Cuadernos de Investigación Geográfica *Geographical Research Letters*	2024	Nº 50 (1)	pp. 109-121	EISSN 1697-9540

http://doi.org/10.18172/cig.5679

EXPLORING AGRICULTURE, CLIMATE CHANGE AND FOOD PLANNING NEXUS: WHERE DOES TERRITORIAL PLANNING STAND?

CECÍLIA DELGADO

Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa I
CICS.NOVA-Interdisciplinary Center of Social Sciences, Lisboa, Portugal.

ABSTRACT. In Portugal, local answers to climate change and food are basically twofold: the approval of a Climate Adaptive Strategy or Plan, which are largely being formulated by Portuguese municipalities and the voluntary signature of the Glasgow Food and Climate Declaration. As both folds are not binding their impact is limited. However, a recent Portuguese framework Law on Climate [2021], aligned with the European Green Deal, imposes that all municipalities must approve a municipal climate action plan before summer 2024. Such a context opens up a window of opportunity to reflect on the lessons learned from the already approved Climate Adaptive Plans and Strategies.

Therefore, we explore in this paper the following inter - connected questions: (1) to what extent Climate Adaptive Plans and Strategies include the increase of local food production; (2) Do they consider each step of the food chain or solely food production? (3) To what extent are those measures transcribed into the planning rules and regulations. In order to do so, we analysed 14 Climate Adaptive Strategies or Plans of a selected group of cities that entered the national competition ECO XXI, based on a sustainable framework of multiple dimensions. In 2021, as much as 57 out of the 308 Portuguese municipalities entered the competition.

Results suggest that adaptive measures relate to increasing local agriculture, mapping out land availability or highlighting the need for local agroecological practices. Moreover, Climate Adaptive Strategies or Plans, measures and actions are predominantly related to agriculture production, leaving behind subsequent food chain activities. This is probably happening due to a narrow and sectorial vision of agriculture that do not consider each one of the stages of the food chain. Lastly, the inclusion of several measures and actions into planning instruments is quite promising, even if still fragile to transform existing reality.

In conclusion, there is an urgent need to expand among food stakeholders the understanding of food and agriculture as part of the food system. In addition, there is a need to increase planner's awareness to these topics as in practice the link between food, climate and planning is still missing. Findings highlight that the potential role of planning is not being fully unleashed. Such a consideration is in line with other international studies confirming that Portugal is not an exception. Therefore, lessons we learned might turn useful for other countries.

Explorando el nexo entre agricultura, cambio climático y planificación alimentaria. ¿Dónde se encuentra la planificación territorial?

RESUMEN. En Portugal, las respuestas locales al cambio climático y a los alimentos son básicamente dos: la aprobación de una Estrategia o Plan de Adaptación al Clima, que está siendo formulada en gran medida por los municipios portugueses, y la firma voluntaria de la Declaración Climática y Alimentaria de Glasgow. Como ambas medidas no son vinculantes, su impacto es limitado. Sin embargo, una reciente ley portuguesa sobre el clima [2021], alineada con el Pacto Verde Europeo, impone que todos los municipios deben aprobar un plan de acción municipal sobre el clima antes del verano de 2024. Este contexto abre una ventana de oportunidad para reflexionar sobre las lecciones aprendidas de los Planes y Estrategias de Adaptación al Clima ya aprobados.

Por lo tanto, tratamos de responder en este trabajo las siguientes preguntas interrelacionadas: (1) ¿En qué medida los Planes y Estrategias de Adaptación al Clima incluyen el aumento de la producción local de alimentos?; (2)

¿Consideran cada paso de la cadena alimentaria o únicamente la producción de alimentos? (3) ¿En qué medida esas acciones se transcriben en normas y reglamentos de planificación?
Para ello, se analizaron 14 Estrategias o Planes de Adaptación al Clima de un grupo seleccionado de ciudades que ingresaron al concurso nacional ECO XXI, basado en un marco sostenible de múltiples dimensiones. En 2021, hasta 57 de los 308 municipios portugueses participaron en el concurso.
Los resultados sugieren que las medidas de adaptación se relacionan con el aumento de la agricultura local, la cartografía de disponibilidad de tierras o la necesidad de prácticas agroecológicas locales. Además, las Estrategias o Planes de Adaptación al Clima, medidas y acciones están relacionadas predominantemente con la producción agrícola, dejando atrás las actividades posteriores de la cadena alimentaria. Esto se debe probablemente a una visión estrecha y sectorial de la agricultura que no considera cada una de las etapas de la cadena alimentaria. Por último, la inclusión de varias medidas y acciones en los instrumentos de planificación es bastante prometedora, aunque todavía frágil para transformar la realidad existente.
En conclusión, hay una necesidad urgente de ampliar entre los interesados la comprensión de los alimentos y la agricultura como parte del sistema alimentario. Además, es necesario aumentar la conciencia de los planificadores sobre estos temas, ya que en la práctica todavía no existe un vínculo entre la alimentación, el clima y la planificación. Las conclusiones ponen de relieve que no se está aprovechando plenamente la función potencial de la planificación. Esta consideración coincide con otros estudios internacionales que confirman que Portugal no es una excepción. Por lo tanto, las lecciones que hemos aprendido pueden resultar útiles para otros países.

Key words: Climate change, climate plans, food system, agriculture, food planning.

Palabras clave: Cambio climático, planes climáticos, sistema alimentario, agricultura, planificación de la alimentación.

Received: 16 March 2023

Accepted: 18 September 2023

Corresponding author: Cecilia Delgado, Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa I CICS.NOVA-Interdisciplinary Center of Social Sciences, Lisboa, Portugal. E-mail: ceciliadelgado@fcsh.unl.pt

1. Introduction

In 2021, the United Nations Intergovernmental Panel on Climate Change sounded the alarm on a looming crisis: Climate Change is generating a "red code for humanity" that requires urgent action (IPCC, 2022). Food systems are deeply entwined with this crisis. In many regions, especially in the developing world, Climate change has already started to reduce agricultural productivity and disrupt supply food chains. Therefore, putting pressure on the livelihoods and threatening significantly hunger and malnutrition, making adaptation efforts crucially important (IPCC, 2022). Recent estimates indicate that food systems contribute more than one third to Greenhouse Gas (GHG) emissions (E.C., 2020). Addressing the challenges of climate change already require a transformation of our food systems, that demands major policy reforms, substantial investment, and an enabling environment that fosters innovation (IPCC, 2022). The urgent need to put food and agriculture at the heart of the global response to the climate emergency is at the core of the Glasgow Food and Climate Declaration, launched in COP26 (2021) and already signed by 114 cities and regions (Nourish Scotland, 2020). Cities are part of the problem but also of the solution. For instance, C40, a network of 96 world cities committed to climate change adaptation and mitigation is recommending to the cities that are part of this network, early consideration of climate hazards and potential responses in order to reduce the risks and protect food supply chains (C40, 2019). The involvement of cities with climate change is in the agenda for the last decade under the umbrella of the European Commission. In 2013 the European Commission approved

it Strategy to Climate Adaptation (European Comission, 2013). This strategy is at the core of both the Mayors Adapt initiative and the Covenant of Mayors Initiative on Climate Change Adaptation. Since its beginning, one key action adopted by the Mayors Adapt signatories was to formulate a comprehensive local adaptation strategy and to integrate adaptation to climate change measures into relevant existing plans. A large number of cities all over Europe, including Portugal, started to formulate such plans and strategies that will be analysed here.

More recently, the European Commission approved in 2020 the European Green Deal (EGD) which is at the forefront of European commitment to tackling climate and environmental-related challenges. One of its major components is the 'Farm to Fork': designing a fair, healthy and environmentally friendly food system strategy (E.C., 2020). Under this strategy several measures on impact and climate change adaption are being considered notably, the reductions of chemical pesticides, fertilisers and antibiotics, or the need to increase organic farming areas. Other measures refer to the need to reduce the environmental impact of the food processing and retail sectors by acting on transport, storage, packaging and food waste. EGD urges as well to increase sustainable food consumption and affordable healthy food for all, in order to reducing the environmental footprint. This is not an easy task as the development of an integrated food policy raises many challenges ahead (Candel and Pereira, 2017; Delgado, 2018, 2023). Within this new European framework, the Portuguese Law on Climate was approved at the end of 2021 (Law n. 98/2021). It recognized that the food chain, including production, fisheries and food consumption is part of a transition towards a more climate neutral society. It is highlighted that local authorities, within the scope of their attributions and competences, should plan and implement climate policies, ensuring their consistency with territorial planning instruments. Those policies, strategies and plans are now mandatory and should be formulated and approved by local authorities before mid-2024, under the Portuguese Law on Climate (Law nº 98/2021).

This new policy window is a unique opportunity to analyse and reflect upon what has been done so far. This paper main aim is to extract lessons from this first round of Climate Adaptive Strategies and Plans developed during the last decade in Portugal, as a tool to advance the forthcoming ones. In order to do this, this paper explores the following research questions: (1) to what extent Climate Adaptive Strategies and Plans include the increase of local food production; (2) Do they consider each step of the food chain or solely food production? (3) To what extent are those measures transcribed into the planning rules and regulations. Our analysis will refer to a selected group of 14 Portuguese municipalities that entered the national competition ECO XXI, based on a sustainable framework of multiple dimensions. All the 14 strategies and plans were developed at municipal level between 2016 and 2020 i.e., previously to the new European Green Deal.

Following the present introduction, section 2 posits the theoretical framework notably the missing conceptual links between agriculture, climate and planning. Section 3 introduces the Portuguese study case and explains the methodology used for investigating it. Section 4 highlights the results from the analysis of 14 selected Climate Adaptative Strategies and Plans focusing on the extent to which they consider food and agricultures as an answer to climate change adaptation. Section 5 discusses the findings, connects back to the theoretical framework and addresses both research questions. The paper concludes upon the relevance of strengthening and deepening investigations on the agriculture, climate change and food planning nexus, in Portugal and beyond.

2. Theoretical framework – the missing links between planning, food and climate

Urban planning still largely ignores food issues. In general, "food remained a stranger to the field of urban planning' until the early 2000s (Pothukuchi and Kaufman, 2000). A survey concluded that the perceived urban–rural divide was a central reason: food and agriculture were considered a rural topic; 'our city is in an agricultural area, but the city doesn't deal with agriculture or farming issues' (Pothukuchi and Kaufman, 2000). Some years later, Sonnino (2009) reached a similar conclusion: 'the

urban–rural divide has misled planners and policy-makers into looking at urban food supply failure as farm failure, rather than as a failure in the food system. The prevailing sectoral planning and decision-making approach, and its lack of a holistic perspective, seems another reason explaining why 'food has been a stranger' to urban planning (Brinkley, 2013; Morgan, 2009; Raja *et al.,* 2008).

Those obstacles did not prevent some pioneers to developed guidelines on how to plan for food. In 2007 Pothkuchi (APA, 2007) formulated to the American Planning Association the Policy Guide on Community and Regional Food Planning. In 2011 White and Natelson (2011) published the guidelines Good Planning for Good Food. In 2012 Viljoen *et al.* (2012) published the book Continuous Productive Urban Landscapes. In 2018 Cabannes and Marocchino (2018) edited Integrating Food into Urban Planning highlighting city-based practices that are reducing these gaps in creative ways and reflecting on progress made world-wide and current obstacles. In 2021 Verzone and Woods published Food Urbanism (2021). Those are some of the examples that show that food is less a stranger to urban planning literature, at least, today than a couple of decades ago.

On the subject of climate change, there are as well several barriers to its inclusion in municipal plans. Ribeiro *et al.* (2018) identified multiple obstacles and limits, being the most relevant ones: the non-mandatory condition of the climate change agenda, the uncertainty associated with the downscaling of climate change scenarios, the scarce scientific insights on how adaptation can be integrated into planning tools, the inexistence of guidelines from central government, the urban planning tradition that ignore the issue of climate change, a predominant culture of reactive management, insufficient technical skills and financing mechanisms. In addition, the formulation and implementation of food and Climate Change Adaptation Strategies or Plans are both reliant on political will that often change according to political cycle, and this limits as well, their inclusion as part of municipal plans and strategies (Delgado, 2020; Doernberg *et al.,* 2019; Ribeiro *et al.,* 2018).

In Portugal a silent revolution has been taking place, especially from 2019 onwards. Several guidelines on planning and climate change were formulated at national level, such as: (1) The national programme for Territorial Planning Policies (2019) which suggests that master plans (Plano Director Municipal in Portuguese) should include climate change mitigation and adaptation measures; (2) The national agency in charge of spatial planning – "Direção Geral do Território", published a compendium of "Good Practices to Master Plans" (DGT, 2020) with a specific section on the role of food and urban agriculture to address climate change effects; (3) A national Agenda – "Terra Futura 2020-2030" - in line with the EGD and Farm to Fork Strategy identified targets to turn the country climate-neutral by 2050; (4) and, the Portuguese Law on Climate ("Lei de Bases do Clima in Portuguese)" published at the end of 2021 (Law n. 98/2021), which highlights the need for sectoral climate policy instruments among several other issues to take into account, such as the agri-food chain, carbon sequestration strategies, green economy and just transition. Moreover, the Roadmap to Carbon Neutrality in Portugal published within the Portuguese Law on Climate (Law n. 98/2021), clearly states the main vulnerabilities and expected impact of climate change in Portugal such as higher incidence and intensity of rural fires, heat waves, droughts and water shortages, desertification, high temperatures, or extreme precipitation events. The complexity and inter-related expected effects, implies that a comprehensive approach to mitigating and climate change adaptation requires both sectoral and integrated policies.

Besides, and this is clearly a window of opportunity for reflexion, the Portuguese Law on Climate turn compulsory, for each municipality and region, to develop and approve a Climate Adaptive Plan, before mid-2024. By the end of 2020, 271 out of a total of 308 municipalities in mainland Portugal, Azores, and Madeira had adopted at least a municipal, intermunicipal or metropolitan planning instrument (strategy or plan) related to climate change adaptation.

The progress towards SDG 13 - Climate Action, in Portugal, through the 2015-2021 period has been significant (INE, 2022) but results can be distorted by covid pandemic, which decreased economic activity and transport circulation and therefore less impact on CO2 emission. Despite such encouraging results, more efforts are needed to meet the 55% GHG reduction target by 2030, when compared to

2005. Moreover, the same INE report (2022) remains silent on data related to SDG 12 – Responsible Consumption and Production. More than 50% of the indicators are not being measure so far. In addition, when comparing existing data from 2015 to 2021, a regressive target tendency is observed. We argue that SGDs 12 and 13 (we recognize thar there are other related Food System SDGs that impact climate change, still this point is out of the scope of this paper) need to be considered as part of a holistic approach to meet GHG reduction target defined by the country's signatories of the Paris Agreement and included in the Portuguese Climate Strategies and Plans to come.

3. Sample and methodology

This paper explores 14 Climate Adaptive Strategies or Plans of a selected group of cities that entered ECO XXI (ECO XXI, 2022) national competition in 2021. The ECO XXI competition is coordinated by ABAE, which is the Portuguese branch of the international Foundation for Environmental Education (Foundation for Environmental Education, 2023). The competition is based on a multi-dimensional framework for sustainability embracing 21 categories, such as governance and participation; cooperation with civil society; climate change; or agriculture. The winning municipalities (i.e., those that summed up the highest results in each of the 21 categories) have the right to display a green flag for one year, which acknowledges city sustainable achievements. In 2021, as much as 57 out of the 308 Portuguese municipalities entered the competition: 40 of them had formulated and approved a Climate Adaptive Strategy or Plan, being 16 at municipal level and 24 as part of a broader metropolitan or regional plan.

Out of these 16 municipalities we closely examined 14 of them, for being predominantly urban, defined as with at least 51% of their population living in administratively considered urban areas. Figure 1 highlight their spread all over Portugal continent and islands. Table 1 summarizes relevant information regarding those 14 municipalities. The number of city inhabitants ranges from 30.374 (Lagos, Algarve Region) to 213.608 (Cascais, Lisbon Metropolitan area). The primary economic sector presence (mostly agriculture) ranges from 0,4% (Valongo) to 7,1% (Torres Vedras) being Portugal average 2,9% (Fundaçao Francisco Manuel dos Santos, 2021).

The oldest Climate Change Strategies were approved in 2016 (Braga, Amarante and Funchal) and the most recent one in 2020 (Valongo). Out of the 14, five municipalities (Maia, Águeda, Leiria, Torres Vedras and Lagos) have developed a subsequent Climate Change Adaptative Plan, which represents a step further the strategy. Such plans detail how a specific measure is going to be carried out e.g., which actions are going to be taken, and by which specific actor, e.g., city department, private sector, civil society, etc.

These 14 municipal strategies and plans were first analysed in order to find out on the one hand the key-sectors for climate change adaptation that were included, and on the other the extent to which agriculture and planning were considered. We then analysed the type of agriculture and food adaptation measures (as part of the strategy) or actions (in the plans)[1] using a double strand approach: food production on the one hand and other stages of the food chain on the other.

Actions or measures that only considered the forest without the agro-forest dimensions were discarded. Water was only considered when directly related to agricultural activities. The last round of examination consisted in a deeper examination of those five cities with a Climate Adaptation Plan - CAP (Cascais, Agueda, Maia, Leiria, Lagos) in order to better understand if and how those cities were foreseeing the integration of their Climate Change adaptation actions into territorial / spatial planning. Finally, we asked for an interview the Planning Department directors of the three cities (Lagos, Maia and Leiria) that had included food and agriculture actions as part of their Climate Change Adaptative Plans. As a result,

[1] Each strategy and plans adopt slightly different designations still usually the strategies refer to measures and plans refer actions, the later one being specific about how and who and eventually which fund could be used.

two semi-structured interviews could be carried out, one with Maia and the second with Leiria. Lagos city preferred to send a clarification note. The online interviews took place in July 2022 and lasted about one hour and mainly focused on the extent to which the planning department collaborated on Climate Adaptative Plans formulation, and how this collaboration is currently maintained. Director's reflections on how and why the selected actions were transposed into planning instruments were welcomed as well.

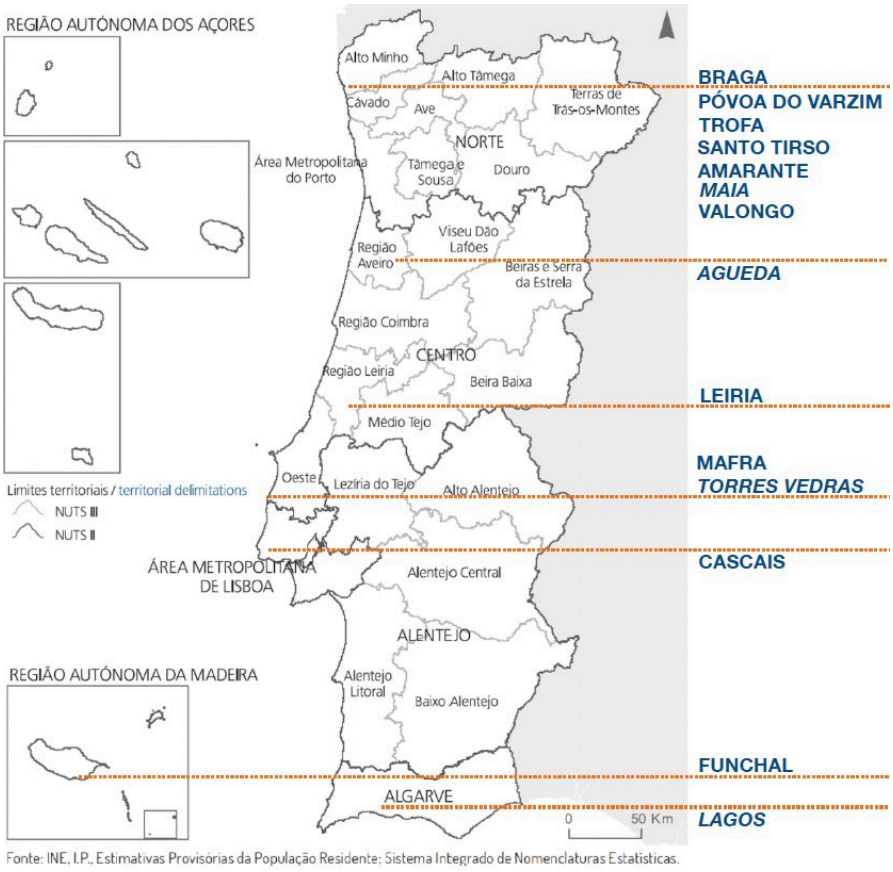

Figure 1. Location of the 14 municipalities analysed.

Table 1. Basic profile of the 14 municipalities analysed.

Municipality	Strategy/ Plan	Year of approval	N. Inhabitants (INE, 2020)	% Inhabitants living in urban area (INE, XXX)	% Primary sector
Águeda	Plan	2018	46 075	79%	1.5%
Amarante	Strategy	2016	53 193	58%	2.3%
Braga	Strategy	2016	182 679	93%	0.6%
Cascais	Plan	2017	213 608	99%	0.5%
Funchal	Strategy	2016	104 024	100%	0.8%
Lagos	Plan	2018	30 374	74%	1.9%
Leiria	Plan	2018	125 267	76%	1.8%
Mafra	Strategy	2017	84 816	72%	2.2%
Maia	Plan	2019	138 971	98%	0.6%
Póvoa de Varzim	Strategy	2019	62 784	81%	5.9%
Santo Tirso	Strategy	2019	68 055	88%	0.8%
Torres Vedras	Strategy	2019	78 530	82%	7.1%
Trofa	Strategy	2019	38 418	87%	1.3%
Valongo	Strategy	2022	97 444	100%	0.4%

4. Results

When analysing the 14 Climate Adaptative Strategies and Plans, 16 different sectors were listed as relevant to climate change (Table 2). Besides Water (although, water, agriculture and climate change being an extremely important nexus to consider, it will not be explored in the present paper) and Health sectors, "Agriculture, forest, and fisheries" appeared as the most frequently referred sectors along with "Biodiversity and landscape" [13 cases out of 14]. "Urban planning and cities" came next [10 cases]. The only city that did not included agriculture as a relevant sector for climate change was Funchal, on Madeira Island, despite having signed the Milan Urban Food Policy Pact, that expressed their commitment to strengthen their food system. These results tend to illustrate the variety of entries through which climate change is being addressed by these cities, and at the same time the disconnect between those entries.

Table 2. Key sectors considered on the 14 CAPES.

Key sectors	Agueda	Amarante	Braga	Cascais	Funchal	Lagos	Leiria	Mafra	Maia	Povoa do Varzim	Santo Tirso	Torres Vedras	Trofa	Valongo	Total
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	14
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	14
3	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	13
4	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	13
5		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	11
6	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	11
7		✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	10
8		✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	10
9			✓	✓		✓	✓	✓				✓			6
10						✓	✓								2
11						✓	✓								2
12	✓														1
13	✓														1
14	✓														1
15									✓						1
16									✓						1

Key sectors: 1. Water resources; 2. Health; 3. Agriculture, forests, and fisheries; 4. Biodiversity (and landscape); 5. People and goods safety; 6. Tourism; 7. Energy and industry / economy; 8. Urban planning and cities; 9. Coastal zone and sea; 10. Demographic Dynamics; 11. Transport and communications; 12. Financial sector; 13. Disaster risks reduction; 14. Infrastructures; 15. Monitoring, info/, awareness-raising; 16. Building.

The analysis indicates as well that although 13 out of the 14 considered agriculture as a relevant sector for climate change adaptation, only 10 of them included clear measures and actions directly related to food production or other stages of the food chain. Despite considering agriculture as a relevant sector for climate change, the four remaining ones, Póvoa do Varzim, Trofa, Valongo, and Funchal did not include clear measures and actions. As previously mentioned, Funchal did not considered agriculture as a relevant sector for climate change adaptation.

The 10 remaining strategies and plans analysed summed up the impressive figure of 407 measures and actions for climate change adaption. However, only 44 of them are related to food and agriculture (10.8%). The lowest proportion of measures devoted to food and agriculture refers to Torres Vedras (5,0%) while Maia (14,5%) posits at the other end of the scale. Such an overall surprisingly low

result clearly indicates the thin relation existing at municipal level between planning, agriculture and climate change adaptation.

Table 3 zooms in the 44 measures and actions related to our major entries: “food production” and “other stages of the food chain”. Results indicate that 27 of the 44 are connected with food production. Seven of them (listed in half of the plans) relate to the use of native species adapted to climate change; followed by access to land (counting 6) consisting of either mapping idle land, improving access, or preserving land; and then five relate to increasing agroecological production and other related practices. Then, 17 out of the 44 measures and actions refer to different stages of the food chain: water access being the most frequent, either through retention basins or use of treated water. Another important finding of the research is the qualitative wealth of measures and actions, in an extremely low proportion of measures [27 out of 407 that were identified].

Table 3. Brief description of the measures and actions considered in the 14 Strategies and Plans analysed.

Topics related with food production	**Nº**
Boost native crops / crops more adapted to climate change /crops diversification	8
Improve land access / make use of idle land/ preserving land for agricultural purposes	6
Increase agroecological production and other related practices	5
Create a seeds bank / preservation of genetic material	2
Create an agriculture agency	1
Develop school community gardens	1
Re-plant forest (eucalyptus) with orchards adapted to climate change	1
Boost agro-pastoral uses	1
Creation of a farmers' stock exchange	1
Setting up a manual for agricultural practices	1
Total measures / actions	27
Topics related with other entry points of the food chain	**Nº**
Create dams and water retention ponds for agricultural use / use of treated water	5
Assessing initiatives	3
Regeneration of local food markets	2
Strength trading and consumption of local products	2
Control supermarkets territorial dissemination	1
Commercial promotion of new fish varieties	1
Assist the conversion of fleets and fishing gears	1
Award for the best practice regarding water for agricultural irrigation	1
Community composters	1
Total measures/actions	17

The next step of the investigation was to better understand if those measures and actions where integrated into territorial instruments primary Master Plans (Plano Diretor Municipal in Portuguese), Detailed Plans and regional Plans that represent the main planning documents in the Portuguese context.

The analysis to the 14 CAPEs reveals that 11 have a chapter on the integration of their measures and actions into territorial planning. However, a closer look to the five municipalities with Climate Adaptation Plans i.e., the ones with detailed actions and an implementation factsheet, indicates that only two of them, Maia and Leiria, included their Climate Change adaptation actions into their municipal territorial plans. This being said, each one of them proposed actions related to agriculture and food: Cascais (5/78); Agueda (6/68); Lagos (15/145); Leiria (5/54); and Maia (9/62). Such finding strongly suggests that the inclusion of food and agriculture’s actions into territorial planning is not perceived as a mandatory step by the most advanced Portuguese local governments in relation to climate change planning.

Table 4 lists down each one of the agriculture and food actions envisioned by Leiria and Maia municipal Climate Adaptation Plans. It summarizes as well how they are expected to be integrated into

the planning instruments. One needs to highlight that in Leiria only half of proposed actions are included into planning instruments, while in Maia, all of them are. An interesting finding when examining the inclusion of actions into territorial planning is the lack of consistency from one city to the other and the subjectivity of policy decisions. For instance, Leiria did not transposed to the Master Plan the regeneration of the city cover market, in opposition to Maia that did so.

Table 4. Brief description of the related food and agricultural action and their inclusion into planning instruments.

Municipality	Action - Description	Yes/No	How actions are being transposed to planning – based on CAP
Leiria (5) *	Regeneration of the local food market	No	Not applicable
	Funding incentives to local livestock and food production and trade	Yes	Master Plan Charter – Positive discrimination and/or fiscal incentives
	Lis Valley pilot case to validate new horticultural and/or fruit crops	Yes	Master Plan Charter – Positive discrimination and/or fiscal incentives
	Regeneration of Junqueira Salt Pans	No	Not applicable
	Prize for best practices on agriculture irrigation	No	No
Maia (9)	Promoting sustainable agricultural practices adapted to climate change	Yes	Master Plan Charter – Proposal of pilot areas
	Mapping of rural and mixed areas including abandoned land with agricultural potential	Yes	Master Plan Charter – Re-classify the soil in the Land use map
	Creation of a land exchange bank	Yes	
	Creation of a farmer's stock exchange	Yes	
	Manual of agricultural best practices		Master Plan Charter – Foresee in the Report as a strategic option.
	Promotion of a sustainable irrigation system	Yes	
	Promotion of native species panting	Yes	
	Revitalization of local food market	Yes	
	Community compost boxes	Yes	

*The CC Leiria Plan doesn't specify for each action how it is translated into urban planning.
Table 4 resulted from author interpretation of a broader list.

As seen in table 4 how those actions are going to be integrated remains largely unclear, even in the most developed and cutting-edge cases at national level: Maia and Leiria municipalities the inclusion of the Climate Change related actions as part of the master plan chapter. Leiria goes one step further in detailing a positive discrimination and/or fiscal incentives for some of its actions.

Finally, the qualitative results obtained through the interviews with the heads of two municipalities planning departments, indicate that the urban planning departments were not always involved in the strategy or the plan formulation process. For instance, Maia representative participated in the elaboration of the strategy, but not of the plan. Both interviewees expressed some astonishment about food planning relevance, both as a topic per se or a relevant one for climate change related actions, although expressing openness to debating about it. Both agreed that master plans' scope mostly relates to land-uses regimes either for agricultural or urban land. They stressed as well that these measures are the only ones to be considered to integrate agriculture and food into planning instruments. It echoes Lagos municipality position, when rejecting our proposal for interview, upon similar grounds. There is a clear convergence that Master plans cannot consider the development of specific actions such as the formulation of pilot cases, creation of land banks, or promotion of agroecological practices. According to the interviewees those actions are outside the planning domain, and even if those actions were

included in their respective Climate Change Plans. These findings highlight the gap between what is detailed in the climate plans and what is city planners' perspective. For instance, both interviewees considered that creating land banks for agriculture should be part of Detailed Plans instead of Master Plan. This planning instrument allows to specify actions such as assets preservation, specify locations for agriculture, or allocation of funding. In addition, both agreed that Climate Change Adaptation Plans should be normative and not binding. It resulted clear from the interviews that some of the actions envisioned in the Climate Plans notably regarding Leiria, were projects that had been previously approved by the municipality. Such is the case of the Leiria local food market that was included in the Plan, but not as a result of a collaborative effort for the Climate Change Plan. At implementation level, the planning departments either in Leiria or Maia have a limited impact, as such projects are led by the Environmental Department, leaving aside Urban Planning. Last but not least, such strategies and plans are non-mandatory, in other words, their implementation relies on political willingness, confirming the silos administrative culture.

5. Discussion

Back to the leading questions: 1) to what extent Climate Adaptive Plans and Strategies include the increase of local food production as a way to address the effects of climate change; (2) Do they consider each step of the food chain or solely food production; (3) How those measures are transcribed to the planning rules and regulations.

Based on the cases we examined in Portugal-one can safely conclude that strategies and plans do include an increase of local food production as a strategy to face Climate Change. However, these measures and action remain limited when compared with the overall number of measures considered (average 10,8% of total number of measures as an average for the 10 cities studied). In conclusion, those numbers substantiate the weak nexus between agriculture, climate change and planning. Such conclusions are in tune with those from different authors (Brinkley, 2013; Morgan, 2009; Raja *et al.,* 2008). Based on this we advocate that efforts and additional practices are needed to illustrate how sectorial issues relating to food could be integrated into Climate Change strategic and operation plans and into Master Plans and sectorial plans in cities. A preliminary way to go might be making data available to planners and policy makers on the impact of food systems on GHG emissions. Unfortunately, these data are limited, and in Portugal alone, metrics regarding SDG 12 (INE, 2021) are only produced for 50 % of the required indicators. In a scenario where more progress is required to meet the 55% GHG reduction by 2030, those metrics are an important tool to have a clear picture of what Food System entail.

Regarding the second question results suggest that indeed food production is being considered, while the other stages of the food chain are less so. Measures related to food loss, waste prevention, food distribution and food consumption are notably missing. Why is this happening? We argue that stakeholders involved in strategies and plans formulation largely miss what Food System entail, and its potential positive impact on climate change adaptation. This is a limit that confirms conclusions from various authors (Candel and Pereira, 2017; Delgado, 2023). Both findings are pointing out that more awareness raising is needed on the positive or negative roles that Food Systems, and each stage of the food chain can play on climate change adaptation. The so far weak consideration for the food system positive and negative impact on climate cannot be missed as a new round of Climate Change adaptation strategies and plans are coming up. Besides, the European Green Deal (2020) is nowadays at the forefront of European commitment to tackling climate and environmental-related challenges and one of its major components is the 'Farm to Fork strategy' which call for a more holistic food systems approach.

Lastly, even if the inclusion of several measures and actions into planning instruments, as identified in the present investigation looks promising, not much seems happening in the field. Several reason might explain such a situation: first, strategies and plans remain normative and in addition are

essentially non-mandatory. This means that their implementation relies primarily on political will; Second, lack of planner's awareness on the subject and, finally an entrenched administrative silo culture often limits communication between agriculture, environmental and planning departments. In short, the findings strongly suggest that the potential role of planning and more precisely food planning in adaptation to Climate change is not being fully unleashed. Such a consideration is in line with various previous findings in other countries, by authors such as Reckien *et al.* (2018) or Doernberg *et al.* (2019) confirming that Portugal is not an exception.

We acknowledge some limitations in our research. Firstly, we don´t clearly know the profile of stakeholders involved on the formulation of the Climate Change adaptation strategies plans, if any, and the technicians involved, besides why they were chosen. Limited information is available on their professional backgrounds, agendas, power, values, and motivations. Further research could somehow complement and nuance our findings.

Secondly, more research is needed to deepen our understanding of the missing links between planning and food. We would like in future research to explore a broader span of municipal urban planners, notably the ones at local level that are in charge of city plan departments. This would eventually introduce additional insights that would complement our findings and help to build an enabling approach to better explore climate change, agriculture, and food planning nexus.

6. Conclusions

This paper clearly calls for the urgent need to posit food chain as a fundamental part of climate change debate and actions. At this point in time, we need to establish supportive and enabling policy mechanisms that will support the formulation of more integrated local climate change adaptation plans.

What does these changes would mean for municipal planners and food planning as a whole? Firstly, it is important to assure that measures included in strategies and plans will be mirrored in planning instruments. So far, it is not happening. Planners' argument stating that master plans are not the right scale instrument for food and urban agriculture development.

Secondly, in countries such as Portugal without a strong urban planning tradition (in Portugal there is not a specific degree on urban planning. Traditionally planning is being led by geographics, engineers, architect, economists), the connection between different disciplines can be an additional challenge as food requires a holistic perspective, often not required in the architecture schools and not present either in planning faculties. This could generate a huge opportunity for some training institutions to lead the way to an emergent topic as food planning.

Thirdly, several guidelines on planning and climate change have been formulated at national level. At the same time other mechanisms such as Municipal Fund for Environmental and Urban Sustainability exist since 2015: they could be used as a way to better consider food issues.

In conclusion, there is a need to increase awareness and outreach among planners and other stakeholders. This process should be supported through information campaigns, broad debates, participatory planning and research on the ground. Bridging the gap between an innovative and facilitating legal environment at the national level and planners addressing these topics at the city level.

Acknowledgement

Author is funded by FCT – *Fundação para a Ciência e a Tecnologia, I.P.*, under the *Norma Transitória* –[DL57/2016/CP1453/CT07] https://doi.org/10.54499/DL57/2016/CP1453/CT0067. The author wants to acknowledge Maia, Leiria and Lagos urban planners' representatives for their collaboration and inputs. The author would like to express her gratitude to the reviewers of this final version and to Yves Cabannes for the proofreading of the article.

References

APA, 2007. Policy Guide on Community and Regional Food Planning. In *APA* (p. 24). American Planning Association.

Law n. 98/2021. Lei de Bases do Clima, Lei n. 98/2021 de 31 de Dezembro. *Diário Da República*.

Brinkley, C., 2013. Avenues into Food Planning: A Review of Scholarly Food System Research. *International Planning Studies 18*(2), 243-266. https://doi.org/10.1080/13563475.2013.774150

C40, 2019. *Good Food Cities Declaration*. Available at: https://www.c40.org/declarations/food-declaration/

Cabannes, Y., Marocchino, C., 2018. *Integrating Food into Urban Planning* (The Bartle). FAO I UCL.

Candel, J. J. L., Pereira, L., 2017. Towards integrated food policy: Main challenges and steps ahead. *Environmental Science and Policy* 73, 89-92. https://doi.org/10.1016/j.envsci.2017.04.010

Delgado, C., 2018. Contrasting practices and perceptions of urban agriculture in Portugal. *International Journal of Urban Sustainable Development* 10(2), 170-185. https://doi.org/10.1080/19463138.2018.1481069

Delgado, C., 2020. Local food policies - Their constraints and drivers: Insights from Portuguese Urban Agriculture initiatives. *Moravian Geographical Reports* 28(3). https://doi.org/10.2478/mgr-2020-0016

Delgado, C., 2023. Lack of Governance Capacity in Food Systems: Lessons from the Portuguese Initiatives. *RIVAR* 10(28), 195-214. https://doi.org/10.35588/rivar.v10i28.5298

DGT, 2020. *PDM GO: Boas práticas para os Planos Diretores Municipais*. CNT - Comissão National do Território.

Doernberg, A., Horn, P., Zasada, I., Piorr, A., 2019. Urban food policies in German city regions: An overview of key players and policy instruments. *Food Policy* 89, 101782. https://doi.org/10.1016/J.FOODPOL.2019.101782

E.C., 2020. *Farm to Fork Strategy*. https://doi.org/10.2775/12468

ECOXXI, 2022. https://ecoxxi.abae.pt/, accessed in August 2022.

European Comission, 2013. *Convenant of Mayors for Climate & Energy Europe.* Available at: https://climate-adapt.eea.europa.eu/en/eu-adaptation-policy/covenant-of-mayors, accessed in February 2023.

Fundaçao Francisco Manuel dos Santos, 2021. *Pordata. Estatísticas sobre Portugal e Europa.* Available at: https://www.pordata.pt/municipios/populacao+empregada+segundo+os+censos+total+e+por+setor+de+atividade+economica-145, accessed in February 2023.

Foundation for Environmental Education, 2023. https://www.fee.global, accessed in January 2023.

INE, 2022. *Indicadores dos Objetivos de Desenvolvimento Sustentável (Sustainable Development Goals Indicators in English) FICHA TÉCNICA*. Available at: http://www.ine.pt

IPCC, 2022. Mitigation of Climate Change Summary for Policymakers (SPM). In *Cambridge University Press* (Issue 1).

Morgan, K., 2009. Feeding the city: The challenge of urban food planning. *International Planning Studies* 14(4), 341-348. https://doi.org/10.1080/13563471003642852

Nourish Scotland, 2020. *Glasgow Food and Climate Declaration*. Available at: https://www.glasgowdeclaration.org/

Pothukuchi, K., Kaufman, J. L., 2000. The Food System: A stranger to the planning field. *Journal of the American Planning Association* 66(2), 113-124. https://doi.org/10.1080/01944360008976093

Raja, S., Born, B., Russell, J. K., 2008. A planners guide to community and regional food planning. *APA Planning Advisory Service Reports* 554, 1-106.

Reckien, D., Salvia, M., Heidrich, O., Church, J. M., Pietrapertosa, F., De Gregorio-Hurtado, S., D'Alonzo, V., Foley, A., Simoes, S. G., Krkoška Lorencová, E., Orru, H., Orru, K., Wejs, A., Flacke, J., Olazabal, M., Geneletti, D., Feliu, E., Vasilie, S., Nador, C., Krook-Riekkola, A., Matosovic, M., Fokaides, P.A., Ioannou, B.I., Flamos, A., Spyridaki, N.A., Balzan, M,V., Fülöp, O., Paspaldzhiev, I., Grafakos, S., Dawson, R., 2018. How are cities planning to respond to climate change? Assessment of local climate

plans from 885 cities in the EU-28. *Journal of Cleaner Production* 191, 207-219. https://doi.org/10.1016/j.jclepro.2018.03.220

Ribeiro, P., Ferrão, J., Seixas, J., 2018. Mainstreaming climate adaptation in spatial planning: the case of baixa Pombalina in Lisbon. *Finisterra* 53(108), 15-38. https://doi.org/10.18055/finis14723

Sonnino, R. (2009). *Feeding the City: Towards a New Research and Planning Agenda* 14(4), 425-435. https://doi.org/10.1080/13563471003642795

Verzone, C., Woods, C., 2021. Food Urbanism. *Food Urbanism*. https://doi.org/10.1515/9783035615678/HTML

Viljoen, A., Bohn, K., Howe, J., 2012. Continuous productive urban landscapes: Designing urban agriculture for sustainable cities. *Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities*, 1-296. https://doi.org/10.4324/9780080454528

White, H., Natelson, S., 2011. *Good planning for good food: How the planning system in England can support healthy and sustainable food*. Available at: https://www.sustainweb.org/reports/good_planning_for_good_food/