Chapter 2
Reassessment of Urban Sustainability and Food Security in the Light of COVID-19

Basu Anindya and Kar Nabendu Sekhar

Abstract The world which is now dominated by cities has to address the issue of urban sustainability. Though the ecology of the cities is deeply influenced by urban agriculture, the discussions about that has not been included with due importance in the urban planning discourse emphasising on smart cities. The need for self-reliant cities has been felt deeply by all when the world was struck by the global pandemic COVID-19, which halted the normal supply chain creating a panic in the urban areas that primarily are consumption-oriented. The need for modern version of ‘back-yard gardening’ is being reconsidered to add to the viability of the bustling cities. In the context of the COVID-19 situation, this article tries to identify the issue of food security in today’s modern cities and to assess the practical avenues available to achieve self-reliance and sustainability. Urban food production is not only a matter of scientific curiosity but now has become an urban policy issue and development tool. Both change in urban developmental plans and ‘urban’ mindset in the ‘new normal’ will help the cities in encountering the coming hard days and be prepared for such outbreaks in future, making cities truly smart and sustainable.

Keywords Smart cities · Sustainability · Food security · Urban farming · COVID-19

2.1 Introduction

‘Change is one thing; progress is another. Change is scientific, progress is ethical. Change is indubitable, whereas progress is a matter of controversy’ Bertrand Russell (1872–1970).

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To make existing cities and upcoming urban centres more ecologically viable there is an urgent priority in the global push for sustainability. A city that strives to be more ecologically sound has to be concerned about access to green space and food security. Most of the modern cities exclusively rely on the import of all sorts of resources to meet their daily basic needs. Food and other essential materials and goods are transported from long distances, within the country or even from other nations and in some cases often across continents. As the future population growth is expected to crowd the cities more and more, there is a need to look into the potential for local self-reliance in food within the cities.

Achievement of high levels of local self-reliance requires the active role of city government, planners, citizens involving a high degree of physical labour and financial investment but the returns like benefits to human health and well-being, local economy and environment must outweigh the costs involved. The main hindrance in pursuing the path of food security in urban areas is the mindset of the ‘urbanites’—there is an ingrained belief that ‘urban’ is intrinsically related with built-up areas and economic sectors like tertiary and quaternary ones. The web is flooded with urban farming jokes, cartoons and memes (Fig. 2.1). Use of knowledge, technology, information and communication holds the key for development and through those pathways the city dwellers will earn money and will be able to afford basic necessities like food and clothing. To put things more lucidly the city residents will show a kind of high-handedness being the rich, choosy customers while the rural regions will remain as the poor providers.

The need for self-reliant cities has been felt deeply by all when the world was struck by the global pandemic COVID-19, which halted the normal supply chain creating a panic in the urban areas that primarily are consumption-oriented. The need of modern version of ‘back-yard gardening’ is being reconsidered to add to the viability of the bustling cities.

Fig. 2.1 The web is flooded with urban farming jokes, cartoons and memes. The ‘urbanite’ mindset that ‘urban’ is intrinsically related with built-up areas and light coloured collars is one of the main hindrances in pursuing the path of food security in urban areas
The article tries to identify the issue of food security in today’s modern cities. It delves into how, in the context of COVID-19 situation, the ignorance about urban agriculture has proved costly for the cities currently facing logistics issues in food delivery and finally assesses the practical avenues available to achieve self-reliance and sustainability.

2.2 Covid-19 Situation and the Urban Scenario

Prior to the Corona virus outbreak, in the past decades, several new diseases have emerged in new geographical areas, with pathogens including Ebola, Zika and Nipah which has affected the physical and economic well-being of several regions. The local outbreak of pneumonia from unknown virus was detected in Wuhan, Hubei, China in December 2019—later identified to be caused by a novel corona virus creating (SARS-CoV-2) acute respiratory syndrome [63] took the shape of global pandemic creating an unprecedented disruption. With reports of high cases and infectivity coming in to break the transmission cycle several countries took measures like temporary restrictions on international and even internal travel, decelerating mobility, social distancing, etc., with an eye towards slowing the spread of this new disease till any substantial vaccine production. Stier et al. [51] estimated that there is a positive relation between city population size and number of COVID cases based on data collected from US cities and advocated for stricter distancing policies in larger cities alongside maintaining socio-economic activities. This is also true for metropolitan cities of India like Mumbai, Chennai, Kolkata, Bengaluru and others. During the COVID-19 pandemic, the world became very familiar with the concept of ‘lockdown’ or ‘stay-at-home’. By early April 2020, 3.9 billion people worldwide, i.e. half of the world population, were under some form of lockdown [9]. For India, the second highest populated country of the world, the lockdown since 25 March, 2020 has been in place with varying stringency, involving 1.3 billion people. Corburn et al. [13] offered a set of policy suggestions to have more effective containment policies in the highly populated urban informal settlements like improved medical facilities, application of an immediate moratorium on evictions, where possible, provision of food assistance, immediate guarantee of payments to the poor, etc. Fernandez [24] while discussing about economic impacts due to COVID-19, rightly pointed out that in a strongly connected and integrated world, the impact of COVID-19 would be way beyond the absolute number of deaths reported, there would be global economic crisis even recessions for which governments have to prepare contingency plans, and aid packages to sustain their economies. He argued that due to lockdowns and shutdowns the service-oriented economies would be worst-hit and the food industry too shall not be exempted for long.

Even before the pandemic situation, extreme weather conditions indicated that global food prices could surge soon and COVID-19 amplified the risk of price spike many times. As the coronavirus crisis unfolded, interruptions in global and local food supply chains were felt; labour shortages due to morbidity, movement restrictions,
social distancing rules; shortages of animal feed, fertilisers, and pesticides affected the production and supply logistics; alongside transportation bottlenecks. Several countries in response to the pandemic took resort to temporary measures like Russia and Kazakhstan levied a ban on wheat export while India and Vietnam imposed an embargo on rice. The United Nations World Food Programme warned that approximately 265 million people could face acute food insecurity by the end of 2020, which is twice that of 2019 [62]. Many pointed that the actual problem lies with food supply disruption rather than food shortages.

In India, lockdown measures had a detrimental effect on the economy and even on local food systems. India’s estimated total food grain production for 2019–20 is 292 million tonnes which is 6.74 million tonnes greater than the previous year [10]. But still, initially there was a huge surge in demand due to panic buying and hoarding of food items fearing an acute shortage which created undue pressure on the supply. The problem in the urban centres has been two-pronged: inadequate supply (both fresh supplies from nearby and packaged goods) and unaffordability by the poorer section who are reeling under joblessness as the prices of the food items shot up steeply. This exposed that the modern cities who eye for comfort and ease of life have largely ignored the need of being self-reliant in terms of food security and were complacent being the ‘buyer’.

World Health Organization (WHO) on 30 January 2020 declared COVID-19 as a public health emergency of international concern. Globally, as on 7 August 2020, there have been 1.89 crores of confirmed cases of COVID-19, including 7.09 deaths, across 213 countries; region-wise the number of cases is highest in America, followed by Europe and South-east Asia and India registering 2,027,074 confirmed cases as of now [64].

Though initially, the outbreak reached severe proportions in European nations like Spain, Italy, France and England; at present the countries which have surpassed others to attain the dubious distinction of being leaders are United States of America, Brazil, India, Russia and South Africa. Except for USA, an interesting grouping of emerging economies under the newly restructured BRICS confederacy can be seen including China which was the first country to be hit by COVID-19. These populous developing countries having high urbanising trend represent about 42% of the population, 23% of GDP, 30% of the territory and 18% of the global trade indicates enough about the situation [4]. If this pandemic trend continues for long, then prolonged lockdowns, severe movement restrictions have to be imposed which would affect the longer food chain supplies for sure and that would be a real test for the food resilience of the urban areas.

### 2.3 Urban Sustainability: Issues and Perspectives

The world which is dominated by cities has to address the issue of urban sustainability. This process was initiated with Agenda 21 at Rio-de-Janeiro, 1992 and was formalised at UN City Summit in Istanbul through Habitat Agenda, 1996. From
then several dimensions of urban sustainability have emerged. The ecological footprint analysis involving energy and material consumption and waste discharge of the defined population of selected urban areas reveals that though it apparently seemed sustainable there is growing competition over the usage of natural capital raising questions about equity and sustainability. Bioregionalism—which can be a tool for sustainability refers to a place primarily defined by its life forms, topography and biota rather than by human dictates, i.e. a region governed by nature, not legislature and bioregional mapping is also done for local empowerment. To safeguard the right of food democracy the future plans need to be flexible having combined land use and creating land reserves for productive green space.

There have been concerted efforts for global mainstreaming of urban sustainability—through several initiatives like ‘eco-city’, ‘ecological city’, ‘zero-carbon city’, ‘solar city’, ‘smart city’ and ‘sustainable city’ were taken but needed certain internationally accepted specifications and standards.

### 2.3.1 Eco-City

Engwicht [18] advocated that eco-cities should encourage inventions for maximising exchange and minimising travel. Urban Ecology [60] formulated ten principles to be followed by ecological cities, one of which was revised land-use priorities to create compact, diverse and green environment. According to the global census of eco-city initiatives, there are 178 eco-city initiatives under development [30]. The goals of urban sustainability involve several environmental, economic and social elements in relation to urban settings. However, more emphasis was given on the environmental parameters than the social ones and the prime goal became to reduce greenhouse gas emission. The threefold governance function of eco-sustainability indicators involves definitional work like conceptualising and designing, performance assessment like monitoring and implementation along with social learning through encouragement of local knowledge and practices.

### 2.3.2 Smart City

The origin of the concept of smart cities can be traced back to the Smart Growth Movement of the late 1990s [41]. Urban development can be achieved by judicious use of human, collective and technological capital. Metropolitan areas across the globe have taken several initiatives to develop urban infrastructure and services intending to improve upon socio-economic conditions, environmental status and competitiveness of the cities. While pursuing these goals the concept of ‘intelligent cities’ came in where usage of technology was higher and it was taken to be the predecessor of smart cities. The term smart is a feature rather than a sign of performance where the main characteristics of smart cities are usage of digital information
in various spheres like mobility, energy use, education, health, urban governance, etc. [54]. But still there is lack of consensus about the actual definition of smart city and there are overlapping ideas for this umbrella term which often coincides with the concept of ‘tech-city’ depending heavily on information and communication technology to provide their competitive edge. Several instances of smart city can be seen—Barcelona which is an advanced, high-tech city striving for sustainable greener environment along with increased quality of life, the city of Amsterdam uses innovative technology for energy-related applications to tackle climate challenges [36], while in Doha, smart city practices are more akin to economic activities [12], in Brisbane, smart technologies are used for designing efficient urban spaces [42].

In India too Smart City Mission was launched in June 2015 with an objective ‘to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of “Smart” Solutions’ [40]. The three main components are—city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development); the third one trying to take care of urban food supply issues. A shift in approach from sustainability assessment to smart city goals was seen in the twenty-first century. A recent report published that only 1% of the total allocated amount of little over rupees two lakh crores for hundred cities under the Smart City Project was spent on health infrastructure, though it is one of ten prime parameters. Interestingly, from the COVID figures derived till May 2020, it came out that—thirty municipalities, including seventeen smart cities accounted for 79% of Corona cases. This pandemic has clearly shown that importance of health and easy access to healthy food as a driving force for economic growth has largely been ignored [39].

### 2.3.3 Sustainable City

Sustainable urban development has become a prerequisite for sustainable development and it is said that there can be no sustainable world without sustainable cities. The sustainability of an urban region is not strictly limited within its boundaries and is deeply influenced by its peri-urban hinterland as it plays a major role in providing resources. ‘Our Common Future’ published in 1987 highlighted the meaning and principle of sustainable development; which was further carried forward through Agenda 21 published in Earth Summit, 1992. At later periods, more importance was attached to the involvement of local community in attaining the sustainability goals within the global framework. The concept of sustainable city became popular from the 1990s which designated the relationship among economic, social and environmental sustainability aspects from a combination of indicators. Sustainable urban development is the core issue, which can be analysed under four themes—society, economy, environment and governance. Dhingra and Chattopadhyay [15] charted several goals for smart and sustainable city, one of them being ensuring efficient service delivery of basic services, which included food supply. To make the concepts
of sustainable city work only formulation of policies would not suffice, the regulations have to be practical and there has to be community involvement along with accountability of practice.

### 2.3.4 Green City

The Green city movement believed in four pillars—ecology, social responsibility, grassroots democracy and non-violence which would guide to improved quality of life, harmony with nature, self-reliance and decentralisation. To achieve the potential for ‘green living’ there are opposing views about the low- versus high-density living and regarding the treatment of the ‘urban commons’. One school suggests that green living is only possible in low-density, semi-rural context and thus cities need to be fragmented into smaller units to bring those qualities back. But the other school points out that this sort of philosophy is absolutely against the spirit of urbanisation where main features are high density and diversity. It further suggests that high-density development leads to more compact, mixed-use urban form and reduced car use reducing the sprawl—leaving more land for open space, gardens, urban agriculture, forestry and horticulture which are to be managed through ‘urban commons’ approach [46]. Zurich, Stockholm and Helsinki are among the cities which have adopted the ‘urban commons’ structure like urban agriculture, forests and community gardens along with exceptional public transport system and have become much greener [6].

### 2.3.5 Self-reliant City

Benjamin Franklin more than two hundred years ago cautioned that ‘the man who would trade independence for security usually deserves to wind up with neither’ and that has been the case in present times. Currently, the world economy is based on distribution lines and people are immensely dependent on supplies which results in fragmented and passive communities.

The World Health Organization Constitution adopted long back in 1946 defined health as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’. To achieve this ideal situation, provision of some aspects like harmony, social justice, suitable food and safe drinking water supply, elementary education, basic housing facilities, etc., were endorsed particularly for the densely populated cities. The idea of ‘global village’ having wide network emerged with improved technological and transportation system. Self-reliance is not only the capacity for self-sufficiency but something more also. It is believed that a self-reliant city has a self-conscious and self-confident community who has the capacity
to produce bulk of its basic requirements utilising the local resource base. Schumacher through his pivotal publication *Small Is Beautiful* [47] advocated for shortening of long-distance distribution lines; he devised the term *Buddhist Economics* where transportation is regarded as necessary evil which needs to be reduced through increased local production. Apart from ecological concerns, the rising energy prices have forced the planners to reduce the movements of materials and concentrate more on local self-reliance.

### 2.3.6 Continuing Metropolitan Mayhem

Long back in 1875, Benjamin Ward Richardson in his presidential address entitled, *Hygeia: The City of Health* to the Health Department of the Social Science Association at Brighton projected an idea of *Utopian City* [45] in the line of Greek, Roman thinkers where public health would be the primary design consideration. But even in modern times, this idea still remains ignored and regarded as utopian.

Undoubtedly COVID-19 is a global phenomenon but case incidences have been much higher in the urban areas having dense population. There have been efforts to *decongest* the cities by following policies of decentralisation of industries and service sectors but not much has been achieved, the demographic dividend has over the years become a burden on the cities. The cities which have been badly hit are—New York, USA; Sao Paolo, Brazil; Moscow, Russia; London, UK; Madrid, Spain; besides many others. All these are bustling cities with robust economic activities and high population density. Similar situation has been mirrored for India. Cabinet Secretary, Government of India pointed out that 13 cities accounted for 70% of the total COVID-19 cases in the country [52] with metropolitan clusters like Mumbai, Delhi, Chennai, Kolkata unceremoniously leading the pack accounting for nearly half of the nationwide COVID-19 tally [44].

### 2.4 Urban Pantry: A Saga of Neglect

A healthy city is one that is self-reliant through holistic planning with engaged citizenry emphasising efficient localism. Though the ecology of the cities is deeply influenced by urban agriculture, the discussions about that have not been included with due importance in the urban planning discourse. This lacuna was first pointed out by Pothukuchi and Kaufman [43] and they conducted a survey on 22 US city planning agencies to establish the issue. In 2007, for the first time, American Planning Association formulated a Policy Guide on Community and Regional Food Planning [3]. Food planning, after a period of ignorance, has now earned a place in the planning agenda of many developed and developing countries. Grewal et al. [26] analysed three separate hypothetical situations for the city of Cleveland, in terms of implementation of urban agriculture, which suffered from lack of access to locally produced healthy
food in spite of available vacant areas and determined the respective levels of potential self-reliance. A study on Sarajevo was conducted by Sommers and Smit [50] which highlighted the fact that a two-year-long blockade forced the country to pursue self-reliance in urban food production leading to a 30% increase in vegetable and minor livestock production. Similar situation was narrated by Brown and Jameton [8] for the United States during the ‘victory garden’ movement of World War II when the households were able to meet 40% of the country’s total vegetable demand. Few cities that have already achieved a degree of self-sufficiency in urban agriculture as documented by Lee-Smith [37] are—Dar es Salaam, Tanzania, Sanghai and Beijing, China which internally produced more than 80% of their vegetable demand. While explaining the importance of urban agriculture, Masi [38] coined the term ‘food desert’ where fast-food restaurants are much closer than grocery stores selling fresh produce in a neighbourhood.

To have an idea about how the second highest populated country of the world, India is doing with internal food provisions—supervised MXL Classification of Landsat 5 images of four metropolitan entities (Table 2.1), Delhi, Mumbai, Kolkata and Chennai—currently the ones worst affected by COVID-19 was done with a temporal framework (1991–2011) with 80% overall accuracy using Q-GIS v3.10.4 (Fig. 2.2). From Fig. 2.2, it becomes evident that over time the extent of agricultural plots within the city limits have drastically dwindled. Mumbai the commercial capital has become almost devoid of agricultural land. The cities eying development, have focused on built-up areas sacrificing their already limited internal food-procuring zones making them completely dependent on peri-urban and rural food supply.

As a response to the challenges posed by the rapid unstable urbanisation to a more sustainable one, Kenworthy [32] set out ten critical responses primarily based

| Metropolitan cities | Satellite | Sensor | Path | Row | Date of acquisition |
|---------------------|----------|--------|------|-----|---------------------|
| Delhi               | Landsat 5| Thematic mapper | 146  | 040 | 04/03/1991 05/02/2001 05/03/2011 |
| Mumbai              | Landsat 5| Thematic mapper | 147  | 047 | 21/03/1991 03/05/2001 08/02/2011 |
|                     |          |         | 148  | 047 | 12/03/1991 18/01/2001 30/01/2011 |
| Kolkata             | Landsat 5| Thematic mapper | 138  | 044 | 06/03/1991 07/03/2001 13/03/2011 |
| Chennai             | Landsat 5| Thematic mapper | 142  | 051 | 18/03/1991 30/04/2001 09/03/2011 |
Fig. 2.2  Extent of agricultural land (in greenish yellow tint) of Delhi, Mumbai, Kolkata and Chennai (1991, 2001 and 2011) derived from supervised classification of LANDSAT 5 images (See Table 2.1 for detailed information) with the graph showing the steadily declining trend of the share of agricultural land.
on transport and planning dimensions. Among those, he accentuated that a city having a compact, mixed-use urban form has to efficiently protect the natural environment, biodiversity and food-producing areas, and the city space in and around the city has to be used judiciously for catering to the food needs. Trindade et al. [55] provided a systematic review of the literature selected from three databases covering six hundred and thirty articles using ‘smart city’ and ‘sustainability’ as keywords; addressing the relationship between smart city and environmental sustainability as portrayed by the selected papers and cited the issue of green economic strategies too. As due to the ongoing processes of industrialisation, urbanisation and globalisation, an increasing share of the goods consumed in the city is produced far away making urban sustainability an issue beyond borders having global consequences.

### 2.5 Cities and Food Resource

For the first time in 2007, greater number of people started living in urban areas than in rural regions as the population density is very high in the former one. The total urban population per cent recorded in 2018 was fifty-five and absolute number of people living in urban areas globally is more than four billion. It is projected that in 2050 it would reach close to seven billion [59].

Cities which house large number of people require vast areas of land for their sustenance which are often not available within their limits and have to depend on imported food. So, presently they are completely dependent on retailing food distribution systems, based on motorised transport accentuating fossil-fuel use and in turn air pollution. In general, the main problems that had been identified in cities across the globe were home foreclosures and resulting vacant land, lack of access to healthy food, hunger and even obesity. The vacant lands, open spaces of residential plots and industrial and commercial rooftops have to be utilised to generate fresh produce of vegetables and fruits through conventional gardening, intensive gardening or hydroponics; to create poultries to cater to basic meat and egg demand and to pursue apiculture for generating honey for achieving the desired level of self-sufficiency.

Food items are broadly categorised into—a. grains, b. vegetables, c. fruits, d. milk and dairy products, e. meats, eggs and nuts and f. fats and oils [56]. Food and Agricultural Association recommended a minimum of 73 kg/person/year each of vegetables and fruits for a healthy livelihood [56]. Barrs [5] reasoned that grain production is not appropriate in urban areas as the yield is low and production of hardy crops are less necessary within the city limits. A portion of vegetables, fruits, small livestock and honey which are part of dietary requirements can be produced within urban limits.
2.5.1 Food Security

Food security is defined as the all-time access to certain amount of food required to lead a healthy life, for all [7]. Since, the twentieth century, food security for millions of urban dwellers has become a concern (Fig. 2.3). Following FAO’s definition, the four key components of food security identified are—availability, accessibility, acceptability and adequacy. It is not possible to study urban food security in isolation as complex interrelationships among rural–urban and local–global are intertwined. Four major areas of concern were identified by Koc et al. [34]: (i) The unprecedented growth of the urban centres is causing stress on food security and it is predicted to grow at a steady rate—by 2050 it is projected that more than two-thirds of the world population will be living in cities [59]. (ii) Urban poverty especially in the cities of the developing world has swelled due to continuous rural migration and non-availability of job opportunities for all. (iii) The existing food markets in the cities often fail to respond to the diverse socio-cultural need of the population and indirectly pressurise them to modify their dietary habits. (iv) Due to the growing commodification and globalisation of the agro-food system the urban consumers have very little idea about the food production and supply chain and often neglect local produce in lieu of cheaper, imported ones creating sustainability issues. The main efforts worldwide have been regarding basic staple food availability and supply. Few issues regarding
food have been largely ignored—the availability of healthy, bioactive ingredients of food which are much needed to strengthen the immunity system, ensuring food safety and taking stringent measures to avoid virus spread among the stakeholders of food supply chain, taking care of food sustainability in the long run.

With the increasing level of poverty in the cities, food insecurity has also been on the rise. The cost of food has gone up much higher in major cities of Latin American, West African and East Asian countries and is often beyond the means of urban poor due to insufficient and unreliable food supplies from rural and foreign sources, urban food production has expanded enormously since the 1970s. It is needless to say that worldwide the urban demand of food will continue to rise and thus, eventually the large cities have to take initiatives for agricultural production within urban areas or in the urban fringe to reduce the large-scale import.

The concept of food system resilience concerning financial capital (production infrastructure), social capital (connections) and human capital (knowledge) covers the issues like food—security, availability, accessibility, utilisation and stability [20] and these can be easily attained by the urban community if there is the reach to the affordable local food systems. As per Drakakis-Smith [16], the urban food system has three main components: food-producing areas (domestic rural and urban along with foreign), marketing networks and urban consumption centres. For achieving security and resilience the risk management strategies have to involve—diversification of produce, substitution of items, entrepreneurship of the locals, cooperation among the regional players, healthy competition, inclusiveness and connectivity among several other factors. HLPE [27] did provide a detailed definition of food system, relating elements, activities and outputs. Only lip service about ‘farm to plate’ will not help, the dynamic interaction among the factors have to be dealt in a holistic way, then only the local food systems serving the urban areas within or nearby the cities can flourish.

2.5.2 Globalisation and Urbanisation

Simai [48] defined globalisation as ‘the entirety of such universal processes as technological transformation; interdependence caused by mass communications; trade and capital flows; homogenization and standardization of production and consumption; the predominance of the world market in trade, investment and other corporate transactions; special and institutional integration of markets; and growing identity or similarity of economic regulations, institutions, and policies’. Globalisation has facilitated massive exchange of information and ideas through modern technological advances. This has led to widespread assimilation of cultures and tolerance to diversity.

But there are certain negative aspects involved too. The autonomy of local communities is often compromised and unnecessary excessive dependence on foreign commodity develops. The emergence and prominence of Multi-National Companies (MNCs), having little understanding about socio-economic fabric of the local
community, in providing necessary goods like food have displaced the local initiatives. Besides, the MNCs care little about the environment, their exploitative production system and global goods transportation results in severe pollution. Moreover, it creates a culture of excessive consumption leading to unsustainable consumerism. Therefore, globalisation negatively affects local economic resilience, autonomy, the environment and sustainability. For a developing country like India, the semi-literate farmers who are not market savvy and are unaware of the market nuances are often controlled by middlemen and are forced to have indirect access in the urban markets. This absence of direct link with the consumers affects the availability and price too affecting both rural farmers and urban consumers which can only be catered by shortening the supply chain, bringing producers close to the consumers.

When the twentieth century began, about 12.5% or 200 million people lived in cities [54]. As per the prediction of United Nations Department of Economic and Social Affairs [57] in Urban Ecology 2050 the urban population is going to account for 67% of the global population. Knorr et al. [33], estimated that by the end of 2020, the global urban population will be 54% and is expected to shoot over 60% by 2030 with the trend being stronger for the developing countries. Out of the 34 megacities, 19 are located in Asia and it has been predicted that by 2030, there would be 41 megacities, of which the majority would be in low-to-middle-income countries [28] which creates more concern for adequate food supply during phases of severe disruptions. With the increasing trend of globalisation, rapid urbanisation is intrinsically linked. Though the universally accepted definition of ‘urban’ is still not there, certain parameters are considered in most cases—population threshold, population density, level of infrastructure, employment type, etc. The urban areas and their resource uses are dynamic in nature, the challenge faced is to transform the cities into self-regulating, sustainable systems where those will become viable—socially, economically, as well as environmentally. It has been aptly put, that urban dwellers do not actually live in a civilisation, but in a mobilisation concerning natural resources, people and products [14]. One of the major goals of United Nations Development Programme [58] is to ‘make cities inclusive, safe, resilient and sustainable’ through implementation of Sustainable Development Goals.

It was globalisation that made several food items available all over the world through improved trade and logistics management, increasing the profitability of the food industry and flexibility of choices for the consumers. This led to the changed dietary habits of the consumers who instead of local produces and markets became more dependent on imported produce and supermarket chains. It is difficult to be unequivocal about the impact of globalisation. Undoubtedly, it expanded the horizon of food produce exchange but at the same time the local producers and short food supply chains were not able to get integrated into the global business due to limited production capacity, non-competitive prices which are dominated by the big multinational players. The ones who oppose the wave of globalisation and resultant urbanisation mention that it creates predatory markets for production and consumption hampering diversity and self-reliance. It is often cited that cities of northern countries are engaged in exporting the surpluses of less nutritious food and importing nutritious ones mostly from the global south [34].
2.5.3 Paradigm Shift

The Agenda 21 (1992) slogan ‘think global, act local’ caught the fancy of many and importance was given on local actions to abate global issues. Local self-reliance emphasises the principle that the localities should be able to derive their basic necessities from within their own physical footprints. To achieve this, local communities have to learn efficient and sustainable use of the limited resources available to them generating resilience. However, at the same time it is overzealous to think of a system which would be completely cut-off from the rest of the world; there would be obviously interactions and exchanges but the thrust would be primarily on the local production system. The relationship between urban forms and its corresponding bioregion decides whether it is consumption-oriented or is able to meet its dietary requirements from its own boundaries or surroundings, delineating the city’s ecological footprint [32].

The same has to be applicable for the urban areas too. Food production in the cities can be initiated in home gardens, windowsill gardens, community gardens in the vacant places, rooftop gardens in commercial spaces, government-supported urban farms—depending on the circumstances and choice of the residents. Various scholars have pointed out the importance of urban agriculture highlighting the potential a) in reducing the local economic leakages; b) in providing increased access to indigenous nutritious food and healthy lifestyle; c) in reducing detrimental environmental impact due to anthropogenic activities and d) in generating a kind of close-knit community feeling.

2.6 Role of Urban Agriculture in Delivering Results

Urban agriculture has been defined by Smit et al. [49] as an industry which produces food (crops and livestock) and fuel mainly through intensive production methods, processes them and even markets them as a response to the daily demand of the consumers of the urban and peri-urban areas. The most befitting answer to food insecurity in urban centres will be home gardening and urban agriculture which can provide regular access to fresh produce and assure a balanced, nutritious diet. Urban agriculture can be defined as all sorts of agricultural production occurring in or around cities.

The modern cities characterised by urban sprawl face amplified travel distance in procuring food through complicated distribution networks which lead to growing carbon footprints and higher cost of procurement—affecting the urban poor. To address these challenges rethinking about vacant spaces, available logistics and existing manpower has to be done, where urban agriculture comes in. It has the potential to modify the entire urban and agricultural landscape, improving local food security and nutrition especially for the urban poor.
There has been an inherent assumption that cities where tertiary activities are predominant will not produce food for themselves but will buy food. Gradually, with the increasing number of mouths to feed production of food within urban area became a necessity and urban agriculture was the only viable way out. In 1975, ‘Slow Street Movement’ was initiated in Berkeley with an aim to ensure sustainability through usage of non-conventional energy, alternative transportation modes along with planting and harvesting fruit trees along the streets. Long back in the 1980s and 1990s US census documented that urban metropolitan areas produced 30 and 40% of the total agriculture produce respectively, going by the dollar value [49]. There has been meteoric rise of urban agriculture in Dar-es-Salaam, Tanzania with the number of families engaged in farming increasing from 18% in 1967 to 67% in 2000 [29]. Similar, has been the case for Moscow—the families involved in food production rose from 20% in 1970 to 65% in 1991 [49]. Urban agriculture has become an acceptable practice with a share of 15–20% of the world’s food supply [35] and during this trying period it is bound to get bigger. Much before, in 2013 42 million households were actively involved with urban agriculture through individual or community efforts [1]. From the estimates of Thomas [53], encouraging figures were seen in smaller Siberian and Asian cities where over 80% of the families were engaged in urban agricultural practices.

Every time, during severe crises like war, civil disobedience and recession the importance of growing food in and around the cities has been felt by the community. One of the first such initiative was Schrebergaerten, in Germany after World War I, when city people had the option to either go hungry or to at least grow their own food partially. In a similar situation during the Second World War, the Dig for Victory campaign in Britain was successful to a certain extent in bringing a portion of urban land into cultivation [25]. For pursuing agricultural activities there are vacant open spaces, derelict land within the cities. Like in Essen, Germany abandoned coal-mining areas were earmarked for urban agriculture projects [14]. In Britain, city farm projects were set up in more than twenty cities on deserted lands [25]. The country with the highest population in the world, i.e. China has several of its densely populated cities including Beijing practising highly intensive urban cropping system. It was also planned that to tackle the issue of growing unemployment in the cities the excess labour can be utilised to adopt new survival strategies like urban agriculture [5]. This has already been done in American cities like Detroit and New York where vast amount of vacant land has been put to use for growing food with active involvement of unemployed workers [14]. The cities of Africa like Harare, Zimbabwe or Cairo in Egypt which are affected by frequent droughts have arranged for their own back-up plans like open-space cultivation, utilising the city fringe and keeping of poultries too [17]. In India, though there have been initiatives to create smart and sustainable cities, little efforts have been taken. From Table 2.2 it is clear that the share of urban population involved in the selected developing countries is quite promising, sole exception being Indonesia where the urban participation is abysmally low. But the disappointing indicator is the share of total income where this sector performs poorly, the case is more severe in Asian and Latin American countries. Besides, under the National Food Security Programmes several success stories have emerged
Table 2.2  Urban agriculture scenario in selected countries (Data Source: Zezza and Tasciotti [65])

| Country  | Year | Urban population participating in agricultural activities (in %) | Share of total income from agriculture in urban areas (in %) |
|----------|------|---------------------------------------------------------------|----------------------------------------------------------|
| Bangladesh | 2000 | 30                                                           | 3                                                        |
| Bulgaria  | 2001 | 27                                                           | 2                                                        |
| Guatemala | 2000 | 42                                                           | 5                                                        |
| Indonesia | 2000 | 11                                                           | 3                                                        |
| Madagascar| 2001 | 33                                                           | 21                                                       |
| Malawi    | 2004 | 46                                                           | 12                                                       |
| Nepal     | 2003 | 57                                                           | 11                                                       |
| Nicaragua | 2001 | 68                                                           | 5                                                        |
| Nigeria   | 2004 | 32                                                           | 27                                                       |

In urban agriculture interventions like—Congo, Bolivia, Sri Lanka, Namibia, Senegal and Brazil which have been able to tackle the issues like space crunch, irrigation, technical know-hows, food processing and urban food marketing systematically and have managed to tide over the food crisis situation in urban areas effectively [21].

Local food systems link productive activities of the adjacent bioregion to the consumers in metropolitan centres and apart from meeting the food security demand, providing fresher and nutritious seasonal produce; it also has several positive impacts on the city like productive space utilisation, micro-climate improvement, conservation of urban climate, reducing atmospheric pollution, judicious waste and nutrient recycling, efficient water management, lessening ecological footprint and enriching biodiversity policy.

The positive impacts of urban agriculture that can be documented are—increased opportunity for job creation; overall marked reduction in crime in the cities; utilisation of vacant lots; meeting up of household dietary requirements; gardening acting as a productive alternative for physical exercise; acting as stress reliever; increased green space helping in reducing the urban heat island effect; reducing carbon emission through shorter supply chains and evoking a community spirit and empowerment.

The all-round utility of urban agriculture has been highlighted covering factors like—ecosystem services, provision of nutrition, safeguarding human health, generation of jobs, increasing aesthetical appeal and increasing community resilience.

The avenues through which urban agriculture can be pursued are—outdoor urban gardens and farms, hydroponic or aquaponic indoor production with options like vertical farming, sky farming, rooftop gardening-landscaping and even opting for urban livestock rearing. Individual attempts for persuasion of agricultural pursuits in urban areas might not be very viable but community-gardening may be a more productive option. It needs to be clarified that practising urban agriculture does not mean that all the citizens would get involved in food production because such an idea would be utopian. Rather, the citizens would have to be sensitised to support the seasonal local production, i.e. encouraging community-supported agriculture.
through closer grower–consumer interaction which would also lift up the community spirit and strengthen social cohesion.

### 2.7 Tackling the Menace of COVID-19

In the face of a planetary crisis like COVID-19 pandemic when the scale of produce, the transportation of food gets affected how will the world deal with it is the moot question? The critical issues that are intricately related are—food security, food safety and food nutrition; which need to be addressed in the light of sustainability. Lockdown refers to limited free movements and activities for people to address specific risks, threatening loss of human lives. Lockdowns are generally preventive in nature which anticipates danger and its degree of strictness in protocol depends on the gravity of the threat. Emergency lockdowns are implemented when due to a looming danger, abrupt restrictions are imposed discontinuing regular activities. There might be continuous or periodic lockdowns depending on the intensity and total duration. Though lockdown in some cases is referred to as ‘mass quarantine’, there is a difference between lockdown and quarantine. While lockdown involves society in general, quarantine separates and restricts the movement of people who are not really ill but have high chances of contracting the disease due to high exposure. China (on January 2020) followed by Italy, Spain, France, UK, New Zealand, India, South Africa (March 2020) took the lockdown measures at various stages of infectivity [31].

It was estimated that the average distance covered for urban food supply in megacities are between 800 and 1500 km [2] which might face many hurdles during the time of pandemics. So, the COVID situation destabilises food security in urban areas both directly by unsettling the food systems through muffled movements and indirectly by limiting physical and economic access of the urban residents during lockdown phases. The perishable food items like fruits, vegetables, raw meat, etc., are difficult to stock for a long time, so to procure all these during the time of restricted movement the informal local markets are the only fallback option. If the local sources are unavailable then the urban middle and lower class are forced to opt for highly expensive supermarket alternatives which are scarce.

Though the initial shock wave of COVID-19 has been absorbed to certain extent; following the guideline of FAO (2008) governments at all levels despite all odds has tried to maintain the food value chain uninterrupted. To ensure food security, many of the national authorities of Asia and Latin America have arranged for food rations (India, Indonesia) or have provided monetary allocation for procuring food (Peru, Singapore) but this cannot be a long-term solution as the local food supply needs to be stable, with minimal supply interruptions and has to be within reach for the growing urban population of these regions. The tackling techniques for COVID-19 are bringing the world together by creating ‘social distance’ among them in unprecedented manners. The connections through commuting, travelling are being restricted while technological connectivity is on the rise. Though there have been no official
restrictions on trade exchanges, due to limited movement supply chain vulnerabilities globally, nationally and locally has been exposed; the outbreak has impacted business and economies severely and is predicted to be much greater than that of the 2003 SARS outbreak. US Centers for Disease Control and Prevention (CDC) issued its ‘Business Pandemic Influenza Planning Checklist’ in 2005 to encourage preparedness but such pandemic plans have mostly been shelved [23]. As response to severe pandemic is complex, it cannot really be devised ‘on the fly mode’, now the world is at a loss to tackle the devastating impact. The shocks of the initial lockdown during Covid-19 crisis were sufficient enough to jeopardise the food security especially that of the low-income households which was not directly related to supply of staples or logistics of food distribution but has its root in the fear of economic collapse and drop in earnings. To do away with this food insecurity several governments took steps like providing free food grains or cash transfers to buy foods. But that covered the staples only, the supply of exotic items which became ‘indispensable’ in kitchen due to globalisation wave were either unavailable or too expensive to afford and the local producers and dealers were not equipped enough to step in to fill that gap.

To be very specific COVID-19 is not the issue which created the food security problem but the one which unravelled the underlying simmering issue of food insecurity in the urban areas, it highlighted the fragility of our urban food systems and questioned the resilience of food systems. The local food systems already tend to face several structural issues such as inadequate infrastructure, locational isolation, lack of access and linkage, etc., which have hindered them to grow and cater to the entire urban population around them. The local and regional food supply chain especially in the developing world involves—apart from food producers, transporters, retailers and sellers, a class of middlemen (aggregators, wholesalers and brokers) who try to maximise the profit detrimentally affecting the agri-business supply and value chain from operating efficiently causing artificial food shortages and price volatility. So, it is obvious that mobility restrictions and lockdowns will worsen the situation through ripple effects.

Though keeping mortality as low as possible is a priority of all the governments, measures to ameliorate the inevitable economic downturn are also imperative. While taking drastic measures to curb the menace of the pandemic imposition of strict lockdown indirectly affected global trade hampering movement of food from areas of surplus to areas of shortage; to avoid severe shortages and associated food insecurity reliance only on local production with shorter supply chain is the only alternative. But if that supply chain is weak then, indirect export bans will pose serious threats to the access of the poor to food who already face a crumbling economy specially in the developing countries like India. India, the country with second highest population in the world also took resort to strict lockdown as precautionary measures but as it took a toll on the economic activities along with livelihood of the economically weaker section, the government took resort to Public Distribution System (PDS) to ensure the supply of basic food for all.
2.8 Conclusion

The conventional idea that agriculture is a negligible entity in urban setup is no more a reality. A formidable number of urban households are involved in this genre, mostly in Africa, but the role is limited when income generation is noted. To attract more people across economic background towards making cities self-reliant on food supply the issue of food security ensuring dietary diversity and calorie availability needs to be highlighted. Once urban agriculture becomes economically viable and profitable the idea for urban food justice shall become a rage in near future.

Getting Accustomed to the ‘New Normal’

In a strongly connected and integrated world, the impact of COVID-19 would be way beyond absolute number of deaths reported; there would be food crunch, global economic crisis even recessions for which governments have to prepare contingency plans.

Today, when the global pandemic of COVID-19 has created huge stress on urban areas; with restrictions on movements, high fear of contamination—import of food articles has been a hassle, urban agriculture emerges as a saviour. Urban food production is not only a matter of scientific curiosity but now has become an urban policy issue and development tool. The food systems integrate various stages of food production, i.e. form ‘farm to fork’ encompassing infrastructure, inputs, institutions and manpower [19] and as this intricate network grows longer the chances of complication increases. FAO Report [22] indicated that due to lengthy large-scale lockdowns farmers were barred from accessing markets and their fresh produce was wasted or sold at a very cheap rate while on the other hand the collection centres in the urban areas faced severe scarcity and there was a steep rise in price. To deal with this, shortening of chain along with facilitation of e-commerce platform has been suggested. It pointed out that like the big brands, the small local producers and suppliers can go for app usage for door-step deliveries covering limited radius. Collection of real-time data taking the aid of information and communication technologies (ICTs), Internet of Things (IoT) platforms might help to improve the connection between local suppliers and buyers when physical contact is an issue. Creating database and dashboard maps with urban agriculture-related production will help in planning urban farm produce movement and would flourish further if partnerships among urban farmers and resultant community-networking is taken seriously. Wesana et al. [61] advocated for value stream mapping for identifying gaps in the supply chain and judicious management of those.

Future Scope

Putting forward specific recommendations for improving urban sustainability and food security is a tough ask because urban areas are unique in their own ways and a blanket scheme is not going to serve the purpose; each case might require different approaches. However, it can be stated very clearly that the importance of urban agriculture has to be highlighted among the urban planners and policymakers so that
they recognise food products as an intrinsic part of urban economy, land use and lifestyle. To empower the interested urban residents imparting ecological, horticultural skills through agroecological training and extension programmes can be helpful in capacity-building.

This pandemic has brought a host of new challenges, out of which the urban food security is one. Emphasis should be given to develop a robust plan for overcoming that and there are several practical ways of handling the issue involving high population density, lockdown vulnerabilities and shortage of supply as discussed in the paper. However, in the long run only policy formulation by the government, involvement of the city dwellers not only out of the fear of food shortage due to the pandemic shall be paying. The ‘uber-urbans’ need to note urban agriculture as ‘chic’, ‘cool’, ‘happening’ and ‘awesome’ then only they would be genuinely involved directly or indirectly in pursuing it in the open spaces of their condominiums, backyard of their houses or on the vacant plot in their neighbourhood (Fig. 2.4). Both change in plans and mindset in the ‘new normal’ scenario will help the cities in encountering the coming hard days and be prepared for such outbreaks in future making cities truly smart and sustainable.

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**Fig. 2.4** Proud and wise city folk braving all negativity pursuing urban agriculture, published during the ‘Victory Garden’ movement after WW-I. Change in urban planning approaches and mindset in the ‘new normal’ will help the cities to be prepared for outbreaks like COVID-19 in future, making them truly smart and sustainable. Source Benefits of Home Gardening (25.07.1920) in City Farmer News [11]
References

1. Algert S, Diekmann L, Renvall M, Gray L (2016) Community and home gardens increase vegetable intake and food security of residents in San Jose. California. California Agriculture, USA
2. Altieri M (2019) How urban agriculture can improve food security in US cities. Phys Org. Download from https://phys.org/news/2019-02-urban-agriculture-food-cities.html
3. American Planning Association (APA) (2007) policy guide on community and regional food planning. Chicago
4. BRICS-Brazil: What is BRICS? (2019) Download from https://brics2019.itamaraty.gov.br/en/about-brics/what-isbrics#:~:text=BRICS%20is%20the%20group%20composed,18%25%20of%20the%20global%20trade
5. Barrs R (1997) Sustainable urban food production in the city of vancouver: an analytical and strategy framework for planners and decision-makers. Canada’s Office of Urban Agriculture. Vancouver, British Columbia, City Farmer
6. Beatley T (2000) Green urbanism: learning from European cities. Island Press, Washington DC
7. Von Braun J (1993) Urban food insecurity and malnutrition in developing countries: trends, policies, and research implications. International Food Policy Research Institute, Washington DC, USA
8. Brown KH, Jameton AL (2000) Public health implications of urban agriculture. J Public Health Pol 21(1):20–39
9. Buchholz K (2020) What share of the world population is already on COVID-19 lockdown? Statista. Download from https://www.statista.com/chart/21240/enforced-covid-19-lockdowns-by-people-affected-per-country
10. Bureau ET (2020). India’s 2019–20 food grain production to hit a record high of 291.95 million tonnes. Econ Times. Download from https://economictimes.indiatimes.com/news/economy/agriculture/indias-2019-20-foodgrain-production-to-hit-a-record-high-of-291–95-million-tonnes-estimates-second-advance-estimate-of-govt/articleshow/74192668.cms?from=mdr
11. City Farmer News: LA’s incentive for urban farming fails to take root (2018). Download from https://cityfarmer.info/l-a-s-incentive-for-urban-farming-fails-to-take-root/
12. Convent S, Thierstein A, Wiedmann F, Salama AM (2015) When the oryx takes off: doha a new rising knowledge hub in the gulf region? Int J Knowl-Based Dev 6(1)
13. Corburn J, Vlahov D, Mberu B, Riley L, Caiaffa WT, Rashid SF, Ko A, Jayasinghe S (2020) Slum health: arresting COVID-19 and improving well-being in urban informal settlements. J Urban Health 1–10
14. Deelstra T, Girardet H (2000) Urban agriculture and sustainable cities. In: Bakker N, Dubbeling M, Gundel M, Sabel-Koshella U, de Zeeuw H (eds) Growing cities, growing food: urban agriculture on the policy agenda. ZEL, Feldafing
15. Dhingra M, Chattopadhyay S (2016) Advancing smartness of traditional settlements-case studies of Indian and Arab old cities. Int J Sustain Built Environ 5(2)
16. Drakakis-Smith D (1990) Food for thought or thought about food: urban food distribution systems. In: Potter RB, Salau AT (eds) Cities and development in the third world. Mansell, New York
17. ENDA-ZW (Environment and Development Activities–Zimbabwe): (1994) Urban Agriculture in Harare. Final report. IDRC 93-0024. ENDA-ZW, Harare
18. Engwicht D (1993) Reclaiming our cities and towns: better living with less traffic. New Society Publishers, British Colombia
19. European Commission: Report of the EC FOOD 2030 (2018) Independent expert group. Recipe for change: an agenda for sustainable food system for a healthy Europe. European Commission, Brussels, Belgium
20. FAO (Food and Agricultural Organization) (2008) An introduction to the basic concepts of food security rome food and agriculture organization. Download from https://www.fao.org/3/a-al936e.pdf
21. FAO (Food and Agricultural Organization) (2011) The place of urban and peri-urban agriculture (UPA) in national food security programmes. Download from https://www.fao.org/3/i2177e/i2177e00.pdf

22. FAO (Food and Agriculture Organization) (2020) FAO director-general urges G20 to ensure that food value chains are not disrupted during COVID-19 pandemic. Download from https://www.fao.org/news/story/en/item/1268254/icode/

23. Fan, VY, Jamison DT, Summers LH (2016) The inclusive cost of pandemic influenza risk. National bureau of economic research, Working paper no 22137. Download from https://www.nber.org/papers/w22137

24. Fernandes N (2020) Economic effects of coronavirus outbreak (COVID-19) on the world economy. SSRN. Available at https://ssrn.com/abstract=3557504. Accessed 1 July 2020

25. Garnett T (2000) Urban agriculture in London: rethinking our food economy. Growing Food. German Foundation for International Development, Feldafing, Germany, Growing Cities

26. Grewal SS, Grewal PS (2012) Can cities become self-reliant in food? Cities 29:1–11; Halweil B (2005) The rise of food democracy. UN Chronicle 42(1)

27. HLPE: Nutrition and Food Security (2017) A report by the high level panel of experts on food security and nutrition. Committee on World Food Security, Rome

28. Hummel JR, Martinez-Moyano I, Lewis LP, Schneider JL (2015) Feeding the future’s cities: challenges in an uncertain world. Download from https://www.fao.org/fileadmin/templates/ags/docs/MUFN/CALL_FILES_EXPERT_2015/CFP3-15_Full_Paper.pdf

29. Jacobi P, Amend J, Kiango S (2000) Urban agriculture in dar es salaam: providing an indispensible part of the diet. Urban agriculture on the policy agenda, Growing Cities, Growing Food

30. Joss S, Tomozeiu D, Cowley R (2012) Eco-city indicators: governance challenges. In: The sustainable city VII: urban regeneration and sustainability. Transactions on ecology and the environment, vol 155. WIT Press, Southampton

31. Kaplan J, Frias L, Mcfall-Johnsen M (2020) A third of the global population is on coronavirus lockdown—here’s our constantly updated list of countries and restrictions. Bus Insid. Download from https://www.businessinsider.in/international/news/a-third-of-the-global-population-ison-coronavirus-lockdown-x2014-hereaposs-our-constantly-updated-list-of-countries-and-restrictions/slidelist/75208623.cms

32. Kenworthy JR (2006) The eco-city: ten key transport and planning dimensions for sustainable city development. Environ Urban 18(1)

33. Knorr D, Khoo CSH, Augustin MA (2018) Food for an urban planet: challenges and research opportunities. Front Nutr 4

34. Koc M, Mougeot LJA, MacRae R, Welsh J (eds) (1999) For hunger-proof cities: sustainable urban food systems. International Development Research Centre, Ottawa

35. Lal R (2020) Home gardening and urban agriculture for advancing food and nutritional security in response to the COVID-19 pandemic. Food Secur 1–6

36. Lee, JH, Hancock MG, Hu MC (2014) Towards an effective framework for building smart cities: lessons from Seoul and San Francisco. Technol Forecast Soc Chang 89

37. Lee-Smith D, Prain G (2006) Urban agriculture and health. In: Hawkes C, Ruel MT (eds) Understanding the links between agriculture and health, Focus 13, Brief 13 of 16. International Food Policy Research Institute, Washington

38. Masi B (2008) Defining the urban-agrarian space. In: Rugate S, Schwarz T, Cleveland Urban Design Collaborative (eds) Cities growing smaller. Urban Infill, vol 1. Kent State University, Cleveland

39. Mehrtra K, Sharma H (2020) Covid wake-up call: health infrastructure only 1 per cent of smart city projects. Indian Express. Download from https://indianexpress.com/article/india/covid-wake-up-call-health-infrastructure-only-1-per-cent-of-smart-city-projects-6425761/

40. Ministry of Urban and Housing Affairs: Smart City Mission (2015) Government of India. Download from https://smartcities.gov.in/content/

41. Neirotti P, De Marco A, Cagliano AC, Mangano G, Scorrano F (2014) Current trends in smart city initiatives--some styled facts. Cities 38
54

B. Anindya and K. N. Sekhar

42. Pancholi S, Yigitcanlar T, Guaralda M (2015) Public space design of knowledge and innovation spaces: learnings from Kelvin Grove Urban Village, Brisbane. J Open Innov 1(1)
43. Pothukuchi K, Kaufman JL (2000) The food system: a stranger to the planning field. J Am Plan Assoc 66(2)
44. Press Trust of India (2020) Delhi, Mumbai, Kolkata and Chennai account for nearly 50% of nationwide Covid-19 cases. Print. Download from https://theprint.in/delhi-mumbai-kolkata-and-chennai-account-for-nearly-50-of-nationwide-covid-19-cases/437222/
45. Richardson BW (1876) Hygeia: a city of health. Macmillan, New York
46. Schneider KR (1979) On the nature of cities: toward enduring and creative human environments. Jossey-Bass Publishers, San Francisco
47. Schumacher EF (1973) Small is beautiful: a study of economics as if people mattered. Harper Perennial, New York (Reprint edition 2010)
48. Simai M (1997) A globalizing world. In: Kirdar U (ed) Cities fit for people. United Nations, New York; Singer HW (1997) A global view of food security. Agric Rural Dev 4(2):3–6
49. Smit J, Nasr J, Ratta A (1996) Urban agriculture: food, jobs and sustainable cities. Publication series for habitat II, vol 1. United Nations Development Programme, New York
50. Sommers P, Smit J (1994) Promoting urban agriculture: a strategy framework for planners in North America, Europe, and Asia. Cities feeding people series, Report 9. IDRC, Ottawa
51. Stier A, Berman M, Bettencourt L (2020) COVID-19 attack rate increases with city size. Mansueto Inst Urban Innov. Download from https://doi.org/10.1101/2020.03.22.20041004
52. The Hindu (2020) Coronavirus: 13 worst-hit cities come under review, Special Correspondent. Download from https://www.thehindu.com/news/national/cabinet-secretary-calls-meeting-with-municipal-commissioners-dms-of-13-covid-19-hit-cities/article31692434.ece
53. Thomas G (2014) Growing greener cities in Latin America and the Caribbean: an FAO report on urban and peri-urban agriculture in the region. Food and Agriculture Organization, Rome. Download from https://www.fao.org/3/a-i3696e.pdf
54. Townsend AM (2013) Smart cities: big data, civic hackers, and the quest for a new utopia. WW Norton & Company, New York
55. Trindade EP, Hinnig MPF, Moreira da Costa E, Marques JS, Yigitcanlar T (2017) Sustainable development of smart cities: a systematic review of the literature. J Open Innov: Technol, Mark, Complex 3(3):11
56. US Department of Agriculture (USDA) (2010) Food availability (per capita) data system. Econ Res Serv (ERS). Download from https://www.ers.usda.gov/Data/FoodConsumption
57. United Nations Department of Economic and Social Affairs (2012) World urbanization prospects, the 2011 revision: highlights. Population division. United Nations, New York. Download from https://esa.un.org/unup/Documentation/highlights.htm
58. United Nations Development Programme (2016) About the sustainable development goals (SDG). Download from https://www.un.org/development/desa/disabilities/envision2030.html
59. United Nations World Urbanization Prospects (2019) The 2018 revision. United Nations, New York. Download from https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf
60. Urban Ecology (1990) Report of the first international eco-city conference. In: Canfield C (ed) Proceedings of ecocity conference, Berkeley
61. Wesana J, Gellynck X, Dora MK, Pearce D, De Steur H (2019) Measuring food losses in the supply chain through value stream mapping: a case study in the dairy sector. Academic Press, In Saving Food
62. World Food Programme (2020) COVID-19 will double number of people facing food crises unless swift action is taken. Download from https://www.wfp.org/news/covid-19-will-double-number-people-facing-food-crisis-unless-swift-action-taken
63. World Health Organization (WHO) (2020a) WHO statement regarding cluster of pneumonia cases in Wuhan, China. Download from https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china
64. World Health Organization (WHO) (2020b) Coronavirus disease (COVID-19). Data last updated: 2020/8/7 Download from https://covid19.who.int/
65. Zezza A, Tasciotti L (2011) Urban agriculture, poverty, and food security: empirical evidence from a sample of developing countries. Food Policy 35(4):265–276; Siegwart R, Nourbakhsh IR, Scaramuzza D (2011) Introduction to autonomous mobile robots, 2nd edn. MIT Press, USA