KEYS TO ESTABLISHING A SUSTAINABLE URBAN FOOD SYSTEM (SUFS)

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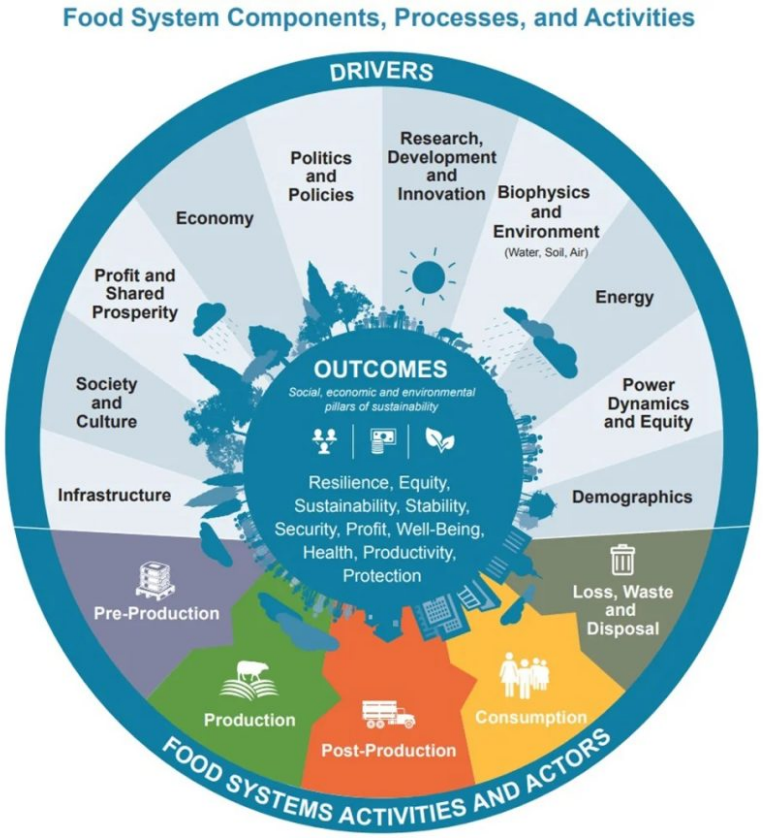


Food Systems Components, Processes, and Activities. Source: Institute for Sustainable Development, 2017.

Introduction

In designing a **Sustainable Urban Food System (SUFS)**, the first question to be asked is not only how food shapes our cities, but also how cities (the people who live in them, the businesses that set up in them, etc.) shape not food itself, but the food system and the demand associated with food consumption.

There are dynamics that go both ways and that also feed back on each other, but the important thing is to introduce the concept of the **food system** to review the relationship between the city and the activities of **production, processing, transport, consumption** and management of food **waste** (Ministry of Agriculture, Fisheries and Food of the Government of Spain, n.d.).

The sphere of **culture** can be incorporated into these aspects to enrich this review between city and food and thus encompass the sphere of **gastronomy**, understood as the art of cooking according to the tastes of a region using local ingredients that perfectly identify the inhabitants of a region (Barcelona Culinary Hub, n.d.). By reviewing all these activities in their relationship with the city, we will be able to introduce some keys that, through urban transformation and regeneration, will guide the configuration of a **SUFS** that also increases the environmental quality of the urban environment and the health of the local population.

Global context

As a **productive sector**, the global food system is one of the most resource-intensive and environmentally polluting: it emits a third of greenhouse gases, is the sector that consumes the most water and pollutes the most, and is the main cause of deforestation and biodiversity loss (Scientific Committee of the Spanish Agency for Food Safety and Nutrition, 2022). Currently more than 50% of the population lives in cities, and by 2050 this percentage will increase to 70% (UN-Habitat, 2022).

It is in cities that the greatest proportion of food demand is concentrated, where food is consumed, while the impacts generated by the food system can appear on the other side of the world. Indonesia and Brazil, two of the countries that have seen the highest rates of deforestation in recent years, have transformed rainforest into agricultural land now dedicated to the cultivation of African palm (whose oil is widely used in the food industry), soya (either for livestock feed or as an ingredient in processed vegetarian foods), or directly for raising livestock. Given the magnitude of the impacts generated, it is important to be aware of the **limited capacity of cities to establish a SUFS whose impact has positive effects of magnitude**, but it is interesting to identify those activities that can generate **environmental, social and also economic benefits at the local scale**.

Production

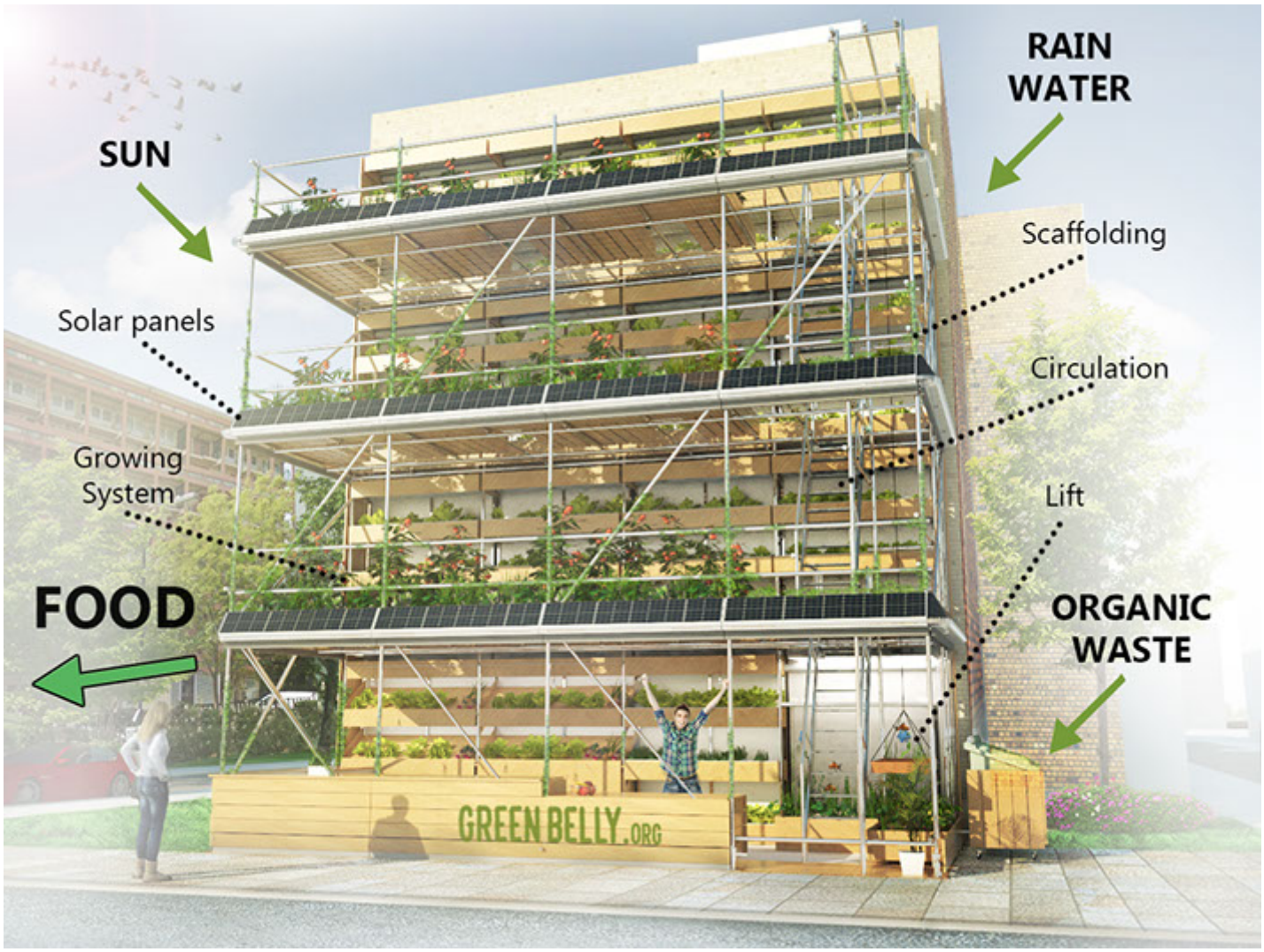
Cities require huge areas of land to provide food for their population. Before the industrial revolution, agro-livestock activities shaped the territory and landscape closest to cities (local food anthropisation). As agriculture and livestock farming have become more industrialised, and as the capacity for transport and food logistics has increased, the transformation of the territory has become increasingly independent of proximity, since, as is the case today, in large cities we can obtain food from anywhere in the world. This is a **global anthropisation of food** that can generate serious environmental impacts, such as the deforestation processes that are generated in rainforests around the world in order to dedicate land to the cultivation of soya or African palm or for livestock (FAO, 2020).

In terms of food production itself, the influence of this activity on the physiognomy of cities does not seem very relevant, and it remains to be seen what impact the dynamics associated with **proximity consumption** and **new forms of production such as urban gardens or vertical farms** will have. Historically, production can be indirectly related to the design and geographical location of cities due to their proximity to production areas for local consumption or for processing and/or export to other places (fishing ports, fish markets, warehouses, meat markets, slaughterhouses, etc.).

It is increasingly common to observe the emergence of **urban gardens** in cities, **whether for environmental or health reasons**. As a result of social awareness in these two areas, access to local fresh produce is becoming increasingly viable, although in terms of gross production, especially in large cities, the quantities of food generated reach a very small percentage of the local population. Even so, this process is generating **new micro-spaces in cities of high environmental quality** (Eric Darr et al, 2023) that foster community collaboration, offer avenues for social integration for vulnerable groups, and improve the quality of urban public space.

More recently, especially in cities in North America and Asia, **vertical farms** are emerging, which

may initially be located in or near cities, with significant productivity generated by hydroponic farming techniques and sophisticated production control systems. The largest and most established vertical farms are located on the outskirts of cities or near logistics centres, occupying industrial buildings, with an intensive production approach; an example of this is **Bustánica, one of the largest vertical farms in the world**, which, between its three floors, offers a production area of more than 30,000 m2 and is located near Dubai airport (Crop One, 2022).



Propuesta de granja vertical urbana. Souce: Green Belly, s.f.

Vertical farms, in their contribution towards the establishment of a **SUFS**, should emerge through new projects inserted into the urban fabric or through the rehabilitation and regeneration of the built environment, shaping a new urban landscape with food-producing buildings. Yet, urban agriculture systems alone **can only provide a limited amount of the nutrients needed for our health** (Tomorrow City, 2022).

Processing

The processing industry has maintained a relationship with the city similar to the process that industry in general has undergone in recent years. Traditionally, it was established in strategic areas of the city, close to the logistical nodes of transport and distribution, or in specific points that facilitated the supply of energy or water for refrigeration. This industry, with its large factories and buildings, underwent a process of micro-location to the suburbs or outskirts of cities, generally for environmental and competitiveness reasons.

Some of the factories and buildings associated with this industry have been preserved and, in some

cases, have undergone r**ehabilitation and adaptive regeneration processes** that have modified their use and the activities that take place in them, moving from the original productive activity towards activities associated with commerce, leisure, culture or art, or towards economic activities housing offices, business centres, etc.

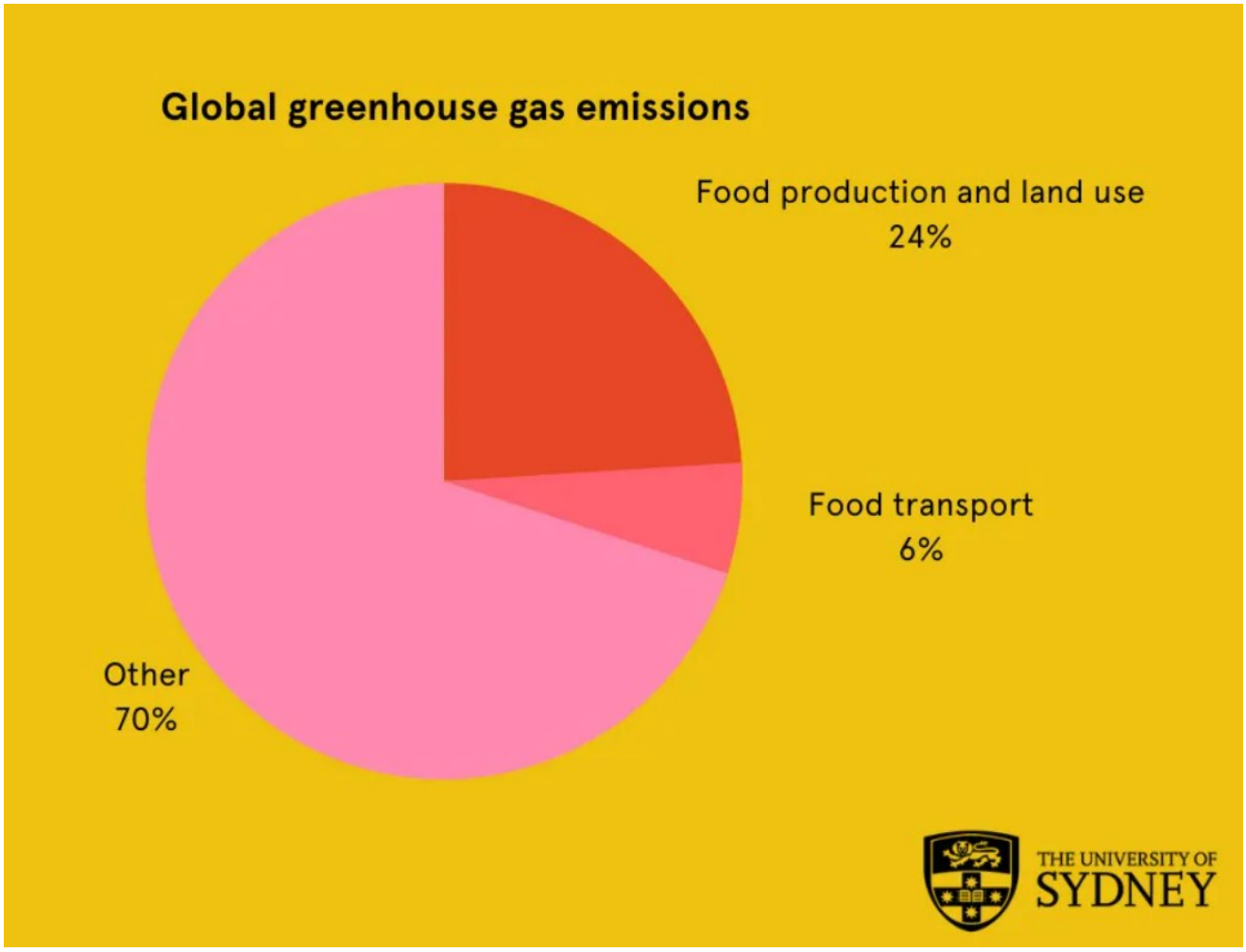
Although markets are nowadays centres for the sale/consumption of food, they traditionally offered different **processing services** that have been maintained to a lesser extent in the surviving traditional markets. As for the buildings themselves, some of them of great architectural value, there are many examples of **markets that have been adapted to other uses and activities**, such as the Mercado de San Miguel (Madrid), The Distillery District (Toronto), Fulton Market District (Chicago), Mercado Central de Santiago (Santiago)...

Other examples of food processing factories that have survived and today offer **other uses and activities** are: Fábrica de Artes y Oficios and Matadero Madrid (Madrid,), La Alhóndiga-Azkuna Zentroa (Bilbao), Tabakalera Building (Donostia-San Sebastián), The Packing House (Anaheim), Ex Fábrica de Cerveza (Valdivia), etc.

The **sustainability of the food system involves reducing the degree of food processing**, simplifying its preparation, which requires adopting healthier consumption patterns based on fresh and, from an environmental point of view, seasonal and local food (Li, M., Jia, N., Lenzen, M. et al, 2022). The preservation and recovery of traditional markets plays an important role here in shaping a **SUFS**, as well as the increase of zero-kilometre gastronomic offerings through restaurants with local food.

Transport

The current food system relies on global trade, the transport of which generates a large amount of greenhouse gas emissions. It is estimated that **19% of total food system emissions are generated by transport** (Li, M., Jia, N., Lenzen, M. et al, 2022).



Greenhouse gas emissions from the food system. Source: University of Sydney, 2022.

It is common to find in cities streets and squares whose names refer to food or aspects related to food (Via delle Tagliate, Bologna; Rue des Poissonniers, Paris; Orange Street, Changsha; Gingerbread Lane, New York; Tofu Street, Taipei; Via del Gelato, Rome; Saffron Hill, London; Cinnamon Street, Edinburgh; Garlic Market, Seoul; Cherry Street, Seattle; Calle de las Huertas, Madrid; Calle Carnicería, Bilbao, etc.). Important transport, distribution and also meeting points that facilitated the food trade, connecting markets, slaughterhouses, factories or warehouses with the great transport infrastructures that led outwards. **The design and configuration of these streets, and also of squares and bridges, was often determined by the transport of foodstuffs**. As with processing activities, **large logistical nodes have moved away from the city centre to the periphery**, such as food markets or intermediate warehouses, and have been integrated into the industrial belts that are now established on the periphery.

The emergence of large **shopping centres** in the suburbs has led to a significant increase in private vehicle transport from the city centre to the periphery. The city centre has seen the flourishing of a large number of supermarkets that require a daily supply of foodstuffs; this same need is felt by hotel and catering establishments, so the city has had to adapt to this new situation in which the concept of **last-mile distribution** appears: food distribution either from outside the cities or from intermediate logistics centres on the periphery, towards the urban fabric. A situation which, in addition, now has to deal with the establishment of **Low Emission Zones** in many European cities.

In addition, the rise of **food delivery** (Just Eat, 2021) is not only changing the food consumption patterns of part of society, but also has implications for transport in cities, intensifying the use of public roads for delivery activities.

A city promoting a **SUFS** should encourage local food consumption, favour local trade, and establish

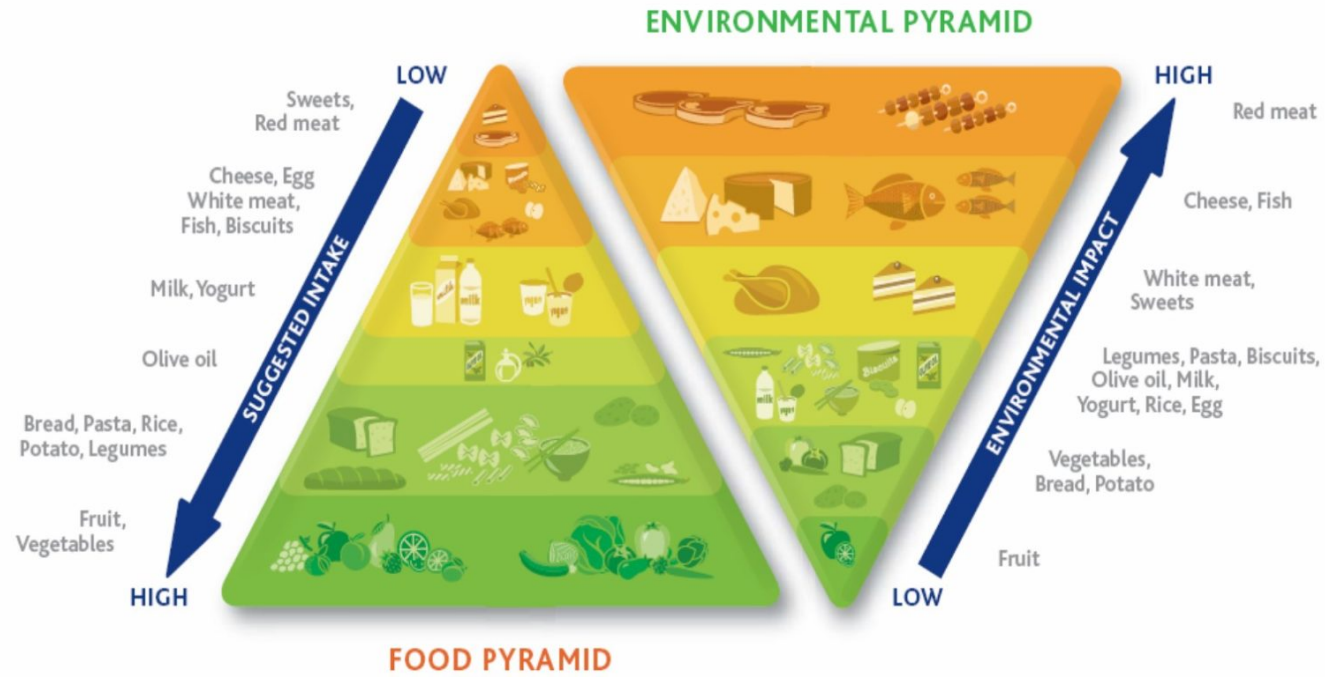
measures for a low-emission last mile system, applying measures derived from the "**15-minute city**" concept.

Consumption

People living in cities are the ones who demand the products and foods. Over time, this demand represents a pattern that shapes the **diet**. In most countries with developed economies, this diet is characterised by a high consumption of ultra-processed foods and, in general, foods high in fat and protein.

In Europe, **26.4% of food calories consumed in households come from ultra-processed foods** (Carlos Augusto Monteiro et al, 2018). According to the current production model, this type of diet generates a significant environmental impact at the global level, and in cities it deepens the problems generated, for example, by the logistics of home food delivery or ghost kitchens.

Nowadays we can access almost any type of food without leaving our couch. This has had consequences on the business models of the hotel and catering industry, as the sector has adapted to this growing demand, generating changes in the layout of restaurants and their terraces that occupy the public highway. Moreover, this demand has led to the appearance of so-called **ghost kitchens** located in residential neighbourhoods, causing conflicts between these types of businesses and the residents of the area.



Food Pyramid combined with the Enviromental Pyramid. Source: Barilla Center for Food & Nutrition, 2010.

Traditional markets, located at strategic points in cities, combining accessibility and centrality for efficient distribution, have been disappearing to the detriment of large shopping centres, generally located in the periphery, and their branches in the form of centrally located supermarkets with a global and homogeneous food offer. Many of these traditional markets, some of them buildings of great architectural value, have undergone a **process of gourmetisation and touristification** that has focused on visitors and/or people with high purchasing power to the detriment of the local population.

The large shopping areas where modern supermarkets are located encourage the dispersed city and the use of the private car for basic shopping, which is in contrast to the concept of the "15-minute city" and the mix of services in the neighbourhoods.

Thus, in terms of consumption, the development of a **SUFS** requires raising public awareness of **sustainable diets**, which are those that generate a reduced environmental impact and contribute to food and nutritional security, and to a healthy life for current and future generations. Such diets, based on fresh and local foods with a predominance of pulses, vegetables and fruits, protect and respect biodiversity and ecosystems, are culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, and optimise natural and human resources. In other words, **sustainable diets tend to generate healthy cities** that avoid the problems associated with the consumption of ultra-processed and cooked food for home delivery.

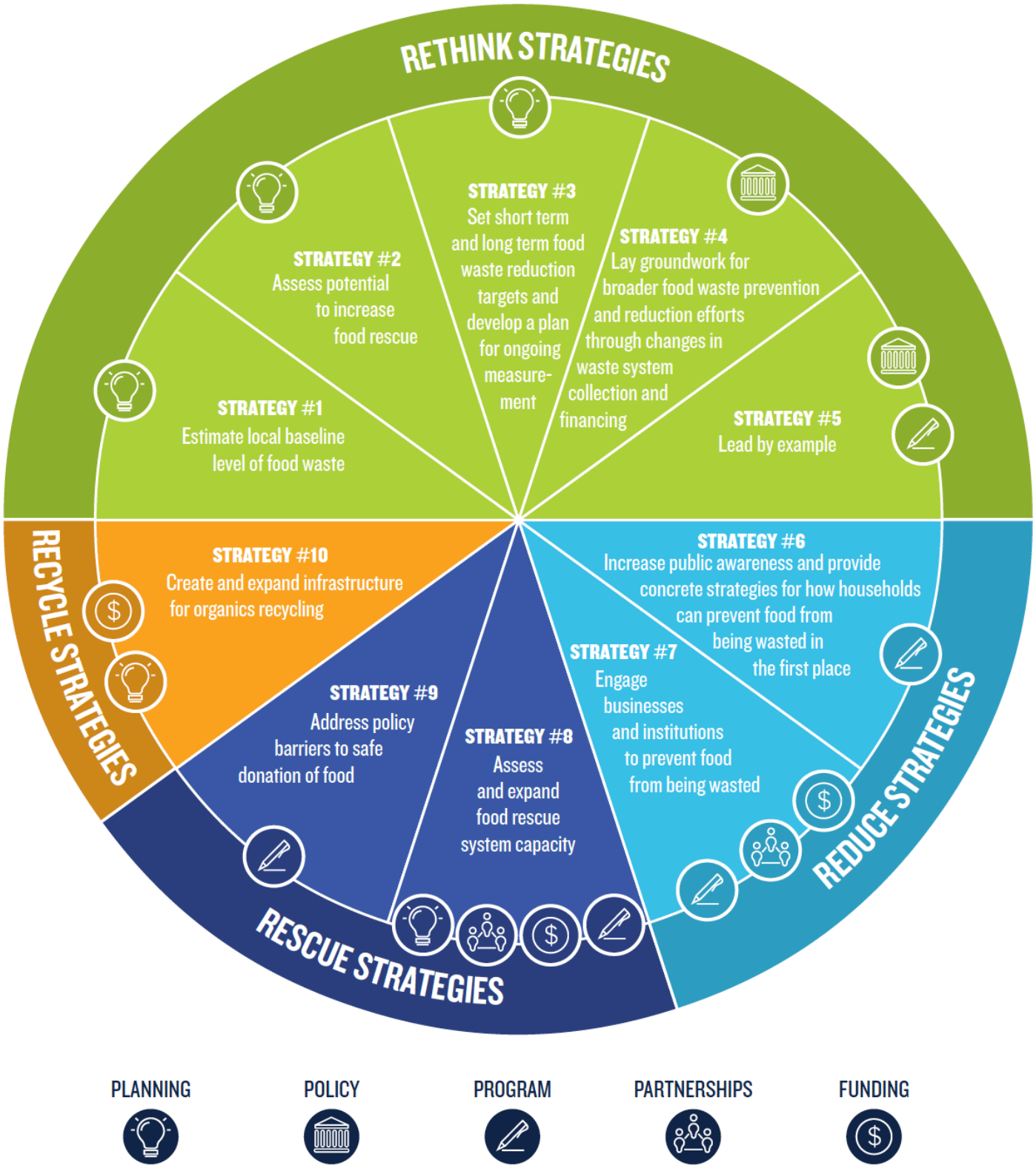
Waste

Food consumption in cities generates a significant volume of waste, represented both in the **organic fraction** above all, and in the **packaging and materials used for its preservation**. In 2019, 931 million tonnes of food were wasted, reflecting the fact that 17% of food production ends up in landfills worldwide (United Nations Environment Programme, 2021). In terms of packaging, an estimated 42% of the world's plastic is used for packaging food and manufactured goods (OECD, 2022).

Waste collection systems tend to occupy the public highway, although some cities have incorporated underground pneumatic collection systems that avoid occupying the surface. Separate waste collection, with the latest incorporation in Spain of the brown bin for the organic fraction, has in recent years increased the need for space for bins in city streets and squares and also inside households.

The establishment of a SUFS again emphasises local consumption and fresh products that promote healthy diets, avoiding the use of packaging necessary for transport and conservation, the waste of which represents one of the most serious environmental impacts generated by the current food system.

In terms of food waste, interesting initiatives are emerging in cities, such as restaurants whose menus are made with food discarded from supermarkets or directly from agricultural production, or applications that provide information on this type of discards in shops that offer them to interested people at a small price.



Tackling food waste in cities: A policy and program toolkit. Fuente: The C40 Knowledge Hub, 2019.

Conclusions

- The establishment of a Sustainable Urban Food System (SUFS) requires a prior analysis of the city's relationship with food, including production, processing, transport, consumption and food waste.
- Cities concentrate the largest proportion of food demand, while the impacts generated by the food system occur on a global scale.
- In terms of food production, a SUFS should promote dynamics associated with proximity

consumption and encourage new forms of production such as urban gardens or vertical farms.

- Urban gardens, limited in terms of production, are nevertheless generators of new micro-spaces in cities with high environmental quality.

- As for industrial food processing, this activity has moved away from city centres, leaving behind some elements of great architectural value,

- The sustainability of the food system involves reducing the degree of food processing, simplifying its preparation, which in cities involves favouring spaces for the trade of local products and food self-production.

- The promotion of healthy diets based on fresh, local, plant-based products can to some extent avoid the impacts generated by food packaging and transport.

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Main picture: USDA