

Informing Sustainable Regional Food Chains through Serious Games: The Play Marmara “Food”

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Abstract

The food system generates one-third of global GHG emissions, with urban regions playing a key role in climate challenges. In Türkiye, the Marmara Region—home to over 25 million people—faces mounting pressure on its food systems due to rapid urbanization, land-use change, and environmental degradation. Despite its agricultural potential, the region experiences declining farmland and water quality. The Play Marmara Food game, developed within the MARUF initiative by Play the City, addresses these challenges through a serious game format. It brings together stakeholders from various sectors to simulate scenarios, visualize data, and co-develop sustainable strategies. This study evaluates the game's role in fostering collaboration and informing food supply chain design to enhance regional sustainability.

Keywords: sustainable regional food systems; food security; supply chains; city gaming; serious game

1. Introduction

The global food system is increasingly recognized as a critical contributor to the climate crisis. According to the Food and Agriculture Organization (FAO), nearly one-third of all human-induced greenhouse gas emissions stem from the production, distribution, and consumption of food (Crippa et al., 2021). However, environmental impact is only one facet of a much broader crisis. Hunger and food insecurity—once on the decline—are rising again worldwide. The FAO reports that the global prevalence of undernourishment (PoU) increased from 8.0% in 2019 to 9.8% in 2021, reversing years of progress and raising doubts about the effectiveness of current food governance models (FAO, 2022a).

This troubling trend signals a deeper systemic problem. Food security depends heavily on access to freshwater, affordable energy, and stable logistics networks— all of which are increasingly vulnerable in a world beset by climate disasters, conflicts, and pandemics (FAO, 2015). Moreover, the inefficiency of current food systems is staggering: nearly 30% of global energy is consumed by food systems, and 38% of that energy is used to produce food that is ultimately wasted (Cuellar & Webber, 2010).

Recognizing this, the United Nations included “Zero Hunger” among its Sustainable Development Goals (SDG 2), acknowledging the need for a multidimensional approach—one that combines food security with social protection, infrastructure investment, and the establishment of sustainable production and distribution systems. The food crisis, fundamentally, is not just about scarcity; it is about the unsustainability embedded within the way we currently produce, distribute, and govern food.

Against this backdrop, regional food systems offer a potential path forward. They can shorten supply chains, promote local resilience, and create opportunities for integrated planning tailored to specific socio-ecological contexts. Yet building such systems requires inclusive governance, data-informed planning, and collaboration across diverse stakeholders— ranging from producers and cooperatives to municipalities, NGOs, and consumers.

Serious game is a structured, interactive method that allows stakeholders to explore real-world challenges in a simulated environment. This paper examines a serious game developed for Türkiye's Marmara Region, *Play Marmara Food*, which seeks to enhance stakeholder dialogue, simulate food system dynamics, and inform strategies for more sustainable regional planning.

The Marmara Region, Türkiye's most populous and industrialized area, plays a dual role as both economic

powerhouse and key agricultural zone. However, it faces mounting challenges related to land-use conflict, environmental degradation, and supply chain fragmentation. This study explores how *Play Marmara Food*, developed by Play the City within the MARUF initiative, facilitates collective problem-solving and knowledge exchange.

The paper proceeds as follows: Section 2 outlines the theoretical foundations of sustainable regional food chains and serious games. Section 3 describes the food system dynamics in Marmara. Section 4 details the game's methodology and design. Section 5 presents the game outcomes and participant insights, as well as discusses the implications for participatory governance and food policy. The final section concludes with recommendations for future applications and research.

2. Theoretical and Methodological Framework

2.1. Sustainable Regional Food Chains

Sustainable regional food chains refer to interconnected systems of food production, processing, distribution, consumption, and waste management that operate within a defined geographical region and are guided by principles of environmental stewardship, social equity, and economic viability. These systems aim to minimize environmental impact while promoting local economic development and food sovereignty (Sonnino et al., 2016).

While the concept of regional food systems offers a sustainable alternative to globalized food chains, their development is constrained by structural and operational challenges, as noted in recent literature and policy frameworks:

- **Land Use Conflicts:** Rapid urbanization often leads to the loss of fertile agricultural land, particularly in peri-urban regions, compromising local food production capacity (FAO, 2023b). This is exacerbated by weak land-use policies and competing economic interests.
- **Governance Fragmentation:** Regional food systems typically span multiple administrative jurisdictions, creating coordination difficulties and regulatory inconsistencies (Moragues-Faus & Morgan, 2015). The absence of integrated food governance hinders systemic change.
- **Logistics and Infrastructure Gaps:** Many regional supply chains lack the infrastructure necessary for efficient and competitive operation, including cold storage, processing facilities, and short distribution networks, coordination issues between transport providers and both small- and large-scale food facilities often result in costly delays and inefficiencies (Day-Farnsworth & Miller, 2014). This limits their scalability and integration into broader markets.
- **Market Access Barriers:** Small-scale producers often face challenges in accessing mainstream markets due to limited bargaining power, lack of certification, and low investment in marketing and technology (Kneafsey et al., 2013). These barriers can reduce the economic viability of regional systems.
- **Environmental Pressures:** The current global food system contributes significantly to climate change, biodiversity loss, and resource depletion. Food production is responsible for approximately one-third of global anthropogenic greenhouse gas emissions (Crippa et al., 2021), with a significant portion attributed to livestock farming and deforestation (Kler et al., 2022; Shabir et al., 2023).
- **Vulnerability:** External shocks such as pandemics and armed conflicts exacerbate food system fragilities. The COVID-19 pandemic and the war in Ukraine, for example, disrupted supply chains, increased food and energy prices, and significantly worsened global hunger and food insecurity (FAO, 2022; Abay, 2022; WFP, 2022). These crises have also emphasized the heavy dependence of food systems on freshwater and affordable energy, heightening their vulnerability (FAO, 2015).
- **Information Deficits:** Data on regional food flows, environmental impacts, and land productivity are often fragmented or outdated, hampering evidence-based planning and policy interventions (FAO, 2023a).
- **Food Waste and Resource Inefficiency:** The energy used to produce the 24.4 billion pounds of dairy products discarded annually in the U.S. alone could meet the world's daily energy needs (Cuellar & Webber, 2010). Reducing such inefficiencies is key to building more sustainable food systems.

To effectively address these multifaceted challenges, integrated and participatory planning approaches have

gained prominence. The City Region Food System (CRFS) framework developed by FAO and RUAF advocates for multilevel, multistakeholder governance to facilitate food system transformation through collaborative and context-specific strategies (FAO, 2023b).

Participatory tools such as serious games provide innovative formats for convening diverse actors, enabling experiential learning, system mapping, and collaborative strategy development (Devisch et al., 2018). By simulating real-world conditions and visualizing complex interdependencies, serious games allow stakeholders to explore alternative futures, test trade-offs, and co-create actionable solutions.

In this context, the Play Marmara Food game exemplifies an applied method that aligns with theoretical and policy frameworks emphasizing collaboration, systems thinking, and integrated governance. By employing serious games as a participatory method, it supports consensus-building and facilitates dialogue across traditionally siloed sectors, making it a relevant methodological tool for informing regional food policy and sustainability planning.

2.2. Serious Games in Planning and Governance

“Serious games” are interactive experiences designed for a primary purpose other than pure entertainment, typically learning, decision-support, or social change (Abt, 1970). Building on Abt’s foundational work, later frameworks describe serious games as the fusion of a *serious* dimension (an explicit real-world objective) and a *game* dimension (rules, feedback, voluntary play) (Djaouti et al., 2011).

Across these forms, games share a common structure of *means* (tools, rules), *goals* (desired outcomes) and *feedback* loops that allow iterative experimentation (Parlett, 1999; Crawford, 1983). This structure makes them attractive for planning tasks where complex systems and competing interests must be explored in a “safe-to-fail” environment.

The planning field has a long tradition of using game-based methods to test policies and accelerate stakeholder learning (Mayer, 2009). Notable precedents include:

Urban growth & land-use games: Workshop-based table-top games that let citizens allocate housing, green space and infrastructure, these tools help reveal trade-offs between density, mobility and environmental quality (Sousa et al., 2022).

- **Infrastructure & mobility games:** Metro-planning games in Singapore and transit-oriented-development role-plays in Europe allow transport agencies to co-design route scenarios with residents, balancing capacity, cost and equity. (LTA Connect, 2019; ULI, n.d.)

- **Climate & resource games:** The *World Climate* negotiation game and the *Food Chain Reaction* scenario game engage national delegates, NGOs and private firms in exploring emissions pathways or global food shocks, underscoring supply-chain interdependencies. (Sterman et al., 2015; WWF, 2016)

- **Local food-system games:** Municipal initiatives such as the “City Region Food System Game” (FAO/RUAF pilots) guide diverse actors through sourcing, processing and waste loops to co-create resilient regional strategies. (Cities 2030, n.d.)

These precedents demonstrate that game mechanics—whether as turn-based strategy, real-time simulation or facilitated role-play—can translate technical data into tactile experiences that catalyse dialogue across disciplinary and institutional silos.

Before using serious games in planning, it’s important to understand that they have both strengths and weaknesses. The same game elements that help people learn and work together can also make things seem simpler than they really are or lead to biased results. Knowing both the benefits—like testing ideas and learning together and the risks, like depending too much on models or needing a skilled facilitator, helps planners use these games more effectively.

Table 1: Strengths of Serious Games as Tools for Participatory Planning

Strengths	Planning value	Key references
System visualisation & experimentation	Players can rapidly test “what-if” scenarios, seeing consequences of land-use or supply-chain choices without real-world risk.	Mayer (2009); Crawford (1983)
Stakeholder engagement & dialogue	Games level power asymmetries, giving community members, NGOs and officials equal turns and shared visual cues, which improves mutual understanding.	Sousa et al. (2022); Djaouti et al. (2011)
Learning & capacity-building	Embedded feedback, scoring and reflection foster deeper retention of planning principles, logistics constraints and policy trade-offs.	Laamarti et al. (2014)
Data integration	Real-life data (e.g. GIS data, statistics), emissions inventories or cost tables can be encoded as game parameters, turning abstract numbers into tangible decisions.	Abt (1970); Parlett (1999)

Play Marmara Food leverages a table-top game to visualize regional food supply chains, logistics challenges, and policy levers. By embedding Marmara-specific data sets, such as drought and erosion risks, and agricultural land use, into an iterative, multi-round game, it builds on the recognized strengths of serious games, including experimentation and dialogue.

- Co-design with planners and technical experts ensures model accuracy and relevance.
- Transparent rulebooks and debrief sessions uncover assumptions and encourage reflection.
- Scalable, data-driven outputs translate game actions into GIS layers and policy briefs, bridging the gap between play and governance.

As a result, the game acts both as a tool to help participants understand complex food-system dynamics and as a decision-support mechanism that directly informs MARUF23’s regional action agenda for “Resilience and Beyond”.

3. The Marmara Region Food System: Context and Challenges

3.1 Regional Profile

Located in northwestern Türkiye, the Marmara Region spans approximately 67,000 square kilometers and is home to over 25 million residents, making it the country’s most densely populated and industrially developed region. Metropolitan hubs such as Istanbul, Bursa, Kocaeli, and Tekirdağ serve as the primary economic engines, due to their concentration of manufacturing industries, international trade links, and advanced logistics infrastructure (MMU, 2024).

This demographic and industrial intensity has significantly reshaped the urban–rural interface. Rapid urbanization and infrastructure expansion have led to increased competition for land and water resources, placing mounting pressure on regional food systems. Agricultural zones are being converted into residential and industrial areas, resulting in a steady decline in cultivable land and threatening long-term food security.

Despite these challenges, the region retains considerable agricultural potential. Fertile alluvial plains, a temperate climate, and access to river basins and coastal ecosystems make it suitable for cultivating a diverse range of crops, including cereals, fruits, and industrial crops. However, this agricultural base is increasingly at risk. Key threats include industrial pollution, unsustainable groundwater extraction, and climate-related stressors such as droughts and irregular rainfall patterns. These conditions are eroding the region's agroecological resilience and undermining sustainable food production (FAO, 2022b).

3.2. Overview of the Food System in the Marmara Region

The Marmara Region faces a complex set of challenges that threaten the sustainability and safety of its food system. Environmental degradation and food safety concerns are particularly acute. For instance, unregistered fertilizer use and the improper disposal of waste generated during olive production, such as olive black water discharged into the sea, contribute significantly to soil and water pollution, posing serious risks to human and ecosystem health (Ozturk et al., 2021).

In addition to plant-based agricultural risks, livestock farming is a major contributor to nutrient pollution. A recent study by Yaylı, Aydoğdu, and Kılıç (2024) assessed the pollution load from livestock manure across the Marmara Region between 2013 and 2022. The total estimated nutrient load was 25,497.5 tons, with nitrogen constituting 90.6% and phosphorus 9.4% of the total. Balıkesir emerged as the province with the highest contribution, while Yalova recorded the lowest. The study also revealed that cattle farming is the primary source of diffuse nutrient pollution. These findings emphasize the urgent need for improved waste management practices and integrated agri-environmental planning to mitigate the long-term impacts of livestock-based agriculture.

Another pressing issue is the rapid and often unregulated conversion of agricultural land for urban, industrial, and infrastructural development. Between 2000 and 2020, the Marmara Region lost thousands of hectares of productive farmland - particularly in peri-urban areas of Istanbul and along coastal zones - primarily due to urban sprawl (MMU, 2024). This process not only diminishes local food production capacity but also fragments ecological corridors essential for biodiversity, pollination, and microclimatic regulation.

Furthermore, intensive land use and unchecked industrial discharge have contributed to the degradation of soil and contamination of groundwater resources. Excessive application of chemical fertilizers and pesticides, compounded by poor wastewater management, has led to declining soil fertility and polluted aquifers, factors that directly compromise long-term food safety and agricultural productivity. A study by Varol and Tokatlı (2021) in the Ipsala district of northwestern Türkiye, an area with a long history of intensive agriculture, found seasonal fluctuations in toxic metal concentrations in groundwater. While contamination levels remained below official drinking water limits, the results underscore the cumulative risks of persistent environmental pressures on regional water quality.

In terms of logistics, the Marmara food system is characterized by a fragmented and inefficient supply chain. Multiple intermediaries, lack of transparency, and weak coordination among actors contribute to post-harvest losses and price volatility, disproportionately affecting small- and medium-scale producers as well as low-income consumers. A regional analysis by the United Nations Development Programme (2021) further supports this observation, identifying rising logistics costs, insufficient technological infrastructure, and limited predictability as key barriers to supply chain efficiency in the region. These issues significantly hinder the ability of local producers to access broader markets and compete with industrial-scale operations.

Given these intertwined challenges, there is a growing recognition of the need for a governance model that is not only integrated but also participatory. International practice points to the City Region Food System (CRFS) perspective put forward by FAO and RUAF, which frames the metropolitan and rural hinterland as a single functional area and emphasizes nested, multi-stakeholder decision-making (FAO, 2023b). As Mäntysalo (2005) argues, effective planning should move beyond interest-based negotiation and aim for mutual understanding and cooperation among stakeholders. Participatory planning processes must be rooted in local realities, beginning at the street

or neighborhood scale and expanding to citywide and regional frameworks. Clearly defining stakeholder roles, decision-making scales, and engagement mechanisms is essential to ensure transparency, accountability, and legitimacy in food system governance.

Building a sustainable and resilient food system in the Marmara Region therefore requires the adoption of multi-scalar, inclusive strategies that address both environmental and socio-economic dimensions, essentially aligning with the integrated agenda championed by the CRFS approach. This includes reducing the environmental burden of agricultural production, improving food safety standards, and enhancing access to nutritious food for vulnerable populations. Ultimately, the transformation of the Marmara food system holds strategic importance not only for regional economic development and public health but also for the broader goal of inclusive and sustainable social development.

4. The Play Marmara Food Game

4.1. Purpose and Development

Play Marmara is a serious game developed through a collaboration between the Marmara Municipalities Union and Play the City, starting in 2018. It debuted at MARUF19 as Turkey's first regional development game. Grounded in real-world data and the methodology of serious gaming, Play Marmara was used as a participatory planning tool to envision sustainable urban and regional futures. The session brought together regional mayors, development agency leaders, practitioners, academics, and university students. This interactive experience at MARUF helped further conversations about the regional development of the Marmara Region.

The most recent comprehensive planning effort for the Istanbul Metropolitan Area dates back to 2005. Given the complexity of managing such a vast urban system, planners and authorities have long acknowledged the need for strategies that operate at both national and regional levels. In recent years, Turkey has been working toward a national spatial planning agenda. Critical regional issues, such as economic development, transportation, ecology, disaster risk, coastal management, and protected areas, demand an integrated planning approach. However, the availability of regional data and the challenge of coordinating across governance levels remain significant obstacles. Play Marmara introduces a novel method to address these issues by allowing key development stakeholders to engage with realistic, data-driven scenarios that simulate multi-level governance processes (MMU, 2019).

The game was first introduced at the Marmara Urban Forum (MARUF) in 2019, focusing on future strategic investments in the region.



Figure 1: Play Marmara 2019 Game Session

The second edition, *Play Marmara 'Sea'*, held in 2021, convened experts from national and local government to collaboratively assess and set priorities for the Marmara Sea Conservation Action Plan.



Figure 2: Play Marmara 'Sea' Game Session

The third edition, *Play Marmara 'Food'*, centers on regional food supply chains, enabling participants to co-design a sustainable food system for the Marmara region.



Figure 3: Play Marmara Food - Mayors Session

4.2. Game Design Methodology

The Play Marmara Food game was designed as a serious game to explore the future of food systems in the Marmara Region through stakeholder collaboration, scenario building, and data-driven decision-making. The game's methodology integrates real-world datasets, stakeholder roles, and interactive tools to support strategic planning for sustainable food systems.

Data collection:

Play Marmara Food was built on a composite geodatabase assembled from seven primary sources: NUTS-2 development-agency strategies; ministry datasets on agriculture, trade, and environment; Copernicus land-use layers; the Greenpeace "How to Feed Istanbul?" inventory; and the Marmara Municipalities Union (MMU) spatial framework. This multi-scalar evidence base captures production volumes, logistics nodes, land-degradation risks, and consumption patterns, providing the empirical boundary conditions that underpin every decision made during play.

Scenario construction and simulation logic

Play Marmara Food unfolds over four iterative rounds, each corresponding to a classic policy cycle stage- diagnosis, strategy design, collaboration, and evaluation. Core parameters (e.g., pollution, energy usage, freight distance) are embedded in *Food-Chain ID* and *Action* cards. Card effects are expressed as additive or multiplicative modifiers on six sustainability indicators -Solidarity, Biodiversity, Technology, Economy, Policy and Healthy Food- mirroring multidimensional evaluation frameworks used in regional planning.

Stakeholder representation and role schema

The stakeholder ecology is reproduced through six Role Cards -local government, producer, cooperative, logistics firm, large-scale retailer/consumer, and NGO- mapped to five sub-regional teams (West Marmara, Istanbul, South Marmara, East Marmara I and II). This taxonomy corresponds to the actor categories observed during field interviews and MARUF participatory sessions, ensuring face validity and role fidelity. Role asymmetries (e.g., fiscal capacity of municipalities, perishability concerns of producers) are encoded as differential starting resources and constraints.

Analogue game components

The material set comprises:

Gameboard a 1 : 125 000 GIS-derived map (240 × 400 cm) printed on a raised table, with GIS data to represent the region's agricultural and urban landscape. It features key land-use types such as orchards, cultivated fields, olive groves, and other agricultural zones, alongside urban settlements marked with logistics centers and wholesale markets. In addition, the map highlights environmentally sensitive areas, including zones with high erosion risk and regions vulnerable to desertification, offering players a realistic spatial context for making decisions related to sustainable land management.

Food-Chain ID Cards offer detailed insights into the supply chains of key agricultural products in the Marmara Region. Covering a variety of crops- including sunflowers, olives, wheat, and grapes- these cards represent the region's most widely produced and consumed items, as well as those grown using different techniques. Each card outlines the technical steps of production and highlights specific challenges associated with both durable and perishable goods, helping players better understand supply chain dynamics.

Action Cards include seventy (70) cards that allow players to express their ideas about the future of food systems. These cards are organized into key categories- production, consumption, logistics, waste, and supply- enabling players to explore different stages of the food chain and propose innovative strategies. Each card is a visual representation of food policies and innovative practices referenced in international reports, turning complex strategies into accessible and actionable game elements.

Collaboration Cards prompts that reward inter-regional alliances with extra actions.

Scoreboard sheets large-format sheets on which facilitators record indicator tallies at the end of each round.

4.3. Game Process

The game session begins with a structured briefing, during which participants are introduced to the regional

food system's core challenges and the sustainability indicators embedded in the game. Participants then select stakeholder roles—such as local government, producer, cooperative, logistics firm, large-scale retailer/consumer, or NGO- based on their professional background and area of interest (MMU, 2024).

The gameplay consist of four rounds (see Figure 4):

(1) Choose Your Team and Product, (2) Sustainable Food Chain, (3) Collaboration, and (4) Evaluation and Expert Review.

1. Choose Your Team and Product: Participants form sub-regional teams and select a key agricultural product, such as wheat, olives, strawberries, based on regional characteristics. Each team locates relevant production clusters on the map and places the corresponding Food-Chain ID Card onto the game board.

2. Sustainable Food Chain: Teams use Action Cards to develop a regional supply chain strategy, selecting interventions like "Organic Fertiliser," "Cold-Chain Logistics," or "Food Literacy Campaigns." Each card influences participants to consider trade-offs and synergies among social, environmental, and economic outcomes.

3. Collaboration: Teams negotiate strategic alliances using *Collaboration Cards*, enabling them to pool infrastructure investments or co-develop solutions such as R&D centers or logistics hubs. These alliances unlock bonus actions, reinforcing the importance of inter-regional cooperation and shared resource planning.

4. Evaluation and Expert Review: At the conclusion of gameplay, indicator scores are transferred on the scoreboard sheets. A panel of food-system experts then reviews the results, offering feedback on the feasibility, equity, and innovation of each team's strategy. These reflections inform subsequent policy briefs and knowledge dissemination efforts.

Play Marmara "Gıda" Oyun dinamikleri:



Figure 4: Play Marmara Food Game Dynamics

This four round structure reproduces the iterative nature of strategic planning while keeping total playtime to approximately 90 minutes. This format helps participants explore systemic interdependencies, test decisions, and co-develop actionable insights for regional food planning.

Collectively, the methodology and process position Play Marmara Food as a rigorously grounded, yet highly interactive, decision-support system capable of translating complex agri-food data into shared strategic visioning for the Marmara Region.

4.4 Game Results and Insights

Between 4–5 October 2023 the Play Marmara Food was played in five facilitated, table-top sessions: one *Mayors' Session*, two *Experts' Sessions* and two *Open Sessions* during MARUF23. In total, the exercise convened two metropolitan mayors, food-system specialists, NGO representatives, game designers, academics, and architecture/urban-planning students- a deliberately hybrid audience that mirrored the diversity of the regional food system. (Özdarendeli, 2024)

In each session, participants formed sub-regional teams and selected one agricultural product- such as wheat, olives, or strawberries- based on their sub region . They were asked a common guiding question: *"How can we make the journey of this product from farm to table cleaner, fairer, and more profitable?"* Guided by their regional data, teams selected a range of Action and Collaboration Cards and sketched quick strategic plans for sustainable supply chains.

Across those sessions participants generated more than forty distinct strategy cards and drafted a dozen inter-regional partnerships. Four themes surfaced repeatedly, whatever the product or sub-region:

- smarter logistics and infrastructure (e.g., "Smart Logistics Village");
- circular-economy and waste solutions (compost, biogas, blockchain audits);
- multi-stakeholder governance platforms (food-policy councils, regional regulations);
- youth and community incentives (young-farmer co-operatives, food-literacy programmes).

The exercise also revealed gaps: when teams' strategies were scored against six indicators—Solidarity, Biodiversity, Technology, Economy, Policy, Healthy-Food— most points accumulated in Technology, Economy, and Policy, while Healthy-Food and Biodiversity lagged, signalling issues that merit greater policy attention.

The Table 2 condenses the most prominent strategies that emerged in the final expert/open sessions, showing how different actor constellations tackled distinct products yet converged on similar leverage points; smarter logistics, circular practices, new governance platforms, and community-focused incentives.

Table 2: Sub-Regions, Products and Key Outcomes of Play Marmara Food

Sub-region / Actor	Product	Key actions selected	Impact
Istanbul team	Wheat	Smart Logistics Village, City Farm, Food Literacy Training, Intl. Trade Networks	Cut freight emissions, shorten producer-consumer link, boost export value

South team	Marmara	Tomato	<i>National Food-Waste Plan, Drought-Resistant Crops, Local Incentive Packages, Regional Supply-Chain Rules</i>	Waste minimisation, climate resilience, rural jobs
West Marmara team		Sunflower	<i>Organic Fertiliser, Food Networks, Food Policy Council, Urban-Ag Zoning</i>	Regenerative soils, direct marketing, governance hub
East Marmara I & II teams		Strawberry	<i>Food Incubation Centre, Blockchain Waste Audit, Young-Farmer Cooperatives, later paired with Organic Fertiliser Export and Irrigation Optimisation</i>	Tech-driven transparency, youth entry, nutrient cycling

5. Discussion

Participatory planning has evolved far beyond public hearings and consultation forms. Contemporary approaches- especially those inspired by collaborative planning theory- increasingly emphasize co-creation, experiential learning, and stakeholder empowerment (Innes & Booher, 2004; Sanoff, 2000).

The *Play Marmara Food* game embodies these principles. It provides a “safe-to-fail” environment where actors from different backgrounds negotiate priorities, test scenarios, and reflect on trade-offs. This aligns with Habermasian ideals of deliberative dialogue that seeks understanding, not dominance (Mäntyselä, 2005).

As highlighted by scholars such as Tan (2016) and Hirscher (2017), serious games can serve as generative tools for urban and regional governance. They stimulate creative thinking, foster trust, and visualize complexity in ways traditional methods often cannot. Additionally, they can help resolve participation fatigue by offering more engaging, hands-on formats (Agger, 2012).

The gameplay process yielded actionable insights for regional planning:

- Serious games democratize planning by enabling diverse actors to engage on equal footing.
- The use of real-world data enhances the credibility and policy relevance of the scenarios explored.
- Structuring gameplay into planning-cycle stages reinforces institutional learning.
- It can be used to guide future policy and investment priorities.

These findings point to the broader potential of serious games as complementary instruments within participatory governance frameworks. As cities and regions grapple with climate-driven uncertainty and systemic food insecurity, tools like *Play Marmara Food* offer a promising model for inclusive, data-informed, and collaborative policymaking.

Despite their promise, serious games are not without limitations:

- **Facilitation quality matters:** Outcomes depend on how well facilitators guide discussions and debriefing.
- **Scalability requires adaptation:** Different regions may need contextual reconfiguration of rules, roles, and data.
- **Decision influence is indirect:** While games can inform policy, translating outcomes into formal governance processes remains a challenge.

Nonetheless, *Play Marmara Food* demonstrates that game-based methods can meaningfully contribute to collaborative planning, resilience-building, and sustainable food system design- especially in regions facing the kinds of multidimensional stressors seen in Marmara.

6. Conclusion

Play Marmara Food shows that a data-driven, multi-stakeholder game can support serious regional planning. This paper set out to examine how the Play Marmara Food serious games can inform the design of sustainable food chains in Türkiye's Marmara Region. Three main insights emerged.

1. Game-based dialogue works. Bringing mayors, public officers, NGOs, academics, designers and students to the same table turned abstract policy goals into concrete, crop-specific strategies. Shared priorities- smarter logistics, circular use of waste, new food-governance bodies and youth incentives- surfaced across all five sessions.
2. Data unlocks meaningful dialogue. Because every card and map layer came from lengthy research, participants could see how their choices would play out on the ground, not just in theory. This turned the game into a live testing arena for policies already anchored in regional statistics and GIS layers.
3. Scoreboards expose blind spots. Technology, economy and policy actions scored high, but "Healthy Food" and "Biodiversity" lagged. This highlights the need for future policy cycles and future game iterations to give equal weight to nutrition and ecosystem health.

The draft actions and collaborations produced in the sessions can be translated directly into the Marmara Municipalities Union's forthcoming regional food strategy. Results are context-specific; testing the model in other Turkish regions would show how adaptable the rules and data needs are. Follow-up research should monitor whether game-generated ideas- such as circular compost loops or food-policy councils-are adopted and with what effect.

Comprehensive data did not slow the process; it made meaningful play possible. Future iterations should deepen health and biodiversity metrics, but the current game already offers a tested, evidence-based format that MMU and other regional bodies can adapt when drafting formal food-system strategies.

To conclude, Play Marmara Food demonstrates that serious games can move beyond public engagement and act as practical decision-support tools. By linking real data, diverse actors and clear scoring, the game offers a scalable method for crafting evidence-based, collaborative food policies in regions facing complex agri-food challenges.

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