

A challenge in any monitoring and evaluation framework is gathering the data needed to make accurate assessments. Simple and relatively inexpensive information and communication technologies (ICTs) are beginning to be shown to be effective in gathering data in a 'bottom-up approach'. Examples include informal settlement dwellers assisting in the mapping of their settlement using GIS technologies, and surveys conducted via simple SMS technology to monitor precise indicators tied to the effectiveness of programs. As these tools become increasingly accessible and sophisticated, the interesting question is how they could be used to support initiatives aimed at food security, and especially the monitoring and evaluation of these initiatives.

A monitoring framework has been proposed by the Food and Agriculture Organization of the United Nations to monitor programs aimed at food systems. The framework, called the Milan Urban Food Policy Pact (MUFPP) evaluation framework, proposes a range of indicators that could be used when developing an appropriate monitoring framework for a specific initiative. The framework does not, however, prescribe or even suggest how the data should be gathered. This research report seeks to review examples of simple technologies used for the monitoring and

evaluation of development programs and propose ways in which simple technologies could be used in the gathering of the data for food security programs.

Purpose and scope

The guiding question that underpins this report is the following: How can relatively simple and inexpensive ICTs be used for monitoring and evaluation activities for initiatives designed to address issues of food security in rapidly urbanizing areas in LMICs. By answering this question, I hope to also offer some insight into the benefits and challenges of using these technologies for this purpose.

The audience for this report could include those working for non-profits, foundations, and other organizations grappling with the issue of food security in rapidly urbanizing contexts in LMICs. While I will present and discuss specific technologies, this report is not intended as a document to describe the technical details of any given technology. Rather it draws from different areas of interest: evaluation, program design, technology application. I believe strongly in a practical, multi-disciplinary approach to situations. I hope that this report provides those working on this issue insight, inspiration, or at the very least, some useful information.

Chapter 2: Methodology and Structure

This report will largely draw from scholarly articles, grey literature, reports, and analyses published by foundations, non-profits, and other organizations, as well as white papers published by companies working in the area of study. Following on arguments presented by Flyvbjerg (2006) that much can be learned from case studies, I will present three examples of how simple technology has been or is being used to gather data in development initiatives. I will also present some of the technologies currently being used and discuss how these could be applied to monitoring and evaluation activities explicitly related to food security.

A review of literature will be used to present the context and important concepts, namely food security and monitoring and evaluation. I will then draw on grey literature and the websites of various organizations working in this area to present and discuss the actual technologies. Three examples will be presented where technology is being applied in LMICs contexts. Finally, a discussion section will use an existing framework as a building block to demonstrate how certain technologies could be used for monitoring and evaluation activities.

Report structure

The following chapter will introduce and discuss the growing interest in the intersection of food security and urban planning, in particular in low- and medium-income countries (LMICs). Chapter 4 will then discuss monitoring and evaluation practices, particularly as they relate to urban planning-related initiatives. Chapter 5 will focus on the actual ICTs being discussed in this report as well as present three organizations that are developing technologies in this area. I will also present a summary of the possible challenges these technologies may present for monitoring and evaluation initiatives. In chapter 6, three examples of initiatives which have used ICTs will be presented and discussed, including the challenges confronted in each example. The chapter will end with a summary of the lessons learned from these three real-world examples. Chapter 7 will combine the different concepts presented so far in the report and propose examples of applying ICTs to three indicators in a recently proposed UN framework for monitoring and evaluating food

security programs through the Milan Urban Food Policy Pact (MUFPP). The report will conclude with a summary of the lessons learned and best practices, as well as proposing areas for further research.

Chapter 3: Food Security as an Urban Planning Issue

Introduction

In this section, I will identify key concepts and some background information on each, as well as provide context to the issues I want to discuss, namely, food security, rapid urbanization in LMICs, and food security and food systems as urban issues.

What is food security?

The definition of what is food security has evolved over the last 50 years (HLPE, 2021, p. 135). At a World Food Conference in 1974, the term was first defined as "[the] availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (FAO, 1974). This definition reflected the thinking at the time that food insecurity was largely a result of the lack of food supplies and price instability (HLPE, 2021). The definition and understanding of food security have evolved considerably since 1974, and even in the last few years better understanding of the complexity of the problem has led to significant additions to the widely accepted definition. Figure 1 describes visually the definition that was published by the High Level Panel of Experts from the Committee on World Food Security (HLPE, 2021). The concept of availability is now just one of six dimensions considered important when examining what impacts food security.

Figure 1: The six dimensions of food security in its latest definition.
Source: (HLPE, 2021, p. 10)

Two of the dimensions, agency and sustainability, were added by the High Level Panel of Experts in 2021, a testimony to the fact that research and understanding of food security continue to evolve (HLPE, 2021, p. 7).

Growing food insecurity in the world, and an ever-more urban issue

The estimated number of people living in a situation of food insecurity is tremendous and appears to be growing, especially in light of the COVID pandemic. A recent report co-authored by various United Nations organizations presented startling statistics (FAO, IFAD, UNICEF, WFP and WHO, 2021). The report estimated that between 720 and 811 million people faced chronic hunger in 2020, representing around 161 million more than in 2019 (FAO, IFAD, UNICEF, WFP and WHO, 2021). And looking beyond the extreme of hunger, the report estimated that nearly 2.37 billion people around the world did not have access to adequate food in 2020, which represents one-third of the world's population (FAO, IFAD, UNICEF, WFP and WHO, 2021). The numbers are staggering. And perhaps what is most important for the discussion to come shortly in this report, the UN report clearly indicated that this growth in hunger was not limited to any one region of the world; the report stated that "persistently high levels of poverty and income inequality continue to keep healthy diets out of reach for around 3 billion people" (FAO, IFAD,

UNICEF, WFP and WHO, 2021, p. vi). The issue of food security is clearly not just an issue confined to rural populations, nor an issue only affecting low- and middle-income countries. As has been argued for years by certain researchers, food insecurity is very much an urban issue and highly impacted by poverty given the high dependency of urban dwellers on purchasing food rather than growing it (Satterthwaite, 2003; Tacoli et al., 2013). Policy prescriptions to address food insecurity broadly have been focused on rural food production and not taken into account the importance of access and affordability of food for poor urban residents (Tacoli et al., 2013, p. 1).

The increasing number of food-insecure people is happening at a time when global food production has increased tremendously. The FAO estimated that agricultural production more than tripled from 1960 to 2015 (Food and Agriculture Organization of the United Nations, 2017, p. 18). Scholars of the topic state that, "the current production of crops is sufficient to provide enough food for the projected global population of 9.7 billion in 2050," yet caution that significant changes to the socio-economic conditions of many along with "radical changes" to the dietary choices are required (Berners-Lee et al., 2018, p. 1). Simply put, however, the world is already producing enough edible calories to feed 9 billion people and yet, despite this abundance, food insecurity is widespread (Vandermeer et al., 2018, p. 2).

Along with an increase in food production, the number of people living in rural areas is decreasing. The UN estimates that the world's rural population peaked in 2007 and will now decline into the future (United Nations, Department of Economic and Social Affairs, Population Division, 2018). The world it seems is on track to become ever-more urban. The UN estimates that with the widespread trend of urbanization around the world, by 2050 an additional 2.4 billion people will be living in towns and cities (Food and Agriculture Organization of the United Nations, 2017). The rapid urbanization rate, however, is not equal among rich, industrialized countries and the low- and middle-income countries. Low-income countries (LICs) are experiencing the fastest urban population growth, and most of this is in Sub-Saharan Africa (Otsuka & Fan, 2021). According to the UN, about half of low-income countries' population live in urban areas today, and by 2050 this proportion will increase to two-thirds (United Nations et al., 2019b, p. xix).

It would seem a paradox that while food supplies are increasing, food security continues to be an issue throughout the world and by some estimates seems to be worsening. The COVID-19 pandemic was particularly effective at emphasizing that the issue of food insecurity is prevalent everywhere and should not be seen as just a rural problem (Welsh, 2021). Increasingly, policy makers, scholars, and analysts understand that food security cannot be addressed through increased food production. Additionally, in the context of rapid urbanization, food insecurity is understood to be as much an urban problem as a rural one (Haysom et al., 2021).

> *Clearly food security is not about simply producing enough food (availability). That's the way policies in most African countries tend to frame it. In most Southern and African cities, the challenge is that nutritious food is unaffordable to most urban residents (accessibility)… In this context of rapid urbanisation, it is now widely recognised that the cities of the South are facing a deepening crisis of poor access to food.* (Haysom et al., 2021, p. 2)

There is also strong and growing evidence that links food insecurity with poverty as urban inhabitants are more reliant on an income that allows them to purchase food than on growing food themselves directly (Tacoli, 2017).

The rapid and sustained rate of urbanization, especially in LMICs, is creating an ever-increasing challenge for governments and urbanists. Population growth is happening at far higher rates in LMICs. "The 47 least developed countries are among the world's fastest growing—many are projected to double in population between 2019 and 2050—putting pressure on already strained resources" (United Nations et al., 2019a, p. 1). Compounding this issue is the trend towards greater urbanization as more and more people move to cities from rural and semi-rural areas.

In summary, food security has historically been seen as a rural issue and a problem of food supply, but there is increasing recognition and understanding that it is an urban issue. At the same time, the world is increasingly urbanized, in particular in LMICs. The problem of food insecurity, therefore, is now beginning to be understood as a major urban issue facing cities in low- and medium-income countries, although high-income countries are not immune either to this problem as has been unfortunately demonstrated during the COVID-19 pandemic.

Recognition of food security as an urban planning issue

With a growing awareness that food security is as much an urban issue as a rural one, there is also broader recognition that food security can and should be seen as an issue that needs greater attention by urbanists (Cabannes & Marocchino, 2018; Tacoli, 2019). A book published in 2021, *Handbook on Urban Food Security in the Global* South, places the issues of food systems and food security squarely in an urban planning context in the Global South (Crush et al., 2020).

As early as 2001, a scholar and project coordinator named Wayne Roberts from Toronto was making the case for why food should be seen as part of urban planning (Roberts, 2001). "Given the over-arching importance of food in urban life, planners need to put food closer to the top of their planning menu" opined Roberts (Roberts, 2001, p. 7). "More than any other of our biological needs, the choices we make around food affect the shape, style, pulse, smell, look, feel, health, economy, street life and infrastructure of the city" (Roberts, 2001, p. 7). He clearly saw how much food can shape a city, and vice versa.

In the years since Roberts' book, various scholars and urban planning practitioners have made the case as well for inclusion of food in urban planning (see for example Morgan, 2009; Steel, 2013; Tacoli, 2017). Writing in 2009, Morgan states, "Among the basic essentials for life— air, water, shelter and food—planners have traditionally addressed them all with the conspicuous exception of food" (Morgan, 2009, p. 341). It seemed, according to Morgan and others since, that this omission was due to food security issues being seen as a rural problem and not in the scope of urban planning issues (Cabannes & Marocchino, 2018; Morgan, 2009; Steenkamp et al., 2021).

A recent book dedicated to the relationship between food and urban planning, entitled *Integrating Food into Urban Planning* (Cabannes & Marocchino, 2018), reviews the history of the relationship between food, food security, and urban planning, and makes a strong argument about the linkage (Cabannes & Marocchino, 2018). The authors are very critical of the urban planning field for its neglect of food. "Until recently, urban planners have paid little attention to food systems, emphasising 'traditional' urban priorities such as public transportation and decent housing" (Cabannes & Marocchino, 2018, p. 6). Their argument is best summed up in this passage:

How food is produced, processed, distributed, consumed, recovered and wasted and how local food systems complement rural agricultural production are issues that relate closely to urban planning, which can be either an opportunity to feed cities better or an obstacle to making food systems work sustainably." (Cabannes & Marocchino, 2018, p. 28)

Other scholars see numerous ways that more traditional urban planning issues impact food, food security, and food systems. Transportation networks are essential to moving food into cities and distributing it in a timely way (Tacoli, 2017). Land use can help ensure that locations are available and accessible to everyone for food markets and other food distribution points (*Food Security in Urban Zimbabwe*, 2016). As this is a relatively recent issue to be addressed by urbanists, much remains to be researched as there are significant knowledge gaps yet a real urgency to understand the different dimensions and complexities of food issues in urban areas (Haysom et al., 2021).

Complexity of food security as an urban planning issue

Food security is arguably an issue that should be near the top of a list of priorities for urbanists and it is important to point out the issue's complexity. In doing research for this report, I identified several aspects of food security that make it a very complex issue especially when approached with an urban planning lens. The following is a non-exhaustive list of the aspects and characteristics of food security, and more broadly food systems, that may render it complex or difficult as an issue for urban planners.

- **A wicked problem**—Food insecurity could be classified as a wicked problem using Rittell and Weber's definition of what constitutes one (Rittel & Webber, 1973). Wicked problems can be characterized by the following: they have multiple causes; they have many interdependencies; stakeholder groups may have different understandings of what the problems are and conflicting goals; wicked problems have no clear solution; attempts to address them often lead to unforeseen consequences; and they are context-specific (Zivkovic, 2017, pp. 236–237). Indeed, the Australian scholar Sharon Zivkovic argues very convincingly in a 2017 paper about the alignment between the characteristics of wicked problems

and the characteristics of food insecurity (Zivkovic, 2017). She makes her argument as follows:

> Both food security and insecurity have multiple causes. The numerous determinants of the four pillars of food security highlight the multiple causes underpinning food security. Examples of the multiple causes of food insecurity include poverty, the poor nutritional quality of the food that is available, a shortage of food outlets, a lack of transport, insufficient time and a lack of knowledge and skills…The multiple causes of food insecurity also have many interdependencies. For example, a reduction in the purchasing power of a local community owing to a major employer shutting down could trigger the closure of a local food store, or the opening of a local farmer's market could encourage existing food stores to provide more fresh fruit and vegetables…Different food insecurity stakeholders have a different understanding of what the problem of food insecurity is and therefore have conflicting goals. For example, some argue that the future food needs of the world can be met by the current levels of production, whereas others argue they cannot; some stakeholders argue that there is enough food in the world and the problem is distribution. (Zivkovic, 2017, p. 237)

Other researchers have pointed out as well the complexity of food systems in general, and particularly when considering food insecurity (Cabannes & Marocchino, 2018). For example, a researcher writing on Bangkok's food systems asserted that, "food systems are too complex to be covered by a single all-inclusive plan that attempts to address the multiple scales and mixes of formal and informal activities and that has been developed by multiple stakeholders" (Cabannes & Marocchino, 2018, p. 76).

- **Intertwined, multi-scalar, multi-dimensional issue**—Related to the first point, food security and food systems are highly intertwined with other urban planning issues, and it is essential to view them as multi-scalar and multi-dimensional (Battersby & Watson, 2018, p. 61). "The prevailing sectoral planning and decision-making approach, and its lack of a holistic perspective, seems another reason explaining why 'food has been a stranger' to urban planning." (Cabannes & Marocchino, 2018, p. 19). In addition, not only must the issue itself be approached in a holistic manner, but so too the policies that will address the issue.

> *In urban settings, policies need to be grounded in a holistic approach that explicitly positions and addresses food and nutrition insecurity within the broader context of urban poverty and intra-urban inequalities. This means taking into account the multiple dimensions of urban poverty, from incomes and the nature of income-generating activities to the provision of adequate housing and infrastructure, to the impacts of urban planning on access to affordable and nutritious food. (Tacoli, 2019, p. 371)*

- **A fairly new urban planning issue, especially in LMICs**—Viewing food security within an urban context and as an urban planning issue are fairly new concepts and much research still needs to be done.

> *The knowledge gaps are many. Hence the urgent need for wide-ranging research in cities of the South to uncover the dimensions and complexities of the food challenge in urban areas. Of equal importance is for cities of the South to see governing the food system as an urban mandate and governance obligation. (Haysom et al., 2021, p. 3)*

In addition, understanding of food security alone as an issue continues to evolve as we saw in the previous section on the definition of food security.

- **Danger of applying solutions or approaches from high-income countries**—There is a general tendency, now criticized, to apply solutions developed in high-income countries to low- and medium-income countries without taking into account the unique contexts (see for example Bolay, 2020; Watson, 2009).

> *Of all the analyses made of urban planning…it appears that this vision of the city and the resulting urban and/or regional organization is historically rooted in the West. Its translation to the Global South was long replicated based mainly on technical and procedural considerations, and without taking into account the human, cultural, geographic or urbanistic realities of local and regional contexts.* (Bolay, 2020, p. 59)

It will be important to not fall into the trap of applying approaches developed in HICs to LMICs and expect them to have similar results. Urban agriculture is one example: a growing trend of advocating for urban agriculture in cities of HICs to combat food insecurity may not be an appropriate nor feasible solution in cities of LMICs for a variety of reasons (Frayne et al., 2014). Badami and Ramankutty (2015) argue that urban agriculture "can only make a limited contribution in

achieving urban food security in low-income countries" (p. 8). Given that recognizing urban food insecurity is fairly new, there may be a risk in the race to address urban food insecurity in rapidly urbanizing cities of the LMICs to grasp for solutions being used in HICs rather than taking the time to analyze each context and identify an appropriate solution.

- **A stereotype that cities represent prosperity and abundance**—There is a persistent stereotype that cities represent bounty and opportunities, and therefore food insecurity is lessened in the urban context. "The vision of the cities as hubs of prosperity, wealth and development, compared with rural areas, is unfortunately not accurate when it comes to food insecurity. This is a challenge for developers and for planners" (Cabannes & Marocchino, 2018, p. 7).

- **Current practice and policy in LMICs may actually be detrimental to food security**—When confronting the issue of food insecurity as an urban planning issue, it may not only be about introducing new policies but also counter-acting existing policies. For example, Morgan points out how "urban planners in Africa have been part of the problem of food insecurity because, until recently, they saw it as their professional duty to rid the city of urban agriculture" (Morgan, 2009, p. 344).

- **The informal sector at odds with policy**—There is a growing understanding of the importance that the informal sector plays in LMICs in addressing the issue of food insecurity. However, the informal sector is often at odds with the policies of governments in LMICs, thus posing an additional challenge when addressing food insecurity as an urban planning issue (Tacoli, 2017, p. 5). For example, growing evidence points to the importance of informal food vendors, e.g., night markets and street vendors, in supplying food to urban inhabitants (Tacoli, 2017).

  > *Despite their pivotal role, informal food vendors in developing countries are quite often victims of abuse by the authorities, including police harassment and arbitrary confiscation of merchandise, or restrictions relating to licences and fees. (Cabannes & Marocchino, 2018, p. 13)*

The above list represents some of the aspects and characteristics of food security as an urban planning issue that render it complex and perhaps different from other issues that urbanists are already confronting.

An urgent urban issue. So now what?

Food security is no longer just a rural issue, nor is it an issue that can be addressed simply by increasing food production and supplies. The past 50 years of research and thinking about this issue have brought an understanding that it is very much an urban issue with many dimensions, and one that will not be solved with simplistic solutions. A strong argument is being made for it to be viewed as an issue for urbanists to tackle, especially since the world is becoming increasingly urban, and rapid urbanization is taking place in countries that have fewer resources to deal with the problem.

The question is, what now? Beyond the need for more research, there is a need for initiatives by governments, non-profits, foundations, and others to target the issue of urban food insecurity. Funding to deal with urban issues is not limitless, and therefore any program to address food insecurity will compete for funding with initiatives addressing other urban issues. A potential funder of a program to address food insecurity will likely require that a framework is in place to ensure effective and efficient use of funds. One way to meet this requirement is through effective monitoring and evaluation, which brings us to our next chapter.

Chapter 4: Monitoring and Evaluation

Introduction

In this chapter I will present an overview of the concept of monitoring and evaluation, first in the broader context of international development where monitoring and evaluation, commonly abbreviated as M&E, has a relatively long and varied history (Morra-Imas & Rist, 2009, pp. 19–22), and then in the more focused area of urban planning where it has a much shorter history of use (Oliveira & Pinho, 2010, pp. 343–346). Finally, I will discuss a subject within the field of M&E called participatory monitoring and evaluation (PM&E), in which interest and use have grown in the past several decades and the understanding of which will help to make my arguments related to this issue later in this report.

Overview of monitoring and evaluation in the context of international development

The topic of M&E is vast, continually evolving, and fraught with debates about the different approaches, its true effectiveness, and its numerous challenges. The goal in this section is to give a sufficient overview in order to understand the context in which I am making my argument concerning the use of technology. Entire books have been written on the intricacy and subtleties of M&E; my intent here is not to summarize this complex subject in a few paragraphs, but rather highlight a few aspects that are relevant to the topic of this report.

When investing in initiatives designed to tackle a problem, governments, non-governmental organizations, and foundations want a way to ensure that the initiatives will in fact make a positive difference and truly address the intended problems. An ever-growing body of evidence points to the wasted efforts—not to mention money—of development initiatives which were arguably well-intentioned but for varying reasons, ultimately failures (Bolay, 2020; Hobbes, 2014; Shepard, 2017). As one author asks rhetorically, "How is it that the number of urban poor continues to rise, despite record-high investments in planning and construction? (Bolay, 2020, p. 59). M&E is considered now a requisite component of any international development initiative (Bornstein, 2006). There seems to be a consensus that it should be an essential component of

any program, policy, plan, or initiative (United Nations Human Settlements Programme, 2009, p. 171). As the saying goes, in order to change something, you need to measure it (Kusek & Rist, 2004, p. 11).

Monitoring can be broadly defined as, "the process of accompanying and tracking progress of a project's implementation [and] is meant to let project management know of difficulties, successes and adjustments in the field in a timely manner, and to allow for appropriate modifications in the design of the overall programme" (Bornstein, 2006, p. 53). Evaluation, in contrast, can be defined as, "The systematic and objective assessment of an on-going or completed project, programme, or policy, its design, implementation and results. The aim is to determine the relevance and fulfillment of objectives, development efficiency, effectiveness, impact and sustainability" (Organization for Economic Co-operation and Development, 2010, p. 21). The definitions and differences between the two terms is summarized in Figure 2.

Figure 2: Differences between monitoring and evaluation.
Source: Kusek & Rist, 2004, p. 14

M&E is not performed easily, with challenges varying from one initiative to another depending on numerous variables. In the case of M&E of urban plans, there are common challenges which are summarized in Figure 3.

Category	Elements
Theoretical issues	What is the role of plans? What ability do plans have to effect change? What is the function of the evaluation? What is the role of values? Who are the clients? What are the criteria of success – effectiveness, efficiency, equity?
Strategic issues	Timing (frequency, point in time) Level (street, neighbourhood, city, region) of measurement/analysis Establishing baseline community conditions
Definition and measurement issues	Defining targets, operationalizing problems Capturing plurality of impact, both perception and experience Tracking unintended impacts or invisible impacts (what has been protected, what has not been built) Translating policy objectives into measurable indicators (i.e. accessibility, interaction indicators) How to measure people's perception of impact versus the actual impact on their behaviour, as well as benefits and costs to people, thus establishing cause-and-effect relationships of plan policy on people and their behaviour Sphere (social, economic, environmental, spatial) of measurement and analysis
Data management	Data manageability and feasibility of monitoring Data availability, quality and access Data analysis and synthesis
Process issues	Understanding linkages and synergies Establishing a supportive environment for monitoring and evaluation Capturing the impact of policy upon community capacity through participation of a cross-section of community members Ensuring that monitoring and evaluation becomes the basis of critical self-reflection and learning

Figure 3: Common challenges in monitoring and evaluating urban plans.
Source: United Nations Human Settlements Programme, 2009, p. 180

Of particular interest to this report is the need for good data, as highlighted in the data management category of Figure 3. Data are often identified as the crucial element to successful, effective monitoring and evaluation initiatives (Covic et al., 2021), although determining which data points are needed can be challenging and will be discussed in the next paragraph. Without good, reliable data, any exercise in M&E may at the least be ineffectual, and at the worst, detrimental to the initiative. When considering the various challenges to M&E in a context of

LMICs, the challenges can even be more formidable. It takes resources and knowledge to gather accurate, timely data, and both of these may be in short supply in LMICs (Ferdinand et al., 2021; Marshall et al., 2021).

Determining what data should be gathered is a challenge that needs to be addressed before tackling the question of how to gather the data. There are various methods to identify indicators and related data points; a full discussion of these methods is out of the scope of this report. Its importance, however, bears mentioning. Methods such as developing a theory of change or logic model for a specific initiative can be used to help identify meaningful measures, indicators, and data points that will help to measure the effectiveness of a program. For complete explanations of these methods, please see the very comprehensive and well-written document, "Logic model development guide" (W.K. Kellogg Foundation, 2004) as well as the academic article entitled, "The use of logic models by community-based initiatives" (Kaplan & Garrett, 2005). While there are various methods, ultimately the goal is to identify meaningful indicators that provide the most accurate measures of the effectiveness and efficiency of the program. Gathering data that serves little or no purpose is to be avoided, and careful thought, consultation, and preparation must be done long before data is actually gathered.

Monitoring and evaluation in the urban planning context

We now turn to monitoring and evaluation in the context of urban planning initiatives, plans, and programs. While the fundamentals by and large remain the same when considering M&E in initiatives focused on urban planning issues, there are particularities that need to be considered.

> *Regardless of the context—growth or decline, developed or developing countries—urban planners and decision-makers need to know how best to use limited resources to address the complex urban challenges (and opportunities) that are presented. Urban planning seeks to be efficient (make optimal use of resources), effective (create desired and meaningful impacts and outcomes), and also seeks to enhance equity (of opportunity, rights, and power, especially with regard to gender). To achieve these '3Es' of good planning practice, decision-makers need a solid foundation of information and direction that can be provided by urban planning—specifically, the monitoring and evaluation of urban plans.* (United Nations Human Settlements Programme, 2009, p. 171)

The concept of evaluation in urban planning has evolved greatly from the mid-1970s when a seminal book by Nathaniel Lichfield (Lichfield et al., 1975) presented and discussed how to evaluate *ex ante* which plan to use when considering various possible plans in an urban planning context. In the subsequent decades further research and discussion on the topic resulted in the articulation of three forms of evaluating urban plans: *ex ante*, done during the formulation of a plan, *formative evaluation*, done during the implementation of a plan, and *ex post or summative*, done after a plan has been implemented (United Nations Human Settlements Programme, 2009, p. 172).

Despite the development and refinement of the methods and approaches for M&E in urban planning, numerous authors have criticized the lack of awareness and use of M&E in urban planning. A seminal article by scholar Emily Talen in 1996 asked the fundamental question, "Because the success of plan-making can be determined only at a future point in time, how do planners ever come to know that what they are doing—the plans they are fashioning—are a legitimate effort?" (Talen, 1996, p. 248). Other scholars joined in the discussion, such as Abdul Phakee with an article in 1998 making the case that evaluation and planning are "inseparable concepts" (Khakee, 1998, p. 359). Work by Canadian scholars Mark Seasons and Dave Guyadeen has shown the under-utilization of M&E in the urban planning profession (Guyadeen, 2019), and program and planning evaluation should be seen as more closely linked (Guyadeen & Seasons, 2018).

As with M&E in development programs discussed in the previous section, there are similar challenges in M&E efforts in the urban planning context. In particular, a common challenge is the gathering of appropriate, accurate data that will assist stakeholders in monitoring and assessing whether programs are effective.

> *Indicators provide the quantitative data and/or qualitative information that demonstrate trends and patterns. This information tells us something about phenomena in the decision-making environment. In the process of monitoring, the information and data generated by indicators are checked and updated regularly. When monitored properly, these data and information provide the evidence that is required to support evaluation.* (United Nations Human Settlements Programme, 2009, p. 172)

The need for good, recent, accurate data is essential in monitoring and evaluation activities, and this can be challenging in any environment but compounded when working in LMICs due to many factors: lack of resources, lack of knowledge to gather data accurately, difficulty in assembling data, and difficultly in providing timely data on a regular basis.

It should be noted that much of the research and articles on urban planning monitoring and evaluation have focused on high-income countries (HICs) and therefore do not speak to the unique contexts that urban planning programs face in LMICs (Bolay, 2020; Watson, 2009). This is an area that could benefit from much more research.

Participatory monitoring and evaluation

Monitoring and evaluation has evolved to be seen largely as a control and accountability function and less as monitoring progress and supplying information to help make initiatives more efficient and effective (Hilhorst & Guijt, 2006, p. 3). There is also concern as to who the stakeholders are who are involved in the M&E activities (Onyango, 2018, p. 428). While primary stakeholders (those most likely to benefit directly from any initiatives) are increasingly involved in other aspects of initiatives, they are still not necessarily fully involved in the monitoring and evaluation efforts (Hilhorst & Guijt, 2006, p. 3).

These concerns, among others, resulted in greater interest in what is known as participatory monitoring and evaluation (PM&E). PM&E can be defined as, "a process where primary stakeholders—those who are affected by the intervention being examined—are active participants, take the lead in tracking and making sense of progress towards achievement of self-selected or jointly agreed results at the local level, and drawing actionable conclusions" (Hilhorst & Guijt, 2006, p. 4). The process itself is predicated on building consensus on the expected results of an initiative, defining how progress is tracked, collecting the necessary data to track the progress, jointly analyzing the data and progress, and deciding together what actions to take (Hilhorst & Guijt, 2006, p. 5). Participatory M&E differs from a more conventional M&E approach in several fundamental ways, as summarized in Table 1.

	Conventional M&E	Participatory M&E
Who plans and manages the process	Senior managers, or outside experts	Local people, project staff, managers, and other stakeholders, often helped by a facilitator
Role of 'primary stakeholders' (the intended beneficiaries)	Provide information only	Design and adapt the methodology, collect and analyse data, share findings and link them to action
How success is measured	Externally defined, mainly quantitative indicators	Internally defined indicators, including more qualitative judgements
Approach	Predetermined	Adaptive

Table 1. Comparison of approaches: conventional M&E and participatory M&E.
Source: Institute of Development Studies, 1998, pp. 1–2

Of particular interest for this report is the role of primary stakeholders in PM&E, and their involvement in the collection and analysis of data. Data, as we have seen earlier, are fundamentally important to effective monitoring and evaluation activities, and in many of the dynamic and fast-moving environments and initiatives aimed at tackling problems in these contexts, frequent and consistent data collection is becoming essential. "Given the rapid pace and extent of change in local government decision-making environments, there is a need for constant assessment of trends, activities and performance" (United Nations Human Settlements Programme, 2009, p. 171). Continuous monitoring and evaluation throughout the life of an initiative is becoming essential in order to avoid what one researcher called "a short self-life of information collected" (Hilhorst & Guijt, 2006, p. 8).

In summary, there is strong and growing evidence that participatory monitoring and evaluation is a useful tool. The United Nations has listed some of the primary positive outcomes of PM&E as being increased transparency, increased sense of ownership of the development process itself among the intended beneficiaries/clients, and increased flexibility to adapt by learning from experiences during plan implementation (United Nations Human Settlements Programme, 2009, p. 176). As we will see in the coming chapters, combining a PM&E approach with certain technologies may permit more accurate, effective, and inclusive monitoring and evaluation of initiatives.

Chapter 5: Technologies and Technology Organizations

Introduction

As was mentioned in the previous section, the collection of data is essential for proper M&E functions. Scholars and practitioners working in development have argued that it is important to measure results in order to determine success or failure (Kusek & Rist, 2004, p. 11). The challenge has been and will continue to be how to go about doing this. In this chapter, I will provide an overview of the different technologies that could be—and in many cases, already are—used in monitoring and evaluation activities. Before presenting and discussing specific examples of how these technologies have been used and making the case for how they can be used specifically in the M&E of initiatives related to urban food security, I want to present the technologies themselves. In addition, I will present several companies that are working in this space to develop the technologies and cite some examples of how the technology can be used.

As noted in the foreword to a paper sponsored by a large donor foundation, The Rockefeller Foundation (Raftree & Bamberger, 2014), the field of M&E has in some respects been slow to adopt and embrace technology as a tool, despite the great promise that the technological and internet revolution has had on many other aspects of life in the 21st century. "In spite of this broad reluctance, M&E innovators are already experimenting in this new space and harnessing the power of technology to confront both real-world evaluation constraints and fundamental methodological challenges" (Raftree & Bamberger, 2014, p. vii).

Technologies available

To give the reader an idea of the type of technologies that are being used or could be used in monitoring and evaluation, I present at a high-level in Table 2 some of these technologies. In my research, I found several fairly recent articles (Dette et al., 2016; Sagmeister, 2017) and a book chapter (Hostettler, 2018, Chapter 2) that present the technologies that have been identified by practitioners in the field of humanitarian responses working in dangerous zones and

insecure environments. I also use information from The Rockefeller Foundation report on technologies for M&E (Raftree & Bamberger, 2014). While I am drawing this summary of technologies from various articles written for the humanitarian field where organizations are operating in highly unstable, insecure areas, similar challenges may be present when considering the needs of M&E for food security programs in LMICs, and these challenges could be overcome using these technologies.

Table 2 is organized by the type of technology considered. For each technology, I provide a brief description along with the possible advantages and potential applications.

Technology	Description	Possible Advantages	Potential Applications
Basic mobile phones	Reliable channel to reach communities through calls, text messages, and IVR (interactive voice recordings) for outreach as well as feedback systems	Cellular network coverage is widespread even in many LMICs, and only growing. Cell phone ownership rates can be high even in low-income communities. Cost can be relatively inexpensive to both acquire and operate.	Phone-based surveys Verification calls Complaint and information hotlines
Smartphones and tablets	Digital devices that can either be given/loaned to stakeholders or taken into the field by M&E staff. Can help collect data as well as visualize data. If cell network available, data collection can by linked to online resources such as cloud database.	Paper-based surveys and other manual collection methods can be digitized, allowing for faster data collection, aggregation, and dissemination than with traditional manual methods. Digital devices are becoming ever cheaper and more accessible as well as more powerful. Smaller devices are more discreet than clipboards and paper.	Surveys and questionnaires
GIS, remote sensing	Using digital devices equipped with GPS technology can allow for capturing data that can then be mapped. Aerial technologies such as satellite images can be used to gather information without a physical presence on the ground needed.	Staff or physical presence of someone is not necessarily needed on the ground, so in remote or insecure locations this can be of great advantage.	Crowd-sourced maps Observations and analysis using satellite imagery Sending accurate location reports

Online communication platforms	Social media networks as well as instant messaging applications (e.g., Facebook, Twitter, WhatsApp).	Widely accessible and in some cases already known and being used by target populations. Often use is free of charge except for fees to connect to the Internet. Standard encryption often used. Target population already familiar with the technology.	Information-sharing Enable communication between and among stakeholder groups in a more informal setting Encourage participation from those who may not be available or able to participate in person. Internal staff communications Complaints and suggestions
Data visualization tools	Online or local software that can take vast quantities of data and create visualizations that are easier to read and understand. Previously very expensive and requiring considerable technical knowledge, now easier and cheaper to acquire and use.	Understand and leverage vast quantities of data quickly and relatively cheaply Enable dissemination and sharing of data in a more easily digestible format.	Real-time visual dashboards of situations Maps and other graphical representations of data

Table 2: Different types of technologies used, possible advantages and potential applications.
Sources used for table: Dette et al., 2016, p. 4; Hostettler et al., 2018, p. 15; Raftree & Bamberger, 2014, p. 5; Sagmeister, 2017, p. 2.

This is just an overview of some of the technologies available and their possible applications. As with the entire technology sector, technologies that could be appropriate for monitoring and evaluation efforts are constantly evolving, and although the information for the table was taken from articles published in the last six years, ever-increasing technological innovations continue to bring new uses to the market. I will present in another section an overview (see Table 3) of just a few of the companies that are working in this space.

Application of these technologies in M&E

Each technology has a variety of potential applications, and these are only limited by the imagination, creativity, and budget of each organization choosing to leverage these technologies. Each application could be used at different points in the monitoring and evaluation cycle. The graphic in Figure 4 describes both the advantages of information and communication technologies (ICTs) (middle circle) as well as how the technologies could be used at each phase of the monitoring and evaluation cycle. A more in-depth description and discussion of each phase is beyond the scope of this report, but more information can be found in a discussion paper

published by The Rockefeller Foundation's Evaluation Office and entitled *Emerging Opportunities: Monitoring and Evaluation in a Tech-Enabled World* (Raftree & Bamberger, 2014).

Diagnosis:
new voices
broader participation
wider range of input
reduced costs

Planning:
more information
greater inclusion/participation
more timely data
geographic information
data visualization
theory of change development

ICTs in monitoring and evaluation can allow for:
higher quality data
variety of data sources
saving time and money
upward, downward, and horizontal accountability
better decision-making
coordination and cooperation

Reporting, sharing, and learning:
wider circulation
interactive sharing
more public engagement with findings

Evaluation:
higher quality data
combined sources
broader input
more accountability
greater range of data types
larger sample sizes
geographic/spatial data
improved sampling
better data on complex programs

Implementation and monitoring:
real-time data
direct feedback
greater transparency & accountability
widened range of indicators
improved data quality and efficiency
quickened course modification

Figure 4: ICTs in monitoring and evaluation.
Source: Raftree & Bamberger, 2014, p. 15

Examples of organizations working in this sector

To better understand the ways these technologies are being leveraged, I thought it interesting to present just three of the hundreds of organizations and companies using these technologies for services and products targeted at the monitoring and evaluation needs in LMICs. In Table 3 I give a short profile of three such organizations: Viamo, KoBoToolbox, and Spatial

Collective. The information for each profile was taken directly from the respective organization's website.

	Viamo	KoBoToolbox	Spatial Collective
History of organization	Started in 2012 by Ghanaian and Canadian engineers in Kumasi. "The founders noticed that there had been a huge increase in mobile phone usage, but that very few organisations were using this communication channel to reach their end-users."	Group of developers and researchers who developed a suite of free and open-source tools for field data collection.	Founded in 2012 in Nairobi, Kenya, with primary focus of activity in Africa
Location	Offices throughout the world	Cambridge, Massachusetts and many other locations worldwide	Nairobi, Kenya
Contact details	www.viamo.io	www.kobotoolbox.org	www.spatialcollective.com
Description	"A global social enterprise improving lives via mobile." "Viamo connects individuals and organizations to make better decisions. We envision a world where all people have access to the information they need to make decisions for healthy, prosperous lives, and have meaningful relationships with governments, civil society, and businesses. We use simple, low-cost technology for data collection and for the provision of public service information via mobile."	A suite of open-source tools developed by the Harvard Humanitarian Initiative for data collection and analysis in humanitarian emergencies and other challenging environments. The initiative is funded entirely through grants and donations.	"Their mission is to train and support communities and organizations on how to adapt available technologies to collect data that is important to them, and then help them store, own and analyze the data in order to make the most appropriate development solutions. The majority of the work is conducted in difficult environments where there are very few existing data, and on issues of significant global importance ranging from environmental management, livelihoods and economic prosperity, formal and informal governance initiatives, safety and security, and property rights."

	Viamo	KoBoToolbox	Spatial Collective
Products/services provided	**Data Collection** Collect valuable information from specific populations, the people an organization serves, or field staff in any local language, in real time. **Information sharing** Share valuable information with a specific population, the people an organization services, or field staff, in any local language, while collecting immediate feedback.	An integrated suite of various tools for data collection, including building the data collections forms, collecting data both online and offline, and then analyzing and managing the data.	Training and community engagement Data collection and research Data storytelling and advocacy. Training communities in mapping, open data, and GIS.
Examples of real-life uses	Helped the Government of Ghana encourage uptake of key health behaviors by using Viamo to reach the target population, increase level of exposure, and measure effectiveness of health promotion messages. Data collected was used for real-time, ongoing monitoring of program indicators, allowing for refinement of messages, methods and vehicles for effective behavior change throughout the course of the project.	An open-source mobile monitoring system for a food security program in Tanzania called Maisha Bora, sponsored by the Belgian Development Agency. Funding agency was able to create data entry forms that met their needs, and then use them to collect data in the field using smart devices and upload the data to the cloud.	"Helped the Revolutionary Government of Zanzibar (RGoZ), and participating local entities, to collect and verify geospatial data by utilizing rectified UAV imagery and community mapping techniques. The assignment aimed to build the capacity of the local Commission for Lands and State University of Zanzibar students, train and supervise the digitization of the UAV imagery, and conduct community mapping in Zanzibar City in order to create a series of detailed spatial data layers. Through this initiative, Spatial Collective completed the mapping of every building on Zanzibar, half a million altogether."

Table 3: Profile of three technology organizations providing solutions that could be applicable to M&E activities.
Source: websites of each organization.

Possible challenges to using these technologies

As with anything, there can be a downside to using the ICTs, but many of the challenges can be overcome or mitigated with sufficient forethought. Listed below are some of the challenges that could be faced when using ICTs in M&E activities in the context of LMICs, as

gleaned from several sources. In many cases, these challenges are just as applicable in HICs as they are in LMICs.

Technology for technology's sake

Thought must be given as to why a specific technology is chosen. Technology should be used to solve a problem and not just for the sake of using technology. Using technology just to say that a high-tech solution is being used can unnecessarily add complexity to a situation where a simpler approach would have sufficed.

Lack of infrastructure

The lack of necessary infrastructure available in LMICs can be a concern when thinking about using certain technologies, such as surveys via SMS or cell phones. However, recent research has shown that even in LMICs with limited infrastructure and resources, cell phone penetration is high enough to conduct valid surveys and use mobile technology for monitoring and evaluation purposes (Leo et al., 2015).

Lack of technical knowledge and resistance of local staff

Depending on the organization and staff, there may be a lack of technical knowledge amongst those who would be involved in monitoring and evaluation activities. Consideration needs to be given to how potential users of the technology would be trained. In addition, there could be resistance to using new technologies and changing the way monitoring and evaluation activities were previously done. Organizational change management measures may need to be considered (Raftree & Bamberger, 2014, p. 39).

Cost

The cost of any new technology is a major consideration, especially for small organizations that may not already have an internal IT department or budget for technology. Consideration must be given to not only the cost of acquiring technology but also the cost of training staff, and the recurring costs once technology is implemented (Driesen, 2016). Some cost can be mitigated by using open-source software and technologies that are available for free or at a minimal cost (Raftree & Bamberger, 2014, p. 38).

Data ownership and privacy concerns

Thought must be given to who owns the data that is gathered for monitoring and evaluation activities and how the data will be secured and protected. These concerns can be

particularly urgent in LMICs with hostile governments or environments where the data could place people in immediate danger (Dette et al., 2016).

As Hostettler states, citing work done by Sandvik et al. and Jacobsen, "Simply put, technology often fails when introduced too quickly in the wrong setting and for the wrong reasons" (Hostettler, 2018, p. 19). That said, technology offers a lot of exciting opportunities especially when considering monitoring and evaluation initiatives in LMICs.

Participatory data collection

Recalling the earlier discussion of participatory monitoring and evaluation, it is important to point out how participation by different stakeholder groups, especially those targeted by initiatives, could be directly involved in the gathering of data which could be assisted or enhanced through the use of technologies described in this chapter.

There are several advantages to having local, front-line stakeholders involved in the gathering of data, whether it be for baseline measurements at the beginning of a project, ongoing monitoring, or end-of-project evaluations. The following table summarizes some of these advantages.

Data collected by communities	Data collected by others
The data remains 'alive' in the community	The data is analyzed and is rarely returned to the community
The data contributes to a realignment of power between the community and the authorities	The data reinforces the power of those outside of the community and the gap between their knowledge and that of the community
The process of data gathering organizes communities in a way that facilitates productive engagement with other urban development stakeholders (especially government)	Has no impact on community organization
Generates a dialogue on planning at the community level	Generates a dialogue in professional/academic circles
Is often more comprehensive owing to improved access to those in informal settlements and is a product of dialogue which reduces misinformation.	Often relies on samples and is prone to misinformation from communities (whether because of community strategy or suspicion)

Table 4: Comparison of characteristics between when data is collected by communities versus collected by others outside of the community.
Source: Dobson et al., 2014, p. 17.

The data gathered by the community can be used in many different ways to assist the initiative as well as monitoring and evaluation activities. Besides just providing raw data, the data can be used to create maps and other visual aids that could in turn be made available to the community. This feedback loop could result in more engagement by the community, could raise more questions or issues that perhaps had not first been uncovered, and provide better insight to all stakeholder groups.

Conclusion

In conclusion, simple, inexpensive information and communication technologies (ICTs) are opening ever-increasing possibilities to organizations, companies, NGOs, governments, and others to allow for faster, cheaper, and more accurate gathering, processing, and understanding of data. The technologies could be deployed and used in such a way so as to involve different stakeholder groups who perhaps had previously been excluded from monitoring and evaluation processes. The technologies come with their own challenges, and technology should not be used blindly and without careful consideration of its impact, disadvantages, and challenges. When used appropriately, with proper planning, consideration, and consultation, ICTs offer exciting opportunities for more effective policymaking, implementation, and monitoring and evaluation of initiatives in LMICs.

Chapter 6: Examples of ICT Usage and Lessons Learned

Introduction

The purpose of this chapter is to offer three examples of how technology is already being used for monitoring and evaluation purposes—not exclusively in the context of urban food security programs—in LMICs. The first example from Tanzania is thanks to a very detailed article written by a staff member of the project speaking directly to the advantages and disadvantages of using technology for M&E purposes. The second example shows how participatory data collection combined with GIS mapping technology could be used for M&E purposes. The third example is food security-related and serves to demonstrate how a very simple questionnaire combined with simple technology can yield very important, almost real-time data.

It was not easy to find specific examples with sufficient information available online to understand the full context and analyze feedback on the implementation and use. Although detailed information about each project was limited, based on the information I found online I am able to draw some conclusions from each case.

In the next chapter I will discuss the specificity of urban food security programs and the possible indicators that could be used for monitoring and evaluation purposes. These technologies and the examples of how they are used, combined with food security indicators, could point to the way simple ICTs could be used in the context of urban food security programs.

Example 1: Mobile monitoring system of food security program, Maisha Bora, Tanzania

Context

The first example is from Tanzania and involves a monitoring system put in place in 2016 for a food security program. The information for this example comes from an online article (Driesen, 2016) written by Toon Driesen, an employee of Enabel, the Belgian federal government's development agency which was coordinating the food security program. Thanks to this short but insightful article, we have an understanding of how staff with limited resources

and budget were able to set up a data collection system that then enabled them to perform monitoring activities using easily available and relatively inexpensive technology.

The program was a five-year food security program in Northern Tanzania. It involved 14 different development organizations and more than 140 different activities in four main sectors: water, livestock, business and entrepreneurship, and nutrition.

Issue or problem to be addressed

According to Driesen, "we were looking for user-friendly data collection tools to make smarter, faster and better-informed decisions based on reliable data" (Driesen, 2016).

Solution and results

This project chose to use an open-source suite of software tools called KoBoToolbox. The suite allows users to create online forms in order to gather data using tablets. Once data were entered into the form using tablets in the field, the software allowed the data to be aggregated and analyzed online.

Driesen explained the use of the software and its advantages this way:

> *We are collecting rich and reliable data, we limit the time spent on data collection and analysis, minimize data entry errors and we ensure a fast flow of information from the field to the office. With the interactive data visualization tools of Tableau Public we are able to create meaningful data insights and act fast based on the results. (Driesen, 2016)*

As one of the data collectors in the field put it, "These tools simplify the job. Instead of coming back from the field and start writing my report I just send my observations instantly" (Driesen, 2016).

Challenges

The list below of initial and continuing challenges is based on the information provided in Driesen's article (Driesen, 2016).

Initial challenges:

- very small team (two people) and very limited budget
- no advanced IT experience among the staff
- needed to design a meaningful monitoring tool considering the needs, concerns, and expectations of partners

Continuing challenges:

- improving the synchronization between our server and our data dashboards
- sharing our data and harnessing the vast amounts of open data for development
- ensuring our staff and partners can keep up with our M&E tools

Lessons learned

The following lessons learned were gleaned from the article written by the project coordinator, Toon Driesen.

- It takes time and investment in human resources: training, coordination. Encourage a work environment that allows for time to learn, experiment, try, fail and succeed.
- Think about how to synchronize data from M&E tool with other program management tools used by the organization.
- Success will depend on the primary users, so invest in the appropriate training and involve them in the design and implementation process
- The goal is not a lot of data, but rather how to use whatever data are gathered effectively. Think about how the organization is equipped to use the data, how the data will be used, and "don't ignore the stories behind the data".
- Begin with open-source technologies that are inexpensive or free and simple to implement. This can be used for a first iteration as you build capacity in the organization. More sophisticated, paid software and plans can be used later in future iterations of the technology.
- Do not forget to involve the different partners and stakeholders. "Involving our Tanzanian government partners in every step of the design process might be one of the most important factors of the success and adoption of our common monitoring system," said Mathias Lardinois, programme coordinator (Driesen, 2016).

Example 2: Mapping for food safety in informal settlements, Nairobi, Kenya

Context

        The second example comes out of Kenya and involves a group of people from an informal settlement in the capital, Nairobi. Leading from a discussion amongst Kenyan and Ghanaian urban poor federations in 2012, food vending was identified as an important income-generating activity for women in informal settlements in Accra and Nairobi (Ahmed et al., 2015, p. 9). The food vendors themselves realized that in order to counter the negative perceptions others had of them, they needed additional data. "They decided that mapping informal settlements' food consumption spaces, tracing vendors' interactions with the local environment and exploring their access to infrastructure would be the major entry points to increasing urban food safety" (Ahmed et al., 2015, p. 9).

Issue or problem to be addressed

- Data and maps lacking the informal settlements' food infrastructure
- Publicly available maps such as Google Maps were out-dated or did not provide clear, useful images because of clouds or other obstructions.
- No commercially available maps available as they have little interest in providing maps for these informal settlements

Solution and results

        Leveraging technical and organizational knowledge from Slum Dwellers International (SDI), the Nairobi group used balloons to map their informal settlements' food infrastructure. Participatory mapping was used involving strong community support for both deciding what to map, the actual mapping activities, and the post-mapping analysis (Cravero, 2015). The group decided for the initial mapping activity to map food kiosks, mobile street vendors, and hazards such as rubbish dumps and open sewers (Cravero, 2015).

Challenges

- Limited budget, which was overcome by using existing, inexpensive technology

Lessons learned

- Use existing technology (in this case, balloon mapping) that has been used and perfected, with information, guides, and kits easily and cheaply available.

- Take the necessary time to work with local partners and stakeholders to build consensus about common challenges and priorities

Example 3: "Press 1 if you did not eat yesterday": The WFP's mVAM project

Context

The headline of an online article in 2013 on the international development news website Devex captures the technological innovation to be discussed here perfectly, "Press 1 if you did not eat yesterday" (Santamaria, 2013). The article describes the origins in 2012 of the World Food Programme's initiative called Mobile Vulnerability, Analysis and Mapping (mVAM) framework. The initial goal was to develop a system in the Democratic Republic of the Congo so that voice calls and text messages would allow staff to gather data from the field without the expense of doing interviews in-person in the field (Santamaria, 2013). The project flourished and a report entitled *Using Mobile Phone Technology to Improve the Collection of Food Security Data: WFP's Mobile Vulnerability, Analysis and Mapping* was published in 2016 by two researchers and sponsored jointly by the Humanitarian Innovation Fund (HIF) and ALNAP (Robinson & Obrecht, 2016). The information presented below comes mainly from this 2016 report.

Issue or problem to be addressed

Reliable, timely, accurate and disaggregated data is important to understanding food security trends (Robinson & Obrecht, 2016, p. 7). The WFP had traditionally relied on costly and time-consuming in-field, in-person interviews to gather the data. Not only was the process costly, but often by the time it was gathered, compiled, and turned into meaningful reports, the data was out-of-date. In addition, the environments where food security is a critical issue are often hostile where the safety of those gathering the information is at risk. As the authors of the report put it succinctly, "A key question for those seeking to apply new technologies to food security data collection is how to manage new tools and modalities in a way that maintains the quality and credibility of data gathered while reducing costs and the time required to produce analysis for decision-making" (Robinson & Obrecht, 2016, p. 7).

Solution and results

There is not one solution to these challenges; this program has evolved and continues to evolve based on each unique situation. For this case study, I use the results of the first major

implementation of mVAM in the Democratic Republic of the Congo and Somalia beginning in 2014.

The solution that was ultimately settled upon after an initial phase of testing was data collection through surveys using a mix of live calls and interactive voice response (IVR) calls which are automated calls where the respondent answers automated voice questions by pushing a button on the phone. The authors of the 2016 report summarized the solution best as follows:

> WFP's innovation was to integrate these technologies into its existing food security monitoring systems and to use them to conduct high-frequency data collection in remote and hard-to-reach areas. This is innovative not only in the technology employed but also in the shift towards high-frequency data collection away from the large-scale, comprehensive but irregular surveys that are most common in food security monitoring. Through mVAM, WFP is collecting data on fewer indicators but with a higher frequency, which is an approach few other organisations have adopted. (Robinson & Obrecht, 2016, p. 10)

Challenges

- Initially there was difficulty in reaching respondents who had been identified for the survey. After some investigation, it was discovered that the problem concerned respondents' inability to find reliable power to charge the cell phones. Solar charging stations were set up and this increased the ability to reach respondents.

- Low cell phone ownership was identified as a possible problem. It was discovered that only 24% of those who had signed up for the surveys owned cell phones. To overcome this situation, the decision was made to distribute cell phones to respondents.

- Working with private sector call centers proved difficult as they were not interested in such a small project. The solution was to train staff in-house to be able to make the calls and conduct the surveys.

Lessons learned

- To deal with issues such as lost phones and other local problems, a local advisory committee was formed. This enabled a feeling of agency by local residents and helped create a communication channel with local communities.

- Introduce IVR calls only after using live calls first to get respondents comfortable with the survey. An initial series of surveys were done using live calls. Then, with respondents comfortable with the survey questions, IVR calls were introduced using the same survey questions. Respondents already comfortable with the survey questions had an easier time adapting to the new technology of IVR calls.

- Live calls were made immediately after IVR calls asking respondents for feedback. This proved invaluable in collecting comments and suggestions.

- Keep plans flexible and work closely with local teams and staff to solve problems.

- A preparatory phase is vital when staff could work with local officials collaboratively to pilot the surveys and technology.

- Do not re-invent the wheel. Instead, learn from existing projects and build on them, learning from their challenges and innovations.

By way of a concluding comment on the work of the WFP's mVAM initiative, it appears it has continued to evolve and become more sophisticated since the project began back in 2012. A recent Twitter post from October 26, 2021 (see Figure 5) speaks to a dashboard on food security for Asia and the Pacific and what would appear to be a visual representation of data being gathered on a near real-time basis.

Figure 5: Screenshot from the Twitter account of the World Food Programs' Vulnerability, Analysis and Mapping division
Source: Twitter.com

Summary of lessons learned

By examining just these three examples from the hundreds if not thousands that exist, there are already common themes in the challenges each solution was trying to address, as well as the lessons learned from the initiative.

A few of the lessons learned from the initiatives described above include:

- **Take the necessary time to plan and implement**—In all three cases, there was some mention of the benefit of taking time to plan the implementation, test the technology, train the users, and think through the implementation process.

- **Do not reinvent the wheel**—In each example, they began the project by investigating what technology already existed and could then be expanded or leveraged for their specific needs. The mobile app in Tanzania was built using an existing technology to create forms that could be filled in on mobile tablets. Balloon mapping leveraged existing technology of using balloons to take low-altitude photos, but in the case of Nairobi was applied to a different context.

- **Partnerships are important**—In each case, it was clearly mentioned that partnerships are important, whether with active stakeholder groups or funding partners. Partners can be important sources of knowledge and funding and maintaining close communications with them is vital.

- **Leverage local communities**—To some extent and in different ways, each project recognized the knowledge and power of local communities and its residents. Whether it was directly surveying and speaking with residents of targeted communities in the initiatives, or using local residents as monitoring and evaluation staff, each of the three projects engaged in some way and at some level with local populations, very different from parachuting in outside 'experts' to assess the situation and make pronouncements of what works and what does not.

- **Data is not the goal**—Perhaps not mentioned explicitly for each initiative, but as evidenced by the end results, the projects did not focus just on gathering data for the sake of gathering data but thought through how they would use that data in a meaningful way: to build maps, ascertain the effectiveness of the initiative, create

resources such as a dashboard that serve not only to monitor but also educate and inform. Just accumulating data for the sake of having a lot of data is not useful; thought should be given to what the ultimate goal is and then how data can support the achievement of that goal.

Chapter 7: Food Security Programs and M&E

Thus far we have looked at food security as an urban issue, particularly in the cities of LMICs. We have also seen why it needs to be addressed as an important urban planning issue. We then covered the importance of monitoring and evaluation, and in particular M&E in the context of urban planning initiatives. In the previous two chapters, we have looked at some of the technologies that could be used for monitoring and evaluation purposes, and then some examples of how simple, inexpensive technologies are being used in the LMIC context to provide monitoring and evaluation activities.

In this chapter I discuss specifically how urban food security programs and initiatives in LMICs could incorporate M&E activities using simple, inexpensive technologies. Obviously there are no universal solutions, and it would be foolish to prescribe a recipe that would be blindly applied across the board. Each context, initiative, and project are different. In addition, before developing any monitoring and evaluation framework for a particular initiative, it would be important to consider the complexity of the urban food security issue, and perhaps what makes it different from other urban planning issues (see Chapter 3, the section entitled, "Complexity of food security as an urban planning issue").

Existing approaches to analyze and monitor food policy and systems

Several researchers have hinted at the tools that might be helpful when analyzing and assessing food systems thus helping urbanists and policy makers establish whether initiatives are making the desired impact on food security.

> *There are a number of experiences from cities of both the Global North and Global South… like food assets mapping in Toronto, food environment mapping in Baltimore, food deprivation maps in Bristol, IQVU in Belo Horizonte, that are quite promising and usually focus on some key aspects of food systems (food distribution, access to nutritious food, land availability for urban agriculture, zoning practices).* (Cabannes & Marocchino, 2018, p. 53)

Maps certainly seem to be one tool that has garnered praise as a way of rendering data more easily understood. The World Food Programme's food security dashboard has continued to evolve since its inception back in 2012 as explained in the example in Chapter 6.

In 2019, the United Nations made an effort to advance the thinking and scholarship around monitoring of food policy and food plans in cities by introducing a framework published in a document entitled, "The Milan Urban Food Policy Pact Monitoring Framework" (Food and Agriculture Organization of the United Nations, 2019). This framework is presented in the next section.

Milan Urban Food Policy Pact monitoring framework

The Milan Urban Food Policy Pact (MUFPP) is an agreement signed in October 2015 by mayors and city representatives from more than 100 cities around the world on the occasion of the Milan Expo "Feeding the Plant, Energy for Life". Among other things, signatories to the pact commit to "work to develop sustainable food systems that are inclusive, resilient, safe and diverse, that provide healthy and affordable food to all people in a human rights-based framework" (*Milan Urban Food Policy Pact*, 2015, p. 2). Following the pact, an MUFPP monitoring framework was introduced in 2019 (Food and Agriculture Organization of the United Nations, 2019). Its purpose is to enable cities to develop their own urban food monitoring system (Carey & Cook, 2021, p. 1).

Included in the structure of the framework are 44 indicators that could be used to monitor improvement in a given city's expected food policy-related outcomes (Food and Agriculture Organization of the United Nations, 2019, p. 7). For a complete list of the indicators, please refer to Appendix A. While the monitoring framework lays out many different indicators a city could use, it explicitly states that ultimately each city should build their own unique framework that matches their unique situation and needs (Food and Agriculture Organization of the United Nations, 2019, p. 6). The framework also acknowledges that it does not provide guidance on how to collect data for any given indicator that it discusses in the framework (Food and Agriculture Organization of the United Nations, 2019). It would seem that the job of figuring out how to gather the necessary data is left to those implementing the framework for a given city.

A report published in 2021 discusses the challenge of gathering data, based on pilot projects trying to implement the monitoring framework in three cities (Carey & Cook, 2021). Three cities piloted the use of the MUFPP monitoring framework in 2019: Antananarivo, Madagascar; Nairobi, Kenya; and Quito, Ecuador. Interestingly, all three of these cities are in countries considered low- or middle-income countries.   One of the biggest challenges was collection of data. "Accessing sufficient data was the most common challenge throughout the pilot process. Even though cities chose indicators based, in part, on easy access to existing information, there were several challenges common to all cities" (Carey & Cook, 2021, p. 20). Not surprisingly, the gathering of appropriate data remains a constant challenge in monitoring and evaluation activities, and these three pilot projects seem to reinforce this idea. According to those working in Nairobi, Kenya, "The need for data to inform the framework indicators revealed bottlenecks and obstacles in the way data is collected, shared and stored across NCC (Nairobi City County)" (Food and Agriculture Organization of the United Nations, 2019, p. 14). However, in Antananarivo, it was reported that the data collection process helped foster a participatory decision-making process (Food and Agriculture Organization of the United Nations, 2019, p. 16). In all cases, the collection of data remained a preoccupation regardless of the indicators that were selected for each city.

How technology could be used to gather and monitor three of the MUFPP indicators

In the MUFPP monitoring framework from the FAO, there are a total of 44 indicators spelled out in detail (see Appendix A for a list of these indicators). As the authors of the framework indicate, there is not an expectation that any one city would use all of these indicators when creating a framework for their city (Food and Agriculture Organization of the United Nations, 2019, p. 12). For the purposes of offering examples of how the simple, inexpensive technologies that have been discussed in this report could be used to gather data for an indicator, I will use indicators 10, 18, and 22 as examples. Indicator 10 concerns daily meat consumption, indicator 18 measures the percentage of food insecure households, and indicator 22 documents community-based food assets. The FAO provides a document that discusses in detail each

indicator of the MUFPP monitoring framework, including a section on data collection and analysis (Food and Agriculture Organization of the United Nations, 2018). In Appendix B, the relevant pages from this document for indicators 10, 18, and 22 are shown.

For the first example, I chose indicator 10 which is a measure of the individual average daily consumption of meat. As with all indicators, there is no strict prescription on how the data should be gathered but rather suggestions and references to external resources. For this indicator, there is a suggestion that the data could come from household dietary surveys, perhaps by way of a question in a larger set of questions. Care would have to be taken to ensure a representative sample of the target population. Of particular interest to anyone wishing to implement this indicator (as well as all other indicators) is the inclusion in the FAO document of examples of how the indicator was applied in other cities and how data was gathered (see Appendix B). As has been mentioned previously, context is always important to consider so it should never be assumed that what worked in one context could work in another. That said, the examples could be useful when considering how to implement the indicator.

For indicator 10, two possible approaches could be taken using the simple technologies that have been discussed previously in this report. First, a survey could be conducted by trained survey takers using hand-held smart devices (a tablet) and an online, web-based form that would be filled out in real-time as the survey is conducted and the results uploaded to a remote server. The advantage of this approach would be the possibility of aggregating and analyzing data very quickly as the survey results would be available electronically as soon as they are uploaded to a server.

The second approach could be to measure this indicator using a very targeted question via cellular SMS service. Again, much attention would have to be paid to making sure a representative sample population is used to obtain an accurate measurement. Assuming such a group could be identified who also had access to a cell phone, it is possible to send weekly or monthly SMS messages asking for the participant to indicate the amount of meat consumed in the last 24 hours. The advantages of this approach include being able to conduct surveys more often as the expense would be much less than the previous approach, the participants might provide more accurate information as they would be recalling their dietary intake from just the

past 24 hours, and the results could be compiled fairly quickly after each round of SMS messages thus providing a more real-time picture of meat consumption.

For the second example of how simple technologies could be used to gather data for the MUFPP monitoring framework indicators, I chose indicator 18 which is the percentage of food insecure households based on the Food Insecurity Experience Scale (FIES). As outlined in the

Figure 6: Data collection in Nairobi, done manually on paper now but perhaps could be done using some simple technologies? Source: Carey & Cook, 2021.

detailed document for indicator 18 (see Appendix B), the data collection and analysis for this indicator consist of an eight-question survey with dichotomous responses. This type of survey, as we have seen in previous examples, could be conducted using SMS and IVR technology. As was discussed in Chapter 5, thought would need to be given to who the target population needs to be for the survey, and whether using cell phone-based surveys would provide a representative sample of the targeted population. Who would actually conduct the surveys would also need to be considered, as well as the frequency. However, based on earlier examples, these simple technologies have proven themselves very effective and efficient and should be considered for data gathering for indicator 18.

Finally, the third indicator I will discuss is number 22, which measures community-based food assets. As the detailed document from the FAO explains, this indicator, "measures the number of community-based food assets in the city, such as community kitchens, community gardens, community shops, cafes, food hubs" (Food and Agriculture Organization of the United Nations, 2018, p. 118). The data collection needed for this indicator is similar to that done in the Nairobi, Kenya example explained in Chapter 6, where a local community using simple GIS technologies mapped the food infrastructure of their informal settlement. A similar approach could be used to gather data for indicator 22, depending on the availability of local actors (paid or volunteer) to help with the mapping. In the FAO's detailed document on indicator 22, several examples are cited of community-led efforts to gather data on community food assets performed in Canada, the United States, and the UK (Food and Agriculture Organization of the United Nations, 2018, p. 122). These examples are all located in high-income countries, whereas this report is focused on low- and middle-income countries. That said, the example from Nairobi is from a low-income country so there is reason to believe that a community-led approach using the simple GIS technologies could be used elsewhere in LMICs. As with every example, attention would have to be given to the particularities of each context and consideration given to how copying approaches from one context to another may be problematic.

With these three examples, I have shown how some of the simple, inexpensive technologies outlined and explained in chapters 5 and 6 could be used to gather data for some indicators from the MUFPP monitoring framework. As has been mentioned numerous times, there is no one-size-fits-all solution with respect to choosing technologies to gather data for these indicators. The context in which the monitoring framework, and therefore the indicators, are being used must be carefully considered. The technologies presented in this report are simple and relatively inexpensive, and thus lend themselves to the context of LMICs. That does not mean, however, that they should automatically be used. Instead, once careful consideration is given to how the monitoring framework will be set up for a given context (in this case, perhaps a city), these technologies can be considered as possible solutions provided the indicators chosen are meaningful and appropriate.

Chapter 8: Conclusion

This report began by painting a troubling picture of the state of food insecurity in the world. Despite the world already producing enough edible calories to feed 9 billion people, food insecurity remains a major and chronic problem for a significant percentage of the world's population. The current COVID pandemic has only compounded the problem. Food insecurity is finally being acknowledged as an urban issue—a significant one—and a growing number of articles and research are showing why it should be addressed through urban planning. At the same time, this issue is compounded by the fact that the world is becoming increasingly urbanized, particularly in LMICs. The problem of food insecurity, therefore, is now beginning to be understood as a major urban issue facing cities in low- and medium-income countries, although high-income countries are not immune either to this problem. The challenges of poverty and hunger feed off of each other—indeed, both are wicked problems—and historical approaches to address hunger have focused on production and supply and ignored or under-estimated the role that accessibility and affordability play.

After arguing that food insecurity is an urban planning issue, this report provided a high-level overview of monitoring and evaluation practices, first in the international development area and then in urban planning. Urbanists would benefit from looking at how M&E, and more specifically participatory monitoring and evaluation (PM&E), are being used and ask how they could be better integrated into urban planning initiatives. In addition, information was presented on some of the available technologies being developed and used by companies and organizations for monitoring and evaluation purposes.

This report then presented three case studies showcasing how simple, relatively inexpensive technologies are being leveraged for M&E activities. While each context and initiative is different and there is no one-size-fits-all solution, the case studies provided some important lessons learned which include: gather data not as the ultimate goal, but rather use appropriate data gathered effectively; take the time necessary to plan and implement M&E activities; leverage existing technologies and approaches—do not reinvent the wheel; place

importance on partnerships, whether with active stakeholder groups or external partners; and finally, leverage the knowledge and expertise of the local communities.

Turning to the specifics of the monitoring and evaluation of programs addressing food security, a monitoring framework was presented as proposed by the Food and Agriculture Organization of the United Nations to monitor programs aimed at food systems. The framework proposes a range of indicators that could be used when developing an appropriate monitoring framework for a specific initiative. This report then presented how data for three of these indicators could be gathered using some of the simple technologies presented earlier in the report.

As stated at the beginning, the information in this report could be useful to the funding community: foundations, governments, and NGOs working on food security and who have a particular interest in the intersection of food security and urban planning. These stakeholders may have a particular interest in seeing how strategies for effective monitoring and evaluation could be implemented for programs addressing food insecurity in the urban context in low- and medium-income countries (LMICs).

The report might also offer insight to urbanists working on food security issues in the context of LMICs, helping to reinforce the idea that food security is an urban issue deserving of increased attention by urbanists. I hope this report encourages all urbanists to think about monitoring and evaluation as a vital component to any plan or program. Based on my research, it seems clear that this is a sorely neglected area of urban planning studies but deserves much greater attention.

The research and writing of this report were done during the COVID-19 pandemic and suffered from many constraints that would not have existed otherwise. Travel to, and fieldwork in, cities of LMICs were not possible, so all of the research was done using existing information obtained through, among other sources, academic journals, websites of organizations, blogs, and grey literature. It was remarkable that when searching for case studies of monitoring and evaluation initiatives of programs addressing urban food security through an urban planning lens, there were very few. This points to an opportunity for future research, especially as the subject

of urban food insecurity in LMICs gains greater attention by urbanists and is recognized as an urgent and significant issue to be addressed.

In conclusion, simple, inexpensive information and communication technologies (ICTs) are providing ever-increasing possibilities to organizations, companies, NGOs, governments, and others for faster, cheaper, and more accurate gathering, processing, and understanding of data. However, before employing a technological solution for data gathering, careful consideration must be given to what the overall objectives of any program or initiative are, and appropriate indicators designed to measure the effectiveness of an initiative. The technologies come with their own challenges, and technology should not be used blindly and without careful considering of its impact, disadvantages, and challenges. Finally, each situation is different, each context unique. There are no one-size-fits-all solutions, and a different approach is needed for each context.

When used appropriately, with proper planning, consideration, and consultation, simple technologies offer exciting opportunities for more effective policymaking, implementation, monitoring, and evaluation of urban food security-related initiatives in LMICs.

Appendix A

The following 44 indicators are from the document published by the Food and Agriculture Organization of the United Nations (FAO) entitled "The Milan Urban Food Policy Pact Monitoring Framework" (Food and Agriculture Organization of the United Nations, 2019). The indicators can be used to monitor the improvements that cities make towards attaining their specific expected outcomes.

1. Presence of an active municipal interdepartmental government body for advisory and decision-making of food policies and programmes (e.g., interdepartmental food working group, food policy office, food team). *This allows for (self)assessment of the presence, multi-stakeholder representation and integration, functioning and effectiveness of an interdepartmental/sectoral food coordination body or mechanism. Furthermore, it helps identify areas for improvement.*

2. Presence of an active multi-stakeholder food policy and planning structure (e.g., food policy councils, food partnerships, food coalitions…). *This enables (self)assessment of the presence, multi-stakeholder representation and functioning and effectiveness of a multi-stakeholder body or mechanism for urban food policy and planning. Furthermore, it helps identify areas for improvement.*

3. Presence of a municipal urban food policy or strategy and/or action plans. *This enables (self)assessment of the presence and level of implementation of a municipal urban food strategy/ policy and/or action plan. If desired, critical assessment of the actual strategy/policy and/or action plan itself may be implemented. Both exercises help define areas for improvement.*

4. Presence of an inventory of local food initiatives and practices to guide development and expansion of municipal urban food policy and programmes. *This enables (self)assessment of the presence and use of an inventory of local food initiatives and practices to guide development and expansion of municipal urban food policy and programmes. It may spur new development or "actualization" of such inventory and define recommendations for better use.*

5. Presence of a monitoring/evaluation mechanism for assembling and analyzing urban food system data to inform municipal policy making on urban food policies. *Allows for (self)assessment of the presence and use of a monitoring/evaluation mechanism for assembling and analyzing urban food system data. Actual monitoring/evaluation will enable reflection on the experiences gained with urban food policies, impacts achieved, and will inform and improve further municipal food policy making and reporting.*

6. Existence of a food supply emergency/ food resilience management plan for the municipality (in response to disasters; vulnerabilities in food production, transport, access; socio economic shocks, etc.) based on vulnerability assessment. *Allows for (self)assessment of the presence and level of implementation of a food supply emergency/ food resilience management plan. If desired, critical assessment of the actual plan may be implemented. Both exercises help define areas for improvement.*

7. Minimum dietary diversity for women of reproductive age. *Assess dietary quality at individual level, specifically looking at women of reproductive age. It is a proxy for the probability of micronutrient adequacy of women's diets.*

8. Number of households living in "food deserts." *Measures the geospatial distribution of the food retail establishments and of socioeconomic population groups to analyze number (or percentage) of households living at a certain distance from food markets.*

9. Costs of a nutritious food basket at city/community level. *Measures the medium cost of a diet meeting the minimum requirements of macro- and micronutrients or food based dietary guidelines e.g., a weighted food price index.*

10. Individual average daily consumption of meat. *NB: This is not a normative indicator on recommended daily intake of meat; it measures meat consumption in order to address sustainable and healthy diets from an environmental perspective.*

11. Numbers of adults with Type 2 diabetes. *Measures number (percentage) of adults with Type 2 diabetes.*

12. Prevalence of stunting for children under five years of age. *Measures prevalence of stunting (poor linear growth) among children under five.*

13. Prevalence of overweight or obesity among adults, youth, and children *Measures prevalence of overweight or obesity among adults, youth, and children (it involves body weight and height measurements for different age and gender groups to determine the percentage of populations that are overweight or obese).*

14. Number of city-led or supported activities to promote sustainable diets *Measures the number of city-led or supported activities to promote sustainable diets (data may be disaggregated by type of activity and target audience).*

15. Existence of policies/programmes that address sugar, salt, and fat consumption in relation to specific target groups (e.g., general public, in hospitals and schools). *Measures the existence of laws/regulations/ policies/ programmes that address sugar, salt, and fat consumption in relation to specific target groups (general public, in hospitals and schools).*

16. Presence of programmes/policies that promote the availability of nutritious and diversified foods in public facilities. *Monitors presence of programmes/policies that promote the availability of nutritious and diversified foods in public facilities.*

17. Percentage of population with access to safe drinking water and adequate sanitation. *Measures the percentage of population with access to safe drinking water and adequate sanitation. By disaggregating the data spatially and by different socioeconomic strata, it is possible to identify which parts of the population are being left behind.*

18. Percentage of food insecure households based on the Food Insecurity Experience Scale (FIES). *Measures severity of food insecurity experience based on the FIES (an indicator of food access, not diet quality).*

19. Percentage of people supported by food and/or social assistance programmes. *Measures the take-up (or usage) of food and/or social assistance support through programmes that target vulnerable groups that are struggling to feed themselves. Over time, this indicator should show how take-up is increasing or decreasing.*

20. Percentage of children and youth (under 18 years of age) benefitting from school feeding programmes. *Measures the proportion of children and youth (everyone under 18 years old) attending school who benefit from a school feeding programme.*

21. Number of formal jobs related to the urban food system that pay at least the national minimum or living wage. *Measures the total number of formal paid jobs that the urban food system provides at (and above) the level of a nationally accepted minimum or living wage. NB: If it is NOT possible to quantify jobs paid at least the national minimum or living wage, the focus should be to quantify the total number of formal paid jobs in the food system.*

22. Number of community-based food assets in the city. *Measures the number of community-based food assets in the city, such as community kitchens, community gardens, community shops, cafes, food hubs.*

23. Presence of food-related policies and targets with a specific focus on socially vulnerably groups *Allows for (self)assessment of the presence, and the level of implementation of food-related municipal policies and targets, that either directly target vulnerable groups or do so indirectly by supporting and enabling the grass-root activities of community-based networks to increase social inclusion and provide food to marginalized individuals.*

24. Number of (types of) opportunities for food-related learning and skill development in food and nutrition literacy, employment training and leadership. *Number of opportunities (courses, classes, etc.) for food system-related learning and skill development in three different categories: food and nutrition literacy; employment training and leadership. This indicator will support gathering baseline data on which to base analysis of gaps, needs, opportunities, and to develop further action.*

25. Number of city residents within the municipal boundary with access to an urban (agricultural) garden. *Measures the accessibility of city residents (and specific target groups) to urban agricultural gardens/land. In order to account for geographic, economic, and social differences across cities in access to gardens, the indicator will only reflect impact accurately if data is filtered by geospatial location, population density, income levels etc.*

26. Presence of municipal policies and regulations that permit and promote agriculture production and processing within the municipal area. *Assesses the presence of supportive municipal policies and regulation that permit and promote urban agriculture production and processing. It will help define gaps or areas for improvement by revising/ formulating new policies and regulations.*

27. Surface area of (potential) agricultural spaces within the municipal boundary. *Monitors the surface area of land within the municipal boundary used for agriculture, zoned/destined for agriculture (although possibly not used at this moment) as well as open vacant and built-up spaces that could potentially be used for agriculture.*

28. Proportion of total agricultural population–within the municipal boundaries–with ownership or secure rights over agricultural land for food production, by gender. *Monitors ownership and rights over agricultural land by specifically promoting data disaggregation by gender.*

29. Proportion of agricultural land in the municipal area under sustainable agriculture. *Measures the total agricultural area in the municipality (also referred to as urban and peri-urban agriculture) under sustainable agriculture (as per the total are of agricultural land in the municipal area).*

30. Number of food producers that benefited from technical training and assistance in the past 12 months. *Tracks the number of food producers (horticultural growers, smallholders, and farmers) in and close to the city who have received technical training and assistance over a given time period (e.g., last twelve months).*

31. Number of municipal food processing and distribution infrastructures available to food producers in the municipal area. *Monitors the number (and type of) municipal infrastructure for storage, processing and distribution of food located in the municipal area, including storage buildings, processing plants, transport facilities and (wholesale and consumer) markets.*

32. Proportion of local/regional food producers that sell their products to public markets in the city. *Monitors the share of local/regional food producers that sell (part of) their products to one or more public market outlets in the city*

33. Annual proportion of urban organic waste collected that is re-used in agricultural production taking place within municipal boundaries. *Measures the percentage of urban organic waste collected and recycled that is re-used in urban and peri-urban agriculture production.*

34. Existence of policies/programmes that address the reduction of GHG emissions in different parts of the food supply chain (e.g., processing, storage, transport, packaging, retail, cooking, waste disposal etc.). *Assesses the existence of policies/programmes that address the reduction of GHG emissions in different parts of the food supply chain (e.g., processing, storage, transport, packaging, retail, cooking, waste disposal etc.).*

35. Presence of a development plan to strengthen resilience and efficiency of local food supply chains logistics. *Allows for (self)assessment of the presence, functioning and effectiveness of a development plan to strengthen resilience and efficiency of local food supply chains logistics. It also helps to define areas for improvement.*

36. Number of fresh fruit and vegetable outlets per 1000 inhabitants (markets and shops) supported by the municipality. *Measures the number of food markets or retail outlets providing fresh fruit and vegetables per 1000 inhabitants that are directly supported by the municipality in some way.*

37. Annual municipal investment in food markets or retail outlets providing fresh food to city residents, as a proportion of total (investment) budget. *Measures annual municipal investment in food markets or retail outlets providing fresh food to city residents, as a proportion of total investment budget (or whichever budget is appropriate for city).*

38. Proportion of food procurement expenditure by public institutions on food from sustainable, ethical sources and shorter (local/regional) supply chains. *Measures the proportion of food procurement expenditure by public institutions on food from sustainable, ethical sources and shorter (local/regional) supply chains. Indicator also measures presence of a set of criteria to drive an increase in the proportion of food procurement expenditure by public institutions on food from sustainable, ethical sources and shorter (local/regional) supply chains.*

39. Presence of food safety legislation and implementation and enforcement procedures *Allows for (self)assessment of the presence, implementation, and enforcement procedures for food safety legislation.*

40. Existence of support services for the informal food sector providing business planning, finance, development advice. *Assesses the existence of support services for the informal food sector providing business planning, finance, and development advice. The focus here is primarily in relation to sanitation and food safety regulations, but it is important to look at wider support needs and provision – e.g., infrastructure, skills etc.*

41. Total annual volume of food losses and waste *Measures (decrease in) total annual volume of food losses and waste.*

42. Annual number of events and campaigns aimed at decreasing food loss and waste. *Collects information on the types of activities (events, campaigns, research studies), targeted sectors (households, business, food service, manufacturing, production etc.) and - if applicable - the actual impact on food waste reduction.*

43. Presence of policies or regulations that address food waste prevention, recovery, and redistribution. *Measures presence of policies or regulations that address food waste prevention, reduction, recovery, and redistribution of safe and nutritious food for direct human consumption.*

44. Total annual volume of surplus food recovered and redistributed for direct human consumption. *Measures the totality of available food recovered and redistributed for direct human consumption along the entire urban food supply chain, occurring from the time at which availability is recorded (in urban and peri-urban areas) until it reaches and is used by the final urban consumer as food.*

Appendix B

For each of the 44 indicators included in the Milan Urban Food Policy Pact Monitoring Framework (Food and Agriculture Organization of the United Nations, 2019), the FAO has created a detailed document (Food and Agriculture Organization of the United Nations, 2018) that includes an overview table, rationale and evidence, a glossary of concepts and definitions used, as well as detailed information on data collection. Below are the pages from this document that concern indicators 10, 18, and 22.

Food and Agriculture Organization of the United Nations

MILAN URBAN FOOD POLICY PACT

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Milan Urban Food Policy Pact Monitoring Framework

March 2021 version

Indicator 10: Individual average daily consumption of meat

MUFPP framework of actions' category: Sustainable diets and nutrition

Note this is not a normative indicator on recommended daily intake of meat. It will monitors meat consumption in order to discuss sustainable and healthy diets from a health and environmental perspective.

Overview table

MUFFP Work stream	Sustainable Diets and Nutrition
MUFFP action	**Promote sustainable diets** (healthy, safe, culturally appropriate, environmentally friendly and rights-based) through relevant education, health promotion and communication programmes, with special attention to schools, care centres, markets and the media.
What the indicator measures	Individual average daily consumption of meat
Which variables need to be measured / what data are needed	▪ Meat categories (ruminants, pork, poultry, fish, etc.) ▪ Red meat vs processed meat ▪ Socioeconomic variables
Unit of measurement *(i.e. Percentages, averages, number of people, etc.)*	Weight of meat consumption If desired, the following could (also) be measured: Share of expenditures on meat of total food expenditures).
Unit(s) of Analysis *(i.e people under 5 years old, etc.)*	Grams of meat per day per capita OR annual kilograms of meat consumption per capita
Possible sources of information of such data	▪ Agriculture departments (meat production data) ▪ Health departments or academic institutions (household dietary surveys)
Possible methods/tools for data-collection	▪ Data analysis from existing reports ▪ Household dietary or consumption surveys
Expertise required	Data analysis, survey design and implementation
Resources required/ estimated costs	

1

Specific observations	The specific categories of animals included in meat consumption can vary, in particular, whether fish are included. FAO defines meat as all animals used for food. However, the OECD includes only beef, veal, pig, poultry and sheep. Aggregate production (carcass mass availability) or retail data are often used as proxies for per capita consumption. The accuracy of production data as a consumption proxy can be limited in countries where the population is small but meat exports are high.
Examples of application	The School of Public Health at the University of São Paulo conducted 24-hour diet recall surveys among residents in 2003 and 2008 to track trends in meat consumption. Data were collected from adolescents, adults and seniors in São Paulo. The daily mean of red and processed meat consumption was 100 g/day in 2003 and 113 g/day in 2008. Excessive red and processed meat consumption was observed in almost 75% of the subjects, especially among adolescents in both surveys. Beef represented the largest proportion of meat consumed, followed by poultry, pork and fish in both surveys[1]. The City of Ghent monitor meat consumption through biannual market research with questionnaires sent out to thousands of citizens in Ghent, Flanders, other Belgian cities, etc. This allows them to see the evolution for Ghent and to compare the city to other regions and cities around Ghent. Total costs for their 2016 survey (including Ghent and Brussels areas) were 6 500 Euro.

Rationale/evidence

Meat/animal sourced protein can be part of a balanced diet contributing valuable nutrients that are beneficial to health. Meat and meat products contain important levels of protein, vitamins, minerals and micronutrients which are essential for growth and development. Further processing of meat offers the opportunity to add value, reduce prices, improve food safety and extend the shelf-life. This can result in increased household income and improved nutrition. While the per capita consumption of meat in some industrialised countries is high, per capita consumption below 10 kg in developing countries must be considered insufficient and often leads to undernourishment and malnutrition. It is also estimated that more than 2 billion people in the world are deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc. Deficiencies occur when people have limited access to micronutrient-rich foods such as meat, fish, dairy, fruit and vegetables. These sources are usually combined in the daily food intake, but in regions where not all of them are readily available, intake of the others needs to be increased. It is for these reasons that some cities (like Nairobi, Kenya and Quito, Ecuador promote livestock production and consumption as an important part of their urban agriculture and urban food security programmes).

Although nutrients from animals may be of higher quality or more readily absorbed than vegetable sources, it is possible to have a healthy vegetarian diet. The steadily growing world population and increasing incomes creates higher demand for meat, but at the same time leaves limited space for expansion in livestock production. Therefore the maximum utilisation of existing food resources becomes even more important[2].

Global meat consumption and production patterns pose a threat to the natural environment by contributing to climate change, resource depletion and the extinction of species. The food system as a whole accounts for an estimated 20-30% of the global greenhouse gas emissions while, within food consumption patterns, meat and dairy products are the main contributors to environmental impacts.

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[1] de Carvalho, A. M., César, C. L. G., Fisberg, R. M., & Marchioni, D. M. (2014). Meat consumption in Sao Paulo–Brazil: trend in the last decade. *PloS one*, 9(5), e96667.
[2] FAO (2014). Animal Production and Health: Meat consumption. Agriculture and Consumer Protection Department. Available from http://www.fao.org/ag/againfo/themes/en/meat/background.html.

2

Among the different types of meat, beef has the largest and chicken the smallest environmental impact in terms of climate change, land use and fossil fuel depletion. Given a growing population and an increase in wealth, the demand for food and meat is predicted to increase by 70% by 2050 for food and by 2030 for meat[3]. With rapid global urbanisation, it will be important for cities to gauge trends in meat consumption to inform health and environmental strategic plans. It is in this context that this indicator monitors meat consumption as part of environmentally sustainable diets.

Glossary/concepts/definitions used
Meat: The flesh of animals used for food (including beef, poultry, pork, fish and others)[4].

Preparations
A meeting should be organised with all staff who will be involved in this activity to:
- Familiarise them with meat consumption assessments
- Agree on the objectives and scope of the analysis and data collection requirements
- Define the methodology to be applied for data collection and analysis, and
- How to coordinate the activities.

Data Collection and Analysis
FAO figures for meat consumption are generally based on carcass mass availability (with "carcass mass" for poultry estimated as ready-to-cook mass), divided by population[5]. The amount eaten by humans differs from carcass mass availability because the latter does not account for losses, which include bones, losses in retail and food service or home preparation (including trim and cooking), spoilage and "downstream" waste, and amounts consumed by pets (compare dressed weight)[6].

For a detailed methodology of population meat consumption data collection and analysis, please refer to the following resources:

FAOSTAT: Food and Agriculture Data. Available from http://www.fao.org/faostat.

OECD Data: Meat Consumption. Available from https://data.oecd.org/agroutput/meat-consumption.htm.

Cities may also decide to add a question on meat consumption in other sustainable diets and nutrition consumption surveys or design a specific survey on the topic. An example survey used in Ghent is available in Dutch and can be obtained from the city of Ghent[7].

References and links to reports/tools
FAO (2013). Current Worldwide Annual Meat Consumption per capita, Livestock and Fish Primary Equivalent. Food and Agriculture Organization of the United Nations. Available from http://www.fao.org/docrep/005/y4252e/y4252e05b.htm.

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[3] Van Mierlo, K., Rohmer, S., & Gerdessen, J. C. (2017). A model for composing meat replacers: Reducing the environmental impact of our food consumption pattern while retaining its nutritional value. *Journal of Cleaner Production*, 165, 930-950. https://www.sciencedirect.com/science/article/pii/S0959652617315330
[4] FAO (1994). Definition and Classification of Commodities. Available from http://www.fao.org/waicent/faoinfo/economic/faodef/fdef17e.htm.
[5] FAOSTAT. (Statistical database of the Food and Agriculture Organization of the United Nations. Methods and Standards. http://faostat3.fao.org/mes/methodology_list/E.
[6] Loss-adjusted food availability documentation. United States Department of Agriculture, Economic Research Service. http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-a<djusted-food-availability-documentation.aspx.
[7] Please contact: katrien.verbeke@stad.gent

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FAO (2014). Animal Production and Health: Meat consumption. Agriculture and Consumer Protection Department. Available from http://www.fao.org/ag/againfo/themes/en/meat/background.html.

Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J. & Tempio, G. (2013). Tackling climate change through livestock. Food & Agriculture Organization.

OECD/FAO (2017), OECD-FAO Agricultural Outlook 2017-2026, OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_outlook-2017-en

Steinfeld, H., Gerber, P., Wassenaar, T. D., Castel, V., & de Haan, C. (2006). Livestock's long shadow: environmental issues and options. Food & Agriculture Organization.

Van Mierlo, K., Rohmer, S., & Gerdessen, J. C. (2017). A model for composing meat replacers: Reducing the environmental impact of our food consumption pattern while retaining its nutritional value. Journal of Cleaner Production, 165, 930-950.

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Food and Agriculture Organization of the United Nations

MILAN URBAN FOOD POLICY PACT

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Milan Urban Food Policy Pact Monitoring Framework

July 2018 version

Indicator 18: Percentage of food insecure households based on the Food Insecurity Experience Scale (FIES)

MUFPP framework of actions' category: Social and economic equity

The indicators measures severity of food insecurity experience based on the Food Insecurity Experience Scale (FIES). This is an indicator of food access, not diet quality.

Overview table

MUFFP Work stream	Social and economic equity
MUFFP action	Use cash and food transfers, and other forms of social protection systems **to provide vulnerable populations with access to healthy food.** This is as a means of increasing the level of food security for specific vulnerable groups.
What the indicator measures	Severity of food insecurity experience based on the Food Insecurity Experience Scale (FIES). This is an indicator of food access, not diet quality.
Which variables need to be measured / what data are needed	The data are collected using the FIES Survey module, composed of 8 yes/no questions asked to an adult respondent. The choice of additional variables to collect in the survey will depend on the objective of the survey, but should include at a minimum basic demographic information.
Unit of measurement *(i.e. Percentages, averages, number of people, etc.)*	Percentage people or households experiencing moderate or severe food insecurity.
Unit(s) of Analysis *(i.e people under 5 years old, etc.)*	Households or individuals
Possible sources of information of such data	The FIES survey module can be included in many types of surveys, such as health and nutrition surveys and household income and expenditure surveys.
Possible methods/tools for data-collection	The FIES survey module (individual or household version)
Expertise required	Survey methodology and statistical analysis
Resources required/ estimated costs	Human and financial resources to include an 8-item survey module in a population survey, collect data in the field and conduct data analysis.

1

Specific observations	The FIES data has been collected by FAO in over 145 countries since 2014 in the Gallup World Poll. The global data reveal that the FIES results show significant and high correlations in the expected direction with most accepted indicators of development, including child mortality, stunting, poverty measures and the Gini index. The FIES can be used to estimate the prevalence of moderate or severe food insecurity at the municipal level when the FIES survey module is included in a survey that is representative of the municipal population. It depends on the sample design.
Examples of application	National survey data in Brazil in 2004, based on the Brazilian Food Insecurity Scale (a predecessor of the FIES), found significant differences in household food insecurity levels among the five geographical regions of the country[1]. Evidence of these stark regional inequalities convinced the Brazilian government to direct resources and public policies toward the more vulnerable regions. Many other examples can be found in Lesson 5 of the FAO e-learning course: SDG Indicator 2.1.2 – Using the Food Insecurity Experience Scale. Available at: http://www.fao.org/elearning/#/elc/en/course/SDG212.

Rationale/evidence

Access to enough nutritionally adequate food was declared a basic human right at the World Food Summit in Rome in 1996.

The United Nations Food and Agriculture Organization (FAO) has undertaken a project called Voices of the Hungry (VoH) to develop and support a survey-based experiential measure of access to food, called the Food Insecurity Experience Scale (FIES). It is an experience-based metric of severity of food insecurity that relies on people's direct responses to a series of questions regarding their access to adequate food.

A growing number of national governments are adopting the FIES. Its ease of application makes it accessible to people at many levels and from diverse fields, although data analysis requires a solid statistical background. Local governments, non-governmental organisations and advocacy groups can also appropriate this relatively simple instrument to monitor food insecurity locally or regionally, engaging diverse stakeholders in the process, and building bridges between people of different backgrounds. This may in fact be where their greatest potential lies to effect change and contribute to guaranteeing the human right to adequate food.

Glossary/concepts/definitions used

Food Security is said to exist when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Preparations

Producing this indicator requires data collection in the field from a representative sample of the population. This implies preparation of the survey questionnaire (print or CAPI), a sampling framework, training of enumerators to collect the data, data collection and analysis.

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[1] Brasil/IBGE (2006). Pesquisa Nacional por Amostra de Domicílios-2004, Suplemento de Segurança Alimentar; Rio de Janeiro. Available from http://biblioteca.ibge.gov.br/visualizacao/monografias/GEBIS%20-%20RJ/segalimentar/suguranca_alimentar2004.pdf.

2

Sampling

The sample design must guarantee representativeness of the sub-populations of interest (e.g. those that are vulnerable to food insecurity, or specific geographic areas of the city).

Data Collection and Analysis

Data collection: 8 question survey module with dichotomous (yes/no) responses
Data analysis: Thresholds can be set on the raw score to classify the food security severity status of respondents, but Rasch analyses and probabilistic assignment are recommended (as described in the e-learning course cited below).

For detailed guides for applying the FIES survey module and analysing the data, see:
the FAO e-learning course: SDG Indicator 2.1.2 – Using the Food Insecurity Experience Scale (FIES). Available at: http://www.fao.org/elearning/#/elc/en/course/SDG212.
Additional important resources can be found at the Voices of the Hungry webpage at: http://www.fao.org/in-action/voices-of-the-hungry/en/#.WoxNck2ovcs. See in particular "Using the FIES": http://www.fao.org/in-action/voices-of-the-hungry/using-fies/en/, where translations of the FIES survey module can be found in 170 languages).
The Food Insecurity Experience Scale: Measuring food insecurity through people's experiences. Available at http://www.fao.org/3/a-i7835e.pdf.

The FIES Survey Module

The FIES-SM questions refer to the experiences of the individual respondent or of the respondent's household as a whole. The questions focus on self-reported food-related behaviours and experiences associated with increasing difficulties in accessing food due to resource constraints.

During the last 12 months, was there a time when, because of lack of money or other resources:

1. *You were worried you would not have enough food to eat?*
2. *You were unable to eat healthy and nutritious food?*
3. *You ate only a few kinds of foods?*
4. *You had to skip a meal?*
5. *You ate less than you thought you should?*
6. *Your household ran out of food?*
7. *You were hungry but did not eat?*
8. *You went without eating for a whole day?*

The set of eight questions compose a scale that covers a range of severity of food insecurity:

No single tool can account for the many dimensions of food and nutrition security. The FIES complements the existing set of food and nutrition security indicators. Used in combination with other measures, the FIES has the potential to contribute to a more comprehensive understanding of the causes and consequences of food insecurity and to inform more effective policies and interventions. Because the FIES is easy for professionals and institutions from any sector to use, its inclusion in diverse

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types of surveys can help strengthen links between different sectorial perspectives, for example, between agriculture, social protection, health and nutrition.

Results from surveys that include the FIES can also be used to inform decisions regarding priorities for targeting programmes and resources. While it is not appropriate to use the FIES to identify individual beneficiaries for programmes, the information provided by population surveys that include the FIES can serve to identify vulnerable sub-populations or geographic areas that are more affected by food insecurity[2].

References and links to reports/tools

Ballard, T.J., Kepple, A.W. & Cafiero, C. 2013. The food insecurity experience scale: development of a global standard for monitoring hunger worldwide. Technical Paper. Rome, FAO. Available from http://www.fao.org/economic/ess/ess-fs/voices/en/.

Cafiero, C., Viviani, S., & Nord, M. (2018). Food security measurement in a global context: The food insecurity experience scale. Measurement, 116, 146-152.

FAO (2016). Methods for estimating comparable prevalence rates of food insecurity experienced by adults throughout the world. Rome, FAO. Available at: http://www.fao.org/3/a-i4830e.pdf

FAO (2017). The Food Insecurity Experience Scale: Measuring food insecurity through people's experiences. Available from http://www.fao.org/3/a-i7835e.pdf.

FAO (2018) FAO e-learning course: SDG Indicator 2.1.2 – Using the Food Insecurity Experience Scale (FIES). Available at: http://www.fao.org/elearning/#/elc/en/course/SDG212

Voices of the Hungry webpage: http://www.fao.org/in-action/voices-of-the-hungry/en/#.WoxNck2ovcs

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[2] FAO (2017). The Food Insecurity Experience Scale. Available from http://www.fao.org/in-action/voices-of-the-hungry/fies/en/.

4

Food and Agriculture Organization of the United Nations

MILAN URBAN FOOD POLICY PACT

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Milan Urban Food Policy Pact Monitoring Framework

July 2018 version

Indicator 22: Number of community-based food assets in the city

MUFPP framework of actions' category: Social and economic equity

This indicator measures the number of community-based food assets in the city, such as community kitchens, community gardens, community shops, cafes, food hubs.

Overview table

MUFFP Work stream	Social and economic equity
MUFFP action	**Promote networks and support grassroots activities** that create social inclusion and provide food to marginalised individuals.
What the indicator measures	The number of community-based food assets in the city. These could be by category, e.g. community kitchens, community gardens, community shops, cafés, food hubs.
Which variables need to be measured / what data are needed	Geographical location; categories and sub-categories of assets; assets that specifically target particular user groups (e.g. free or low-cost catering or retail)
Unit of measurement *(i.e. Percentages, averages, number, etc.)*	Number by category of community-based food asset
Unit(s) of Analysis *(i.e people under 5 years old, etc.)*	Type of community-based food asset
Possible sources of information of such data	-Existing asset maps or directories -Local food sector reports -Public food register (or lists kept by the environmental health team who register premises dealing with food) -NGO's, community sector, local food networks -Food Policy Council or equivalent body -Welfare & food insecurity workers; academics
Possible methods/tools for data-collection	Analysis of existing reports and registers; interviews with key stakeholders; online searches; surveys with key stakeholders.

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	(NB: some of the data required for this indicator may already have been collected for other indicators, e.g. school feeding; social assistance programmes, food-related learning and skills development)
Expertise required	Research, data analysis, interview and survey skills
Resources required/ estimated costs	
Specific observations	The most useful way to present the collated data is on food asset maps or in directories. A decision will need to be made about whether to include school-based assets or keep this a separate indicator. GIS mapping of these can be a useful planning and political tool as well as a community engagement vehicle.
Examples of application	Vancouver: http://www.vch.ca/public-health/nutrition/food-asset-map

2

Rationale/evidence

To enable a connection with the planning system: In 2007 the American Planning Association (APA) produced its Policy Guide on Community and Regional Food Planning, a belated attempt to make amends for the fact that the planning community, academics and professionals alike, had signally failed to engage with the food system (Morgan, 2009).[1]

To empower community action: Since 2000, the concept and practice of Food Systems Assessments has developed significantly, driven by i) interest in local food system and ii) the importance of including the food system in urban planning. A review of food system assessment approaches identified eight types of assessments (Freedgood, Meter and Pierce-Quiñonez, 2011). One of these was community food asset mapping, a participatory model that engages a wide range of stakeholders in charting the assets in their food system in the form of a map. 'Avoiding the negative implications of a "needs" assessment (which can spiral community members into inactivity), an "asset map" can bring people together more positively to discuss what their community already has, rather than what it lacks.'[2]

Sharing information: Understanding the presence, location, and impact of community-based food assets is an important early step in urban food system planning. Sharing this information in the form of a map or directory enables wider engagement, networking and provides a basis for new collaborations to further strengthen the food system. Importantly it can also inform policy and strategic decision making by the municipality.

Baseline data: In Vancouver (as in a number of other cities), one of the ways to create a baseline of Vancouver's food system is to document food assets. 'Food assets are defined as resources, facilities, services or spaces that are available to Vancouver residents, and which are used to support the local food system'[3].

Glossary/concepts/definitions used

Categories of food assets: Each city will need to work out the most appropriate categories to use. For example, Vancouver use the following criteria: 'places where people can grow, prepare, share, buy, receive or learn about food' and have identified eight categories.

- Schools
- Community organisations
- Retail stores or markets,
- Growing food spaces
- Kitchen or food programmes,
- Neighbourhood food networks,
- Free or low cost grocery items,
- Free or low cost meals.

Within these categories, some have further sub-categories. For example, kitchens are further broken down into three sub-categories: kitchen access, food skills workshops, community kitchen

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[1] Feeding the city: the challenge of urban food planning, Kevin Morgan, Cardiff University (editorial); International planning studies, volume 14, 2009

[2] Emerging assessment tools to inform food system planning, Julia Freedgood, Marisol Pierce-Quiñonez, Kenneth A. Meter; Journal of Agriculture, Food Systems ad Community Development, 2011 https://foodsystemsjournal.org/index.php/fsj/article/viewFile/84/83

[3] What feeds us: Vancouver food strategy, January 2013 http://vancouver.ca/files/cov/vancouver-food-strategy-final.PDF

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programmes. Growing food divides into four: community gardens, community orchards, urban farms, garden programmes and education.

Community organizations and schools are included 'because they are places where community members can get support with learning and health or connect with others in their community'.[4] However, the schools are only noted for their presence rather than any specific food assets they offer.

Vancouver has collected information on food assets and created an interactive online map as a resource. The North Shore Community asset map (north of Vancouver city) is very similar with a few slighty diffferent sub-categories to suit their situation, e.g. growing food categories. (See website link in footnotes for further details).

Preparations
The team responsible for monitoring this indicator should agree on:
1. Whether or not to include schools; clear rationale for decision
2. Main asset categories and sub-categories; clear rationale for decisions
3. Any other types of data disaggregation that will be used (see further below)
4. Data collection and recording method (it may be most efficient to create a map)
5. If surveys are to be used, survey questions and instrument have to be designed. Training of survey enumerators may be needed.
6. How the information gathered for this indicator could be shared (e.g. maps/directories).

Sampling
In case data are collected by means of a survey with food-related community based organisations, the aim is to fill as many gaps and gather specific details so a sample is not relevant. It might be pragmatic to focus on particular neighbourhoods if resources are very limited, with the view to building up more information as soon as that becomes possible.

Data collection and data disaggregation
Note: Some of the data required for this indicator could usefully inform some of the other social and equity indicators, e.g. school feeding; social assistance programmes, food-related learning and skills development. This should be identified from the start. Otherwise, data generated for them would also be useful for this indicator.

Data disaggregation can be done by:
1. Geographical location e.g. neighbourhoods
2. Categories of assets e.g. community kitchens, community gardens, community shops, cafes, food hubs.
3. Sub-categories of assets – see notes above. These may only become clear once analysis of data is underway. Each city will need to decide what sub-categories are most useful and locally relevant.
3. Type of user group - it may be important to identify assets that specifically target particular user groups.

Data collection can be from existing records, registers and reports; from interviews with key stakeholders to identify further sources of information; from a survey with community-based food

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[4] Vancouver Coastal Health, Vancouver Food Asset Map http://www.vch.ca/public-health/nutrition/food-asset-map

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organisations to identify food assets, specific details of focus of activity and types of users – to help fill gaps in data and clarify sub categories.

Data analysis/calculation of the indicator

The indicator is computed by calculating the total number of community-based food assets. On its own, a number is not very revealing so it needs to be understood alongside a more useful detailed breakdown of assets by geography, category and subcategory, ideally presented visually.

References and links to reports/tools

Ideas on how to gather and present the data on community food assets:

Vancouver, Canada: food asset mapping
Vancouver Coastal Health, Vancouver Food Asset Map http://www.vch.ca/public-health/nutrition/food-asset-map

London, UK: using a community-led asset approach
Gipsy Hill Food Village Hub: a community-led asset based approach to positively influencing the local food system; Cunningham and Oki, Public Health Lambeth Borough Council
https://www.lambeth.gov.uk/sites/default/files/Gipsy Hill Final_0.pdf

Washington, US: example of a localised neighbourhood asset map
Camp Washington food and community asset map
https://static1.squarespace.com/static/5633fcede4b0b0c3596ed436/t/5788f6e103596e546ca53ace/1468593896214/Camp+Washington+Food+and+Community+Asset+Map+-+Pages.pdf

Food coops toolkit, Sustain, UK: includes guidance on food mapping and community audits
A community audit is a type of mapping, but goes into more detail than food mapping because as well as finding out about food outlets, a community audit also includes other local facilities and services. https://www.sustainweb.org/foodcoopstoolkit/communityaudit/

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