

SUSTAINABLE
DEVELOPMENT
GOALS
ADDRESSED
BY URBAN
FARMING

AUTHORS: R. SEMENOVA, K. WILHELM

TABLE OF CONTENT



I. Table of content

1. Introduction

2. Sustainable Development Goals addressed by urban farming

- a. Goal 1 : No Poverty
- b. Goal 2 : Zero Hunger
- c. Goal 3 : Good Health and Wellbeing
- d. Goal 4 : Quality Education
- e. Goal 5 : Clean Water and Sanitation
- f. Goal 6 : Affordable and Clean Energy
- g. Goal 7 : Decent Work and Economic Growth
- h. Goal 8 : Industry, Innovation and Infrastructure
- i. Goal 9 : Reduced Inequalities
- j. Goal 10 : Sustainable Cities and Communities
- k. Goal 11 : Responsible Consumption and Production
- l. Goal 12 : Climate Action
- m. Goal 13 : Life on Land
- n. Other goals

3. GROOF : the nexus of Sustainable Development Goals

4. Conclusion

5. Sources

II Table of Figures

Figure 1 : Sustainable Development Goals (United Nations, 2019)

INTRODUCTION

SUSTAINABLE DEVELOPMENT GOALS



17 Sustainable Development Goals, presented on the figure below, were adopted in 2015 by the United Nations General Assembly in New York in order to be achieved by 2030. Being the core part of the 2030 United Nations resolution (Transforming our world: the 2030 Agenda for Sustainable Development), these goals are aimed at achieving peace, prosperity and sustainable development in its three dimensions – economic, social and environmental.

The **2030 Agenda** is the first set of goals valid world-wide that couples development and environmental aspects. It incorporates such aspects as fighting against poverty and hunger, protection of democracy and peace, education and equal rights. The prime addressees of the SDGs are the 193 member states of the United Nations (Umwelt Bundesamt, 2016).

Urban farming is an umbrella term that incorporates various activities aimed at producing food within the city confines. In its' diverse forms, it addresses numerous SDGs and all three aspects of sustainable development. This report is dedicated to the analysis of these goals and the extent to which urban farming can contribute to their successful implementation.

In 2017, the UN resolution 71/313 was adopted in order to identify specific targets and indicators for each goal to monitor the progress of achieving them. There is no common deadline for all targets, however, the timespan applicable to most of them lies between 2020 and 2030. The indicators are regularly reviewed by the United Nations Statistical Commission. The current indicator list follows the revisions adapted during the 51st Commission's meeting in 2020.

Sustainable Development Goals addressed by urban farming

Goal 1 : No Poverty

This goal aims to end poverty worldwide, regardless of its form. Climate change and the subsequent shifts in weather patterns can contribute to global poverty, making Goal 1 related to the Goal 13. The positive influence of urban farming on climate change will be discussed further. Moreover, urban farming is very often related to the creation of new local food value chains. This results in the creation of new cash flows, jobs and even markets. FAO states successful examples of profitable small-scale gardening activities: in Dakar, Senegal, women kept micro-gardens and sold the crop surplus through family kiosks, which gave them the opportunity to earn equally to laborer's wage; whereas in Lima, Peru, women combine urban farming with household duties and childcare in order to earn extra income. FAO continues that due to the fact that the supply chain in this sector is long and complex, jobs and added value can be created in production, supply and marketing from producer to consumer (FAO, 2015).

Goal 2 : Zero Hunger

The goal addresses "ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture". According to the UN, the Covid-19 pandemic poses an additional threat to food systems which were already subject to a certain level of insecurity. The most affected are the small-scale food producers who present the majority in the developing regions (United Nations, n.d.). Urban farming increases local food production in cities and thus helps prevent food shortages: the logistics challenges, longer travel distances and energy-intensive storage conditions associated with the global food value chains can be overcome or avoided (Dosch, et al., 2015). Moreover, increasing the proportion of fresh vegetables in one's diet results in improved nutrition, reduces risk of heart disease and protects against certain types of cancer (U.S. Department of Agriculture, n.d.). Urban farming is a great source of fresh locally produced vegetables. In developing countries or megacities, a possible topic for urban farming projects with a social focus to address is providing food for families with low or no income. Reducing costs of such projects can be achieved through using synergies with buildings in horticulture production.



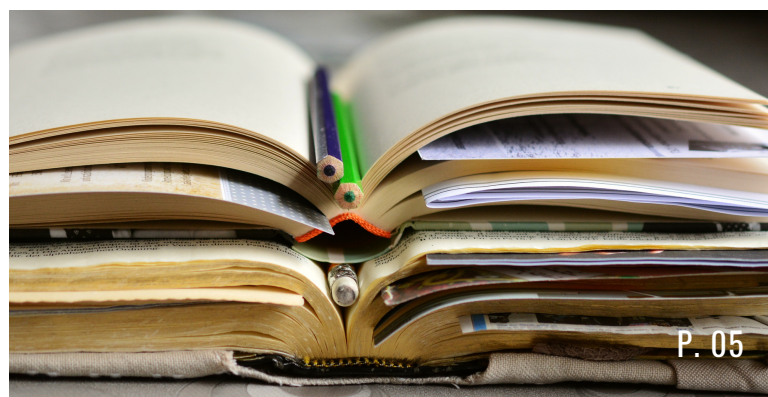
Sustainable Development Goals addressed by urban farming

Goal 3 : Good Health and Wellbeing

The third goal strives to “ensure healthy lives and promote well-being for all at all ages”. While the major emphasis here is put on functioning and accessible healthcare systems, the indicators also include promotion of mental wellbeing and reduction of deaths and illnesses due to hazardous chemicals and contamination and pollution of air, soil and water (United Nations, n.d.). Gardening benefits mental health of people and reduces stress which is especially important in urban areas with lack of green spaces (Why gardening is good for your mental wellbeing, n.d.). Moreover, urban farming in its communal form brings people together and serves as a point of social interaction. This increases the level of connection between people in urban areas, helps people get to know their neighbors. An example of this is the project "Les Jardins Perchés" from the French city of Tours which combines the construction of 76 social rental housing units with the creation of a professional urban garden farm, both on the roofs of the residence and on the ground (Le Projet, n.d.). Furthermore, as discussed above, increasing the share of fresh vegetables in one's diet has direct health benefits. Rooftop farming can lessen the burden that conventional agriculture puts on soil and water. Furthermore, the microclimate and air quality of cities can be improved, consequently reducing the number of deaths resulting from particulate matter and ground-level ozone (Dosch, et al., 2015).

Goal 4 : Quality Education

This goal addresses ensuring “inclusive and equitable quality education and promote lifelong learning opportunities” (United Nations, n.d.). While a basic knowledge of farming and gardening was common back in the day, among today's urbanites it has become an exceedingly rare skill. For the participants of communal urban farming, there is a chance to acquire new knowledge and put it into practice directly. Moreover, there is an opportunity for people to learn from each other (Meyer-Rebentisch, 2013). For the commercially oriented urban greenhouses, there is a common practice of hosting educational tours and excursions on site as an additional revenue stream. For example, Ferme Abattoir in Brussels offers 5 different types of educational visits tailored for different ages and purposes from schoolchildren to business owners (BIGH Brussels Aquaponics Farm, n.d.). The lessons learnt from such projects have an interdisciplinary nature: people learn how food production can be linked to climate change mitigation and adaptation, land use change, and benefits for the urban environment such as cooling and flood avoidance.



Sustainable Development Goals addressed by urban farming

Goal 5 : Clean Water and Sanitation

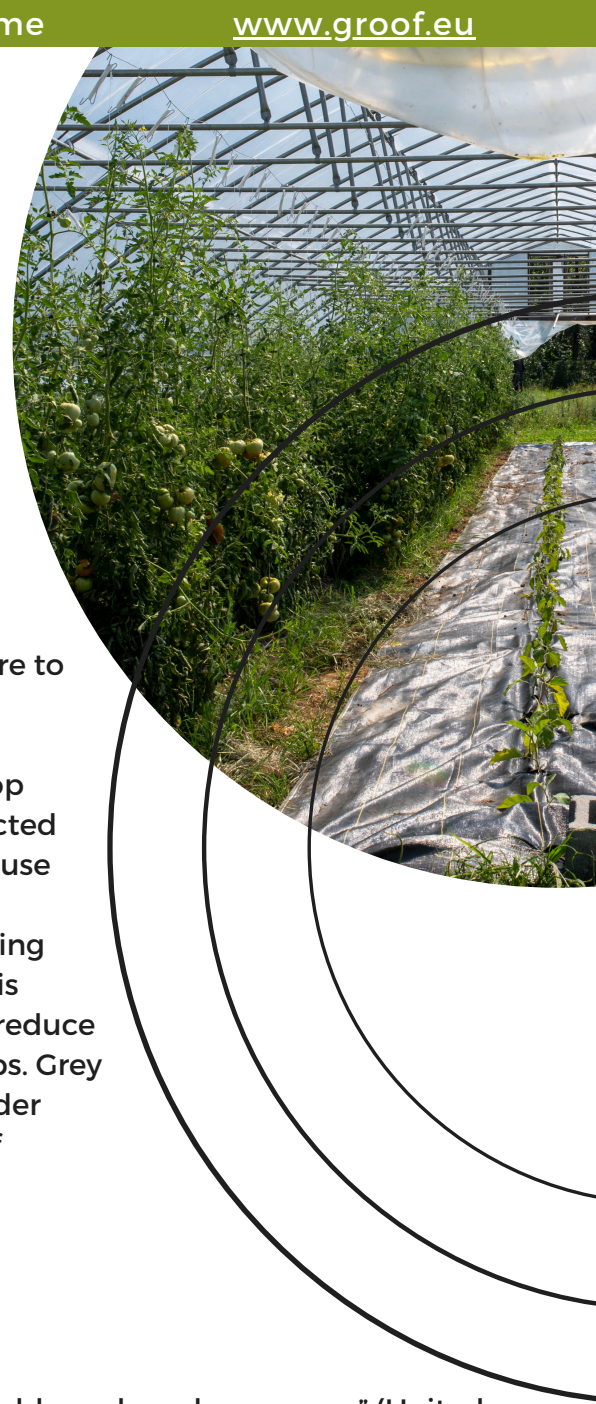
This goal is dedicated to ensuring “availability and sustainable management of water and sanitation for all”. Among the targets are to increase water-use efficiency and to improve water and sanitation management with the participation of local communities (United Nations, n.d.). These targets can be reached with the help of rooftop farming where rainwater is used for the production process. Collected rainwater can sometimes cover the entire demand of the greenhouse and thus improve the water-use efficiency (Wilhelm, et al., 2020). Moreover, there is an opportunity to re-use urine from the supporting building as a fertilizer by applying waterless toilets to collect it. This practice, still not very common at the moment, has a potential to reduce both water demand for flushing and fertilizer demand for the crops. Grey water from the building could also be used to water the crops, under some constraints: when properly treated and with the presence of special building infrastructure. However, this topic needs to be researched more.

Goal 6 : Affordable and Clean Energy

The goal addresses ensuring “access to affordable, reliable, sustainable and modern energy” (United Nations, n.d.). Urban farming projects can promote the use of renewable energies. Specifically, rooftop farms working in synergy with their supporting building, can accommodate a photovoltaic (PV) system that generates energy for the use on the farm and in the building. Such systems can be designed to serve an additional shadowing purpose for the days with high solar radiation (Wilhelm & Semenova, 2020). Integrating PV systems into rooftop farms increases the share of renewable energies in the urban energy mix and additionally reduces the overall demand for the energy generated by other sources.

Goal 7 : Decent Work and Economy Growth

This goal calls for promoting “sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (United Nations, n.d.). Urban farming creates new food value chains and markets which result in new jobs. Additionally, workload is created in the area of urban planning and architecture in order to ensure the implementation of new urban farming facilities (Dosch, et al., 2015). The EU-funding schemes ensure the availability of a reliable source of capital which makes investing in urban farming projects more attractive.



Sustainable Development Goals addressed by urban farming

Goal 8 : Industry, Innovation and Infrastructure

This goal aims to “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” (United Nations, n.d.). Urban farming can increase the resilience of cities by improving food and nutrition security within their boundaries. Moreover, it can be considered an innovation in itself because it addresses producing food in urban areas in an alternative way (Dosch, et al., 2015). A successful example of improving the food security within one town is an Incredible Edible project in Todmorden, UK. A public meeting, initiated there in 2008, addressed the “Americanization of the British diet, the dissociation of food from its agricultural and geographic provenance, as well as of a centuries-late response to the off-shoring of British agricultural biodiversity and of food production generally” (Paull, 2013). The topic in question was whether or not the UK could feed itself autonomously. Urban gardening became the approach to ensure the food security in Todmorden: permission and guerrilla gardens appeared all over the town with a “help yourself” approach so that every by-passer was encouraged to take some fresh locally grown vegetables for free. The profile of local food was successfully raised.

Goal 8 : Reduced inequalities

In this goal, the focus is put on “reducing inequality within and among countries” (United Nations, n.d.). Urban farming facilities often serve as points of inclusion for people with disabilities. For example, more than half of the employees in the project Vertical Harvest, a three-story indoor farm in Wyoming, the USA, have disabilities such as spina bifida, visual impairment, brain injury, or autism. Customized employment plans were put in place to train and support the workers. According to Caroline Croft Estay, the co-founder of Vertical Harvest, “employees on the autism spectrum with limited verbal skills likely do well in the detail-oriented tasks associated with growing tomatoes and microgreens, whereas the more social employees tend to be productive and happy in the packaging department” (Hausen, 2019). Another example of inclusion through urban farming are intercultural gardens that bring together refugees, immigrants and natives to promote knowledge exchange and social contacts. Such gardens allow immigrants and refugees, who often come from small farming communities, to exercise their farming knowledge in the immigration country. Because they often plant vegetables and herbs from their country of origin, there is a chance for others to get to know new species (Intercultural Garden, n.d.). One successful example is the International Gardens of Göttingen, which have been in operation since the 1990s.



Sustainable Development Goals addressed by urban farming

Goal 10 : Sustainable Cities and Communities

This goal calls for “making cities and human settlements inclusive, safe, resilient and sustainable”. One of the targets involves “reducing the environmental impact of cities, including by paying special attention to air quality and municipal and other waste management” (United Nations, n.d.). Urban farms and gardens can improve the air quality and microclimate in cities, as a result, reducing mortality rate due to ground-level ozone and particulate matter (Dosch, et al., 2015). Nowadays, urban areas consume 3/4 of the world’s natural resources and generate over half of global waste. Reusing food- and human waste together with livestock manure in urban and peri-urban production could supply twice the world’s demand of NPK nutrients every year – 386 million metric tons (Dubbeling, 2017). Urban farming can also contribute to the resilience of the cities by limiting the damages through extreme weather events. Especially, flooding can be prevented by green spaces acting as rain retention (Dosch, et al., 2015).

Goal 11 : Responsible Consumption and Production

The goal seeks to “ensure sustainable consumption and production patterns” (United Nations, n.d.). According to the UN Secretary-General (2019), unsustainable use of natural resources continues to be a worldwide issue, with the global material footprint increasing from 73.2 billion metric tons in 2010 to 85.9 billion metric tons in 2017, a 17.4% increase since 2010 and a 66.5% – from 2000. The material footprint of high-income countries is greater than their material consumption which relies on materials delivered from other countries by international supply chains. This also applies to the agricultural sector and, as a result, 13.8% of food was lost in supply chains in 2016 (United Nations, n.d.). According to FAO, there are differences between food losses and food waste. Per capita food waste in Europe and North America amounts to 95-115 kg every year, while in sub-Saharan Africa and South and Southeast Asia this figure is around 6-11 kg. Food losses are comparable in industrialized and developing countries, but the points where food gets lost differ: for industrialized countries, 40% of losses occur at post-harvest and processing levels while in developing countries more than 40% of losses happen at retail and consumer levels (Gustavsson, Cederberg, Sonesson, van Otterdijk, & Meybeck, 2011). Urban farming’s shortened supply chains go a long way towards reducing the amount of spoiled food and, moreover, can increase the sustainability of production processes by creating synergies with buildings or interlinking separate production lines. For example, the ECF farm in Berlin specializes in producing fish and basil: they reuse water twice in the aquaponic cycles, use fish excrement as plant fertilizer and use no plastic packaging for their products (ECF21). Moreover, as urban farming projects often provide educational opportunities, it helps shape consumer behavior and makes people notice the link between food production, waste and climate change.



Sustainable Development Goals addressed by urban farming

Goal 12 : Climate Action

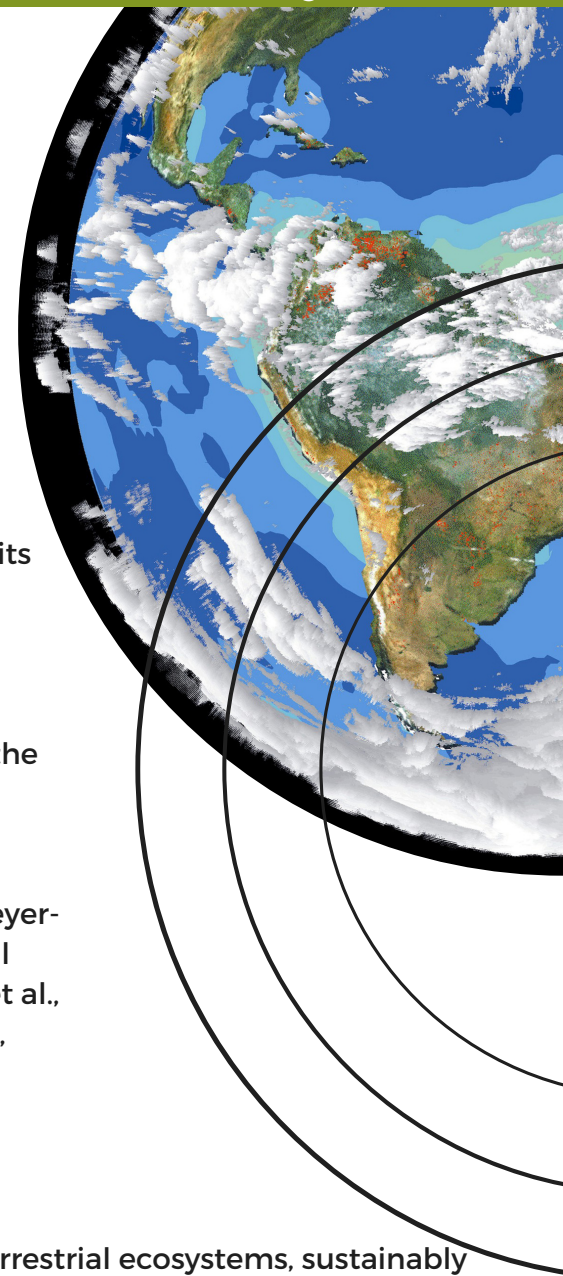
The goal aims to “take urgent action to combat climate change and its associated impacts”. Among the many targets put forth by the UN, awareness-raising and education in the area of climate change mitigation are specifically highlighted. It was mentioned earlier that urban farming facilities often act as educational points by providing lifelong learning opportunities and educational visits. Many skills in the field of food cultivation have been lost due to the division of labor. Research has also indicated that people who are less familiar with agriculture processes have less understanding of ecological interconnections and feel less responsibility for the environment (Meyer-Rebentisch, 2013). However, urban farming is not only an educational tool but also a direct means of combatting climate change (Dosch, et al., 2015). Abridged supply chains, retention and infiltration of rainwater, heat island reduction and carbon capture are provided to the urban environment by farming within its confines.

Goal 13 : Life on Land

The goal seeks to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss” (United Nations, n.d.). As competition for scarce land and the world’s population is growing, it is important to use urban land efficiently. Every day in Germany, around 52 hectares are newly designated as settlement and transport areas (BMU, 2020). Part of this area can be assigned to urban farming activities, especially on rooftops, in order to benefit humankind and ecosystems alike. As it stands, ecosystem services of urban farming have been acknowledged yet have not been quantified extensively (Wilhelm & Smith, 2017), (Clinton, et al., 2018), (Aerts, Dewaelheyns, & Achten, 2016). It is documented that urban farming systems can contribute to urban biodiversity to a high extent and provide important ecosystem services such as pollination, pest control, and climate resilience. The key drivers for these services are varied vegetative structure, increased native plant diversity, and reduction of urban impervious surface (Lin, Philpott, & Jha, 2015). According to Clinton et al. (2018), “food production, nitrogen fixation, energy savings, pollination, climate regulation, soil formation and biological control of pests could be worth as much as 80-160 billion dollars annually in a scenario of intense worldwide implementation of urban farming”.

Other goals

All 17 SDGs are complementing each other and are generally interconnected, thus the exclusion of goals 5 (Gender Equality), 14 (Life below Water), 16 (Peace, Justice and Strong Institutions) and 17 (Partnerships for the Goals) from this analysis is justified by the fact that other goals are addressed by urban farming in a more direct way (ex. Gender Equality vs. Reduced Inequalities; Life below Water vs. Clean Water and Sanitation).



GROOF : The nexus of SDG

It can be observed from the section above that the SDGs are interconnected and thus can be grouped into broader topics. GROOF and the topics it addresses is a very good illustration of these interconnections. The core idea of GROOF involves six areas of action presented in the table below: it demonstrates which SDGs can be grouped together as part of addressing each area of action

To illustrate this with a specific example, the area of food value chains will be discussed in detail. Implementation of urban farming activities results in the creation of new urban food value chains which lead to the creation of new jobs and even markets, thus tackling goal 8: Decent Work and Economic Growth. Cities become less dependent on long international supply chains and thus become more self-sufficient (Goal 11: Sustainable Cities and Communities). Shorter supply chains translate into less GHG emissions and less food spoiled during transportation (Goal 13: Climate Action).

Most urban farms grow vegetables with a few exceptions where fish production is included, too. It is recommended to regularly consume vegetables as part of one's healthy diet – to help avoid risk of chronic diseases and intake nutrients essential for one's body maintenance (U.S. Department of Agriculture , n.d.). Thus, both Goal 2: Zero Hunger and Goal 3: Good Health and Wellbeing are addressed in this context. The plants It is very common for urban farms to employ interns and host guided visits, thus providing educational opportunities to students and broader public who get to learn the interconnection of food production, climate change mitigation and sustainability (Goal 4: Quality Education). These educational activities have an enormous potential to reshape the conventional consumption patterns (Goal 12: Responsible and Production).

To conclude, GROOF specifically and urban farming in general address Sustainable Development Goals across the three sustainability pillars: economic, ecological and social.

Topic	SDGs												
Socio-economic impact	1 NO POVERTY			4 QUALITY EDUCATION	6 CLEAN WATER AND SANITATION		8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION		15 LIFE ON LAND
Promotion of renewable energies				4 QUALITY EDUCATION		7 AFFORDABLE AND CLEAN ENERGY	8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE		11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	
GHG emission reduction			3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION	6 CLEAN WATER AND SANITATION			9 INDUSTRY, INNOVATION AND INFRASTRUCTURE		11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	15 LIFE ON LAND
Food value chain		2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION			8 DECENT WORK AND ECONOMIC GROWTH			11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	15 LIFE ON LAND
Sustainable land use management		2 ZERO HUNGER		4 QUALITY EDUCATION	6 CLEAN WATER AND SANITATION		8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE		11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	
Community engagement		2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION			8 DECENT WORK AND ECONOMIC GROWTH		10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION		

CONCLUSION



This report was dedicated to the overview of the Sustainable Development Goals as part of the 2030 Agenda for Sustainable Development adopted by the United Nations in 2015. The addressees of the 2030 Agenda are the 193 UN member states and the goals are aimed at achieving peace, prosperity and sustainable development in its three dimensions – economic, social and ecological.

It was demonstrated that urban farming in general and GROOF specifically have a significant potential to contribute to the achievement of Sustainable Development Goals. Overall, urban farming addresses 13 out of 17 Goals across economic, social and ecological vectors:

- 1.No Poverty
- 2.Zero Hunger
- 3.Good health and Wellbeing
- 4.Quality Education
- 5.Clean Water and Sanitation
- 6.Affordable and Clean Energy
- 7.Decent Work and Economic Growth
- 8.Industry, Innovation and Infrastructure
- 9.Reduced Inequalities
- 10.Sustainable Cities and Communities
- 11.Responsible Consumption and Production
- 12.Climate Action
- 13.Life on Land.

As the goals are broad in their definition and targets, big interconnection exists among them and it is practically impossible to target one SDG without addressing one or several others. Within the context of GROOF, it was illustrated how the goals are spanned over the six areas of action defined in the project proposal: socio-economic impact, promotion of renewable energies, GHG emission reduction, food value chain, sustainable land use management and community engagement.

SOURCES

United Nations. (n.d.). 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal2>

BIGH Brussels Aquaponics Farm. (n.d.). Visits. Retrieved May 2021, from BIGH Brussels Aquaponics Farm: <https://bigh.farm/en-visits/>

United Nations. (n.d.). 11 Make cities and human settlements inclusive, safe, resilient and sustainable. Retrieved July 2021, from United Nations. Department of Economic and Social Affairs Sustainable Development: <https://sdgs.un.org/goals/goal11>

United Nations. (2015, October 21). Transforming our world: the 2030 Agenda for Sustainable Development. Retrieved from United Nations. Department of Economic and Social Affairs. Sustainable Development.: <https://sdgs.un.org/2030agenda>

United Nations. (2019). Communications materials. Retrieved from Sustainable Development Goals: <https://www.un.org/sustainabledevelopment/news/communications-material/>

Umwelt Bundesamt. (2016, September 14). SDGs: A challenge for sustainability policy. Retrieved May 2021, from Umwelt Bundesamt: <https://www.umweltbundesamt.de/en/topics/sustainability-strategies-international/sdgs-a-challenge-for-sustainability-policy>

United Nations. (2019). The Sustainable Development Goals Report 2019. New York: United Nations. Retrieved May 2021, from United Nations Statistics Division: <https://unstats.un.org/sdgs/report/2019/goal-12/>

United Nations Secretary-General. (2020, April 28). Progress towards the Sustainable Development Goals: report of the Secretary-General. Retrieved May 2021, from Official Document System of the United Nations : <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N20/108/02/pdf/N2010802.pdf?OpenElement>

BMU. (2020, May 27). Flächenverbrauch – Worum geht es? Retrieved July 2021, from Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit: <https://www.bmu.de/themen/europa-internationales-nachhaltigkeit-digitalisierung/nachhaltige-entwicklung/strategie-und-umsetzung/reduzierung-des-flaechenverbrauchs/>

United Nations. (2018, May 16). 68% of the world population projected to live in urban areas by 2050, says UN. Retrieved from United Nations: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

Umwelt Bundesamt. (2016, September 14). SDGs: A challenge for sustainability policy. Retrieved from Umwelt Bundesamt: <https://www.umweltbundesamt.de/en/topics/sustainability-strategies-international/sdgs-a-challenge-for-sustainability-policy>

Dosch, F., Haury, S., Skowski, J., Wahler, B., Willinger, S., Arndt, T., . . . Mösch, S. (2015). Grün in der Stadt – Für eine lebenswerte Zukunft. Berlin: Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB).

Meyer-Rebentisch, K. (2013). Das ist Urban Gardening!: Die neuen Stadtgärtner und ihre kreativen Projekte. München: BLV.

SOURCES

Paull, J. (2013). "Please Pick Me" - How Incredible Edible Todmorden is repurposing the commons for open source food and agrobiodiversity. In J. Franzo, D. Hunter, T. Borelli, & F. Mattei, *Diversifying Foods and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health*. Oxford: Routledge.

Hausen, J. (2019, November 8). This Wyoming Greenhouse is a Place for Employees with Disabilities to Grow. Retrieved May 2021, from Bitterroot the West's Magazine: <https://bitterrootmag.com/2019/11/08/this-wyoming-greenhouse-is-a-place-for-employees-with-disabilities-to-grow/>

Dubbeling, M. (2017, April 27). Sustainable Cities Require Urban Agriculture. Retrieved May 2021, from Meeting of the Minds: <https://meetingoftheminds.org/sustainable-cities-require-urban-agriculture-20941>

Wilhelm, J., & Smith, R. (2017, April 17). Ecosystem services and land sparing potential of urban and peri-urban agriculture: A review. *Renewable Agriculture and Food Systems*, 33(5), 481-494.

Clinton, N., Stuhlmacher, M., Miles, A., Uludere, N., Wagner, M., Georgescu, M., . . . Gong, P. (2018, January). A Global Geospatial Ecosystem Services Estimate of Urban Agriculture. *Earth's future*, 6(1), 40-60.

Lin, B., Philpott, S., & Jha, S. (2015, May). The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. *Basic and Applied Ecology*, 16(3), 189-201.

Aerts, R., Dewaelheyns, V., & Achten, W. (2016). Potential ecosystem services of urban agriculture: a review. *PeerJ*.

Wilhelm, K., & Semenova, R. (2020, November 26). Detailed overview on potentials for IFSB and ULG pilots. Retrieved July 2021, from Interreg North-West Europe: <https://www.nweurope.eu/projects/project-search/groof/news/detailed-overview-on-potentials-for-ifs-and-ulg-pilots/>

Wilhelm, K., Kirschnick, U., Becker, J., Grabowski, M., Tettamanti, E., Rastovac, D., . . . Volk, D. (2020). Deliverable 1.3 / Joint recommendations for the pilot implementation. REPORT IFSB Pilot [Unpublished manuscript].

FAO. (2015). Sustainable livelihoods. Retrieved July 2021, from Food and Agriculture Organization (FAO): <http://www.fao.org/ag/agp/greenercities/en/whyuph/livelihoods.html>

United Nations. (n.d.). 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development.: <https://sdgs.un.org/goals/goal2>

U.S. Department of Agriculture. (n.d.). Vegetables. Retrieved May 2021, from MyPlate: [https://www.myplate.gov/eat-healthy/vegetables#:~:text=fat%20and%20calories.\),Nutrients,vitamin%20A%2C%20and%20vitamin%20C](https://www.myplate.gov/eat-healthy/vegetables#:~:text=fat%20and%20calories.),Nutrients,vitamin%20A%2C%20and%20vitamin%20C).

United Nations. (n.d.). 3 Ensure healthy lives and promote well-being for all at all ages. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal3>

Why gardening is good for your mental wellbeing. (n.d.). Retrieved 2021 May, from Thrive: https://www.thrive.org.uk/how-we-help/what-we-do/why-gardening-is-good-for-our-health/why-gardening-is-good-for-your-mental-wellbeing#:~:text=Research%20in%20Sweden*%2C%20for%20example,symptoms%20of%20depression%20and%20anxiety.

SOURCES

Le Projet. (n.d.). Retrieved May 2021, from Résidence Les jardins perchés: <http://les-jardins-perches.fr/le-projet/>

United Nations. (n.d.). 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal4>

United Nations. (n.d.). 6 Ensure availability and sustainable management of water and sanitation for all. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal6>

United Nations. (n.d.). 7 Ensure access to affordable, reliable, sustainable and modern energy for all. Retrieved July 2021, from United Nations. Department of Economic and Social Affairs Sustainable Development: <https://sdgs.un.org/goals/goal7>

United Nations. (n.d.). 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal8>

United Nations. (n.d.). 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal9>

United Nations. (n.d.). 10 Reduce inequality within and among countries. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal10>

Intercultural Garden. (n.d.). Retrieved May 2021, from Gardeniser: <https://gardeniser.eu/en/e-learning/intercultural-garden>

United Nations. (n.d.). 11 Make cities and human settlements inclusive, safe, resilient and sustainable. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal11>

United Nations. (n.d.). 12 Ensure sustainable consumption and production patterns. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal12>

Gustavsson, J., Cederberg, C., Sonesson, U., van Otterdijk, R., & Meybeck, A. (2011). Global food losses and food waste. Rome: Food and Agriculture Organization of the United Nations (FAO).

United Nations. (n.d.). 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Retrieved May 2021, from United Nations. Department of Economic and Social Affairs. Sustainable Development: <https://sdgs.un.org/goals/goal15>

U.S. Department of Agriculture . (n.d.). Vegetables. Retrieved from My Plate. U.S. Department of Agriculture : <https://www.myplate.gov/eat-healthy/vegetables>

PARTNERS



Do not hesitate to visit GROOF website : www.groof.eu

Discover GROOF Guidelines : <https://www.urbanfarming-greenhouse.eu/>
This is a summary of GROOF's experience in designing and building an energy efficient rooftop greenhouse.

