



# Citizens driving the transition to sustainable urban food systems

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## ABSTRACT

Reaching a sustainable future in which cities characteristics meet all needs and expectations of citizens is an ambitious challenge at a global level. The present study aimed to identify appropriate ways to transform cities into “greener-cities” using a citizen science approach. In a three phases-project, co-design dynamics were conducted with different citizens’ groups: consumers, chefs, producers/suppliers, and experts in different scientific disciplines. First, four focus groups were carried out for diagnosing the food system of the city (Donostia-San Sebastián) and identify potential solutions. Then, two workshops with mixed participants from different stakeholders’ groups were carried out to co-design suitable initiatives previously identified in the first phase. Finally, the co-designed initiative was presented and tested: an immersive experience where participants could taste a local and seasonal dish presented by a Chef in a 360° video room with projections of an organic farm. Results showed that innovative educational activities or programs, such as the developed “Gastronomic Journey”, could be used to engage citizens and move forward to a greener city. The experience was considered as an opportunity to discover the city’s flavor and culture, and to bring awareness to citizens about challenges of the food system through the chef’s speech.

## 1. Introduction

The food system embraces the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal of food products, as well as the economic, societal, and natural environments in which they are embedded (FAO, 2018). Gastronomy mainly understood as “the reasoned knowledge of what we eat and how we eat it. An interdisciplinary area of knowledge that studies and generates physical-chemical, cultural and socioeconomic processes where humans grow, process, distribute and consume good foods and beverages that affect their physical, mental and social well-being”, is also included in the food system, because it participates of almost all aforementioned activities mentioned. Moreover, gastronomy is considered a significant component of cultural heritage, as it exposes people’s habits and practices and serves as a representation of their identity (Eusko Jaurlaritz/Gobierno Vasco, 2020).

Over the last century, food systems have undergone considerable transformation, bringing important benefits such as an increment in food production, able to feed a growing world population (Ritchie, 2017). However, it has also produced negative impacts that pose risks to

the sustainability of the planet such as the degradation of the ecosystems (Tilman and Clark, 2014); a decrease of large groups of food producers (European Commission, 2021); the erosion of people’s knowledge of food preparation (Ritzer, 1996; Warde, 1997; Engler-Stringer, 2010) and a rapid rise in obesity and associated non-communicable diseases (Whitmee et al., 2015; Fardet and Rock, 2020).

Cities represent a major role in the transition to more sustainable food systems because of being areas of high demand for food resources, and this demand is expected to be boosted by the growing population in urban areas (United Nations, 2019). Different methods could help engaging population to follow more sustainable practices in relation to food purchase and consumption. Living labs are open innovation environments, physical or conceptual spaces to test real-life experiences using a collaborative approach (e.g.: citizen science) and are considered to be great spaces to engage citizens (European Network of Living Labs, 2022). Citizen science (CS) is a recent approach of knowledge production based on the active engagement of people in research activities, and in which scientists and citizens collaborate to scientific research which is profitable for science and society (Serrano-Sanz et al., 2014; Reynolds et al., 2021).

Within the framework of citizen science activities, different methods

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of research and interaction with citizens can be used, such as surveys, personal interviews, hackathons, etc. (Bergvall-Kareborn and Stahlbrost, 2009). Therefore, some of these activities follow qualitative consumer research methods. Qualitative methods are defined as systematic investigations of the bases of a subjective experience: beliefs, expectations, opinions, attitudes, and perceptions. These methods pretend to obtain relevant information from a group of individuals with a common interest to discover factors that motivate a person to act in a certain way (e.g., to buy or not a product, to recycle or not a specific material ...) (Lawless and Heymann, 2010). Some of the most frequently chosen methods are focus groups, in which the researcher usually is the moderator of the session (Guerrero and Xicola, 2018); a more practical approach such as workshops, practical sessions in which some hands-on activities are conducted by all participants while the information is collected (Ørngreen and Levensen, 2017); and also participant observation, a method in which researchers role is to observe participants activity in a specific context without interacting with them (Conerly, et al., 2021).

Gastronomic experiences have shown to significantly contribute to dietary change, influencing eating habits and consumer preferences toward a more balanced consumption pattern (Allirot et al., 2016; Mora et al., 2020). Maybe because food experiences can elicit different emotional responses in consumers (King and Meiselman, 2010), driving their choices, and therefore impacting their routines, habits, and beliefs. The food choice model defined by Köster and Mojet (2007) explained the variety of factors that could impact consumers' choices (product, person, and contextual factors). Understanding how these factors and their relationships are understood in a specific urban environment, could help to design valuable products, experiences, and services for the consumer, and co-design a more sustainable food system. Thus, considering the potential of gastronomy to drive dietary change, the aim of the present study was to develop qualitative research to explore citizens' opinion on the main challenges and potential solutions to transform the urban agri-food community of Donostia-San Sebastián (Basque Country, Spain) into a more sustainable system, keeping the gastronomic identity of the city.

## 2. Materials and methods

### 2.1. City's context

Donostia-San Sebastián (approximately 182,000 citizens) is a city strongly connected to its close rural and natural environment, located in the Basque Country (Spain). This city is well-known because of its international projection on gastronomy from the 1970s onwards; a strong historical culinary tradition resulted in the emergence of the *new Basque cuisine* (the avant-garde culinary movement). Hence, gastronomy is an essential component of the city's culture, and this singularity is one of the main attractions to visit the city: a tourism driver. The tourism organism of the city reported that, in 2021 (a year with pandemic restrictions) over one million visitors stayed overnight in the city, and some of the main activities enjoyed by the visitors were: eating *pintxos* (finger food), eating in traditional restaurants, and eating in fine dining restaurants (San Sebastián Turismo, 2022).

### 2.2. Procedure

To achieve the research goal, a multi-method approach of three phases was designed to 1) allow the gradual exploration of the city's challenges and solutions related to sustainability and gastronomical identity, and 2) facilitate the exchange of knowledge among participants throughout the process. Different citizens/stakeholder groups from the Donostia-San Sebastián food system participated in all the phases: consumers (C), chefs (Ch), producers-suppliers (PS), and experts (E) in different scientific disciplines related to the gastronomy field. Participants were recruited using the Basque Culinary Center (BCC) networks.

BCC includes a school and a technology center with different associated business (e.g.: gastronomy courses for citizens and professionals, events, etc.). To reach different stakeholders of the city (citizens, chefs, institutions, suppliers, and producers) information on the recruitment process was shared via the newsletters and social networks of the center, as well as BCC'S consumers database. Volunteers interested in taking part of the dynamics directly contacted the researchers of the project, and the participants groups were organized. No reward was offered, just the opportunity to work on the improvement of the Donostia-San Sebastián food system. The different phases of the research were developed in LABe, the digital gastronomy living lab located in the city of San Sebastian which has a restaurant that could be used to design specific gastronomy experiences. Fig. 1 shows a scheme with the different phases of the study.

In the first phase, a total of 36 participants took part in the study. Four focus groups (FG) were conducted, using a common moderators guide, but in which the different segments of participants were grouped (1 FG with chefs, 1 FG with producers and suppliers, 1 FG with scientists, 1 FG consumers). The 2-h focus groups were led by a trained moderator, who began the discussion by asking participants about their definition about sustainability and how to apply the main ideas of this definition to the food system of the city. Then, respondents were asked to imagine a hypothetical sustainable food system to encourage them to collaborate in defining how to reach a more sustainable food system. In the second part of the session, the group worked on identifying specific challenges to reach those hypothetical sustainable futures and propose some solutions for the current system. Supplementary material 1 shows the focus groups moderator's guide and materials used during the 1st phase.

The second phase of the research consisted of two workshops (n = 10) in which different participants of the aforementioned groups of the food system participated. In these sessions, the results of the previous FGs were presented and volunteers worked together to identify the challenges that could be solved through education/or awareness

### 1<sup>st</sup> Phase: Focus groups

Challenges of the Donostia - San Sebastián food system



### 2<sup>nd</sup> Phase: Workshops

Definition of educative or awareness actions for the city



### 3<sup>rd</sup> Phase: Public and engagement event

Pilot of the co-created awareness actions: round table + gastronomic experience

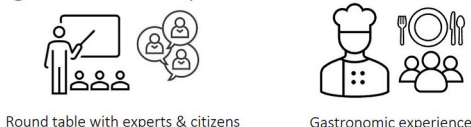


Fig. 1. Outline of the three phases of the study.

campaigns, and to propose educative/awareness actions that could be used targeting different citizens groups (e.g., producers, distributors, chefs, and consumers). Then, the group voted the preferred solution and participants were asked to suggest the different actions that should include the selected initiative. [Supplementary material 2](#) shows the workshop guide used during the 2nd phase.

The information collected during phase I and II was used to design phase III. During the third phase, a public event was held in which 50 citizens participated. The information obtained through the previous activities and the viewpoint on challenges and solutions on Donostia-San Sebastián's sustainability of different food system experts was shared with the citizens in a round table discussion. The speakers shared their vision to achieve sustainable cities: quality design, lower carbon emissions, inclusive and affordable neighborhoods, etc. Then, citizens expressed their own vision of Donostia-San Sebastián and their perception on their own involvement in the transition to a more sustainable city. After the event, citizens joined a designed pilot of the gastronomic experience codesigned during phase II, called "Gastro-Kultur", and centered in seasonal products. Participants tasted a local and seasonal dish presented by a Chef in a 360°-video room with projections of an organic farm on the walls. Through a chef's explanation, participants tasted a leek "pintxo" (finger food), presenting its strong connection to traditional food culture and explaining that it was based on a zero-waste concept. To measure the impact of the experience, participants were asked to rate liking of the experience, using a 9-point hedonic scale (1 = dislike extremely; 5 = neither like, not dislike; 9 = like extremely). Also, a Check-All-That-Apply (CATA) ballot including 8 different items was used: "I have learnt something new", "I found it interesting", "time has flown by", "I would like to repeat the experience tasting other products", "it is an interesting experience to link the countryside with the city", "it helps to promote consumption of seasonal products", "too much technology" and "felt like never-ending". To complete the activity, several informatory stands were placed to provide further information to citizens and to invite citizens to imagine a gastronomic and sustainable "future" of Donostia-San Sebastián and write some lines about it. Respondents of this brief open survey could win a LABe lunch/dinner voucher raffle.

### 2.3. Data analysis

The focus groups, the workshops, and the event were digitally recorded and transcribed verbatim, with participant names coded to ensure confidentiality using NVivo Transcription (online platform, QSR International, Melbourne, Australia). The responses of the FGs were analyzed grouping the insights into problems and solutions. The comments from the workshops were analyzed by grouping the different educational awareness interventions and listing the wide variety of activities proposed for the "Gastronomic Journeys". Comments and discussion belonged to citizens vision for San Sebastian and their involvement in the transition to sustainability of the event were also grouped into similar topics. Three researchers worked independently to pool the items and then contrast their findings. The results presented in the manuscript show the consensus reached by the 3 researchers. Data obtained from consumers in the gastronomic experience, "Gastro-Kultur", was also analyzed. Hedonic ratings and CATA responses were analyzed by descriptive analysis, calculating the mean and standard deviation of the liking data, and frequency counts of the CATA data. Excel® was used for the analyses (Excel® 2210, Microsoft Corporation, USA).

### 2.4. Ethical considerations

The protocol and procedures used in this study were approved by the Basque Culinary Center scientific committee (BCC22/0809), which stated a waiver consent. All articles from the Declaration of Helsinki and the 2016/679 EU Regulation on the protection of natural persons

regarding the processing of personal data and on the free movement of such data were met. The experimental procedure was explained and a written consent indicating voluntary participation was obtained from each participant prior to beginning the study in each of the phases.

## 3. Results

### 3.1. Challenges of the Donostia-San Sebastián's food system and potential solutions

Many challenges and possible solutions were mentioned by the different citizens' groups during the focus groups sessions of the first phase. Challenges were grouped by the research team into 12 main categories ([Table 1](#)): (1) *Increment/demand for resources* due to increased tourism and population; (2) *Lack of consumer awareness* because of a lack of rooting with the gastronomic culture knowledge about the impact of the food system on the environment and their own wellbeing, and lack of culinary knowledge (from a nutrition and food preparation stand point); (3) *Denaturalization of the city* because of the loss of green or public spaces to create community; (4) *Greenhouse gas emissions* due to the logistics/transport; (5) *Lack of resources* (e.g.: raw material and energy dependency rising prices of energy); (6) *Waste* generated at a household and also industry levels; (7) *Lack of interactions among the different stakeholder of the food system*; (8) *Easy access to ultra-processed foods*: ultra-processed foods are cheaper than processed or fresh foods; (9) *Mainstream access to fair market products*: fair prices for suppliers and producers; (10) *Lack of professional staff in hospitality*: due to poor work-life balance; (11) *Misleading advertising*: lack of credibility and lack of transparency of food messages; (12) *Unfair land prices*: multinationals and big companies pay the same price as self-employed and SMEs for a space in the city. Most of the challenges were identified by all the groups of stakeholders ([Table 1](#)). However, a couple of them were mentioned by just one or two stakeholders' group, being more specific. For example, the challenge *Greenhouse gas emission* was only mentioned by the experts and producers & suppliers groups. The *Lack of professional staff in hospitality* was specifically commented by experts and chefs. Participants also suggested potential solutions for the different challenges ([Table 1](#)). In general, participants agreed to cluster the different solutions for the different challenges into four groups: awareness-raising actions (e.g.: workshops to promote the consumption of seasonal products), digitalization of the food system (e.g.: development of a platform for the food system stakeholders where the different interested can access and search for suppliers, chefs, consumers), governance instruments (e.g.: taxes, regulation), and urban planning (e.g.: urban farming, spaces for community linkage). It is important to highlight that awareness-raising actions such as sensibilization, education, and training were the solutions mostly mentioned by most of the stakeholders involved in the focus groups. However, participants agreed that to achieve the development of greener cities, all strategies must be interconnected, providing a holistic vision or a systemic approach to the problem.

### 3.2. Defining specific and suitable solutions

In phase 2, workshops participants were asked to provide concrete actions that contribute to solving the identified challenges. Because awareness-raising actions were some of the most mentioned solutions during phase 1 to transform the society were the ones chosen to drive the discussion. [Table 1](#) includes the main actions suggested during the workshops. Participants of the workshops agreed that it is important to raise awareness to educate the population, first in a formal education context, and second through non-formal training or activities designed for citizens.

The two main ideas mentioned in relation to awareness success were the importance of repetition of the message/action and the power of positive reinforcement.

Four key actions were identified as suitable to trigger a change in the

**Table 1**  
Problems and solutions identified by the different stakeholders' groups during the first phase of the project.

	Challenges	Stakeholders' groups	General solutions (phase 1: focus groups sessions)	Specific solutions (phase 2: workshops)
1	Rise in demand for resources	E, Ch, PS, C	Awareness-raising actions (e.g.: workshops)	Actions for increasing the consumption of seasonal products, changing habits of eating fish or vegetables out of season.
2	Lack of consumer awareness	E, Ch, PS, C	Awareness-raising actions (e.g.: urban farming)	Provide accurate information to consumers to ensure product traceability. Educate consumers about the environment, local products, and seasonality through product storytelling in stores and restaurants. Gardening at schools. Restaurants with only seasonal products. Creating solidarity buying groups: surplus products can be provided to those in need.
3	Denaturalization of the city	E, Ch, PS, C	Urban planning (e.g.: create spaces for food dialogue where the city can express itself on food issues, sustainability, etc.)	Creation of edible green spaces, not purely ornamental gardens. Creation of spaces or forums for debate, perhaps within the framework of the old markets of the cities/ towns. Create live spaces to produce food, to sale products, and to generate community linkages. Creation of urban gardens for restaurants and citizens in the city to promote the consumption of seasonal vegetables. Prioritizing the urbanization of abandoned territories (rehabilitate the old territories) before building in a new area.

**Table 1 (continued)**

	Challenges	Stakeholders' groups	General solutions (phase 1: focus groups sessions)	Specific solutions (phase 2: workshops)
4	Greenhouse gas emissions	E, PS	Governance instruments (e.g.: taxes)	Car-free zones, effective - local regulations in place. Planning for centralized distribution of goods to short supply chains.
5	Lack of resources	E, Ch, PS, C	Governance instruments (e.g.: regulation)	Promotion of the use of renewable energies by public administration Campaigns to sensitize the population about the importance of being consistent with the management of resources to reduce consumption.
6	Waste	E, Ch, PS, C	Awareness-raising actions for producers, industry and citizens  Governance instruments (e.g.: taxes, regulation)	Training of the stakeholders of the food system (supply, waste, etc.). Transmit correctly to the public how waste is recycled (infographic/ quick video to see that explains where things go). When someone moves to the city, prepare a welcome pack that includes an explanation on how to recycle in the city with the prepared infographic, QRs, videos, etc. Economic policies (e.g.: discount for recycling), returnable packaging. Obtain support to discourage overproduction or at least encourage that waste is not generated in the Food Industry. Generate a specialized collection system for food waste for treatment to producers, hospitality, and industry because large quantities are needed to

(continued on next page)

Table 1 (continued)

Challenges	Stakeholders' groups	General solutions (phase 1: focus groups sessions)	Specific solutions (phase 2: workshops)
			create a circular economy Elimination of sanitary barriers in hospitality for donations.
7	Connection problem between the stakeholder of the food system	E, Ch, PS, C	Digitalization of the food system Networking, digitization of the first sector and system connections (between actors)
8	Easy accessibility to ultra-processed foods	E, Ch, PS, C	Awareness-raising actions for consumers and governance instruments for industries
9	Fair market	Ch, PS, C	Awareness-raising actions Education of stakeholder such as fishermen, farmers, producers, so that they know the effect of overproduction on their economic result. Example: overfishing generates a drop in price of fish that affects the profit of fishermen. Regulation of the market to make prices equal against imports. Raising public awareness to accept more days without an open bar and to pay a little more.
10	Work/staff sustainability in hospitality	E, Ch	Governance instruments Awareness-raising actions Regulation of land/rent prices for professionals in the city. Additional support of the local commerce.
11	Misleading advertising	E, Ch, PS, C	Governance instruments Legislation on sustainability and health issues.
12	Equal land prices for all businesses	E, Ch, PS	Governance instruments Regulation of land/rent prices for professionals in the city. Additional support of the local commerce.

city of Donostia-San Sebastián: 1) to provide education on sustainable practices to all the stakeholders of the food system, 2) to design and promote “seasonal” experiences to the citizens, 3) thematic tourism centered on primary production, and 4) to create spaces in the city context in which chefs and producers can collaborate. Participants of the workshop concluded that all those actions could be summed up in what they called “Gastronomic Journeys”, defined as “innovative activities or educational programs to discover the flavor and culture of the city, to increase citizens awareness about the challenges of the food system, and also involve them in the transformation of the city. The possible content of the in “Gastronomic Journeys” was extracted from ideas mentioned during the workshops and was linked with the aforementioned four key actions. Also, the name of the initiative was also agreed during the workshops resulting in “GastroKultur”: *gastro*-referring to the gastro-

food system, and *-kultur* indicating the importance of including the culture of the city in the transition towards sustainability.

3.3. Transfer event and “GastroKultur” pilot experience: effective strategies to bring awareness to the population

During the round table of phase 3, the general public seemed to engage with the speakers and contributed with different questions and ideas, showing interest in the topics treated in the debate. One of the most discussed issues was the feeling of “lack of knowledge” about the importance of sustainability on the food system.

Also, a general concern about the general responsibility of waste generation was identified, mentioning that consumers could take action to reduce it. The attendees were convinced that citizens have the ability to pressure on the food system to make it more sustainable.

In general, the public seemed to enjoy the transfer event and the pilot experience and expressed their interest in participating in future similar events. The overall liking average of the experience was 8.15 on the 9-point scale, meaning that the transfer event and the gastronomic experience “liked very much”. Results of the CATA question showed that the immersive experience was interesting for most of citizens and brought them the opportunity to “learn something new”. It is important to mention that more than the 50% of participants showed interest in repeating the experience with other food examples and acknowledged that it could help in promoting the consumption of seasonal products (Table 2).

4. Discussion

The present study shows some ideas on how to promote a more sustainable food system in Donostia-San Sebastián using some examples of citizen science activities and social initiatives.

Creating spaces of dialogue about food issues could help to incorporate citizens’ views and opinions on the city food policies. This kind of initiatives are becoming increasingly common in some cities under the structure of food policy councils (Schiff, 2008; Moragues et al., 2013; Gupta et al., 2018); these are spaces where citizens and food system stakeholders can interact and work together on addressing food systems deficiencies, shaping a desirable food system, and moving forward an “active food citizenship” from a role of a passive consumer. The present study used LABe living lab space as the interaction platform to generate interactions among citizens and different stakeholders. Brons et al. (2022) proposed classifying living labs in: (i) those in which participants can perform as experts, but in an unreflexively way, to deal with everyday issues, and (ii) those which aim is to explore future scenarios; the present study may fit in both types, because participants used their knowledge on the current food system issues of the city to imagine a better and more sustainable future. During the last years, a variety of living labs have been developed with the aim of improving different aspects of the food system (Jansma and Visser, 2011; Gamache et al., 2020; Kretschmer and Dehm, 2021; Brons et al., 2022; Hvitsand et al., 2022). The present study shows an example of an up-to-date application of living labs experiences based on gastronomy.

Table 2

Data frequency counts of the Check-All-That-Apply question to measure the impact of the immersive gastronomic experience in the citizens.

Item	%
I learned something new	60
The experience was interesting	56.7
I would like the experience to be repeated with other products	53.3
Helps promote the consumption of seasonal products	50
It is an interesting experience to link the countryside to the city	46.7
The experience was too short	26.7
Too technological	3.3
The experience was too short	0

Actions which aim was “raising awareness” were considered a cornerstone to transit to a more sustainable food system in the city. In concordance with the suggestions of the participants of the different discussion groups of the present research, [Aschemann-Witzel et al. \(2015\)](#) highlighted the need to spread information to raise awareness repeatedly to be effective, as well as choosing the proper moment in which consumers are open to change their perceptions and habits. Even being a short-term intervention, the developed “Gastronomic Journey” received great feedback from participants. Spreading the experience of “Gastronomic Journeys” on a larger scale, (e.g. in different locations of the city) and involving diverse stakeholder (chefs, teachers, institutions, enterprises), could amplify the impact of this awareness-raising initiative. Similar experiences with longer interventions have shown promising results. For example, the Canadian “Growing roots” project aimed to prevent unhealthy diets and food insecurity of newcomers, empowering them with food and nutritional knowledge based on local and indigenous healthy food practices. The results revealed that participants were able to adapt their cooking traditions to Canadian food environment, preserving their cooking culture and incorporating healthy recipes ([Henderson and Slater, 2019](#)). This experience exemplifies how food literacy can be a powerful tool for engaging people to healthy and sustainable diets while being a mean of culture and tradition preservation ([Oakden et al., 2021](#)). [Kretschmer and Dehm \(2021\)](#) conducted a study in which, through participatory processes, university students and other stakeholders redesigned the canteen menus to more sustainable ones (based on organic meal and regional procurement). These researchers remarked the importance of improving the culinary quality of meals to engage more consumers in future experiences. Gastronomy has been suggested as a driver of change on consumer habits ([Allirot et al., 2016](#); [Mora et al., 2020](#); [Motoki and Togawa 2022](#)). [Allirot et al. \(2016\)](#) studied how involving children in cooking healthy foods reduced neophobia in kids and favored these foods choices. [Mora et al. \(2020\)](#) showed that menus of a “calorie control diet” were more accepted when designed including chefs’ gastronomic knowledge (flavor and texture enhancement by using specific culinary techniques) than when designed in a conventional manner (conventional cooking techniques). Also, [Motoki and Togawa \(2022\)](#) explored the impact of different senses (olfactory, tactile, auditory, and visual signals) on consumers’ assessments, selections, and consumption of food, indicating the potential of multimodal strategies on improving the election of healthy meals. In the present research, using a tasting experience in which a chef enhanced the flavor properties of a seasonal product using a zero-waste approach, seemed to properly exemplify to citizens the potential of culinary knowledge for reaching a more sustainable city.

The findings of the present research revealed that citizen centered approach is an effective way to incorporate stakeholders/citizens perspectives and knowledge on identifying the city’s food system challenges and propose solutions. Also, gastronomic experiences resulted in an effective alternative to engage consumers, but future studies should properly assess the potential of gastronomy to boost more urban sustainable consumption habits in the long term.

Also, because “sustainability” can be understood in a different manner depending on the culture ([Torán-Pereg et al., 2023](#)), and therefore the challenges and potential solutions may greatly differ depending on the city, cross-cultural studies should be conducted in different regions to determine the role of gastronomy and how to change the food systems around the world.

## 5. Conclusion

The citizen science approach was useful to better understand the challenges in relation to the sustainability of the food system of Donostia-San Sebastián. Raising awareness was considered an important contributor to solve some of the identified challenges. An initiative was co-designed, a pilot gastronomic immersive experience which aim was to spread information on seasonal foods and the possibility of using

culinary techniques to avoid waste generation. The pilot of the co-designed initiative was tested with citizens and results suggested that the inclusion of sensory-driven experiences could be useful for creating an engaging environment in which the entire food system could be involved to find solutions to reach a more sustainable city. Therefore, results showed that gastronomy, through sensory-driven experiences, could also be an interesting tool to engage citizens to more sustainable food consumption habits.

## CRedit authorship contribution statement

**Paula Torán-Pereg:** Investigation, Writing – original draft. **María Mora:** Methodology, Investigation, Writing – review & editing. **Laura Vázquez-Araújo:** Investigation, Supervision, Writing – review & editing. **Stéfani Novoa:** Methodology, Project administration, Funding acquisition.

## Declaration of competing interest

María Mora, on behalf of the authors of the manuscript entitled “*Citizens at the center of the transition towards sustainable cities*”, declares that authors have no conflicts of interest related to the publication of the submitted manuscript.

## Data availability

Data will be made available on request.

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## Appendix A. Supplementary data

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