

REPORT

FOOD WASTE, FOOD SECURITY AND CLIMATE DIPLOMACY: A Roadmap for Türkiye Ahead of COP31

ULUÇ KARAKAŞ, BAŞAR BAYSAL

NOVEMBER 2026 | NUMBER: 280

SETA

FOOD WASTE, FOOD SECURITY AND CLIMATE DIPLOMACY: A Roadmap for Türkiye Ahead of COP31

ULUÇ KARAKAŞ
BAŞAR BAYSAL

SETA

COPYRIGHT © 2026 by SETA

All rights reserved.
No part of this book may be reprinted or reproduced or utilized
in any form or by any electronic, mechanical or other means,
without permission in writing from the publishers.

The conclusions and recommendations of any SETA Foundation
publication are solely those of its author(s), and do not reflect the
views of the Institution, its management, or its other scholars.

SETA Publications 280
ISBN: 978-625-5703-99-6

Editorial Team: Ebrar Üzümcü, Sudib Sontoran, Gizem Akbaş
Layout: Said Demirtaş

SETA | FOUNDATION FOR POLITICAL, ECONOMIC AND SOCIAL RESEARCH
Nenehatun Cd. No: 66 GOP Çankaya 06700 Ankara TÜRKİYE
Tel: +90 312.551 21 00 | Fax :+90 312.551 21 90
www.setav.org | info@setav.org | @setavakfi

SETA | İstanbul
Defterdar Mh. Savaklar Cd. Ayvansaray Kavşağı No: 41-43
Eyüp İstanbul TÜRKİYE
Tel: +90 212 395 11 00 | Fax: +90 212 395 11 11

SETA | Washington D.C. Office
1025 Connecticut Avenue, N.W., Suite 1106
Washington, D.C., 20036 USA
Tel: 202-223-9885 | Fax: 202-223-6099
www.setadc.org | info@setadc.org | @setadc

SETA | Berlin
Kronenstraße 1, 10117 Berlin GERMANY
berlin@setav.org

SETA | Bruxelles
Avenue des Arts 6, 1000 Bruxelles BELGIUM
Tel: +32 2 313 39 41

CONTENTS

SUMMARY | 7

INTRODUCTION | 11

**FOOD LOSS AND WASTE:
DIVERGENT EFFECTS ON CLIMATE AND FOOD SECURITY | 17**

Food Security: Definition and Dimensions | 17

Food Loss and Food Waste: Definition and Measurement | 20

Effects of Climate Change on Food Security | 21

The Scale of the Problem | 25

Emissions: Estimates and System Boundaries | 26

Methane and Resource Burden | 28

Interaction: From Climate to Loss, from Methane to Yields | 30

The Different Outcomes of Loss and Waste | 31

**FOOD IN THE CLIMATE REGIME:
FROM KORONIVIA TO ANTALYA | 35**

Food in Negotiated Texts (1992-2022) | 36

Voluntary Declarations and Limited Negotiated Outcomes (COP28-SB64) | 37

Decisions Open in Antalya (COP31) | 40

FLW in Nationally Determined Contributions | 42

The Measurement Gap | 45

FLW in Climate Finance | 47

COUNTRY EXPERIENCES: INSTRUMENTS AND OUTCOMES | 53

Binding Instruments: Targets, Bans and Fees | 53

Facilitative and Voluntary Instruments:
Laws, Incentives and Industry Agreements | 55

Interventions at the Consumption Stage | 57

Lessons for Türkiye | 58

TÜRKİYE: INSTITUTIONAL EXPERIENCE, MEASUREMENT AND COP31 | 63

Institutional Experience: Three Strands and the Next Step | 63

The Contribution of FLW to Food Security in Türkiye | 66

Data and Measurement | 67

FLW in Climate Commitments | 71

Hosting COP31: Linking the Two Themes | 73

CONCLUSION | 77

SUMMARY

Food loss and waste (FLW) is a problem at the intersection of climate change and food security. According to an estimate that the Intergovernmental Panel on Climate Change (IPCC) gives with *medium confidence*, FLW contributed 8-10 percent of total anthropogenic greenhouse gas emissions in the 2010-2016 period. This figure shows the footprint share of FLW in emissions, not its mitigation potential. According to the United Nations Environment Programme (UNEP), 1.05 billion tonnes of food were wasted in retail, food service and households in 2022. According to *The State of Food Security and Nutrition in the World* (SOFI) 2026, the number of people facing hunger in 2025 is estimated at 645 million. SOFI is the joint report of the Food and Agriculture Organization of the United Nations (FAO) and other United Nations (UN) agencies. This picture makes FLW prevention a policy area that can serve both goals at once. COP31, which Türkiye is hosting in Antalya on November 9-20, 2026, offers an important opportunity to link work in this area to the climate regime and to Türkiye's climate commitments.

The report argues that FLW prevention can serve both goals together, but that this will not happen on its own. Loss and waste

have different outcomes. In the climate regime, agriculture and food security have become institutionalized, while FLW has remained mostly in voluntary channels. Türkiye has more than a decade of experience in this area. The next step is to link this experience to a national measurement system and a measurable climate commitment. The main findings and recommendations of the report can be listed as follows:

- Loss and waste should be addressed through separate policies. In terms of emissions, the most reliable gain lies in reducing consumption-stage waste and methane from organic waste. The most direct gain from loss reduction, by contrast, is on the food security side. Its emissions effect varies with the product, price pass-through and the energy source of the cold chain, and in some cases it can increase total emissions. FLW prevention also has a cost on the producer side. Modeling by the Organisation for Economic Co-operation and Development (OECD) estimates that halving FLW would reduce net agricultural value added by about 4 percent.
- Food has become institutionalized in the climate regime, while FLW has remained in voluntary channels. In the negotiated texts reviewed, FLW appears only in one paragraph of decision 3/CP.27 of 2022. FLW language has developed mainly in the voluntary declarations of COP28 and COP29. At COP31, there are four decision points that could change this situation. These are the fate of the Sharm el-Sheikh joint work on agriculture and food security (SJWA) and the start of the second global stocktake (GST2). The other two are whether the mitigation work programme will be extended, and the renewal of the just transition work programme.
- FLW remains in the minority in national commitments, measurement and finance. Of the 116 new-generation nationally determined contributions (NDCs) reviewed by Climate Focus and the World Wide Fund for Nature (WWF), 33 contain an explicit measure targeting FLW. Only a small part of FAO's loss data is based on official reporting. Within agrifood climate finance, the item that includes FLW is the least funded area. Writing a target into the NDC does not guarantee that it will be met. It does, however, turn a measurement-based

target into an item that is reported under the transparency framework and undergoes expert review.

- Country experiences show that the outcome of an instrument can be demonstrated only through consistent measurement. There is limited evidence on whether binding targets and bans (the EU, France, South Korea) or framework laws and voluntary agreements (Japan, Norway, the United Kingdom) reduce waste more. The two countries that can show long-term results, Japan and the United Kingdom, rely on consistent time series. Increases in donations, by contrast, show rescued food, not prevented waste.
- Türkiye's experience of more than a decade has developed along three lines, namely campaigns, international initiatives and the institutional framework. This experience extends from the Campaign to Prevent Bread Waste in 2013 to the Climate Law of 2025. It includes the National Strategy Document on Prevention, Reduction and Monitoring of Food Loss and Waste and its Action Plan (National Strategy) of 2020. Türkiye included FLW in its updated NDC of 2023. An OECD survey covering 42 countries and the European Commission cited it as one of three countries that had done so. The NDC 3.0 of November 2025 left the methodological detail to the next biennial transparency report (BTR). The first step in linking this experience to measurement is a national measurement system and a base year. The National Strategy has already set out the division of tasks for this system.
- At COP31, the realistic goal is not a new obligation but commitments linked to measurement. The Presidency has defined FLW as a focus area under the Zero Waste and Methane Reduction theme of the COP31 Action Agenda, but it has not included FLW in the Food Security theme. The report proposes a mechanism that links the two themes through FLW and tracks loss and waste commitments separately. The mechanism would move to measurable targets once the base year has been measured and would provide for annual reporting after the COP. At the national level, the area that stands out is the fresh fruit and vegetable chain. This is where households waste the most and where the food security potential of loss reduction is highest.

The Action Agenda is based on voluntary initiatives and is not intended to create new obligations for countries. The proposed mechanism could help the steps taken during the hosting period continue after COP31. It could also turn the experience Türkiye has built up since 2013 into a model that other countries can draw on.

INTRODUCTION

Food loss and waste (FLW) is a large-scale problem that concerns both the climate agenda and the food security agenda. According to the estimate by Crippa and colleagues, food systems accounted for 34 percent (range 25-42 percent) of global anthropogenic greenhouse gas emissions in 2015.[1] According to the Intergovernmental Panel on Climate Change (IPCC), FLW contributed 8-10 percent of total anthropogenic emissions in the 2010-2016 period.[2] According to the UN Environment Programme (UNEP), 1.05 billion tonnes of food were wasted in retail, food service and households in 2022.[3] The number of people facing hunger in 2025 is estimated at 645 million (range 608-696 million).[4] Part of the food produced is lost before it is

1 Monica Crippa et al., "Food Systems Are Responsible for a Third of Global Anthropogenic GHG Emissions", *Nature Food* 2, no. 3 (2021): 198-209. The IPCC's approved 2019 text puts the food system share in the range of 21-37 percent (*medium confidence*). See IPCC, "Summary for Policymakers", in *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, ed. Priyadarshi R. Shukla et al. (IPCC, 2019), 8 (A.3).

2 The figure is given with *medium confidence*. IPCC, "Summary for Policymakers", 22 (B.6.3). The source of the figure and its system boundaries are discussed in the first section.

3 UNEP, *Food Waste Index Report 2024. Think Eat Save: Tracking Progress to Halve Global Food Waste* (Nairobi: UNEP, 2024), XII. For the share on the loss side, see the first section. The two shares cannot be added together.

4 FAO et al., *The State of Food Security and Nutrition in the World 2026: Understanding and Addressing the High Cost of a Healthy Diet* (Rome: FAO, 2026), xii.

consumed, while hundreds of millions of people cannot access sufficient food. Whether FLW prevention delivers gains in both areas at once depends on the stage and the instrument of the intervention.

The climate regime put food on its agenda from the very beginning, through food production. The United Nations Framework Convention on Climate Change (UNFCCC) provides for the stabilization of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. Under the Convention, this level should be achieved within a time frame that ensures food production is not threatened. The Paris Agreement also recognizes safeguarding food security and ending hunger as a fundamental priority.[5] In the negotiations, agriculture and food security became a joint work item of the two subsidiary bodies through the Koronivia joint work on agriculture (KJWA) (4/CP.23). It was adopted at the 23rd session of the Conference of the Parties (COP) to the UNFCCC in 2017. In 2022, it was given a four-year timeline through the Sharm el-Sheikh joint work on implementation of climate action on agriculture and food security (SJWA), established by decision 3/CP.27. The place of FLW in this process, however, is limited. Among the negotiated texts reviewed, FLW appears only in the paragraph of decision 3/CP.27 that notes the Koronivia outcomes. It does not appear in the decision on the first global stocktake or in the Global Mutirão decision (1/CMA.7) adopted at COP30.[6] The picture is similar in national commitments. According to the assessment by Climate Focus and the World Wide Fund for Nature (WWF), 33 of the 116 new-generation nationally determined contributions (NDCs) reviewed as of May 2026 contain an explicit measure to prevent or reduce FLW.[7]

5 United Nations, "United Nations Framework Convention on Climate Change" (New York, May 9, 1992), art. 2; United Nations, "Paris Agreement" (Paris, December 12, 2015), preamble.

6 UNFCCC, Decision 3/CP.27, "Sharm el-Sheikh Joint Work on Implementation of Climate Action on Agriculture and Food Security", FCCC/CP/2022/10/Add.1, March 17, 2023, 18, para. 2(t). For the texts screened and the scope of the screening, see the second section and Table 2. The decision numbers cited in the report show the body that adopted the decision and the session. For example, 3/CP.27 is decision 3, adopted at the 27th session of the COP. 1/CMA.7 is decision 1, adopted at the 7th session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA), held in Belém together with COP30.

7 Haseeb Bakhtary et al., "Food Forward NDCs: An Assessment of Nationally Determined Contributions (NDCs) 3.0", policy brief (Climate Focus and WWF, June 2026), 6, 12, accessed October 27, 2026, https://climatefocus.com/publications/foodforwardndcs2026/. For other counts based on different criteria, see Table 3. In the international literature, this latest round of NDCs is called NDC 3.0, and the report uses the same name (UKB 3.0 in the Turkish original).

COP31 in November 2026 is a suitable time to build this link, for two reasons. The first is the climate regime's own calendar. The progress and outcomes of the SJWA, the continuation of the Koronivia process, will be reported to COP31.[8] Meeting in Bonn in June 2026, the subsidiary bodies left the consideration of the SJWA reports to the 65th sessions of the UNFCCC subsidiary bodies (SB65), to be held in Antalya in November 2026.[9] The second global stocktake (GST2) will also begin at the 8th session (CMA8) of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA). CMA8 will meet alongside COP31, and GST2 will be completed in 2028.[10] Decisions on the institutional future of food and agriculture in the climate regime are on the COP31 agenda.

The second is Türkiye's hosting of COP31. COP31 will be held in Antalya on November 9-20, 2026. Türkiye runs the COP31 Presidency, the World Leaders' Summit and the Action Agenda, while the President of Negotiations from Australia leads the negotiations.[11] The Presidency has given FLW a place in the Action Agenda. Under the agenda's Zero Waste and Methane Reduction theme (Zero Waste theme for short), food waste prevention has been defined as a focus area. The aim is to bring countries and the private sector together around measurable commitments.[12] Food Security, by contrast, is a separate theme, and FLW is not among its focus areas.[13] If the two themes are linked through FLW, the Presidency can make progress in both.

8 UNFCCC, Decision 3/CP.27, 19-20, para. 14 and 20.

9 SBSTA, "Report of the Subsidiary Body for Scientific and Technological Advice on Its Sixty-Fourth Session, Held in Bonn from 8 to 18 June 2026", FCCC/SBSTA/2026/5, August 28, 2026 (advance version), 13-14, para. 79, 83 and 88; "Issues Related to Agriculture and Food Security", UNFCCC, accessed October 12, 2026, https://unfccc.int/topics/land-use/workstreams/agriculture.

10 UNFCCC, Decision 1/CMA.5, "Outcome of the First Global Stocktake", FCCC/PA/CMA/2023/16/Add.1, March 15, 2024, 21, para. 194; "The Second Global Stocktake", UNFCCC, accessed October 12, 2026, https://unfccc.int/topics/global-stocktake/about-the-global-stocktake/the-second-global-stocktake.

11 "COP31", UNFCCC, conference page, accessed October 12, 2026, https://unfccc.int/cop31; "COP31 President-Designate Kurum Sends First Official Letter to UN Secretariat and States Parties", Directorate of Climate Change, April 15, 2026, accessed October 12, 2026, https://iklim.gov.tr/en/cop31-president-designate-kurum-sends-first-official-letter-to-un-secretariat-and-states-parties-news-4905.

12 "Zero Waste", COP31 Türkiye Presidency, COP31 Türkiye Action Agenda, accessed October 12, 2026, https://cop31.tr/action-plan/zero-waste. For the full name of the theme, see Murat Kurum, "COP31 Presidency's 3rd Letter to the Parties", COP31 Presidency, August 28, 2026, 3, accessed October 27, 2026, https://unfccc.int/sites/default/files/resource/cop31_3rd_presidency_letter.pdf.

13 "Food Security", COP31 Türkiye Presidency, COP31 Türkiye Action Agenda, accessed October 12, 2026, https://cop31.tr/action-plan/food-security.

The report asks under what conditions FLW prevention serves climate and food security goals at the same time. It also asks how this link can be built in 2026, both in the climate regime and in Türkiye's policy documents. The report argues that FLW prevention can serve both goals together, but that this depends on two conditions. The first condition is that loss and waste be addressed through separate policies, because their returns and trade-offs differ. In terms of emissions, the most reliable improvement lies in reducing consumption-stage waste and methane from organic waste. The most direct positive effect of loss reduction, by contrast, is on the food security side.[14] The second condition is that FLW become a trackable item in climate policy. The first step toward this is national measurement. Without measurement, a target in the NDC cannot be tracked. A statement of finance needs also rests on a cost estimate. A measurable commitment and a statement of finance needs in the NDC, in turn, link measured progress to the transparency framework and to climate finance. During its hosting of COP31, Türkiye can link its experience of more than a decade to this framework.

The report is based on document analysis. It draws on official texts, the reports and databases of international organizations, and peer-reviewed academic literature, with priority given to primary sources.[15] The report does not collect primary data, and FLW data rest largely on modeled estimates.

14 This assessment is the report's own. For its basis, see Andrea Cattaneo et al., "The Environmental Impact of Reducing Food Loss and Waste: A Critical Assessment", *Food Policy* 98 (2021): 101890, pp. 1, 12; Andrea Cattaneo et al., "Reducing Food Loss and Waste: Five Challenges for Policy and Research", *Food Policy* 98 (2021): 101974, pp. 3, 5; FAO, *Achieving SDG 2 without Breaching the 1.5 °C Threshold: A Global Roadmap, Part 1 – How Agrifood Systems Transformation through Accelerated Climate Actions Will Help Achieving Food Security and Nutrition, Today and Tomorrow, In Brief* (Rome: FAO, 2023), 29; Brent R. Heard and Shelie A. Miller, "Potential Changes in Greenhouse Gas Emissions from Refrigerated Supply Chain Introduction in a Developing Food System", *Environmental Science & Technology* 53, no. 1 (2019): 251-260, abstract. For methane from organic waste, see UNEP and CCAC, *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions* (Nairobi: UNEP, 2021), 9, 114. See also the first section.

15 The official texts used are the UNFCCC, the Paris Agreement, COP and CMA decisions, conclusions of the subsidiary bodies, COP31 Presidency documents, Türkiye's NDCs and its biennial transparency report (BTR), plan and strategy documents, and national legislation. Secondary and advocacy sources are used with their nature stated. The report covers sources available as of October 27, 2026. The content of undated web pages may have changed after this date. Figures from different editions are not compared. For example, the SOFI report asks readers not to compare figures published in different editions. See FAO et al., *SOFI 2026*, 5. In this report, the figures on hunger and on access to a healthy diet are taken only from the 2026 edition. The findings on food prices are based on SOFI 2025 (see the first section). The report expands a SETA Odak article by one of the authors, Karakaş. See Uluç Karakaş, "Gıda Güvenliği, Gıda İsrafı ve İklim Diplomasisi: Tarladan Sofraya İklim Değişikliği ile Mücadele" [Food Security, Food Waste and Climate Diplomacy: Fighting Climate Change from Farm to Fork], *SETA Odak*, July 25, 2026, accessed October 12, 2026, https://www.setav.org/gida-guvenligi-gida-israfi-ve-iklim-diplomasisi-tarladan-sofraya-iklim-degisikligi-ile-mucadele.

For this reason, each figure is given with its year, scope and denominator. Figures that measure different stages, denominators or system boundaries are not added together. The word *waste* in the title is used in its broad public sense. The report distinguishes between loss and waste.

The report consists of four sections. The first section defines the concepts of food security and FLW and the measurement problem. It then addresses the effects of climate change on food security and the climate burden of FLW. The main finding of the section is that loss and waste have different outcomes for climate and food security. The second section traces the course of food in the climate regime from Koronivia to COP31. It then examines the place of FLW in NDCs, measurement and climate finance. The third section compares the instruments of selected countries in two groups, binding instruments and facilitative and voluntary instruments. The fourth section assesses Türkiye's institutional experience, data situation, climate commitments and hosting of COP31. The conclusion brings the findings together, discusses what can be achieved for FLW in Antalya and sets out recommendations for Türkiye.

FOOD LOSS AND WASTE: DIVERGENT EFFECTS ON CLIMATE AND FOOD SECURITY

Preventing food loss and waste is an area where climate and food security policies intersect. However, loss and waste have different outcomes in these two areas. In terms of emissions, the most reliable gain lies in reducing consumption-stage waste and methane from organic waste. In terms of food security, the most direct gain is on the loss side. This section first defines the concepts of food security and FLW and the measurement problem. It then addresses the effects of climate change on food security, the climate burden of FLW and the different outcomes of loss and waste.

Food Security: Definition and Dimensions

The concept of food security was first defined in terms of the adequacy of global supply. The 1974 World Food Conference framed the concept as the availability of adequate world supplies of basic foodstuffs at all times and the offsetting of fluctuations in production and prices. However, the availability of food alone is not enough to explain hunger. For this reason, the UN Food and Agriculture Organization (FAO) added physical

and economic access to the definition in 1983.[16] The 1996 World Food Summit Plan of Action laid the foundation of the definition widely used today. Under this definition, food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.[17] In 2001, FAO also added social access to the definition. This version is the most widely used definition today.[18] This report also takes the 2001 version as its basis.[19]

The definition is made operational through four dimensions. These are availability, access, utilization and stability. Availability refers to the supply of food of sufficient quantity and quality through domestic production or imports. Access refers to the ability to reach food economically, socially and physically. Utilization covers achieving nutritional well-being through an adequate diet, clean water, sanitation and health care. Stability covers the ability to maintain these conditions in the face of sudden shocks or cyclical events.[20] The High Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security (CFS) argues that the concept has expanded to include the dimensions of agency and sustainability. Sustainability is the ability to provide food security in the long term without compromising the economic, social and environmental bases that generate food security for future generations.[21] The stability dimension was added to the definition for short-term disruptions such as conflict, disasters or market turmoil. Long-term trends such as climate change and the degradation of natural resources, however, are not easily captured by this dimension. For

16 Amartya Sen's studies of famine showed that the availability of food alone is not enough to explain hunger. HLPE, *Food Security and Nutrition: Building a Global Narrative towards 2030*, HLPE Report 15 (Rome: Committee on World Food Security, 2020), 6-7.

17 FAO, *Rome Declaration on World Food Security and World Food Summit Plan of Action* (Rome: FAO, 1996), Plan of Action, para. 1.

18 According to the High Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security, this version is today the most authoritative and most widely used definition. HLPE, *Food Security and Nutrition*, 7. For this form of the definition, see FAO, *The State of Food Insecurity in the World 2001* (Rome: FAO, 2001), 49 (Glossary).

19 In the Turkish original, the report uses gıda güvenliği as the equivalent of food security and gıda emniyeti as the equivalent of food safety. The Turkish literature uses different equivalents, so the report follows Karakaş's choice. See Karakaş, "Gıda Güvenliği, Gıda İsrafı" [Food Security, Food Waste], n. 2.

20 HLPE, *Food Security and Nutrition*, 7, 10 (Box 1).

21 HLPE, *Food Security and Nutrition*, xv, 8-9.

this reason, the Panel considers it necessary to include sustainability in the concept.[22] The Panel also lists food loss and waste among the problems that significantly affect availability.[23] FLW prevention connects to food security through more than one dimension. It affects effective supply under availability, the cost and price of food under access, resilience to shocks under stability, and the resource burden of the food system under sustainability.[24]

BOX 1. The Securitization of Food and the Concept of Food Security

In security studies, securitization is a concept that explains how an issue is constructed as an existential threat and how this often triggers extraordinary political responses. Drawing on securitization theory, Mangnus and Candel distinguish four dimensions. These are the securitizing move, interaction with the audience, context and outcome.[25]

The authors applied this framework to the food policy of the European Union (EU). After the start of the war in Ukraine and the spike in commodity prices, the European Commission framed the vulnerabilities of the food system, including its dependence on imported energy, fertilizer and feed, as an existential threat. This was followed by steps such as the withdrawal of the proposed regulation on the sustainable use of pesticides. According to the authors, these steps effectively dismantled the Farm to Fork Strategy's claim to systemic transformation.[26] According to Mangnus and Candel, securitization is not the only cause of these reversals, but it has acted as a factor that strongly amplified them. In their view, securitization tends to reduce complex problems to a binary of threat and emergency response. It puts short-term solutions and technocratic control ahead of deliberation and structural reform. As the authors note with reference to Lang and Barling, the concept of food security has also long been criticized for prioritizing supply-side solutions and pushing issues of power, access and social justice into the background.[27]

Daoudy and colleagues see the question of for whom security is defined, that is, the referent object, as decisive. Traditional security studies take the nation-state as the referent object, while the human security approach focuses on the well-being of communities and individuals. The authors describe the securiti-

22 HLPE, *Food Security and Nutrition*, 9.

23 HLPE, *Food Security and Nutrition*, 22, 28.

24 This assessment is the report's own. For its basis, see HLPE, *Food Security and Nutrition*, 9, 22, 28, 42; FAO et al., *SOFI 2026*, 87; and the sources cited in the first section on climate impacts and methane.

25 Ellen Mangnus and Jeroen Candel, "Food Securitization and the Unmaking of European Food Policy Reform", *Nature Food* 6, no. 10 (2025): 910.

26 Mangnus and Candel, "Food Securitization", 911.

27 Mangnus and Candel, "Food Securitization", 910-912.

zation of climate change as a threat to humanity as a double-edged sword. In their view, this discourse raises awareness, but the climate-conflict narrative can obscure the part played by domestic policy choices.[28] This report uses food security not as a state-centered security issue but in the sense of the FAO definition, namely access by all people at all times to sufficient food.[29] This choice is close to the human security approach. The report treats FLW prevention as an instrument that can increase effective food supply without a proportional increase in agricultural production and can help lower the cost of a healthy diet.[30] Because this instrument works through efficiency and requires no extraordinary measures, it can complement the production-focused responses that come to the fore in times of crisis.[31]

Food Loss and Food Waste: Definition and Measurement

Sustainable Development Goal (SDG) Target 12.3 calls for halving per capita global food waste at the retail and consumer levels by 2030 and reducing food losses along production and supply chains, including post-harvest losses.[32] The target is not equally ambitious for the two phenomena. A numerical target was set for waste, while only a reduction was called for in the case of loss. The two phenomena are also tracked with separate indicators. Loss is tracked with FAO's Food Loss Index for the stages from post-harvest up to retail.[33] Waste is tracked with UNEP's Food Waste Index in retail, food service and households.[34] What the two indicators measure is also different. The loss index tracks the change in percentage loss

28 Marwa Daoudy et al., "What Is Climate Security? Framing Risks around Water, Food, and Migration in the Middle East and North Africa", *WIREs Water* 9, no. 3 (2022): e1582, pp. 2-3.

29 FAO, *State of Food Insecurity 2001*, 49 (Glossary).

30 This is the assessment of FAO and the other organizations. FAO et al., *SOFI 2026*, 87.

31 This assessment is the report's own. For its basis, see Mangnus and Candel, "Food Securitization", 910-912; FAO et al., *SOFI 2026*, 87.

32 UNEP, "SDG Indicator Metadata: Indicator 12.3.1(b) Food Waste Index", last updated July 29, 2024, section 0.b, accessed October 27, 2026, https://unstats.un.org/sdgs/metadata/files/Metadata-12-03-01b.pdf.

33 The Food Loss Index (SDG 12.3.1a) tracks the quantities of food that leave the supply chain entirely from post-harvest or post-slaughter up to retail (retail excluded) and do not go to another use, such as feed or industry. The indicator measures only quantitative loss. Qualitative and economic losses are outside its scope. FAO, "SDG Indicator Metadata: Indicator 12.3.1(a) Food Loss Index", last updated November 4, 2025, sections 2.a, 4.b, accessed October 27, 2026, https://unstats.un.org/sdgs/metadata/files/Metadata-12-03-01a.pdf.

34 The Food Waste Index (SDG 12.3.1b) covers food, and the associated inedible parts, removed from the human food supply chain in retail, food service and households. Removal refers to destinations such as landfill, compost, anaerobic digestion, sewer or controlled combustion. UNEP, *Food Waste Index Report 2024*, V.

for a basket of commodities, while the waste index measures the total mass of waste.[35]

For this reason, the two indices cannot be added together.[36] Nor can the common public claim that one-third of the food produced is lost or wasted be derived from the sum of the two rates. This figure is based on a 2011 FAO estimate. Although the need for more data was stressed, it is used in policy debates as if it were an established fact.[37] The real problem is measurement. Estimates based on modeling from other countries' data are enough to show the scale of the problem, but not to track change over time. That requires direct national measurement.[38] Country estimates can also have large margins of error.[39] The loss index, for its part, cannot be published at the country level with the available data and is calculated only at the regional and commodity group level.[40]

Effects of Climate Change on Food Security

Climate change affects food security through more than one channel. Through its direct effects on food production, it is expected to increase the undernourished population and to create knock-on effects on food prices and household incomes.[41] The literature, however, long focused on the first of these effects, that is, the availability dimension, and the stability dimen-

35 The loss index tracks the change in percentage loss for a basket of ten key commodities relative to a base period. "12.3.1 Global Food Losses", FAO, SDG Indicators Data Portal, accessed October 12, 2026, https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1231-global-food-losses/en/; UNEP, *Food Waste Index Report 2024*, V.

36 According to UNEP, the two indices rest on different reference points. UNEP, *Food Waste Index Report 2024*, XVII; also XII, n. 2.

37 The assessment is that of Cattaneo and colleagues. Cattaneo et al., "Reducing Food Loss and Waste", 1.

38 UNEP classifies waste estimates into three levels. Level 1 rests on modeling from other countries' data. Level 2 is direct national measurement and meets the monitoring requirement of SDG 12.3. Level 3 adds further disaggregation to this measurement, such as by destination and by edible part. UNEP, *Food Waste Index Report 2024*, 4. The SDG 12.3.1(b) metadata defines the same distinction as two levels (I and II). See UNEP, "Indicator 12.3.1(b)", section 2.a, Table 1.

39 Random error in country estimates can be, for example, around 25 percent. UNEP, "Indicator 12.3.1(b)", section 4.b.

40 FAO, "Indicator 12.3.1(a)", section 4.j; FAO, "12.3.1 Global Food Losses".

41 This is an IPCC assessment (*high confidence*). Rachel Bezner Kerr et al., "Food, Fibre, and Other Ecosystem Products", in *Climate Change 2022: Impacts, Adaptation and Vulnerability*, ed. Hans-Otto Pörtner et al. (Cambridge: Cambridge University Press, 2022), 725.

sion has been studied relatively little.[42] Below, these effects are discussed in turn across the four dimensions. Because FLW prevention protects food that has already been produced, it can affect the availability, access and stability dimensions together.

Although global hunger has improved slightly in recent years, hunger is becoming regionally concentrated. According to *The State of Food Security and Nutrition in the World* (SOFI) 2026, the joint report of FAO and other UN agencies, about 645 million people faced hunger in 2025. In Asia, the subregion where the prevalence of hunger is highest and still rising is Western Asia.[43] Access to a healthy diet is a much wider problem. About one-third of the world's population cannot afford a healthy diet.[44]

The effect of climate change on food availability is already visible. Human-induced warming has slowed the growth of agricultural productivity in mid and low latitudes over the past 50 years. Droughts, floods and marine heatwaves also contribute to reduced food availability and higher prices.[45] This effect is not evenly distributed geographically. The Mediterranean Basin, which includes Türkiye, is a hotspot of highly interconnected climate risks. In the region, surface temperature has risen by 1.5°C compared with the pre-industrial period. Precipitation is *likely* to decrease in most areas, by 4 to 22 percent depending on the emissions scenario.[46] Findings specific to Türkiye point in the same direction. About half of Türkiye's land is moderately or highly susceptible to desertification, and a marked decrease in precipitation has been projected for almost the entire country in the 2021-

42 According to this 2013 review, 70 percent of publications on the topic addressed availability. The stability dimension was examined in only 4.2 percent of them. Tim Wheeler and Joachim von Braun, "Climate Change Impacts on Global Food Security", *Science* 341, no. 6145 (2013): 510.

43 The estimate range is 608-696 million. The point estimate is 7.8 percent of the world population. FAO et al., *SOFI 2026*, xii. In the region, this share rose from 9.3 percent in 2015 to 13.0 percent in 2025. FAO et al., *SOFI 2026*, 7. SOFI revises its hunger series retroactively every year. For this reason, the figures on hunger and on access to a healthy diet are taken only from the 2026 edition, while the findings on food prices are based on SOFI 2025. FAO et al., *SOFI 2026*, 5.

44 The number of people unable to afford a healthy diet was 2.69 billion in 2025, equal to 32.7 percent of the world population. FAO et al., *SOFI 2026*, xiii.

45 These are IPCC findings. *Medium confidence* is given for the slowdown in productivity growth, and *high confidence* for the impact of droughts, floods and marine heatwaves. Bezner Kerr et al., "Food, Fibre", 717.

46 These are IPCC findings. *High confidence* is given for the temperature increase, and *medium confidence* for the decrease in precipitation. Elham Ali et al., "Cross-Chapter Paper 4: Mediterranean Region", in *Climate Change 2022: Impacts, Adaptation and Vulnerability*, ed. Hans-Otto Pörtner et al. (Cambridge: Cambridge University Press, 2022), 2235.

2050 period.[47] The warming of about 1.5°C observed over the last 25 years is estimated to have led to a loss of about 9 percent in wheat yields.[48] In its NDC 3.0, Türkiye also expects warming above the global average and more frequent and longer droughts (see Box 2).[49]

Reduced availability passes through to access via prices and hits low-income households hardest. Low-income urban and rural households that are net food buyers reduce their consumption of various food groups when prices rise.[50] A 10 percent increase in food prices is estimated to be associated with a 3.5 percent increase in moderate or severe food insecurity.[51] The size of the effect is therefore closely related to the share of income spent on food. The Organisation for Economic Co-operation and Development (OECD) and FAO state that in Europe and Central Asia, the 2021-2023 price increase hit hardest the countries and households where this share is high. The share of food in household expenditure is about 16 percent in Türkiye and about 6 percent in the United Kingdom.[52]

Climate change affects the utilization dimension through nutritional quality. Rising atmospheric carbon dioxide directly contributes to lower food quality by reducing levels of protein, iron, zinc and some vitamins.[53] In this way, nutritional quality can fall even when calories are sufficient.

The stability dimension refers to the uninterrupted availability of and access to food. As extreme events become more frequent, the stability of food supply is projected to decline.[54] A recent period offers an example. When the

47 According to data cited by the IPCC, the area prone to desertification is 48.6 percent of Türkiye's land. Alisher Mirzabaev et al., "Desertification", in *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, ed. Priyadarshi R. Shukla et al. (IPCC, 2019), 264, 278.

48 This study uses 1995-2019 data for 820 districts of Türkiye. Alper Demirdogen et al., "The Impact of Climate Change on Wheat in Turkey", *Regional Environmental Change* 24, no. 1 (2024): 1-2, 5.

49 Republic of Türkiye, *The Second Nationally Determined Contribution (NDC 3.0)* (Bonn: UNFCCC, November 2025), 11.

50 This is an IPCC finding (*high confidence*). Bezner Kerr et al., "Food, Fibre", 796.

51 This is an estimate of SOFI 2025. FAO et al., *The State of Food Security and Nutrition in the World 2025: Addressing High Food Price Inflation for Food Security and Nutrition* (Rome: FAO, 2025), xiii.

52 OECD and FAO, *OECD-FAO Agricultural Outlook 2024-2033* (Paris: OECD Publishing; Rome: FAO, 2024), 97. The figure is the 2021-2023 average. OECD and FAO, *Agricultural Outlook 2024-2033*, 97.

53 This is an IPCC finding (*high confidence*). Bezner Kerr et al., "Food, Fibre", 798.

54 Cheikh Mbow et al., "Food Security", in *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, ed. Priyadarshi R. Shukla et al. (IPCC, 2019), 443 (Table 5.1). This is an IPCC projection. IPCC, "Summary for Policymakers", 15.

pandemic and the war in Ukraine combined with extreme weather events, global agricultural commodity prices peaked in March 2022. Median global food price inflation returned to pre-pandemic levels only in 2024.[55] In this period, the effect of the shock on food security showed up in prices. Not every climate shock produces the same price effect, because the effect varies with the type of event, macroeconomic conditions and the fiscal capacity of countries.[56] Still, sudden food production losses have become more frequent since at least the mid-20th century, and this makes stability a policy area of its own.[57]

Protecting food that has already been produced is also among the instruments for stability and adaptation. For the stability dimension, the IPCC lists infrastructure investment, the reorganization of markets and trade, and the reduction of food loss and waste among examples of adaptation and mitigation.[58] Dietary change and the reduction of food waste are also among the adaptation options proposed for the Mediterranean.[59] Reducing FLW can increase effective food supply without the need for a proportional increase in agricultural production, and it can lower the cost of a healthy diet.[60] This effect does not occur in every case, however. A decrease in FLW does not always replace an equivalent amount of food production.[61] The conditions under which the effect occurs are discussed at the end of this section.

BOX 2. Türkiye in 2025: Drought and Agricultural Frost

What happened in Türkiye in 2025 is consistent with the projections reported above. According to the Turkish State Meteorological Service (MGM), Türkiye's average temperature in 2025 was 15.1°C, 1.2°C above the 1991-2020 average. Areal precipitation was 414.9 mm, 27.6 percent below average,

55 FAO et al., *SOFI 2025*, 41. Median global food price inflation rose from 2.3 percent in December 2020 to 13.6 percent in January 2023. FAO et al., *SOFI 2025*, xiii.

56 This is a finding of SOFI 2025. FAO et al., *SOFI 2025*, 53.

57 This assessment is the report's own. For the finding that sudden production losses are becoming more frequent, see Bezner Kerr et al., "Food, Fibre", 717.

58 Mbow et al., "Food Security", 443.

59 Ali et al., "Cross-Chapter Paper 4: Mediterranean Region", 2249.

60 This is the assessment of SOFI 2026. FAO et al., *SOFI 2026*, 87.

61 This is the World Bank's assessment. World Bank, *Addressing Food Loss and Waste: A Global Problem with Local Solutions* (Washington, DC: World Bank, 2020), xiii.

and 2025 was the driest year since 1964.[62] The agricultural frost in the second week of April damaged many crops, especially apricots and hazelnuts. A parliamentary inquiry committee on the issue was set up in the Grand National Assembly of Türkiye (GNAT).[63] According to Turkish Statistical Institute (TurkStat) data, production of cereals and other crop products (excluding fodder crops) fell by 9 percent in 2025 compared with the previous year. Production of fruits, beverage and spice crops fell by 30.9 percent. Wheat production fell by 13.7 percent to 17.9 million tonnes, while hazelnut production dropped by 38.5 percent and apple production by 48.3 percent.[64] After TurkStat released its second estimates in October 2025, Minister of Agriculture and Forestry Yumaklı stated that the situation was under control thanks to strong stocks and foreign trade measures taken as needed. He added that there was no risk to the country's food needs. Yumaklı also announced that a total of TL 46.5 billion would be paid to producers affected by the frost damage.[65] The Climate Change Adaptation Strategy and Action Plan (2024-2030) cites an estimate based on the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). According to this estimate, drought-related economic losses have been calculated at 1.2 percent of gross domestic product (GDP).[66] The decreases in the TurkStat data are annual changes in production. They are not post-harvest food loss in the sense of the SDG 12.3.1a Food Loss Index.[67]

The Scale of the Problem

The relationship between FLW and climate change runs in both directions. FLW contributes to emissions. Climate change, in turn, can increase food losses by affecting spoilage in storage and transport. Reducing FLW is a miti-

62 Ministry of Environment, Urbanization and Climate Change, Turkish State Meteorological Service (MGM), *2025 Yılı Türkiye İklim Değerlendirmesi* [Türkiye Climate Assessment for 2025] (Ankara: MGM, February 2026), 1, 23.

63 MGM, *2025 Yılı Türkiye İklim Değerlendirmesi* [Türkiye Climate Assessment for 2025], 29.

64 "Bitkisel Üretim İstatistikleri, 2025" [Crop Production Statistics, 2025], TurkStat, News Bulletin 53939, December 26, 2025, accessed October 14, 2026, https://veriportali.tuik.gov.tr/tr/press/53939.

65 "Bakan Yumaklı: Gıda İhtiyacında Risk Oluşması Söz Konusu Değildir" [Minister Yumaklı: There Is No Risk to Meeting Food Needs], DHA, October 24, 2025, accessed October 12, 2026, https://www.dha.com.tr/ekonomi/bakan-yumakli-gida-ihtiyacinda-risk-olusmasi-soz-konusu-degildir-2745263.

66 Ministry of Environment, Urbanization and Climate Change, Directorate of Climate Change, *Climate Change Adaptation Strategy and Action Plan (2024-2030)* (Ankara: Directorate of Climate Change, 2024), 28-29, 376-377. On p. 375 of the same document, however, the share of drought is given as 1.6 percent of GDP ($12.352 billion), based on the average annual loss (AAL) values calculated for Türkiye.

67 FAO, "Indicator 12.3.1(a)", sections 2.a, 4.b.

gation measure with synergies for food security and land use.[68] However, the policy value of this relationship is not the same for loss and for waste. This difference is discussed at the end of the section.

In 2022, 1.05 billion tonnes of food were wasted in retail, food service and households. This amount corresponds to 132 kilograms per capita per year and to about 19 percent of the food available to consumers.[69] Of this waste, 60 percent occurs in households, 28 percent in food service and 12 percent in retail.[70] The share of food lost from post-harvest up to retail was 13.3 percent in 2023. No clear progress has been made in reducing losses since monitoring began in 2015.[71]

The loss rate is calculated against food produced, and the waste rate against food available to consumers. For this reason, the two rates are not added together.[72] The IPCC estimate can serve as a combined indicator. According to this estimate, 25-30 percent of all food produced is lost or wasted.[73]

Emissions: Estimates and System Boundaries

For the emission share of FLW, the starting point of this report is the IPCC assessment. According to this assessment, global FLW contributed 8-10 percent of total anthropogenic greenhouse gas emissions in 2010-2016.[74] This figure should be read with two caveats. First, the figure is not the IPCC's own calculation. It is based on FAO's 2013 and 2014 *Food Wastage Footprint*

68 This is an IPCC assessment (*robust evidence, medium agreement*). Mbow et al., "Food Security", 443 (Table 5.1), 463, 492.

69 This is a UNEP estimate. UNEP, *Food Waste Index Report 2024*, XII.

70 In absolute terms, the amounts are 631 million tonnes in households, 290 million tonnes in food service and 131 million tonnes in retail. UNEP, *Food Waste Index Report 2024*, XII (Table 1), 46 (Table 23).

71 According to the assessment text on FAO's data portal, the share was 13.0 percent in 2015. FAO, "12.3.1 Global Food Losses"; United Nations, "The Sustainable Development Goals Report 2026" (New York: UN, 2026), 33.

72 UNEP, *Food Waste Index Report 2024*, XII (n. 2), XVII.

73 This is the estimate in the approved Summary for Policymakers (SPM) of the IPCC's 2019 Special Report on Climate Change and Land (*medium confidence*). IPCC, "Summary for Policymakers", 22 (B.6.3).

74 The figure is given with *medium confidence* in the SPM, which is approved line by line. IPCC, "Summary for Policymakers", 22 (B.6.3); for the approval process, IPCC, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, ed. Priyadarshi R. Shukla et al. (IPCC, 2019), VI; Mbow et al., "Food Security", 440.

studies.[75] The 2013 FAO report, for its part, gives an absolute value rather than a percentage.[76] Second, the 8-10 percent figure shows the footprint share of FLW in total emissions. It does not show an achievable mitigation potential. The calculation that eliminating FLW would cut global emissions by 8 percent rests on extreme assumptions, such as unchanged consumption and full price pass-through.[77]

Other estimates in the peer-reviewed literature span a wide range (Table 1). One estimate based on an input-output model put the emissions embedded in FLW in 2014 at about 4.4 percent of global emissions.[78] A calculation covering only the production stage up to the farm gate found 2.2 billion tonnes of CO2 equivalent for 2011.[79] An accounting that also covers the supply chain and waste management reached 9.3 billion tonnes for 2017, or about half of food system emissions.[80] In 2026, the same research group put this share at about 19 percent of global anthropogenic emissions.[81] The differences stem mainly from system boundaries, denominators and data years. This report uses the IPCC figure of 8-10 percent as its main figure.

75 In the chapter text of the same report, the figure is given at one point with *low confidence*. Mbow et al., "Food Security", 479, 492, 531.

76 This value is 3.3 billion tonnes of carbon dioxide equivalent (CO2e), excluding land-use change. FAO, *Food Wastage Footprint: Impacts on Natural Resources. Summary Report* (Rome: FAO, 2013), 6, 17.

77 This observation comes from Cattaneo and colleagues. Cattaneo et al., "Environmental Impact", 2.

78 This is the estimate of Gatto and Chepeliev. The absolute value is 1.8 billion tonnes of CO2 equivalent. Alessandro Gatto and Maksym Chepeliev, "Global Food Loss and Waste Estimates Show Increasing Nutritional and Environmental Pressures", *Nature Food* 5, no. 2 (2024): 141-142 (Table 1), 146.

79 This is the calculation of Porter and colleagues. Storage, transport, processing and waste management are not included in it. Stephen D. Porter et al., "A Half-Century of Production-Phase Greenhouse Gas Emissions from Food Loss & Waste in the Global Food Supply Chain", *Science of the Total Environment* 571 (2016): 721-722.

80 This is based on the abstract of the article by Zhu and colleagues. Jingyu Zhu et al., "Cradle-to-Grave Emissions from Food Loss and Waste Represent Half of Total Greenhouse Gas Emissions from Food Systems", *Nature Food* 4, no. 3 (2023): 247-256, abstract.

81 This is the study by Yin and colleagues. Ke Yin et al., "Misbehaviour Dominates GHG Emissions from Food Loss and Waste", *Nature Climate Change* 16, no. 4 (2026): 424-425.

TABLE 1. FLW EMISSION ESTIMATES AND THE REASONS FOR THEIR DIFFERENCES

Source	Data year	Magnitude	Denominator	Scope and note
IPCC (2019; SPM B.6.3 and Mbow et al.)	2010-2016	8-10%	Total anthropogenic emissions	Based on FAO's 2013 and 2014 *Food Wastage Footprint* estimates; *medium confidence* in the SPM, *low confidence* in the chapter text (p. 479)
FAO (2013)	2007	3.3 Gt CO2e	(no percentage given)	Excluding land-use change
Porter et al. (2016)	2011	2.2 Gt CO2e	(no percentage given)	Production stage only (up to the farm gate)
Gatto and Chepeliev (2024)	2014	1.8 Gt CO2e; about 4.4%	Global greenhouse gas emissions	Input-output model; emissions embedded in production
Zhu et al. (2023), based on the abstract	2017	9.3 Gt CO2e; ~half of food system emissions	Food system emissions	Including supply chain and waste management
Yin et al. (2026)	2021	6.9 Gt CO2e; about 19%	Global anthropogenic emissions	Broad system boundary; same research group as Zhu et al.
FAO (2023)	(not specified)	8%	Agrifood system emissions	Food waste in landfills only

Source: Compiled by the authors.[82]
* The differences stem mainly from system boundaries, denominators and data years; the figures cannot be added together.
** Gt CO_2e: billion tonnes of carbon dioxide equivalent

Methane and Resource Burden

One of the prominent parts of the climate burden of FLW is methane from organic waste in landfills. Because methane is short-lived in the atmosphere, cutting it affects warming relatively quickly. Landfills and wastewater account for about 20 percent of global anthropogenic methane emissions.[83] This share is not limited to food waste. It covers all landfill and wastewater sources. The share of methane from ruminant livestock and rice cultivation attributable to lost and wasted food is, by a rough

82 For the sources in the table, see nn. 74, 76, 78, 79, 80, 81; FAO, *Achieving SDG 2*, 29.

83 This is the estimate of UNEP and the Climate and Clean Air Coalition (CCAC). UNEP and CCAC, *Global Methane Assessment*, 9, 11; UNEP, *Global Methane Status Report 2025* (Paris: UNEP, 2025), 20; FAO, *Achieving SDG 2*, 29.

estimate, about 50 million tonnes per year.[84] The 100-year global warming potential of methane is about 27-28 times that of carbon dioxide.[85] However, the effect of waste measures on methane emissions emerges fully only with a delay of 10-20 years, because organic matter already deposited in landfills continues to decompose. For this reason, it is recommended that mechanisms and incentives that prevent FLW be prioritized together with mandatory source separation.[86] In Türkiye, too, waste carries clear weight in methane emissions. According to Türkiye's first biennial transparency report (BTR), the waste sector accounted for 2.9 percent of total greenhouse gas emissions in 2022 but for 19.6 percent of total methane emissions. Biowaste makes up 50.4 percent of municipal waste.[87] These data suggest that organic waste may also be a clear area for methane mitigation in Türkiye.

FLW also carries a land and water burden. In 2007, lost and wasted food was produced on about 28 percent of the world's agricultural land. The surface water and groundwater used to produce this food amounted to about 250 km^3.[88] A more recent estimate puts this share at about 19.7 percent of agricultural land.[89] Halving FLW could reduce global cropland needs by about 14 percent by 2050 compared with baseline scenarios.[90]

84 The estimate rests on a rough assumption and does not cover methane from decomposition in landfills. UNEP and CCAC, *Global Methane Assessment*, 114.

85 In the IPCC's Sixth Assessment Report, the 100-year value for non-fossil (biogenic) methane is 27.0. National inventories, however, use the 100-year values of the Fifth Assessment Report, as agreed under the Paris Agreement. In the Fifth Assessment Report, the value for methane excluding climate-carbon feedbacks is 28. Piers Forster et al., "The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity", in *Climate Change 2021: The Physical Science Basis*, ed. Valérie Masson-Delmotte et al. (Cambridge: Cambridge University Press, 2021), 1017 (Table 7.15); Gunnar Myhre et al., "Anthropogenic and Natural Radiative Forcing", in *Climate Change 2013: The Physical Science Basis*, ed. Thomas F. Stocker et al. (Cambridge: Cambridge University Press, 2013), 714 (Table 8.7); Republic of Türkiye, *NDC 3.0*, 16.

86 This is a UNEP recommendation. UNEP, *Global Methane Status Report 2025*, 22, 76.

87 Republic of Türkiye, *First Biennial Transparency Report of Türkiye* (Ankara: Directorate of Climate Change, November 2024), 46, 49, 101.

88 This is an FAO estimate. The area is about 1.4 billion hectares. The water amount refers to the blue water footprint. The figure covers loss and waste together. FAO, *Food Wastage Footprint*, 6, 37.

89 This is the 2014 estimate of Gatto and Chepeliev. FAO, *Food Wastage Footprint*, 6, 37; Gatto and Chepeliev, "Food Loss and Waste Estimates", 141.

90 This is based on the study by Bajželj and colleagues, as cited by the IPCC. Mbow et al., "Food Security", 492.

Interaction: From Climate to Loss, from Methane to Yields

The reverse direction of the relationship is also documented. Higher temperature and humidity raise storage costs and reduce the quantity and quality of stored produce. A rise in outdoor temperature from 17°C to 25°C is estimated to increase the energy use of cold stores by about 11 percent.[91] In Türkiye, too, low precipitation and large areas of dryland farming are cited among the main causes of losses.[92] Methane, for its part, lowers yields through both warming and ground-level ozone. According to one estimate, more than half of the yield loss caused by human emissions in 1850-2010 can be attributed to the temperature and ozone increases caused by methane.[93] Each 1 million tonnes of methane abated prevents about 145,000 tonnes of ozone-related losses of wheat, soybeans, maize and rice each year.[94] In this way, reducing methane from FLW can also contribute to food security. Figure 1 summarizes these interaction loops and the points of intervention.

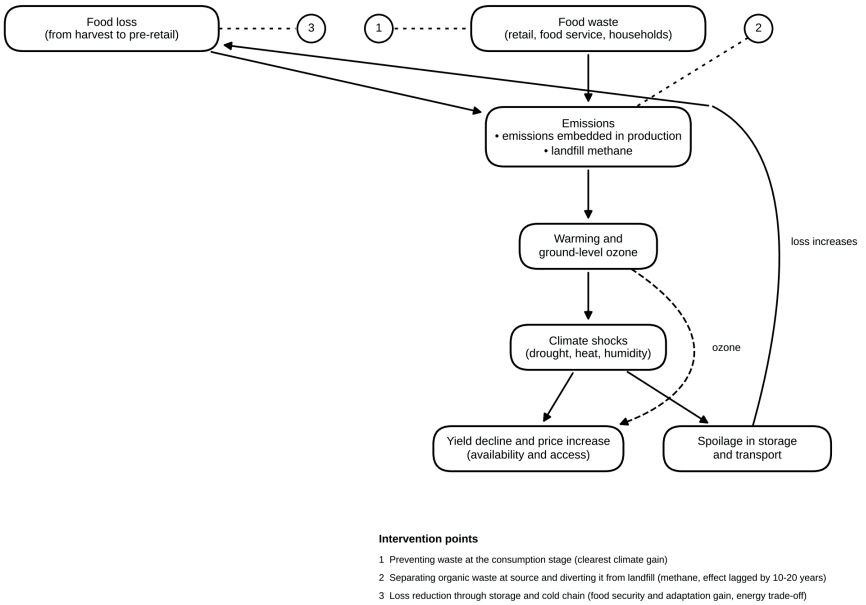
91 Bezner Kerr et al., "Food, Fibre", 790.

92 This is the Türkiye country report prepared by Tatlıdil and colleagues under FAO's regional program for Europe and Central Asia. F. F. Tatlıdil et al., "Food Losses and Waste in Turkey: Country Report" (FAO, 2013), 2, accessed October 27, 2026, https://www.fao.org/fileadmin/user_upload/reu/europe/documents/FLW/Turkey_en.pdf.

93 These are IPCC findings. The finding that methane reduces yields is given with *medium confidence*. The estimate cited by the IPCC, which covers four major crops, is also given with *medium confidence*. Bezner Kerr et al., "Food, Fibre", 724.

94 This is the estimate of UNEP and CCAC. UNEP and CCAC, *Global Methane Assessment*, 11.

Figure 1. Interaction Loops between Food Loss and Waste and Climate Change and Points of Intervention



Source: Compiled by the authors based on the sources cited in the footnote. Each loop is supported by separate sources. The cycle as a whole is this report's synthesis.[95]

The Different Outcomes of Loss and Waste

Loss and waste have different outcomes for climate and food security, so they should be addressed through separate policies. FLW reduction is not an end in itself but an intermediate target that serves primary goals such as food security or emission reduction.[96] In terms of emissions, the most reliable gain lies in consumer waste. Modeling shows that reducing loss at or near the farm level can increase total emissions.[97] One reason is that loss reduction can create emissions at later stages, for example through greater energy

95 IPCC, "Summary for Policymakers", 22 (B.6.3); Mbow et al., "Food Security"; Bezner Kerr et al., "Food, Fibre"; UNEP and CCAC, *Global Methane Assessment*; UNEP, *Global Methane Status Report 2025*; Cattaneo et al., "Environmental Impact"; Cattaneo et al., "Reducing Food Loss and Waste".

96 This is the assessment of Cattaneo and colleagues. The authors recommend different strategies for loss and for waste. Cattaneo et al., "Reducing Food Loss and Waste", 2 and Table 1.

97 According to the simulation study by Cattaneo and colleagues, focusing on consumer waste is more effective if the aim is to reduce emissions. Cattaneo et al., "Environmental Impact", 1, 12.

use in the cold chain.[98] In terms of food security, however, the effect of loss reduction can be direct. In an experiment in Tanzania, low-cost hermetic storage bags reduced the share of people experiencing severe food insecurity during the lean season by 38 percent.[99] The two phenomena also differ in geography. Post-harvest losses in Sub-Saharan Africa are more than twice those in Europe and North America.[100] Household waste, on the other hand, is not a problem of rich countries alone. Per capita household waste is similar in high-income and middle-income countries.[101] Loss reduction also reduces land and water use, and its most direct positive effect is on food security.[102]

This difference becomes clearer when one looks at the stages of the chain. Reducing waste at the consumption stage improves all environmental indicators. In energy-intensive supply chains, by contrast, loss reduction may not lower carbon emissions even under a high price pass-through scenario.[103] These results rest on a stylized model and show only the relative size of the effects.[104] The results of a general equilibrium study that tracks the economy as a whole also show that emission gains on the loss side remain limited. In this study, loss reduction in domestic primary stages has strong positive effects on food security and agricultural land use. The global fall in greenhouse gas emissions, however, remains marginal because of the economic expansion triggered by productivity gains. Sub-Saharan Africa and Latin America and the Caribbean see a net increase.[105] The results of OECD modeling point

98 Cattaneo et al., "Reducing Food Loss and Waste", 5.

99 This is a randomized trial on maize in two districts of Tanzania. Cattaneo et al., "Reducing Food Loss and Waste", 3.

100 In 2023, the post-harvest loss rate was 23.0 percent in sub-Saharan Africa and 10.0 percent in North America and Europe. FAO, "12.3.1 Global Food Losses".

101 Average per capita household waste differs by only 7 kilograms across high-income, upper-middle-income and lower-middle-income countries. Data for low-income countries are insufficient. UNEP, *Food Waste Index Report 2024*, XIV (Table 3).

102 This assessment is the report's own. For its basis, see Cattaneo et al., "Environmental Impact", 1, 12; Cattaneo et al., "Reducing Food Loss and Waste", 3.

103 This is the analysis of Cattaneo and colleagues. Cattaneo et al., "Environmental Impact", 1, 6, 8.

104 Cattaneo and colleagues state that their findings rest on a stylized partial equilibrium model. Cattaneo et al., "Environmental Impact", 12.

105 This is the study by Kuiper and Cui. The model treats loss reduction as a costless productivity gain and tracks price and income feedbacks across the whole economy. The reduction in global emissions is 0.07 percent. Marijke Kuiper and Hao David Cui, "Using Food Loss Reduction to Reach Food Security and Environmental Objectives: A Search for Promising Leverage Points", *Food Policy* 98 (2021): 101915, abstract; sections 3.1 and 3.5.

in a similar direction. In this model, halving FLW by 2030 reduces direct greenhouse gas emissions from agriculture by 4 percent and lifts 137 million people out of hunger.[106] However, the same model estimates that lower demand would reduce agricultural net value added by about 4 percent, and by about 5.5 percent in low-income countries.[107] For this reason, it is recommended that FLW reduction be treated as a tool whose gains and costs vary with the stage of the chain, rather than as a costless win-win measure.[108]

Two separate policy logics follow from these findings. In high-income countries, interventions at the final stages of the chain maximize greenhouse gas savings. In low-income countries, interventions at the early stages can support food security more effectively. Solutions to preserve food, such as cooling, should not create new emissions by increasing the use of non-renewable energy, F-gases or plastics.[109] The net emission effect of the cold chain also depends on context. In a study modeling the introduction of cold chains in Sub-Saharan Africa, post-harvest losses fall by 23 percent, yet the emissions added by the cold chain exceed the emissions from the losses avoided.[110] Inadequate cold chains, for their part, are estimated to be capable of causing up to 620 million tonnes of food loss and 1.8 billion tonnes of CO2 equivalent emissions each year. Because products differ in their environmental intensity, investments that prioritize reducing loss will produce different results from those that prioritize reducing emissions.[111] That said, the roughly 50 million tonnes of production-related methane and the roughly 14 percent reduction in cropland cited above concern FLW as a

106 Claude Nénert et al., *The Potential Effects of Reducing Food Loss and Waste: Impacts on the Triple Challenge and Cost-Benefits Analysis*, OECD Food, Agriculture and Fisheries Papers 222 (Paris: OECD Publishing, 2025), 2, 10.

107 The study's calculation weighs costs and benefits together. On this basis, the economically adjusted range for a global FLW reduction target for 2030 is 26-47 percent. The lower end of the range corresponds to the reduction level at which social welfare is highest. The upper end corresponds to the highest reduction level before total costs begin to exceed total benefits. Nénert et al., *Potential Effects*, 2, 4, 11, 15, 17.

108 This assessment is the report's own. For its basis, see Nénert et al., *Potential Effects*, 2; Cattaneo et al., "Environmental Impact", 1.

109 This is the assessment of FAO's 2023 global roadmap. FAO, *Achieving SDG 2*, 29-30.

110 This is the study by Heard and Miller. It assumes that production and consumption patterns do not change. Net food-related emissions rise by 10 percent in the North America scenario and by 2 percent in the Europe scenario. Heard and Miller, "Potential Changes", abstract and "Results" section.

111 This is the estimate of Friedman-Heiman and Miller. Aaron Friedman-Heiman and Shelie A. Miller, "The Impact of Refrigeration on Food Losses and Associated Greenhouse Gas Emissions throughout the Supply Chain", *Environmental Research Letters* 19, no. 6 (2024): 064038, p. 1.

whole. Loss reduction therefore also offers a possible climate and land gain. Whether this gain materializes on the emission side, however, depends on price and cold chain effects. Because loss and waste differ in their returns and trade-offs, they should be addressed separately.[112] How far these two logics have been carried into the climate regime and national commitments is the subject of the second section.

112 This assessment is the report's own. For its basis, see Cattaneo et al., "Environmental Impact", 1; Cattaneo et al., "Reducing Food Loss and Waste", 2, 5; Kuiper and Cui, "Using Food Loss Reduction", abstract; Heard and Miller, "Potential Changes", abstract; Friedman-Heiman and Miller, "Impact of Refrigeration", 1; UNEP and CCAC, *Global Methane Assessment*, 114; Mbow et al., "Food Security", 492; FAO, *Achieving SDG 2*, 30; UNEP, *Global Methane Status Report 2025*, 76; Bezner Kerr et al., "Food, Fibre", 790.

FOOD IN THE CLIMATE REGIME: FROM KORONIVIA TO ANTALYA

Agriculture and food security have become increasingly institutionalized in the climate regime. FLW, by contrast, has appeared only once in the negotiated texts screened, and FLW language has developed mainly in voluntary declarations. This language in the declarations is also reflected only to a limited extent in national commitments, measurement and climate finance. This section first traces, in chronological order, through which texts and with what legal weight food entered the climate regime. Table 2 brings together the date and nature of each text and whether it refers to FLW. The section then examines the place of FLW in NDCs, in measurement and in finance. At COP31 in Antalya, there are several concrete channels that could be used to link FLW institutionally to the negotiated processes.

Food in Negotiated Texts (1992-2022)

Food entered the climate regime from the very start, but through the lens of production and security. The objective article of the UNFCCC calls for stabilizing greenhouse gas concentrations in the atmosphere within a time frame that does not threaten food production.[113] The Paris Agreement also recognizes food security as a fundamental priority and calls for climate resilience to be fostered in a manner that does not threaten food production.[114] Neither text addresses food consumption or food loss and waste.[115] Agriculture is a politically sensitive issue in the negotiations. Food production touches on sovereignty, trade competitiveness and livelihood security. For this reason, states have traditionally been reluctant to subject this area to international mitigation commitments.[116]

For a long time, agriculture was handled in the negotiations under a narrow agenda. Agriculture has been on the agenda of the Subsidiary Body for Scientific and Technological Advice (SBSTA) since 2011. The Koronivia joint work on agriculture (KJWA) (4/CP.23), adopted in 2017, turned this agenda into joint work that also involves the Subsidiary Body for Implementation (SBI). It did not, however, include consumption or loss and waste among its topics.[117] The SJWA, established in 2022, brought food security into its scope but left out the concept of food systems, which also covers en-

113 United Nations, "United Nations Framework Convention on Climate Change", art. 2.

114 Food security appears in the preamble of the Agreement, and food production in Article 2.1(b). United Nations, "Paris Agreement", preamble and art. 2.1(b).

115 This finding rests on a full-text search of the two texts. The preamble of the Paris Agreement refers in general terms to sustainable patterns of consumption and production, but this reference does not mention food.

116 This is the observation of Mezzacapo and van Zeben. Enrico Mezzacapo and Josephine van Zeben, "Integrating Food Systems into the International Climate Law and Policy Framework", *Review of European, Comparative & International Environmental Law* 35, no. 2 (2026): 453.

117 UNFCCC, Decision 4/CP.23, "Koronivia Joint Work on Agriculture", FCCC/CP/2017/11/Add.1, February 8, 2018, 19, para. 1; UNFCCC Secretariat, "Work Undertaken by Constituted Bodies and Financial and Other Entities under the Convention, as well as by Relevant International Organizations, on Activities Related to the Sharm el-Sheikh Joint Work on Implementation of Climate Action on Agriculture and Food Security", FCCC/SB/2025/4, May 16, 2025, 5, para. 5-6; Dhanush Dinesh et al., "Has Process Hijacked Purpose? Outlook on Food Systems Transformation in the Global Climate Change Processes", *Outlook on Agriculture* 53, no. 2 (2024): 99, Table 1. At the request of COP17, SBSTA held five in-session workshops on agriculture between 2013 and 2016 (FCCC/SB/2025/4, 5, para. 5). The Koronivia decision refers to paragraphs 75-77 of decision 2/CP.17 and to the reports of these workshops (4/CP.23, 19). The initial elements listed in the decision included soil, nutrient and livestock management, the assessment of adaptation, and the socioeconomic and food security dimensions of climate change in the agricultural sector. UNFCCC, Decision 4/CP.23, 19, para. 2(a)-(f). The decision asked the subsidiary bodies to report to COP26 (November 2020; para. 4).

ergy and waste.[118] The only basis for FLW in the negotiated texts also lies in decision 3/CP.27, which established the SJWA. The decision lists reducing food loss and waste among approaches with high adaptation and mitigation potential.[119] Among the negotiated texts screened in this report, this paragraph is the only place where FLW appears.[120] The basis is narrow, but it offers a starting point for COP31. A food systems approach that also covers FLW was raised in the SJWA workshops as well.[121]

Voluntary Declarations and Limited Negotiated Outcomes (COP28-SB64)

After 2023, FLW language developed in voluntary declarations rather than at the negotiating table. The COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action listed reducing food loss and waste among its objectives. It expressed, as an intention, the integration of this aim into NDCs and national adaptation plans.[122] Türkiye is among the countries that endorsed the declaration.[123] The declaration is

118 The SJWA was established as four-year work by decision 3/CP.27, adopted in Sharm el-Sheikh in 2022. UNFCCC, Decision 3/CP.27, 19-20, para. 14 and 20. The decision does not state an end date separately. Paragraph 14 defines the work as lasting four years, and paragraph 20 requests a report to COP31. C2ES, "Issues and Options: The Future of Agriculture and Food Security Discussions Under the UNFCCC", discussion paper, June 3, 2026, 1, accessed October 27, 2026, https://www.c2es.org/document/the-future-of-agriculture-and-food-security-discussions-under-the-unfccc/. Where this term appears in SJWA documents, a footnote has been added stating that it does not exclude other approaches. See UNFCCC Secretariat, "Systemic and Holistic Approaches to Implementation of Climate Action on Agriculture, Food Systems and Food Security, Understanding, Cooperation and Integration into Plans: Workshop Report by the Secretariat", FCCC/SB/2025/5, September 5, 2025, 1, n. 1; SBSTA and SBI, "Sharm el-Sheikh Joint Work on Implementation of Climate Action on Agriculture and Food Security: Draft Conclusions Proposed by the Chairs", FCCC/SB/2025/L.5, November 14, 2025, n. 3.

119 UNFCCC, Decision 3/CP.27, 18, para. 2(t).

120 This finding rests on a full-text search of 4/CP.23, 3/CP.27, 1/CMA.5 (including 2/CMA.5 and 3/CMA.5 in the same document), 1/CMA.7 and the other CMA.7 decisions in the same document, and of the conclusions of SBSTA 63/SBI 63 (FCCC/SB/2025/L.5) and SBSTA 64 (FCCC/SBSTA/2026/5). The search does not cover all COP and CMA decisions.

121 At the SJWA workshop in June 2025, many participants stated that this approach is fundamental to food security. One participant, however, raised the possible drawbacks of shifting the focus from agriculture to food systems. UNFCCC Secretariat, FCCC/SB/2025/5, 13, para. 54.

122 "COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action", COP28 Presidency, December 2023, objective 5, accessed October 12, 2026, https://www.cop28.com/en/food-and-agriculture. "COP28 UAE Declaration", commitment paragraph and item 1 of the 2025 efforts.

123 "COP28 UAE Declaration", list of endorsers. The list is in alphabetical order. Mezzacapo and van Zeben refer to 159 Parties that signed the declaration; see Mezzacapo and van Zeben, "Integrating Food Systems", 460.

not binding, and the formal agriculture negotiations have not been able to recognize it. Even so, it sets out political expectations that could influence NDC updates.[124] The COP29 Declaration on Reducing Methane from Organic Waste, for its part, linked FLW directly to methane and to NDCs. The declaration encourages setting, where appropriate, quantitative targets or measurable actions on methane from waste and food systems in future NDCs. Türkiye is also among the endorsers of this declaration.[125] There is progress between the two declarations. The first mentions FLW as a general objective, while the second seeks to tie it to measurable NDC actions. The food waste initiative launched by UNEP at COP30 followed the same line.[126]

In the negotiated texts, however, the picture is different. At COP28, the decision on the first round of the global stocktake (GST1) was adopted. The global stocktake assesses collective progress toward the long-term goals of the Paris Agreement every five years. The decision mentioned food only in its preamble and its adaptation section and did not include food loss and waste in its mitigation section.[127] These references are assessed as a procedural rather than a substantive development.[128] COP30

124 This is the assessment of Mezzacapo and van Zeben. Mezzacapo and van Zeben, "Integrating Food Systems", 454, 463-464. This is as reported by Dinesh and colleagues. Dinesh et al., "Has Process Hijacked Purpose?", 101.

125 "COP29 Declaration on Reducing Methane from Organic Waste", Climate and Clean Air Coalition (CCAC), list of endorsers updated July 28, 2025, accessed October 12, 2026, https://www.ccacoalition.org/content/cop29-declaration-reducing-methane-organic-waste. CCAC, "COP29 Declaration". CCAC, "COP29 Declaration", list of endorsers. The list is in alphabetical order. The list dated July 28, 2025 includes 65 countries.

126 The initiative also aims at a reduction of up to 7 percent in methane. Aruna Chandrasekhar et al., "COP30: Key Outcomes for Food, Forests, Land and Nature at the UN Climate Talks in Belém", Carbon Brief, November 26, 2025, accessed October 12, 2026, https://www.carbonbrief.org/cop30-key-outcomes-for-food-forests-land-and-nature-at-the-un-climate-talks-in-belem. The information is taken from a secondary source.

127 UNFCCC, Decision 1/CMA.5, 2 (preamble), 8 (para. 55), 9 (para. 63(b)). According to Carbon Brief's count, food appears six times in the final text. Two of these are in the preamble and four are in the adaptation section; see Aruna Chandrasekhar et al., "COP28: Key Outcomes for Food, Forests, Land and Nature at the UN Climate Talks in Dubai", Carbon Brief, December 15, 2023, accessed October 12, 2026, https://www.carbonbrief.org/cop28-key-outcomes-for-food-forests-land-and-nature-at-the-un-climate-talks-in-dubai/. On the mitigation side, the language closest to food is the call for the rapid reduction of non-carbon-dioxide emissions by 2030, in particular methane. UNFCCC, Decision 1/CMA.5, 6, para. 28(f). The decision also refers to sustainable consumption and production and to the circular economy (p. 7, para. 36).

128 This is the assessment of Mezzacapo and van Zeben. The authors also note that food systems do not appear in the mitigation section. Mezzacapo and van Zeben, "Integrating Food Systems", 456. The finding that FLW does not appear in the decision is based on a full-text search of the decision; see n. 120.

produced a similar result. None of the words food, agriculture, hunger or methane appears in the Global Mutirão decision (1/CMA.7), and the SJWA talks in Belém produced only procedural conclusions.[129] The subsidiary bodies that met in Bonn in June 2026 (SB64) left the consideration of the SJWA reports to SB65 in Antalya.[130] As a result, the future of the SJWA, and with it the place of FLW at the negotiating table, has been left to COP31.

Two conclusions follow from this course. The first is that the position of food in the climate regime has strengthened at the political level but remains limited in the legal framework. Food systems have become part of the political agenda but (not yet) part of the legal framework.[131] The second is that FLW holds a separate position even within the food topic. The only basis for FLW in the negotiated texts is paragraph 2(t) of 3/CP.27. Voluntary initiatives can create political momentum in the short term, but their shelf life is short and they do not report their results systematically.[132] For this reason, carrying the language of the two declarations Türkiye endorsed into the negotiated processes could make this language durable.

129 UNFCCC, "Report of the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement on Its Seventh Session, Held in Belém from 10 to 22 November 2025. Addendum. Part Two", FCCC/PA/CMA/2025/19/Add.1, March 30, 2026, 2-8 (Decision 1/CMA.7). The just transition decision adopted in the same package (2/CMA.7) refers to small-scale farmers and food production (p. 11, para. 12(f)). According to observers, the main points of disagreement are finance, technology pathways and how the outcomes should be framed. SBSTA and SBI, FCCC/SB/2025/L.5, para. 2 and 4; Laura Salfi et al., "Progress Slows on Sharm el-Sheikh Joint Work as Time Runs Out", CGIAR News, December 16, 2025, accessed October 12, 2026, https://www.cgiar.org/news-events/news/progress-slows-sharm-el-sheikh-joint-work-time-runs-out. The conclusions note that more time is needed to complete the discussion of the workshop report. FLW also does not appear in the Belém Declaration on Hunger, Poverty and People-Centered Climate Action, which was adopted outside the negotiations. "Belém Declaration on Hunger, Poverty, and Human-Centered Climate Action", COP30 Presidency, November 7, 2025, 1-6, accessed October 27, 2026, https://cop30.br/en/news-about-cop30/documents/cop30-belem_declaration_eng-final.pdf/@@download/file; Mezzacapo and van Zeben, "Integrating Food Systems", 463.

130 The subsidiary bodies also noted with appreciation that Parties are increasingly integrating climate action on agriculture, food systems and food security into their national plans. SBSTA, FCCC/SBSTA/2026/5, 13-14, para. 79, 83 and 88; 13, para. 81; UNFCCC, "Issues Related to Agriculture". Food security was also the subject of the April 2026 dialogue of the UAE just transition work programme, which was launched at COP27 and operationalized at COP28. SBSTA, FCCC/SBSTA/2026/5, 11-12, para. 61 and 63.

131 The phrase is Mezzacapo and van Zeben's. Mezzacapo and van Zeben, "Integrating Food Systems", 464. The original reads, "Food systems have become part of the political agenda, but not (yet) of the legal framework."

132 This is the 2024 assessment of Dinesh and colleagues. The authors recommend impact assessments of these initiatives. For the scope of the search, see n. 120. For the voluntary channels, see nn. 122, 125 and 126. Dinesh et al., "Has Process Hijacked Purpose?", 100-101, 104.

Decisions Open in Antalya (COP31)

In Antalya, four processes that will affect whether FLW moves into the negotiated processes are open at the same time. The first is the fate of the SJWA. If Parties do not decide to renew it, the work will end at COP31.[133] The options range from continuing the work to a new agenda item, a constituted body or a Presidency initiative. Extending the scope to food systems would require a new joint work decision. If Parties end the work and do not set up another process in its place, climate action in this area will continue through the work of non-Party stakeholders.[134] The second is the second global stocktake (GST2), which will begin at CMA8 and end in November 2028. Submissions to the information collection phase are requested by February 28, 2027, at the latest.[135] The third is whether the mitigation work programme, which produces messages on the waste sector including the circular economy, will be extended.[136] Türkiye has previously proposed zero waste practices as a topic for this programme's global dialogues.[137] The fourth is the renewal of the just transition work programme.[138]

In the division of roles at COP31, Australia leads the negotiations and Türkiye leads the Action Agenda. The area where Türkiye can bring FLW directly to the fore is therefore the Action Agenda. On the Agenda, food waste prevention falls under the Zero Waste and Methane Reduction theme,

133 According to the US-based Center for Climate and Energy Solutions (C2ES), SBSTA and SBI agreed at COP30 to continue the joint work. UNFCCC, Decision 3/CP.27, 20, para. 20; "Key Negotiations & Related Outcomes of the UN Climate Conference in Belém (COP30)", C2ES, 2026, accessed October 12, 2026, https://www.c2es.org/document/key-negotiations-related-outcomes-of-the-un-climate-conference-in-belem.

134 A June 2026 C2ES analysis, prepared before the SB64 outcomes, lists seven options. C2ES, "Issues and Options", 1-5; for the expansion of scope, see 4, para. 15. Taken together, the options are the continuation or termination of the SJWA, a series of dialogues, a new agenda item or work programme, a new constituted body, a COP31 Presidency initiative, and encouraging agricultural experts to take part in existing UNFCCC workstreams.

135 UNFCCC, "The Second Global Stocktake"; UNFCCC, Decision 1/CMA.5, 21, para. 194. The technical assessment component will begin at SB66 in June 2027 (same web page).

136 The work programme (MWP), established at COP26, aims to scale up mitigation ambition and implementation before 2030. In 2025 it also produced messages on forests. C2ES, "Key Negotiations".

137 The work programme operates through two global dialogues a year and investment-focused events. For the 2025 global dialogues, Türkiye proposed the transformation of agriculture, forestry and other land use (AFOLU) and zero waste practices. It also listed sustainable food systems among the solutions it put forward. C2ES, "Key Negotiations"; Republic of Türkiye, "Submission by Türkiye on the Topics for the 2025 Global Dialogues within the Scope of the Sharm El-Sheikh Mitigation Ambition and Implementation Work Programme", February 2025, accessed October 27, 2026, https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202502201615---T%C3%9CRK%C4%B0YE_MWP%20SUBMISSION_FEB2025.pdf.

138 SBSTA, FCCC/SBSTA/2026/5, 12, para. 63; C2ES, "Key Negotiations".

and Food Security is also on the program as a separate theme.[139] How the two themes can be linked through FLW is discussed in the fourth section.

TABLE 2. MILESTONES FOR FOOD, AGRICULTURE AND FLW IN THE CLIMATE REGIME

Date	Development	Nature	Reference to FLW
May 1992	UNFCCC Art. 2 (food production) and Art. 4.1(c), (e) (agriculture and waste management)	Treaty	No
2011; 2013-2016	2/CP.17; five in-session agriculture workshops under SBSTA	COP decision; subsidiary body	Not screened
Sept. 2015	SDG Target 12.3 (outside the climate regime)	UN General Assembly resolution	Yes (halving waste, reducing losses)
Dec. 2015	Paris Agreement, preamble (food security as a fundamental priority), Art. 2.1(b)	Treaty	No
Nov. 2017	Koronivia (4/CP.23), joint work of SBSTA and SBI	COP decision	No
Nov. 2022	SJWA (3/CP.27), four years, report to COP31	COP decision	Yes, only instance (para. 2(t))
Dec. 2023	UAE Declaration, 159 countries and the EU; endorsed by Türkiye	Voluntary declaration	Yes (objective 5 and item 2 of the 2025 efforts)
Dec. 2023	GST1 (1/CMA.5), food in the preamble and the adaptation section	CMA decision	No
Nov. 2024	COP29 Declaration on Reducing Methane from Organic Waste, 65 countries (July 2025 list of endorsers); endorsed by Türkiye	Voluntary declaration	Yes (targets and encouragement for NDCs)
Nov. 2025	COP30, Global Mutirão decision; SJWA procedural conclusions; 5 voluntary food indicators in the Global Goal on Adaptation; Belém Declaration on Hunger, Poverty and People-Centered Climate Action; UNEP initiative	CMA decision; subsidiary body; voluntary	Yes in the UNEP initiative; no in the Mutirão decision, 2/CMA.7, the SJWA conclusions and the Belém Declaration; Global Goal on Adaptation food indicators not screened
June 2026	SB64, SJWA reports noted and consideration left to SB65; April 2026 just transition dialogue (food security) welcomed	Subsidiary body conclusions	No
Nov. 2026	COP31/CMA8/SB65, Antalya (fate of the SJWA, start of GST2, extension of the MWP, renewal of the just transition work programme)	Open decisions	Subject to decision

139 COP31 Türkiye Presidency, "Zero Waste"; COP31 Türkiye Presidency, "Food Security"; Kurum, "COP31 Presidency's 3rd Letter", 2-5.

Source: Compiled by the authors based on the documents and studies cited in the footnote.[140] SDG Target 12.3 lies outside the climate regime and is included in the table for comparison.

FLW in Nationally Determined Contributions

The language in the declarations is reflected only to a limited extent in national commitments. Some current NDCs focus on reducing food waste, while others leave this area out.[141] NDCs are estimated to address about 40 percent of food system emissions, and the gap is estimated to reach 82 percent in the pre-farm and post-farm stages.[142] The number of countries that include FLW is growing, but these countries are a minority by every measure. Of the 193 countries that had submitted NDCs in 2022, 21 wrote an FLW commitment directly into their NDC.[143] Of the countries attending COP30, 30 have a loss or waste commitment in their NDC.[144] Among the new-generation NDCs (NDC 3.0)[145] submitted from 2025 onward, this share is 28 percent. Of the 116 NDCs reviewed, 33 contain an explicit measure on FLW. In the previous NDCs of the same Parties, this number was 17.[146] These counts rest on differ-

140 United Nations, "United Nations Framework Convention on Climate Change"; United Nations, "Paris Agreement"; UNFCCC, Decision 4/CP.23; UNFCCC, Decision 3/CP.27; UNFCCC, Decision 1/CMA.5; UNFCCC, FCCC/PA/CMA/2025/19/Add.1 (Decisions 1/CMA.7 and 2/CMA.7); SBSTA, FCCC/SBSTA/2026/5; "COP28 UAE Declaration"; CCAC, "COP29 Declaration", list of endorsers; "Belém Declaration"; UNFCCC, "The Second Global Stocktake"; Chandrasekhar et al., "COP28: Key Outcomes"; Chandrasekhar et al., "COP30: Key Outcomes"; Dinesh et al., "Has Process Hijacked Purpose?"; C2ES, "Issues and Options"; C2ES, "Key Negotiations"; UNFCCC Secretariat, FCCC/SB/2025/4; SBSTA and SBI, FCCC/SB/2025/L.5; Mezzacapo and van Zeben, "Integrating Food Systems"; Brian Lipinski, "SDG Target 12.3 on Food Loss and Waste: 2025 Progress Report" (Champions 12.3, September 2025), accessed October 27, 2026, https://champions123.org/sites/default/files/2025-09/champions-12-3-2025-progress-report.pdf.

141 This is FAO's assessment of current NDCs. FAO, *Achieving SDG 2*, 3.

142 Mezzacapo and van Zeben, "Integrating Food Systems", 453-454. The authors take these figures from FAO's 2024 analysis.

143 This is UNEP's assessment, based on data from the UK organization Waste and Resources Action Programme (WRAP). Of these 21 countries, 7 include commitments on waste only and 12 on loss only, while 2 address both. UNEP, *Food Waste Index Report 2024*, 70 (Box 11).

144 This is WRAP's assessment dated October 29, 2025. The number has risen by six since COP29. "Just 30 Countries Include Food Loss and/or Waste in Their NDCs", WRAP, press release, November 11, 2025, accessed October 12, 2026, https://www.wrap.ngo/media-centre/press-releases/just-30-countries-include-food-loss-andor-waste-their-ndcs. The press release does not give the total number of NDCs reviewed.

145 Bakhtary et al., "Food Forward NDCs", 6 ("the latest round of NDCs – so-called NDCs 3.0"); "What Third-Generation NDCs Mean for Global Climate Action", UNDP, Climate Promise, accessed October 12, 2026, https://climatepromise.undp.org/news-and-stories/what-third-generation-ndcs-mean-global-climate-action. According to UNDP, countries submitted their third-generation NDCs in 2025.

146 This is the assessment by Climate Focus and WWF as of May 2026. The share in previous NDCs is 15 percent. Bakhtary et al., "Food Forward NDCs", 6-7, 12. In the same study, the number of NDCs with measures on post-harvest storage, processing and transport rose from 29 (25 percent) to 53 (46 percent).

ent criteria and cannot be added together (Table 3). Each of them, however, shows a trend that is upward and still limited.

FLW targets in NDCs are rarer still.[147] The counts therefore also include qualitative references. For example, the United Kingdom's 2035 NDC sets no quantitative target and mentions food waste in a qualitative paragraph.[148] Even so, the country is counted among those that included FLW in their new NDC.[149] In an OECD survey covering 42 countries and the European Commission, the three countries that explicitly mention FLW in their NDCs are Canada, China and Türkiye.[150] The picture is similar for waste methane. More than 150 countries refer to the waste sector in their NDCs, but few set a quantitative target for waste methane.[151] In this picture, Türkiye is among the countries that mentioned FLW early in their NDC. The next step is to turn this reference into a measurable target.

Writing FLW into the NDC does not secure the outcome, but it makes FLW visible and trackable. The Paris Agreement obliges each Party to prepare and communicate successive NDCs and to pursue domestic mitigation measures to achieve the objectives of these contributions.[152] Preparing and communicating an NDC is a procedural obligation of result, and each Party must do its utmost to ensure that its NDC reflects its highest possible

147 According to the OECD, few countries include references to and targets for FLW reduction in their current NDCs. The OECD recommends that more countries set a base year and a target for FLW in their NDCs. OECD, "Achieving Food Loss and Waste Reduction: From Targets to Action", OECD Policy Brief, November 2025, 2, accessed October 27, 2026, https://www.oecd.org/en/publications/achieving-food-loss-and-waste-reduction_edd99594-en.html; OECD, *Beyond Food Loss and Waste Reduction Targets: Translating Reduction Ambitions into Policy Outcomes*, OECD Food, Agriculture and Fisheries Papers 214 (Paris: OECD Publishing, 2025), 5.

148 The paragraph states that the government will work with business and will continue to support WRAP's work. HM Government, *United Kingdom of Great Britain and Northern Ireland's 2035 Nationally Determined Contribution*, CP 1250 (London: HM Government, January 2025), 33, 44.

149 The Global Action Drive, "Embedding 'Food Loss and Waste' in Climate Policy: A Practical Guide" (October 2025), section "Commit to Delivering UN Sustainable Development Goal Target 12.3", accessed October 27, 2026, https://www.champions123.org/sites/default/files/2025-10/A%20Practical%20Guide%20to%20Embedding%20%E2%80%9CFood%20Loss%20and%20Waste%E2%80%9D%20in%20Climate%20Policy.pdf; Lipinski, "SDG Target 12.3", 9.

150 OECD, *Beyond Food Loss and Waste*, 15, n. 8. For Türkiye, the document used is the updated first NDC of 2023. For China, it is the 2022 progress document on the implementation of the NDC (p. 38).

151 This is UNEP's finding. The report states that in this sector priority should go to mechanisms and incentives to prevent FLW, and to mandatory separation of waste at source. UNEP, *Global Methane Status Report 2025*, 16, 76.

152 United Nations, "Paris Agreement", art. 4.2. For the provision that successive NDCs should reflect progression and the highest possible ambition, see art. 4.3.

ambition.[153] Achieving the target in an NDC, by contrast, is not an obligation to guarantee the result. It is an obligation of conduct that requires best efforts.[154] In short, Parties are obliged to submit NDCs but are not obliged to achieve the targets in them.[155] For this reason, this report does not refer to NDC targets as binding targets.

The main gain from the NDC is accountability. Parties regularly provide information on progress. This information undergoes technical expert review and is subject to facilitative, multilateral consideration of progress.[156] The system is not punitive.[157] A measurable FLW target therefore does not guarantee the outcome, but it turns the target into an item that is reported and subject to expert review. For a country, this means that the target gains international visibility.[158] Since the second biennial transparency reports are expected to be submitted by the end of 2026, this channel is close at hand for Türkiye as well.[159]

153 According to the 2025 advisory opinion of the International Court of Justice, Parties have limited discretion when preparing their NDCs, and the applicable standard of due diligence is stringent. International Court of Justice, "Obligations of States in Respect of Climate Change", Advisory Opinion, July 23, 2025, 75-78, para. 235, 245-246.

154 This is the Court's assessment. International Court of Justice, "Obligations of States", 79-80, para. 251, 253. The original reads, "not a guarantee that communicated NDCs will be achieved, but rather that they will make best efforts to obtain such a result."

155 This is Rajamani's assessment. Lavanya Rajamani, "Interpreting the Paris Agreement in Its Normative Environment", *Current Legal Problems* 77, no. 1 (2024): 170, 191. In her 2016 study, Rajamani reads the obligations in Article 4.2 to prepare, communicate and maintain NDCs and to pursue domestic measures as binding obligations of conduct. She states that these are combined with a good-faith expectation of results. The Court characterizes them differently, but the two readings agree that achieving the target in an NDC is not an obligation of result; see Lavanya Rajamani, "The 2015 Paris Agreement: Interplay Between Hard, Soft and Non-Obligations", *Journal of Environmental Law* 28, no. 2 (2016): 354.

156 The transparency framework established by Article 13 of the Agreement aims to provide a clear understanding of Parties' progress toward achieving their NDCs. United Nations, "Paris Agreement", art. 13.5. United Nations, "Paris Agreement", art. 13.7(b), 13.11 and 13.12. The rules for holding the review every two years are set out in the implementing decisions, not in the text of the Agreement.

157 The compliance committee established by Article 15 of the Agreement is facilitative and non-punitive in nature. The Agreement also contains no mechanism that assesses the adequacy of the actions of individual Parties. United Nations, "Paris Agreement", art. 15.2; Rajamani, "Interpreting the Paris Agreement", 179.

158 Domestic measures toward this target are also linked to the obligation of due diligence. United Nations, "Paris Agreement", art. 13.7(b) and 13.11; International Court of Justice, "Obligations of States", 79, para. 252. According to the Court, domestic mitigation measures should be taken with due diligence to achieve the objectives set out in successive NDCs.

159 Kurum, "COP31 Presidency's 3rd Letter", 9.

The Measurement Gap

This accountability depends on measurement, and measurement is the weakest link in the chain. On the loss side, only 7 percent of the loss factors FAO uses are based on official reporting. The rest are estimated.[160] For this reason, small changes in the global loss rate largely reflect data updates and new country estimates.[161] On the waste side, data have increased, but national baselines suitable for monitoring are still scarce. Most new household studies have a narrow geographic scope and are therefore not suitable for national monitoring.[162] Countries that have set targets aligned with SDG Target 12.3 cover about 55 percent of the world's population. Countries that have begun measuring and reporting a baseline represent 12 percent.[163] In short, setting targets is far more common than measuring. Countries also cite the lack of measurement and monitoring as the most significant obstacle to FLW policy.[164]

The ways to close the gap are known. Reorganizing and using existing waste data is a cost-effective starting point. In most countries with reliable data, the availability of data for every sector probably stems from the presence of at least one institution clearly responsible for measurement.[165] More cost-effective measurement methods are also needed.[166] Without these steps, an FLW target cannot produce the progress information that the transpar-

160 Of 185 countries, the number reporting loss for at least one product was 23 in 2016, 42 in 2018 and 12 in 2019. FAO, "Indicator 12.3.1(a)", section 4.b (Comment and limitations).

161 The global loss rate rose from 13.0 percent in 2015 to 13.3 percent in 2023. In view of this increase, the UN identifies stagnation, or even regression. It also states that the increase remains within the expected range of model fluctuations. UN Statistics Division, "The Sustainable Development Goals Extended Report 2026", Goal 12, Indicator 12.3.1, accessed October 27, 2026, https://unstats.un.org/sdgs/report/2026/extended-report/Extended-Report-2026_Goal-12.pdf; United Nations, *Sustainable Development Goals Report 2026*, 33.

162 Household data have increased to 194 data points in 93 countries. Of the newly identified household studies, 76 percent are not suitable for national tracking. UNEP, *Food Waste Index Report 2024*, 4, 10, XIV.

163 This is the 2025 assessment of the Champions 12.3 coalition, which brings together public and private sector leaders working to achieve SDG Target 12.3. Lipinski, "SDG Target 12.3", 4 (Table 1).

164 This is the assessment of the countries in the OECD study. OECD, *Beyond Food Loss and Waste*, 11.

165 This is UNEP's assessment. The recommendation to reuse data is aimed at countries that do not yet have estimates for retail and food service. UNEP, *Food Waste Index Report 2024*, 13, 23. The original wording is "Revisiting and repurposing existing data could therefore be a cost-effective way for countries with no current estimates for food service and retail to form estimates" (p. 13) and "at least one organization having clear responsibility for food waste quantification, whether a ministry, national agency or independent organization" (p. 23).

166 This is the finding of Cattaneo and colleagues. Cattaneo et al., "Reducing Food Loss and Waste", 3. The original reads, "will also require finding more cost-effective measurement approaches than current methods based on surveys and model-based estimations".

ency framework requires.[167] For this reason, countries are asked to measure FLW and to show progress through their biennial transparency reports.[168] A practical guide builds this chain in four steps. The FLW target is written into the NDC, an implementation plan is prepared, resources are allocated on the basis of a cost estimate, and progress is measured and reported through transparency reports.[169] This is also why governments are advised to strengthen their data systems to track the agrifood targets in their NDCs.[170]

TABLE 3. FLW IN NDCS: DIFFERENT COUNTS

Source	Cutoff date	Unit and denominator	Criterion	Result
UNEP 2021 (citing Schulte et al. 2020)	Not specified (Schulte et al. 2020)	NDCs	Mentioning	0 for waste; 11 for loss
WWF-UK 2021	Not specified (published 2021)	Signatories to the Paris Agreement	Included in national carbon plan	Less than 6%
UNEP 2024 (with WRAP 2022 data)	2022	193 countries submitting NDCs	Reduction commitment directly in the NDC	21 (7 waste only, 12 loss only, 2 both); plus disposal and treatment plans in 29 NDCs
OECD 2025	2023 survey	43 respondents (42 countries and the European Commission)	Explicit mention in the NDC	3 countries (Canada, China, Türkiye)
WRAP 2025	October 29, 2025	Countries attending COP30; total number reviewed not given	Commitment to reduce loss and/or waste	30 countries (7 with both); +6 since COP29
United Nations Development Programme (UNDP), n.d.	Not specified (128 Parties had submitted NDC 3.0 by the end of 2025)	NDC 3.0; denominator not specified	Reference to FLW	22%

167 This is the assessment of this report. The relevant provision is Article 13.7(b) of the Agreement. United Nations, "Paris Agreement", art. 13.7(b); UNEP, *Food Waste Index Report 2024*, 4. According to the UNEP report, Level 1 estimates based on modeling are not sufficient to track change over time. The need for national tracking is met by Level 2, which is based on direct measurement.

168 This is the call of Champions 12.3. Lipinski, "SDG Target 12.3", 1.

169 The guide cites the Gambia's NDC implementation plan as an example. The plan includes targets for FLW reduction, a responsible institution and a five-year cost estimate. The Global Action Drive, "Embedding 'Food Loss and Waste'", section "How to Take System-Level Action". The guide is an advocacy document. It is used here as an implementation template, not as evidence.

170 This is the recommendation of Climate Focus and WWF. Bakhtary et al., "Food Forward NDCs", 15.

TABLE 3. FLW IN NDCS: DIFFERENT COUNTS				
Source	Cutoff date	Unit and denominator	Criterion	Result
Climate Focus and WWF 2026	May 27, 2026	116 NDCs 3.0 (143 Parties) and the same Parties' 116 previous NDCs	Explicit measure to prevent/reduce FLW	33 (28%); 17 (15%) in previous NDCs
UNEP 2025 (waste methane, for comparison)	June 2025	Countries that are Parties to the Paris Agreement	Measure targeting waste methane	115 countries (59%); few with numerical targets

Source: Compiled by the authors.[171]
* The figures rest on different units, criteria and dates, so they cannot be added together or compared directly; they are shown together to indicate the scope of the counts, and a trend can be read only from comparisons within the same source.

FLW in Climate Finance

Turning measurement into a trackable commitment in the NDC also depends on finance, and FLW is one of the least funded areas of climate finance. Three gaps are interlinked in agrifood systems. The need declared in NDCs falls short of the need consistent with 1.5°C, current flows do not meet the declared need, and data are insufficient. Of the 167 Parties whose NDCs were reviewed, only 62 state the level of finance needed for agrifood.[172] The share of agrifood in tracked climate finance is increasing, but it is still small.[173] Despite its weight in global emissions, this area has received

171 UNEP, *Food Waste Index Report 2021* (Nairobi: UNEP, 2021), 20; UNEP, *Food Waste Index Report 2024*, 70; UNEP, *Global Methane Status Report 2025*, 16, 76; WWF-UK, *Driven to Waste: The Global Impact of Food Loss and Waste on Farms* (Woking: WWF-UK, 2021), 3; OECD, *Beyond Food Loss and Waste*, 5-7, 15; WRAP, "Just 30 Countries"; UNDP, "What Third-Generation NDCs Mean"; Bakhtary et al., "Food Forward NDCs", 6-7, 12.

172 The Climate Policy Initiative (CPI) and FAO define these three gaps as the planning gap, the finance gap and the data gap. CPI and FAO, *The Triple Gap in Finance for Agrifood Systems*, revised edition (Rome: FAO, 2025), 5, 23, 30, 33.

173 The ClimateShot Investor Coalition (CLIC) has its secretariat run by CPI. According to its 2025 report, climate finance for agrifood systems rose from $28.5 billion in 2019/20 to $94.9 billion in 2021/22, and its share of global climate finance rose from 3.6 percent to 7.2 percent. The increase comes mainly from domestic public investment in China and Europe. This report uses these data as its headline figure, because they are the most recent source covering all tracked flows. CLIC, "Landscape of Climate Finance for Agrifood Systems 2025" (Climate Policy Initiative and ClimateShot Investor Coalition, May 2025), 2, accessed October 27, 2026, https://www.climatepolicyinitiative.org/wp-content/uploads/2025/05/Landscape-of-Climate-Finance-for-Agrifood-Systems-2025.pdf. Of the flows tracked in 2021/22, 40 percent ($38 billion) come from new data sources and methodological improvements. Even when these adjustments are excluded, agrifood climate finance more than doubled, from an annual average of $22 billion in 2019/20 to $57 billion in 2021/22 (pp. 15-16, 18).

only 3.8 percent of tracked mitigation finance.[174] Sources give different figures because they use different denominators (Box 3).

The Food and Diets category, which includes FLW, is the least funded part of this area. In 2021/22 the category received only 0.5 percent of agrifood climate finance, and the sources reviewed contain no flow figure specific to FLW.[175] Opportunities to reduce loss at stages close to production in low- and middle-income countries are also overlooked.[176] The need, by contrast, is much larger. The annual investment need of the Food and Diets category is calculated at $52.8 billion, of which $18.8 billion is for FLW.[177] This gap between flow and need is also reflected in NDCs. Agrifood accounts for only 15 percent of the total finance need declared in NDCs, and the share of food waste stays at 3 percent.[178] As a result, FLW has a limited place in NDCs as a finance need, just as it does as a target.

There are instruments that can be used to close the gap. The first is existing public agricultural support. This support is large, but it is only loosely tied to environmental outcomes.[179] Reducing FLW, in turn, can help ease economic and environmental pressures.[180] Production and consumption

174 CLIC, "Landscape of Climate Finance for Agrifood Systems 2025", 4.

175 The amount for this item is $0.4 billion. The funds are concentrated in R&D and awareness-raising, and 87 percent is provided as grants. In the geographic distribution, Western Europe accounts for 51 percent and the US and Canada for 19 percent. CLIC, "Landscape of Climate Finance for Agrifood Systems 2025", 6, 38. In one place (p. 33), the report gives this share as 0.4 percent. The difference appears to result from rounding. The report also gives the increase needed to meet the need with different multipliers in different places, so no multiplier is used here. Besides FLW, the item also covers diets. The financing sources reviewed contain no flow figure specific to FLW. CLIC, "Landscape of Climate Finance for Agrifood Systems 2025", 38. None of the financing sources cited in Box 3 contains a flow figure specific to FLW.

176 This is CLIC's finding. CLIC, "Landscape of Climate Finance for Agrifood Systems 2025", 6.

177 This is the calculation of CPI and FAO. CPI and FAO, *The Triple Gap*, 19. CPI and FAO stress that these estimates should be read as an indication of the scale of the investment needed, not as point estimates. CPI and FAO, *The Triple Gap*, 33. The flow data used to calculate the finance gap are for 2019/20. The 2021/22 data in the CLIC (2025) report are higher, and the two figures refer to different years.

178 Of this need, 65 percent depends on international sources and is therefore conditional. CPI and FAO, *The Triple Gap*, 5, 7. Food waste is mostly treated as a secondary issue in statements of need. CPI and FAO, *The Triple Gap*, 25. The report's executive summary gives the same need under a different classification, as 2 percent for waste and 1 percent for post-harvest (p. 7).

179 In the 54 countries monitored by the OECD, total support to agriculture averaged $842 billion a year in 2022-2024. The potentially most distorting types of support make up 66 percent of producer support. Only 5 percent of it is tied to environmental action beyond legal minimum requirements. OECD, *Agricultural Policy Monitoring and Evaluation 2025: Making the Most of the Trade and Environment Nexus in Agriculture* (Paris: OECD Publishing, 2025), 21-22.

180 This is the finding of the OECD's 2023 report. OECD, *Agricultural Policy Monitoring and Evaluation 2023: Adapting Agriculture to Climate Change* (Paris: OECD Publishing, 2023), 25.

subsidies that lower food prices are also counted among the drivers of FLW.[181] Directing a small part of this support to FLW items such as cold chain, storage and measurement could offer a source of finance within the existing budget.[182] The second instrument is climate finance. Alongside commitments, the NDC process is an existing channel for declaring finance gaps.[183] Sustainable development bonds and sovereign green bonds can finance cold chain infrastructure powered by renewable energy and facilities that convert food waste into energy.[184] To this end, it is recommended that commitments be backed by a roadmap that includes cost estimates and resourcing strategies.[185] The third instrument is methane-focused initiatives. The Lowering Organic Waste Methane Initiative (LOW-Methane), launched at COP28, aims to mobilize more than $10 billion in investment, but the sources reviewed contain no data on what has been delivered.[186] Food banks are also reported to have begun accessing voluntary carbon markets.[187] Public-private partnerships offer a blended finance model.[188]

All of these instruments rest on cost estimates, and the cost of preventing FLW varies greatly by context. The median cost is about $500

181 This is the World Bank's finding. World Bank, *Addressing Food Loss and Waste*, xiii.

182 This is the assessment of this report. The OECD recommends a general shift toward environmentally beneficial measures and does not mention FLW specifically. OECD, "Innovation for Sustainable Productivity Growth: Agricultural Policy Monitoring and Evaluation 2024", policy note, November 6, 2024, 1.

183 The World Bank recommends that countries include FLW reduction both in their NDCs and in their sources of climate finance. It states that a dedicated global financing instrument for FLW would create momentum. World Bank, *Addressing Food Loss and Waste*, xvii, 70, 72.

184 By August 2020, the World Bank had issued sustainable development bonds featuring FLW in 29 transactions, totaling more than $2.1 billion. World Bank, *Addressing Food Loss and Waste*, 73-74.

185 This is a recommendation of the implementation guide prepared by The Global Action Drive. According to the guide, commitments should also specify the resources needed from international funders. The Global Action Drive, "Embedding 'Food Loss and Waste'", section "Back Up Commitments with Dedicated Resources".

186 The initiative aims to reduce waste methane by at least 1 million tonnes a year well before 2030. Its scope extends from FLW reduction to landfill emissions, and its targets are in the nature of a statement of intent. "Lowering Organic Waste Methane Initiative (LOW-Methane)", Global Methane Pledge and CCAC Secretariat, press release, COP28, 2023, accessed October 12, 2026, https://globalmethanepledge.org/news/lowering-organic-waste-methane-initiative-low-methane. The sources reviewed (the CCAC press release; UNEP, *Global Methane Status Report 2025*, 78; the web pages of the COP29 Declaration on Reducing Methane from Organic Waste) contain no data on what the initiative has achieved.

187 Lipinski, "SDG Target 12.3", 7.

188 UNEP describes the financing of partnerships in three stages, namely seed funding, bridge financing and diversified long-term financing. The activities of the Food Waste Free United initiative in the Netherlands are financed in equal shares by the public and private sectors. UNEP, *Food Waste Index Report 2024*, 93-95 (Figure 32); OECD, *Beyond Food Loss and Waste*, 28.

per tonne, but it varies widely by product, supply chain stage and type of intervention.[189] In EU initiatives, costs range from about €19 to €24,000 per tonne.[190] The model estimate for Türkiye is about $109 per tonne, but this figure is not field data.[191] The commitments announced by philanthropic organizations at COP30 are not dedicated to FLW either.[192] In this report's assessment, Türkiye's position in this respect is favorable. General services support, mostly for infrastructure, makes up 42 percent of total agricultural support, and this share is three times the OECD average.[193] The OECD also recommends linking the new agricultural support model to measurable environmental and social outcomes.[194] The 2023 increase in climate-related agrifood finance to Europe and Central Asia also came largely from World Bank projects in Türkiye.[195] This finance channel and support structure can be expanded to cover FLW items such as cold chain, storage and measurement.

189 This is the OECD's estimate. Nénert et al., *Potential Effects*, 4.

190 According to a compilation of 43 initiatives in the EU, the range is €19.44 to €23,863.51 per tonne. OECD, *Beyond Food Loss and Waste*, 31. The OECD takes this compilation from the European Commission's Joint Research Centre (JRC).

191 The average initial cost that the OECD model estimates for Türkiye is $109.33 per tonne. The estimate is derived from a simple regression based on GDP per capita and a development-status dummy variable, and it depends largely on income level. Nénert et al., *Potential Effects*, 27 (Table A C.2). The estimate is derived from a simple regression of initiative costs reported in the literature on GDP per capita and a development-status dummy (pp. 26-27), and it is not product-specific. The model assumes that costs are financed through consumer prices (p. 7).

192 The pledges were announced for agricultural innovation, small-scale producers and adaptation, and they total $3 billion. Christoph Bals et al., "Energetic Start, Outcome with Major Gaps: Looking Back at COP30 in Belém", Germanwatch blog post, January 19, 2026, accessed October 12, 2026, https://www.germanwatch.org/en/blog/energetic-start-outcome-major-gaps-looking-back-cop30-belem.

193 These are OECD data for 2022-2024. The OECD average is 14 percent. The largest components of support are infrastructure, mainly irrigation, and marketing and promotion (duty loss payments and capital transfers to state economic enterprises). OECD, *Agricultural Policy Monitoring 2025*, 612. According to the same source, producer support in 2022-2024 was about 9 percent of gross farm receipts, below the OECD average (13.2 percent).

194 OECD, *Agricultural Policy Monitoring 2025*, 613.

195 This is FAO's finding. The projects relate to solar energy, forestry policy and agricultural water resources. Giulia Maria Galbiati et al., *Climate-Related Development Finance to Agrifood Systems: Global and Regional Trends. Report 2025* (Rome: FAO, 2025), 17-18. Of the finance in the region, 87 percent was provided through debt instruments. The amount going to Türkiye is not given separately.

BOX 3. Climate Finance Estimates for Agrifood and FLW

Source	Measured	Period	Figure
CLIC (2025)	Agrifood in all tracked climate finance	2021/22	7.2% ($94.9 billion)
UNFCCC Secretariat (2025; citing the CPI estimate in the Standing Committee on Finance's Sixth Biennial Assessment)	Agrifood in total climate finance	2021-2022	4%
Climate Focus (as cited in Mezzacapo and van Zeben 2026)	Food systems in public climate finance	Not specified	Less than 3%
FAO (2025)	Climate-related development finance to agrifood systems (OECD Development Assistance Committee, OECD-DAC)	2023	$27.6 billion (up 1% from 2022)
CLIC (2025)	Food and Diets in agrifood climate finance	2021/22	0.5% ($0.4 billion)
CPI and FAO (2025)	Annual investment need for FLW	Annual average for 2024-2030 (top-down estimate consistent with 1.5°C)	$18.8 billion

The first two rows use the same denominator (total climate finance) and the same period, but they give different figures. The CLIC (2025) figure also includes flows captured through new data sources. The other rows rest on different denominators, scopes and data sources. The figures in the table are therefore not interchangeable. CLIC's 2023 report gave the 2019/20 share as 4.3 percent. The 2025 report lowered this share to 3.6 percent because of an upward revision of the global total.

Source: CLIC, "Landscape of Climate Finance for Agrifood Systems 2025", 2, 6; UNFCCC Secretariat, FCCC/SB/2025/4, 16; Mezzacapo and van Zeben, "Integrating Food Systems into the International Climate Law and Policy Framework", 458; Galbiati et al., *Climate-Related Development* Finance to Agrifood Systems, viii; UNFCCC Secretariat, "Work Undertaken by Constituted Bodies and Financial and Other Entities under the Convention, as well as by Relevant International Organizations, on Activities Related to the Sharm el-Sheikh Joint Work on Implementation of Climate Action on Agriculture and Food Security", FCCC/SB/2026/1, March 25, 2026, 17; CPI and FAO, *The Triple* Gap in Finance for Agrifood Systems, 16, 19.

COUNTRY EXPERIENCES: INSTRUMENTS AND OUTCOMES

Countries approach FLW with instruments of different legal character. These instruments fall into two groups. The first group includes binding targets, bans and fees. The second includes framework laws, facilitative regulations and voluntary industry agreements. Both groups share a common problem. Evidence showing which instrument actually reduces waste is limited. Fewer than one third of countries set binding legal targets in their national FLW strategies, and only 43 percent of policy instruments are evaluated in terms of actual FLW reduction.[196] This section compares the two groups of instruments and draws lessons for Türkiye.

Binding Instruments: Targets, Bans and Fees

The EU is the most comprehensive example of the binding approach. In 2025 the EU set legally binding national targets for food waste. By the end of 2030, member states will reduce food waste by 10 percent in processing and manufacturing and by 30

196 This is the OECD survey covering 42 countries and the European Commission. OECD, *Beyond Food Loss and Waste*, 7, 20, 29. On the small number of countries that carry out regular impact assessments, see OECD, "From Targets to Action", 1.

percent per capita in retail, food service and households.[197] The targets were deliberately set to start below SDG Target 12.3, and a gradual approach was adopted.[198] Primary production was left outside the targets, and the assessment of losses at this stage was deferred to the 2027 review.[199] Data for 2020-2023 do not yet show a clear downward trend.[200] In this report's assessment, this framework is also worth following for Türkiye, which is in a Customs Union with the EU. The National Circular Economy Strategy and Action Plan (NCESAP) includes the 10 percent and 30 percent targets, which were at the proposal stage in the EU at the time.[201]

France and Spain chose the route of bans and sanctions. In 2016 France established a hierarchy that puts prevention first, and it banned the deliberate destruction of unsold edible food under penalty of fines.[202] Large retailers are obliged to offer a donation agreement to a charity, but the donation itself is not mandatory.[203] Donations have increased, but tax deductions were decisive in this increase. Compliance has not been inspected in practice, and

197 Directive 2025/1892, which amends Waste Framework Directive 2008/98/EC, entered into force on October 16, 2025. The deadline for the targets is December 31, 2030, and the reference period is the annual average for 2021-2023. The target for processing and manufacturing is set in absolute quantities. Directive (EU) 2025/1892 of the European Parliament and of the Council of 10 September 2025 Amending Directive 2008/98/EC on Waste, OJ L, 2025/1892, 26.9.2025, art. 1 (Directive 2008/98/EC art. 9a(4)) and art. 3; "Revised Waste Framework Directive Enters into Force to Boost Circularity of Textile Sector and Slash Food Waste", European Commission, news, October 16, 2025, accessed October 12, 2026, https://environment.ec.europa.eu/news/revised-waste-framework-directive-enters-force-2025-10-16_en. Data for 2020 may also be used for the reference period under certain conditions (recital 19).

198 According to the recitals of the Directive, binding targets should follow a gradual approach that starts from a lower level than the one set in the SDG. Directive (EU) 2025/1892, recital 15.

199 The Directive also provides that Member States, after consulting food banks and where appropriate, take measures to ensure that the economic operators they designate offer donation agreements. The Commission will review the targets by December 31, 2027. Directive (EU) 2025/1892, art. 9a(1) and 9a(8). Member States are to transpose the Directive into national law by June 17, 2027 (art. 2(1)).

200 This is the Commission's assessment. European Commission, "Revised Waste Framework Directive".

201 Ministry of Environment, Urbanization and Climate Change (MoEUCC), *Ulusal Döngüsel Ekonomi Stratejisi ve Eylem Planı (2025-2028)* [National Circular Economy Strategy and Action Plan (2025-2028)] (Ankara: MoEUCC, 2025), 22-23, 28-29. The NCESAP presents the targets with reference to the Commission's 2023 proposal.

202 This is Law No. 2016-138 of February 11, 2016. The penalty for a violation is €3,750. Loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire, *Journal officiel de la République française*, February 12, 2016, Environmental Code art. L. 541-15-4, L. 541-15-5 and L. 541-15-6.

203 The obligation covers retailers with a sales area of more than 400 square meters. Loi n° 2016-138, art. L. 541-15-6; Assemblée nationale, *Rapport d'information sur l'évaluation de la loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire*, n° 2025, Graziella Melchior and Guillaume Garot (Paris: Assemblée nationale, June 12, 2019), 25.

the law's effect on the quantities wasted has not been measured.[204] In 2025 Spain passed a law that covers the entire supply chain and requires businesses above a certain size to prepare prevention plans.[205] Because the law is new, this study found no data on its effect.

South Korea combined economic instruments with a landfill ban. The country introduced volume- and weight-based waste fees and banned the direct landfilling of food waste in 2005. Most food waste is now converted into feed, compost or energy.[206] The system diverted food waste from landfill and increased recovery, but its effect on waste prevention has remained unclear. The amount of waste in 2019 was 16 percent higher than in 2013.[207] There is evidence that waste fees are effective in reducing waste, but little is still known about the effectiveness of these instruments.[208] In the Korean case, the landfill ban is a strong instrument for methane, but its prevention effect needs to be measured separately.[209]

Facilitative and Voluntary Instruments: Laws, Incentives and Industry Agreements

Italy, by contrast, chose a facilitative route instead of sanctions. The 2016 law treats donation as an option, not an obligation. It allows products past their best-before date to be donated under certain conditions, and it keeps

204 According to the French National Assembly's 2019 evaluation report, supermarket donations to Banques Alimentaires rose by 23 percent between 2015 and 2018. The report states that the 60 percent tax reduction is one of the main drivers of donation, and in some cases even its precondition. Assemblée nationale, *Rapport d'information*, 19, 27, 28, 31, 56. Based on partial data, the report also judges that the law has probably slowed the continuing trend in waste (p. 19). One of the report's rapporteurs is also the rapporteur of the law, so the evaluation is not independent in this respect.

205 The law provides for fines of between about €2,000 and €500,000. Lipinski, "SDG Target 12.3", 6; OECD, *Agricultural Policy Monitoring 2025*, 127. The information is taken from a secondary source.

206 A volume-based waste fee was introduced in 1995, and a weight-based food waste fee was applied nationwide in 2013. In 2019, 36.2 percent of food waste was converted into feed, 38.1 percent into compost and 12.5 percent into energy. Esther Lee et al., "The Management of Food Waste Recycling for a Sustainable Future: A Case Study on South Korea", *Sustainability* 16, no. 2 (2024): 854, pp. 1-2, 12-13 (Table 5). The use of leftover food as pig feed has been banned since July 2019 (p. 11).

207 The figure covers the amounts of volume-based waste and food waste. The separate collection rate also fell from 93.6 percent to 88.8 percent between the fifth and sixth national waste statistics surveys. Lee et al., "Management of Food Waste Recycling", 5-6.

208 This is reported by Schanes and colleagues. Karin Schanes et al., "Food Waste Matters: A Systematic Review of Household Food Waste Practices and Their Policy Implications", *Journal of Cleaner Production* 182 (2018): 986.

209 For the methane that landfilled food waste produces through anaerobic decomposition, see Lee et al., "Management of Food Waste Recycling", 1.

donation tax-neutral.[210] Donations increased by 95 percent between 2016 and 2025.[211] The increase shows that donation has picked up, but a reduction in waste cannot be inferred from this figure. The success of the approach depends less on bureaucratic burden than on the capacity of food rescue organizations and on the reputational risks of food past its date.[212]

Japan is the country that combines the facilitative approach with measurement. The 2019 Act on Promotion of Food Loss and Waste Reduction is a framework law with no numerical targets or sanctions, and it places a duty of effort on businesses and consumers.[213] Numerical targets are set in the basic policies. The target of halving business-related waste from fiscal year 2000 levels was met in fiscal year 2022, but the market contraction caused by the pandemic also contributed to this result.[214] The new target is a 60 percent reduction in business-related waste and halving household waste by 2030.[215] Japan's main strength is measurement. Large businesses are required

210 This is Law No. 166 of August 19, 2016. Municipalities may apply a waste tax reduction in proportion to donations. This reduction is optional, and the law contains no penalty provisions. Legge 19 agosto 2016, n. 166, *Gazzetta Ufficiale* Serie Generale n. 202, 30.08.2016, art. 3(1), 4(1), 16(1)-(2), 17.

211 The figure is based on a news report. Camilla Curcio, "Food Waste: The Gadda Act Has Led to the Recovery of Food and Medicines Worth 10 Billion" (the newspaper's English edition), *Il Sole 24 Ore*, October 7, 2026, accessed October 12, 2026, https://en.ilsole24ore.com/art/food-waste-the-gadda-act-10-billion-worth-of-food-and-medicines-recovered-AJ6edtaB. The report is based on initial findings. The information is taken from a secondary source.

212 This is Busetti's assessment. Bureaucratic burden accounts for only a small part of the cost of donation, and reputational risks limit both supply and demand. Simone Busetti, "A Theory-Based Evaluation of Food Waste Policy: Evidence from Italy", *Food Policy* 88 (2019): 101749, pp. 1, 4, 8.

213 The Act requires the government to set a basic policy. Act on Promotion of Food Loss and Waste Reduction (original title in Japanese), Act No. 19 of May 31, 2019, art. 5, 6 and 11.

214 The target is set in the basic policy under the Food Recycling Act (Act on Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources). The Ministry of Agriculture, Forestry and Fisheries states that the market contraction caused by COVID-19 also played a part. "Business-Sourced Food Loss Reduction Target Achieved in FY2022" (title in Japanese), Ministry of Agriculture, Forestry and Fisheries of Japan, press release, June 21, 2024, accessed October 12, 2026, https://www.maff.go.jp/j/press/shokuhin/recycle/240621.html. The Japanese term *shokuhin rosu* refers to the discarding of edible food. The Ministry of the Environment of Japan defines the term as "food that is discarded even though it is actually edible" (translated from Japanese). Under the definition in the first section of this report, the term largely corresponds to waste. The text therefore uses the phrase "business- and household-sourced waste", and the official name of the law is kept as it is; see "Release of the FY2024 Food Loss Estimate" (title in Japanese), Ministry of the Environment of Japan, press release, June 30, 2026, accessed October 12, 2026, https://www.env.go.jp/press/press_05155.html.

215 The second basic policy was adopted in 2025. The estimate for fiscal year 2024 is about 4.61 million tonnes (2.24 million tonnes from households and 2.37 million tonnes from businesses). Business-related waste rose slightly compared with the previous year. Ministry of the Environment of Japan, "Release of the FY2024 Food Loss Estimate". For the second basic policy, see Consumer Affairs Agency of Japan, Act on Promotion of Food Loss and Waste Reduction and related regulations, Second Basic Policy (Cabinet decision of March 25, 2025; in Japanese), accessed October 12, 2026, https://www.caa.go.jp/policies/policy/consumer_policy/information/food_loss/promote.

to report their waste, while household waste is estimated through annual surveys based on municipal waste composition analyses. This has produced a consistent time series since 2008.[216]

Norway and the United Kingdom use voluntary industry agreements. In Norway, the agreement signed in 2017 between ministries and food industry organizations is voluntary but binding on its parties.[217] The agreement aims to halve per capita waste across the whole food chain by 2030 and divides this target into interim targets.[218] The sources consulted, however, contain no published data on its results. The Courtauld Commitment in the United Kingdom has produced a long data series. Household waste per capita fell by 27 percent between 2007 and 2018, and a rebound occurred during the pandemic.[219] Total waste per capita rose again between 2018 and 2021.[220] Moreover, the decline is hard to attribute to individual interventions. Changes in prices and incomes may also have played a role.[221]

Interventions at the Consumption Stage

At the consumption stage, no single instrument appears to be sufficient. Most interventions reduce waste by only 5-20 percent, and methods based on self-reporting record less waste than direct measurement.[222] Some well-designed

216 The reporting obligation covers businesses that generate more than 100 tonnes of food waste per year. A 28 percent per capita reduction could be traced between 2008 and 2019. UNEP, *Food Waste Index Report 2024*, 32 (Box 5). When 2020 data are included, the reduction is 31 percent.

217 The agreement was signed between five ministries and twelve food industry organizations (Industry Agreement on Reduction of Food Waste). The characterization is that of the Norwegian Ministry of Climate and Environment. "Agreement to Reduce Food Waste", Norwegian Ministry of Climate and Environment, June 28, 2017, accessed October 12, 2026, https://www.regjeringen.no/en/historical-archive/solbergs-government/Ministries/kld/news/2017/agreement-to-reduce-food-waste/id2558931/.

218 The target is relative to 2015. The interim targets are 15 percent for 2020 and 30 percent for 2025. Industry Agreement on Reduction of Food Waste (English version), Oslo, June 23, 2017, art. 4.

219 According to UNEP, total per capita waste fell by 23 percent over the same period, while the household reduction between 2007 and 2021 was limited to 17 percent. UNEP, *Food Waste Index Report 2024*, XIX, 85 (Box 14). In the same place, UNEP reports a benefit-cost ratio of 7 to 1 for Courtauld over the 2015-2018 period.

220 According to WRAP, total per capita waste fell by 18.3 percent between 2007 and 2021 but rose by 5.6 percent between 2018 and 2021. WRAP, *The Courtauld Commitment 2030 Milestone Report 2023*, accessed October 12, 2026, https://wrap.ngo/resources/report/courtauld-commitment-milestone-report-2023.

221 This is the assessment by Reynolds and colleagues for the 2007-2012 period. Christian Reynolds et al., "Review: Consumption-Stage Food Waste Reduction Interventions: What Works and How to Design Better Interventions", *Food Policy* 83 (2019): 23.

222 Of the 17 interventions found in the review by Reynolds and colleagues, 13 measured the reduction quantitatively. Reynolds et al., "Review", 7, 26. Reynolds et al., "Review", 24. For example, the diary method reports about 40 percent less waste than waste composition analysis.

interventions, however, deliver larger results. In an experiment with 52 hotels in Norway, smaller plates and information signs with social norm messages reduced waste by about one fifth.[223] The hospitality sector in Türkiye, especially all-inclusive hotels in Antalya, could benefit from this result.[224] Simplifying date labels also has considerable potential, while choice architecture interventions such as accessibility and defaults deliver most of the effect. Because average effects remain small, using these instruments together is recommended.[225]

Lessons for Türkiye

Four lessons for Türkiye emerge from country experiences. The first is measurement. The two countries that can show long-term results, Japan and the United Kingdom, rely on consistent time series. In France the law's effect on waste has not been measured, and in Italy the available data are limited to donations. Türkiye's 2020 National Strategy Document on Prevention, Reduction and Monitoring of Food Loss and Waste and its Action Plan (National Strategy) was prepared under the coordination of the Ministry of Agriculture and Forestry (MoAF) in cooperation with FAO. It envisages that FLW will be estimated and measured through TurkStat. It is recommended that this action be supported with reporting by large businesses and a municipal survey component, and that it be turned into a long-running time series.[226] The second is choosing instruments by sector. Japan's success in

223 Smaller plates achieved a 19.5 percent reduction and information signs a 20.5 percent reduction. Reynolds et al., "Review", 16 (Table 2). The primary study is by Kallbekken and Sælen (2013). Each intervention group included seven hotels.

224 A study based on interviews with employees of all-inclusive hotels in Antalya also recommends smaller plates and portions. See Bendegul Okumus et al., "Tackling Food Waste in All-Inclusive Resort Hotels", *International Journal of Hospitality Management* 88 (2020): 102543, pp. 1, 6.

225 According to Schanes and colleagues, information campaigns are among the most common instruments. Schanes et al., "Food Waste Matters", 986, 988. The same study also reports a finding that well-defined regulations appear more effective than financial incentives in tackling household waste (p. 986). This is based on the abstract of the 2026 meta-analysis by Lohmann and colleagues. Paul M. Lohmann et al., "A Meta-Analysis Assessing the Effectiveness of Demand-Side Interventions for Sustainable Food Consumption and Food Waste Reduction", *Nature Food* 7, no. 1 (2026): 88-99, abstract. The citation is based on the abstract of the article. This is the recommendation of Reynolds and colleagues. Lohmann et al., "A Meta-Analysis", abstract; Reynolds et al., "Review", 26.

226 UNEP, *Food Waste Index Report 2024*, XIII, XIX, 32, 85; Assemblée nationale, *Rapport d'information*, 56; Busetti, "A Theory-Based Evaluation", 3; Curcio, "Food Waste: The Gadda Act"; Republic of Türkiye Ministry of Agriculture and Forestry (MoAF) and FAO, *Türkiye'nin Gıda Kayıpları ve İsrafının Önlenmesi, Azaltılması ve Yönetimine İlişkin Ulusal Strateji Belgesi ve Eylem Planı* [National Strategy Document on Prevention, Reduction and Monitoring of Food Loss and Waste and its Action Plan] (Ankara: MoAF and FAO, 2020), 21 (Action 1.2.1).

meeting its business target suggests that obligations and reporting can work in concentrated segments such as retail and manufacturing. At the consumption stage, by contrast, effects remain small. The third is using voluntary and binding instruments together. Norway's voluntary agreement that binds its parties, the EU's gradual binding targets and Japan's model combining a duty of effort with mandatory reporting are different forms of this. The fourth is that donation does not mean prevention. Increases in donations show rescued food, not prevented waste. FLW reduction is an intermediate goal, and instruments should be chosen according to the final aim to be achieved.[227]

The last lesson can be applied directly in Türkiye. Türkiye has long had tax provisions for food banking, and NCESAP envisages preparing a new legal framework for donation.[228] In light of the French and Italian experience, it is recommended that this framework also cover the capacity of food rescue organizations and the measurement of the effect of donation (see Box 4).[229]

227 Cattaneo et al., "Reducing Food Loss and Waste", 2.

228 Action 2.8.2 of the NCESAP provides for a legal framework for donating products close to their best-before date through food banking. MoEUCC, *UDESEP* [NCESAP], 64-65. Tax provisions on food donated to food banking were introduced by Law No. 5035, Bazı Kanunlarda Değişiklik Yapılması Hakkında Kanun [Law on Amendments to Certain Laws] (adopted December 25, 2003; *Resmi Gazete* [Official Gazette], January 2, 2004, no. 25334 (bis)); for details, see Box 4.

229 Busetti, "A Theory-Based Evaluation", 8; Assemblée nationale, *Rapport d'information*, 56.

TABLE 4. SELECTED COUNTRY MODELS ON FLW

Country	Main instrument and legal nature	Target and scope	Known outcome and limitation	Possible step for Türkiye
EU	Directive (EU) 2025/1892; in force since October 16, 2025	By December 31, 2030, 10% in processing and manufacturing and 30% per capita in retail, food service and households; legally binding, gradual; primary production excluded	No implementation results yet; no clear decline in 2020-2023	A national baseline aligned with the EU method, following the EU reference in NCESAP
France	2016 law. Ban on deliberate destruction; obligation for retailers over 400 m^2 to offer a donation agreement	No numerical waste target in the law	Supermarket donations to Banques Alimentaires up 23% (2015-2018); tax deduction one of the main drivers; no enforcement in practice; effect on waste not measured	Designing the donation framework together with enforcement and impact measurement
Italy	2016 law. Facilitating donation; tax neutrality; no penalties	No numerical target	Donations increased (news data); reputational risk and rescue capacity decisive; no data found on the effect on waste (no reliable implementation data in an early evaluation)	Adding the capacity of food rescue organizations to the work under NCESAP 2.8.2
Spain	2025 law. Whole chain; prevention plan obligation; penalties	Hierarchy and prevention plan	New; no impact data found	A prevention plan obligation starting with large businesses
Japan	2019 framework law (duty of effort); mandatory reporting for businesses over 100 tonnes under the Food Recycling Act	60% for business-related waste and 50% for household waste by 2030 (2000 baseline), in the second basic policy of 2025	Earlier 50% target for business-related waste met in 2022 (COVID effect acknowledged); time series since 2008	Supporting the National Strategy's TurkStat measurement action (Action 1.2.1) with business reporting and municipal surveys
South Korea	2005 landfill ban; weight-based fees since 2013	Diversion from landfill and recovery	High recovery, but volume-based waste and food waste in 2019 16% above 2013	Supporting the separate collection action under Zero Waste in NCESAP 2.8.5 with quantity and prevention indicators

TABLE 4. SELECTED COUNTRY MODELS ON FLW

Country	Main instrument and legal nature	Target and scope	Known outcome and limitation	Possible step for Türkiye
Norway	2017 industry agreement. Voluntary but binding on its parties	50% per capita by 2030 (2015 baseline); interim targets of 15% (2020) and 30% (2025)	No outcome data found	An industry agreement with interim targets and data reporting
United Kingdom	Courtauld Commitment (voluntary public-private partnership); qualitative reference in the NDC	50% per capita by 2030 (2007 baseline); no numerical target in the NDC	27% decrease in households in 2007-2018; 5.6% increase in total in 2018-2021; causality disputed	A public-private agreement that produces a long-running measurement series (see Conclusion)

Source: Compiled by the authors.[230]
* Outcome data for Italy and Spain are drawn from secondary sources.

230 Directive (EU) 2025/1892; Loi n° 2016-138; Legge n. 166/2016; Japan, Act No. 19 of 2019; Ministry of the Environment of Japan, "Release of the FY2024 Food Loss Estimate"; Ministry of Agriculture, Forestry and Fisheries of Japan, "Business-Sourced Food Loss Reduction Target Achieved in FY2022"; Assemblée nationale, *Rapport d'information*; Busetti, "A Theory-Based Evaluation"; Lee et al., "Management of Food Waste Recycling"; Industry Agreement on Reduction of Food Waste; WRAP, *Courtauld Milestone Report 2023*; UNEP, *Food Waste Index Report 2024*; HM Government, *2035 Nationally Determined Contribution*; Lipinski, "SDG Target 12.3"; European Commission, "Revised Waste Framework Directive"; MoEUCC, *UDESEP*; Curcio, "Food Waste: The Gadda Act"; OECD, *Beyond Food Loss and Waste*; OECD, *Agricultural Policy Monitoring 2025*; Reynolds et al., "Review"; MoAF and FAO, *Ulusal Strateji* [National Strategy]; Republic of Türkiye, *Updated First Nationally Determined Contribution* (Bonn: UNFCCC, April 2023).

TÜRKİYE: INSTITUTIONAL EXPERIENCE, MEASUREMENT AND COP31

Türkiye has more than a decade of institutional experience in FLW, and hosting COP31 offers an opportunity to link this experience with measurement and climate commitments. The next step for this experience is to bring the responsibilities shared among different institutions together around a common measurement system. In the National Strategy, MoAF is mainly responsible for actions to prevent loss and consumer waste. Responsibility for organic waste actions, by contrast, is shared among the Ministry of Environment, Urbanization and Climate Change, local governments, the Union of Municipalities of Türkiye and MoAF.[231] This section first addresses this experience. It then turns to the channels through which FLW connects to food security in Türkiye, the data situation, climate commitments and COP31 hosting.

Institutional Experience: Three Strands and the Next Step

Türkiye's experience in FLW has developed along three strands. The first strand is campaigns. The Campaign to Prevent Bread

231 The waste-side duties of municipalities are set out in the Zero Waste Regulation. MoAF and FAO, *Ulusal Strateji* [National Strategy], 18-29, 34-35 (responsible institution column in the action tables; Actions 4.1.1-4.1.6). The Ministry of Environment, Urbanization and Climate Change (MoEUCC) is responsible for the food waste inventory through the Zero Waste Information System. Guidance on reduction falls to MoEUCC and local governments, the collection of organic waste to the Union of Municipalities of Türkiye and waste generators, and the compost and R&D actions to MoAF. The document uses the ministry's name at the time (Ministry of Environment and Urbanization). Zero Waste Regulation, *Resmi Gazete* [Official Gazette], July 12, 2019, no. 30829, art. 9; the amendment in the current text, *Resmi Gazete*, October 9, 2021, no. 31623.

Waste, launched in 2013, was presented by FAO as a good practice, and after the campaign the amount of bread wasted daily fell from 5.9 million to 4.9 million.[232] The Save Your Food campaign, launched with FAO in 2020, continued this line.[233] In the second strand, Türkiye took the issue beyond its own borders. A technical platform on the measurement and reduction of FLW was established as an outcome of the 2015 G20 Presidency, and Türkiye also funded an FAO project that supports measurement work in Central Asia and Azerbaijan.[234] In 2021 the national roadmap prepared for the UN Food Systems Summit identified FLW prevention as one of four national priorities, and Türkiye also supported the FLW and methane declarations at COP28 and COP29.[235] This line, running from campaigns to international initiatives, offers experience that can be carried into the COP31 Presidency.

The third and most comprehensive strand is the institutional framework. The 2020 National Strategy assigned a responsible institution to each

232 FAO, *The State of Food and Agriculture 2019: Moving Forward on Food Loss and Waste Reduction* (Rome: FAO, 2019), 113. FAO reports the campaign data from a secondary source. National sources give the same decline as a fall from 5.95 million to 4.9 million loaves of bread per day and as an 18 percent reduction. See MoAF, *Towards Sustainable Food Systems: National Pathway*, national pathway for the UN Food Systems Summit (Ankara: MoAF, November 2021), 61; MoAF and FAO, *Ulusal Strateji* [National Strategy], 7.

233 Deniz Çiçek Palabıyık, "Gıdanı Koru Kampanyası ile Gıda İsrafı ve Kayıpları Önlenecek" [Food Waste and Losses to Be Prevented with the Save Your Food Campaign], Anadolu Agency, May 20, 2020, accessed October 12, 2026, https://www.aa.com.tr/tr/ekonomi/gidani-koru-kampanyasi-ile-gida-israfi-ve-kayiplari-onlenecek/1847616; "Gıdanı Koru-Sofrana Sahip Çık Kampanyasının Lansmanı Gerçekleştirildi" [Save Your Food Campaign Launched], Republic of Türkiye Ministry of Agriculture and Forestry, May 26, 2020, accessed October 12, 2026, https://www.tarimorman.gov.tr/ABDGM/Haber/562/Gidani-Koru-Sofrana-Sahip-Cik-Kampanyasinin-Lansmani-Gerceklestirildi; MoAF and FAO, *Ulusal Strateji* [National Strategy], 2-3, 21.

234 The platform was established by FAO and the International Food Policy Research Institute (Technical Platform on the Measurement and Reduction of Food Loss and Waste). MoAF, *Towards Sustainable Food Systems*, 34. The World Bank also counts Türkiye's G20 Presidency among the advocates on FLW. See World Bank, *Addressing Food Loss and Waste*, 106, n. 2. The project also covers Türkiye. "Reduction of Food Loss and Waste in Central Asia, Azerbaijan and Turkey", FAO, project page (FAO-Türkiye Partnership Programme II, 2019-2021), accessed October 12, 2026, https://www.fao.org/in-action/fao-turkey-partnership/projects/project-detail/en/c/1363051/.

235 The roadmap defines the transition to sustainable consumption and FLW prevention together as one priority. MoAF, *Towards Sustainable Food Systems*, 3. After the 3rd Agriculture and Forestry Council, the Ministry set 46 main actions and 324 sub-actions to be completed by the end of 2023, and the roadmap lists them among its milestones (pp. 3, 17). The national dialogue on which the roadmap is based recommended strengthening the regular measurement and monitoring of FLW. MoAF, *Türkiye'de Gıda Sistemlerinin Dönüşümüne Doğru* [Towards the Transformation of Food Systems in Türkiye] (Ankara: MoAF, 2021), 42. Of the problems raised by stakeholders, 15.58 percent fall under the main intervention area Transition to Sustainable Consumption and Prevention of Food Loss and Waste (pp. 17, 21). Türkiye joined the UN Food Systems Convergence Initiative as a pilot country and developed a Convergence Action Plan. "Countries Gathered in İzmir to Shape Food, Water and Climate Priorities ahead of COP31", UN Food Systems Coordination Hub, September 23, 2026, accessed October 12, 2026, https://www.unfoodsystemshub.org/latest-updates/news/detail/countries-gathered-in-i-zmir-to-shape-food--water-and-climate-priorities-ahead-of-cop31/en. "COP28 UAE Declaration", list of signatories; CCAC, "COP29 Declaration", list of endorsers.

action, and according to the OECD, Türkiye is one of ten countries that built their strategy on the food waste hierarchy. Of the planned actions, 70 percent have been completed.[236] On the waste side, the Zero Waste Regulation requires municipalities to report data that also cover food waste. The Zero Waste Project became an international movement when the UN General Assembly declared March 30 the International Day of Zero Waste.[237]

236 The Strategy consists of four strategic objectives, 13 targets and 94 actions. MoAF and FAO, *Ulusal Strateji* [National Strategy], 2-3, 18-35. The number of actions was obtained by counting the actions in the document's action tables. Action 1.2.1 provides for FLW to be estimated and measured together with TurkStat. Action 1.1.14 provides for the establishment of the National Platform for Preventing, Reducing and Managing Food Loss and Waste. Action 1.2.6 provides for the action plan to be reviewed and updated every year. Action 4.1.1 provides for the food waste inventory of zero waste certified premises to be compiled through the Zero Waste Information System. MoAF and FAO, *Ulusal Strateji* [National Strategy], 20-21, 34. OECD, *Beyond Food Loss and Waste*, 22. The OECD also counts Türkiye among eight countries that use the term food waste in line with the FAO definition (p. 8). This is according to the Türkiye country chapter of the OECD report. A total of 881,000 pledges were received from consumers. OECD, *Agricultural Policy Monitoring 2023*, 581. The consumer and sector strands of the Strategy are complemented by the Türkiye Food Literacy Strategy and Action Plan (2022-2028) and the Guidelines on the Prevention of Food Waste at Hotels, Restaurants and Other Public Consumption Points. FAO, *Türkiye Gıda Okuryazarlığı Stratejisi ve Eylem Planı 2022-2028* [Türkiye Food Literacy Strategy and Action Plan 2022-2028] (Ankara: FAO, 2023), 2; Metro Türkiye et al., *Otel, Restoran ve Diğer Toplu Tüketim Yerlerinde Gıda İsrafı ile Mücadele Kılavuzu* [Guidelines on the Prevention of Food Waste at Hotels, Restaurants and Other Public Consumption Points] (n.d.), 3. The Guidelines correspond to Action 1.1.10 of the Strategy. See MoAF and FAO, *Ulusal Strateji* [National Strategy], 19.

237 The Zero Waste Project, launched in 2017, was institutionalized by this regulation in 2019. The regulation includes in its definition of biodegradable waste the food and kitchen waste from homes, restaurants, retail outlets and food processing facilities. It requires municipalities to carry out work that encourages waste prevention and to report data on the waste they collect to the Zero Waste Information System every month. Republic of Türkiye, "Submission by Türkiye", section "Mainstreaming Zero Waste Practices"; Zero Waste Regulation, current text (as amended on October 9, 2021), art. 4/1-ğ, 9/2-c, 9/2-m. The original 2019 text of art. 9/2-m provided for reporting twice a year, in January and July. The amendment of October 9, 2021 made reporting monthly and added that the checking of the previous year's data must be completed by the end of March each year (amendment in *Resmi Gazete*, October 9, 2021, no. 31623; current text on mevzuat.gov.tr, accessed October 17, 2026). The assessment that the project has become a global movement is that of the Twelfth Development Plan. Presidency of Strategy and Budget (SBB), *On İkinci Kalkınma Planı (2024-2028)* [Twelfth Development Plan (2024-2028)] (Ankara: SBB, 2023), 19, para. 120; UN General Assembly, "Promoting Zero-Waste Initiatives to Advance the 2030 Agenda for Sustainable Development", A/RES/77/161, December 14, 2022. Under the Zero Waste Project, the recovery rate is targeted to rise from 30.1 percent in 2022 to 42.5 percent in 2028. SBB, *On İkinci Kalkınma Planı* [Twelfth Development Plan], 216. According to the first BTR, the recycling rate rose from 13 percent in 2017 to 34.92 percent in 2023 and is projected to reach 60 percent in 2035. See Republic of Türkiye, *First Biennial Transparency Report*, 207. With the 2021 amendment, the zero waste certificates that provincial municipalities and large district municipalities must obtain were tied to separate collection that also covers biodegradable waste. Silver, gold and platinum certificates require a minimum three-stream collection system that also covers biodegradable waste. The obligation applies to provincial municipalities and to district municipalities with a population of more than fifty thousand. Under the general provision of the regulation, separate accumulation is an option. Action 2.8.5 of NCESAP also provides for improving the effectiveness of separate collection at source. Zero Waste Regulation, current text (as amended on October 9, 2021), art. 14/3-c, 14/4-ç, 16/2; MoEUCC, *UDES-EP*, 66-67. Art. 14/4-ç, added by the 2021 amendment, requires local administrations to set up a minimum three-stream collection system, including equipment dedicated to biodegradable waste, for silver, gold and platinum zero waste certificates.

The 2025 Climate Law made the establishment, implementation and monitoring of the zero waste system an obligation of institutions, and it gave the Directorate of Climate Change the authority for annual monitoring.[238] The institutions and powers to monitor FLW in Türkiye are therefore largely defined.

The step that would bring these three strands together is measurement. The Strategy already envisages measuring FLW through TurkStat, and this measurement can be turned into a trackable time series. The Climate Law has also created a monitoring mandate that could link FLW to methane reduction. This mandate could prepare the ground for FLW to be included in measurable form in the next NDC update. A strong step that Türkiye could put forward at COP31 is therefore to bring its existing campaigns and instruments together in a single measurement and reporting line.

The Contribution of FLW to Food Security in Türkiye

In Türkiye, the contribution of FLW prevention to food security can be expected mainly through the access and stability channels. Türkiye is among the upper-middle-income countries.[239] In high-income countries, interventions at the final links of the chain maximize greenhouse gas savings, while in low-income countries interventions at the first links can support food security more effectively. Türkiye sits between these two ends.[240] The effect of halving FLW on agricultural emissions is greatest in upper-middle-income countries, while its effect on nutrition declines as the level of development

238 The deadline for adapting legislation and planning instruments and for preparing local climate action plans is December 31, 2027, and it can be extended by up to one year. Climate Law No. 7552, *Resmi Gazete*, July 9, 2025, no. 32951, art. 4/1, 4/4, 5/4 and provisional art. 2. NCESAP, which covers the 2025-2028 period, contains 53 actions and lists food and biomass among its priority sectors. MoEUCC, *UDESEP*, 16-17, 36-37, 62-69. NCESAP also states that measures to reduce food waste will have a positive effect on greenhouse gas emissions (pp. 22-23). The Presidential Agriculture and Food Policies Board is also carrying out work on preventing food waste, and this work has put food banking and the legal framework on its agenda. This information is based on a statement by Council member Ramazan Bingöl in July 2025. Uğur Aslanhan and Mücahit Enes Sevinç, "Yıllık 23 Milyon Tonluk Gıda İsrafının Engellenmesi İçin Düğmeye Basıldı" [Work Launched to Prevent 23 Million Tonnes of Food Waste a Year], Anadolu Agency, July 31, 2025, accessed October 12, 2026, https://www.aa.com.tr/tr/yesilhat/sifir-atik/yillik-23-milyon-tonluk-gida-israfinin-engellenmesi-icin-dugmeye-basildi/1826722.

239 This is the World Bank's classification for fiscal year 2027. "World Bank Country and Lending Groups", World Bank, fiscal year 2027, accessed October 16, 2026, https://datahelpdesk.worldbank.org/knowledgebase/articles/906519.

240 This dichotomy is set out in FAO's 2023 global roadmap. FAO, *Achieving SDG 2*, 30.

rises.[241] The main channels of the contribution are therefore access, through household budgets and the cost of a healthy diet, and stability, through supply in the face of climate shocks (see Box 2).[242] The Twelfth Development Plan also defines waste prevention as a policy for ensuring food security.[243]

The most promising area may be the fresh fruit and vegetable chain. The food group that households waste most is fresh fruit and vegetables, with bread in second place.[244] On the loss side, low rainfall and extensive dry farming areas are counted among the main causes of loss.[245] Grain loss has been found to be negatively associated with food security and positively associated with import dependence and price increases.[246] Global modeling also shows the highest potential for food security in fruit and vegetable value chains.[247] The fresh fruit and vegetable chain could therefore be an area in Türkiye that serves climate and food security goals together, on both the loss side and the waste side. This is a hypothesis, and it needs to be tested with product-level data.

Data and Measurement

Existing figures on FLW in Türkiye are based on estimates, not measurement. Current estimates range from about 16 to 26 million tonnes per year (Table 5). The figures do not contradict each other, because they cover dif-

241 This is a finding of the OECD model. The nutrition effect is measured through calorie intake. Nénert et al., *Potential Effects*, 12. In the model, halving FLW reduces agricultural emissions by between 3 and 5 percent, depending on the level of development. The result on calorie intake partly stems from the assumption that rescued food is consumed in the local market in countries where undernourishment is widespread (p. 12).

242 The assessment is this report's own. For its basis, see Nénert et al., *Potential Effects*, 12; FAO, *Achieving SDG 2*, 30. For the dimensions of food security, see the first section.

243 SBB, *On İkinci Kalkınma Planı*, 100, para. 495.

244 These are TurkStat data for 2025. The shares are 39.7 percent and 32.5 percent. These percentages show the distribution of households by the food group they waste most, not the share in the amount wasted. "Hanehalkı Tüketim Harcaması, 2025" [Household Consumption Expenditure, 2025], TurkStat, News Bulletin 58010, June 2, 2026, accessed October 14, 2026, https://veriportali.tuik.gov.tr/tr/press/58010.

245 This is a finding of the Türkiye country report prepared for FAO. Tatlıdil et al., "Food Losses and Waste in Turkey", 2.

246 This study uses data for 1991-2019. Its findings are correlational. Nihal Ahmed et al., "Intensifying Effects of Climate Change in Food Loss: A Threat to Food Security in Turkey", *Sustainability* 15, no. 1 (2023): 350, p. 1.

247 This is the global general equilibrium model of Kuiper and Cui. Kuiper and Cui, "Using Food Loss Reduction", abstract; Cattaneo et al., "Reducing Food Loss and Waste", 5. In the model, the strongest effects of loss reduction on food security and the environment appear in low-income regions (abstract).

ferent stages with different definitions and methods. The highest estimate covers the entire chain and mainly reflects loss in agricultural production.[248] The lowest estimate, by contrast, excludes consumer waste.[249] The figure of 19.1 million tonnes in official documents was derived, according to the document, from calculations based on TurkStat data.[250] UNEP's household waste figure for Türkiye is likewise a model estimate drawn from other countries' data, with low confidence.[251] International monitoring systems contain no measurement-based value for Türkiye.[252] FAO's Food Loss Index is not published at the country level either.[253] The National Strategy left a numerical FLW quantity to the result of a measurement to be carried out with TurkStat.[254] Choosing one of the existing figures does not close this gap. A national measurement system can close it.[255]

248 The highest estimate is about 26 million tonnes. According to the same study, the consumption stage accounts for 8 percent of the total. Güray Salihoğlu et al., "Food Loss and Waste Management in Turkey", *Bioresource Technology* 248 (2018): 88, 90, 92.

249 This estimate is about 16 million tonnes and covers the stages from farm to retail. Belkıs Çakar et al., "Assessment of Environmental Impact of FOOD Waste in Turkey", *Journal of Cleaner Production* 244 (2020): 118846, pp. 1-2, 4.

250 A national measurement system can also standardize the method for this calculation. MoAF, *Türkiye'de Gıda Sistemlerinin Dönüşümüne Doğru* [Towards the Transformation of Food Systems in Türkiye], 40.

251 The figure is 102 kilograms per capita. UNEP, *Food Waste Index Report 2024*, 9, 172.

252 This is as of UNEP's 2024 report. According to UNEP, in most countries with high-confidence data, the availability of data for every sector probably stems from the existence of at least one institution clearly responsible for measurement. UNEP, *Food Waste Index Report 2024*, 23. The report states that G20 countries have an important opportunity to lead on measuring, reporting and reducing food waste (p. 23). The value given for Türkiye is based on modeling (p. 172). The report names Argentina and Türkiye as the G20 countries that do not yet have a household food waste estimate (pp. 22-23, Table 13). For Action 1.2.1, the responsible institution is MoAF and the cooperating institution is TurkStat. See MoAF and FAO, *Ulusal Strateji* [National Strategy], 21.

253 FAO, "Indicator 12.3.1(a)", section 4.j.

254 MoAF and FAO, *Ulusal Strateji* [National Strategy], 21. The document gives no amount of FLW in tonnes.

255 Such a system is a requirement of national monitoring under SDG Target 12.3. It can also lay the groundwork for writing FLW into the NDC in measurable terms. UNEP, *Food Waste Index Report 2024*, 4. For measurement in NDCs, see the second section.

TABLE 5. EXISTING FLW ESTIMATES FOR TÜRKİYE: SCOPE, SOURCE AND METHOD

Figure	Scope	Published by	Method and confidence
26.04 million tonnes/year (edible)	Loss and waste, entire chain; consumption stage 8%	Salihoğlu et al. (2018)	FAO model; TurkStat 2016 production data and 2013 loss rates; peer-reviewed
23 million tonnes/year; 102 kg per capita	Presented as waste; scope not specified	Waste Prevention Foundation of Türkiye (Türkiye İsrafı Önleme Vakfı, TİSVA, 2025), as reported by Anadolu Agency	Method not explained in the source; per capita figure is the same as the UNEP (2024) household estimate
19.1 million tonnes/year	Loss and waste; stage not specified	MoAF (2021)	Method not explained in the source; refers to "TurkStat data (2020) calculations"
18.8 million tonnes/year	Scope not specified	Statement by the Minister of Agriculture and Forestry (2020); hotel-restaurant-café (HORECA) guide	Method not explained in the source
18 million tonnes/year	Loss and waste	FAO project page	Method not explained in the source
16 million tonnes/year	Farm to retail; excludes consumers	Çakar et al. (2020)	Life cycle assessment; peer-reviewed
8.69 million tonnes; 102 kg per capita	Household waste only	UNEP (2024)	Modeled from other countries; low confidence
7.76 million tonnes; 93 kg per capita	Household waste only	UNEP (2021)	Modeling; low confidence; not comparable with the 2024 estimate
22.8% (share)	Individuals who report throwing away food they bought without eating it	Ministry of Trade (2018)	Survey; self-reported

Source: Compiled by the authors.[256]
* The rows cannot be added together because they measure different stages and system boundaries.

Some of the building blocks of such a system already exist. Action 1.2.1 of the Strategy assigns responsibility for measurement to MoAF and TurkStat. TurkStat also publishes waste indicators under the Household Budget

256 Salihoğlu et al., "Food Loss and Waste Management", 88, 90, 92; Aslanhan and Sevinç, "Yıllık 23 Milyon Tonluk"; MoAF, *Türkiye'de Gıda Sistemlerinin Dönüşümüne Doğru* [Towards the Transformation of Food Systems in Türkiye], 40; Palabıyık, "Gıdanı Koru Kampanyası" [Save Your Food Campaign]; Metro Türkiye et al., *Gıda İsrafı ile Mücadele Kılavuzu* [Guidelines on the Prevention of Food Waste], 9; FAO, "Reduction of Food Loss and Waste"; Çakar et al., "Assessment of Environmental Impact", 1-2, 4; UNEP, *Food Waste Index Report 2021*, 65; UNEP, *Food Waste Index Report 2024*, 9, 46, 172; Ministry of Trade, *Türkiye İsraf Raporu* [Türkiye Waste Report], 100.

Survey that track household behavior, from shopping planning to date labels.[257] These indicators are valuable. However, they are self-reported percentage distributions and do not measure the quantity of waste. Studies on household waste in Türkiye are also mostly survey-based, and self-reported methods can underestimate waste.[258] Tracking how waste changes over time requires direct national measurement. Adding a quantity module to the existing indicators could therefore be a suitable starting point.[259]

The cost of a measurement system can be kept limited by drawing on existing data. Simplified methods based on municipal solid waste and waste composition data have been developed for this purpose, and Japan produces its household estimate from such data.[260] Similar data exist in Türkiye. NC-ESAP provides for monitoring circular economy indicators, and the Strategy links the Zero Waste Information System to the food waste inventory.[261] The Household Budget Survey and municipal waste composition data could therefore offer a good starting point. Once the system starts with household

257 In the 2025 results of the survey, the third most wasted group after fresh fruit and vegetables and bread is milk and dairy products, at 15.1 percent. TurkStat, "Hanehalkı Tüketim Harcaması, 2025" [Household Consumption Expenditure, 2025]. The annex table of the bulletin gives the indicators by income group for 2024 and 2025. In 2025, 84 percent of households state that they never throw food away. Spoilage ranks first among the reasons for throwing food away, at 74.4 percent. TurkStat, "Gıda İsrafı Göstergelerinin Gelire Göre Sıralı Yüzde 20'lik Gruplara Göre Dağılımı, Türkiye, 2024, 2025" [Distribution of Food Waste Indicators by Quintiles Ordered by Income, Türkiye, 2024, 2025], annex table to the Household Consumption Expenditure 2025 bulletin, June 2, 2026, accessed October 14, 2026, https://veriportali.tuik.gov.tr/tr/press/58010.

258 TurkStat, "Gıda İsrafı Göstergeleri" [Food Waste Indicators], 2024 and 2025 columns. All values in the table are percentages of households. For example, Republic of Türkiye Ministry of Trade, *Türkiye İsraf Raporu* [Türkiye Waste Report] (Ankara: Ministry of Trade, December 2018), 100; Ozan Çamoğlu, "Samsun Kent Merkezindeki Hanehalklarının Gıda İsraf Düzeylerinin ve Etkili Faktörlerin Araştırılması" [An Investigation of Household Food Waste Levels and Influencing Factors in Samsun City Center] (unpublished master's thesis, Ondokuz Mayıs University, 2020), i (384 households, face-to-face survey); Seda Muti Tabanlı, "Türkiye'de Tüketici Kaynaklı Gıda İsrafının Norm Aktivasyon Teorisiyle İncelenmesi" [Examining Consumer Food Waste in Türkiye through Norm Activation Theory], *Tarım Ekonomisi Araştırmaları Dergisi* [Journal of Agricultural Economics Research] 12, no. 1 (2026): 2 (422 participants, online survey). This is noted both in the international literature and in a study conducted in Türkiye. Reynolds et al., "Review", 24; Belkıs Çakar, "Türkiye'de Süpermarketlerden Kaynaklanan Gıda Atıklarının Karbon, Su ve Enerji Ayak İzlerinin Belirlenmesi" [Determining the Carbon, Water and Energy Footprints of Food Waste from Supermarkets in Türkiye] (unpublished PhD dissertation, Istanbul University-Cerrahpaşa, 2020), 15.

259 This is a finding of UNEP. UNEP, *Food Waste Index Report 2024*, 4.

260 This is UNEP's simplified method. UNEP, "Indicator 12.3.1(b)", section 4.c. Cattaneo and colleagues state that systematic measurement of FLW will require approaches that are more cost-effective than the current survey-based and model-based methods. Cattaneo et al., "Reducing Food Loss and Waste", 3. UNEP also sees revisiting and using existing data as a cost-effective path for countries without retail and food service estimates. UNEP, *Food Waste Index Report 2024*, 13 (Box 1), 23.

261 MoEUCC, *UDESEP*, 36-37, 90-91 (Objective 6.1); MoAF and FAO, *Ulusal Strateji* [National Strategy], 34.

and municipal waste and expands to other stages, international estimates for Türkiye could also move from modeling to the country's own measurement data.[262]

FLW in Climate Commitments

Türkiye is one of the few countries that mention FLW in their climate commitments. The next step is to turn this reference into measurable action. The updated first NDC, submitted in April 2023, lists reducing FLW among the policies of critical importance for managing greenhouse gas emissions in the agriculture sector.[263] The same NDC states that agricultural methane will be managed through policies that do not put food security at risk, and that advanced methane policies require additional international finance.[264] The link between FLW, food security and climate finance that this report argues for is thus already present in Türkiye's own NDC. In the OECD survey, Türkiye is one of three countries that explicitly mention FLW in their NDCs.[265] NDC 3.0, submitted in November 2025, aims to reduce emissions in 2035 by 466 million tonnes of CO2 equivalent relative to the business-as-usual scenario, and it envisages reaching this goal without compromising food security.[266] The document leaves methodological assumptions and sectoral detail to the next BTR.[267] Within this structure, the 2023 reference to FLW could be turned into a measurable action or target in the next BTR and NDC update.[268] The COP31 Presidency also encourages Parties to integrate waste-related methane reduction opportunities into their updated NDCs with measurable targets.[269]

262 UNEP, *Food Waste Index Report 2024*, 4 (Level 1 modeling is designed as temporary support until national measurement capacity is built). The assessment is this report's own. For its basis, see UNEP, *Food Waste Index Report 2024*, 13, 23; Republic of Türkiye, *First Biennial Transparency Report*, 46.

263 Republic of Türkiye, *Updated First Nationally Determined Contribution*, 12-13.

264 Republic of Türkiye, *Updated First Nationally Determined Contribution*, 13.

265 OECD, *Beyond Food Loss and Waste*, 7, 15, n. 8.

266 The target is to limit emissions to 643 million tonnes. Republic of Türkiye, *NDC 3.0*, 4-5.

267 Republic of Türkiye, *NDC 3.0*, 4, n. 4. The text contains no language on FLW or methane from organic waste. It refers to the waste sector in general terms, within the framework of the zero waste approach and the diversion of waste from landfill (p. 1).

268 The assessment is this report's own. A commitment tied to measurement can be tracked more easily across NDC cycles. Kurum, "COP31 Presidency's 3rd Letter", 9.

269 COP31 Türkiye Presidency, "Zero Waste".

Türkiye already reports waste methane under the transparency framework, and waste accounts for a significant share in this area. The waste sector was responsible for about one fifth of total methane emissions in 2022.[270] In 2024, this share was 18.5 percent.[271] However, the mitigation effects of the waste measures in the BTR have not yet been quantified.[272] Once this effect is quantified, the climate contribution of preventing FLW and diverting organic waste from landfill could become visible. Because of organic waste already landfilled, this contribution materializes in full only after a delay of 10-20 years. It is recommended that this delay also be taken into account.[273]

Other policy documents address FLW but do not tie it to a measurable target. The Twelfth Development Plan lists improving cold chain logistics and awareness-raising work on FLW among its measures.[274] The Climate Change Adaptation Strategy does not yet include an action directly targeting FLW.[275] NCESAP also finds that current waste legislation contains no quantitative target for reducing food waste.[276] In the next plan period, an FLW indicator could be added to the agriculture sector targets, and an indicator on the quantity of loss could be added to the Adaptation Strategy.[277] On the loss side, the agricultural support structure also offers an opportunity. As shown in the second section, general services support accounts for 42

270 According to the first BTR, the share is 19.6 percent, and biowaste makes up 50.4 percent of municipal waste. Republic of Türkiye, *First Biennial Transparency Report*, 46, 49.

271 These are the latest TurkStat data. In the same year, 62.0 percent of methane came from agriculture, and waste sector emissions reached 15.4 million tonnes of CO2 equivalent. "Sera Gazı Emisyon İstatistikleri, 1990-2024" [Greenhouse Gas Emission Statistics, 1990-2024], TurkStat, News Bulletin 58000, March 27, 2026, accessed October 14, 2026, https://veriportali.tuik.gov.tr/tr/press/58000. TurkStat data are calculated with AR5 global warming potential values.

272 The BTR states that the work on mitigation scenarios will be detailed in the second BTR. Republic of Türkiye, *First Biennial Transparency Report*, 205-206 (Table 28), 214.

273 UNEP, *Global Methane Status Report 2025*, 22, 24.

274 SBB, *On İkinci Kalkınma Planı* [Twelfth Development Plan], 100, para. 495, 495.1, 495.3.

275 The closest action (AGR12) is to minimize losses and damage in irrigation, cold chain, storage and transport infrastructure. MoEUCC Directorate of Climate Change, *Climate Change Adaptation Strategy*, 148-149, 440 (AGR12). The Strategy text makes no direct reference to food loss and waste (food loss, food waste).

276 MoEUCC, *UDESEP*, 30-31. NCESAP also records the need for a common measurement methodology and indicators for food waste (pp. 22-23).

277 The agricultural sector targets of the Twelfth Development Plan consist of land, support, production, livestock, forest and irrigation indicators. The AGR12 monitoring indicators of the Adaptation Strategy consist of indicators on water storage, irrigation, insurance, the number of cold storage facilities and transport infrastructure. See SBB, *On İkinci Kalkınma Planı* [Twelfth Development Plan], 104 (Table 20); MoEUCC Directorate of Climate Change, *Climate Change Adaptation Strategy*, 440.

percent of total support.[278] In this report's assessment, part of this item could be directed to loss-reducing infrastructure such as cold chains and storage.

Hosting COP31: Linking the Two Themes

The Action Agenda is the main channel through which Türkiye can make FLW visible at COP31. Under the division of roles, Chris Bowen of Australia leads the negotiations, while Türkiye runs the Presidency, the World Leaders' Summit and the Action Agenda, which rests on voluntary initiatives.[279] COP31 President Murat Kurum stresses that they do not treat combating waste and wastefulness, food security and climate awareness as separate issues.[280] This approach could also be reflected in the program through FLW. FLW is currently one of the focus areas of the Zero Waste theme, and this focus area aims to bring countries and the private sector together around measurable commitments. FLW is not among the focus areas of the Food Security theme.[281] The Presidency's intention in this area is clear. The Climate High-Level Champion presents the Zero Waste Istanbul Platform as the flagship initiative of COP31, and Kurum says that they will announce Türkiye's determination to prevent food waste in Antalya.[282]

278 OECD, *Agricultural Policy Monitoring 2025*, 612.

279 UNFCCC, "COP31"; Directorate of Climate Change, "First Official Letter"; Kurum, "COP31 Presidency's 3rd Letter", 1, 8. Kurum, "COP31 Presidency's 3rd Letter", 2-4, 7.

280 Kurum is also the Minister of Environment, Urbanization and Climate Change. "COP31 President-Designate and Minister Kurum Unveils COP31 Action Agenda", Directorate of Climate Change, June 9, 2026, accessed October 12, 2026, https://iklim.gov.tr/en/cop31-president-designate-and-minister-kurum-unveils-cop31-action-agenda-news-4985. In the English text, the wording is "We do not treat the fight against waste, food security, and climate awareness as separate issues".

281 COP31 Türkiye Presidency, "Zero Waste" (focus area "Preventing Food Waste"). The focus areas are the food-water-climate nexus, finance for women farmers, youth and climate-resilient agriculture. COP31 Türkiye Presidency, "Food Security". Each of the twelve days of the conference is dedicated to one priority area. In the thematic days program, November 9 is the Food, Agriculture and Health day and November 11 is the Zero Waste day. "COP31 Thematic Days Announced: 12 Days, 12 Priorities", COP31 Türkiye Presidency, August 24, 2026, accessed October 12, 2026, https://cop31.tr/news-detail/thematic-days-announced-2026; Kurum, "COP31 Presidency's 3rd Letter", 3, 8.

282 Climate High-Level Champion Samed Ağırbaş also states that a global effort to reduce FLW will be launched. Samed Ağırbaş, "Vision Statement: Climate High-Level Champion for COP31", Climate High-Level Champions, June 23, 2026, accessed October 12, 2026, https://www.climatechampions.net/media/news/vision-statement-climate-high-level-champion-for-cop31/. Food waste was chosen as the theme of the 2026 International Day of Zero Waste. "Sıfır Atık, COP31 Yolunda En Somut ve En İnsani Köprüdür" [Zero Waste Is the Most Concrete and Most Humane Bridge on the Road to COP31], NTV, March 29, 2026, accessed October 12, 2026, https://www.ntv.com.tr/turkiye/sifir-atik-cop31-yolunda-en-somut-ve-en-insani-koprudur-1717918.

In this structure, FLW is well placed to link the two themes. The waste strand could be linked to the Zero Waste theme, and the loss strand to the Food Security theme's focus areas on climate-resilient agriculture and the food-water-climate nexus.[283]

The real question is whether this link will last beyond COP31. International civil society organizations recommend turning FLW commitments into concrete policies through sound monitoring and evaluation frameworks.[284] It is also stressed that the results of Presidency initiatives should be assessed with reliable metrics.[285] At the domestic level, the National Platform envisaged in the Strategy and the annual monitoring mandate in the Climate Law could take on this function.[286] The issue falls within the remit of several institutions. MoAF, the Directorate of Climate Change, TurkStat, the Ministry of Trade and the Presidential Agriculture and Food Policies Board (Cumhurbaşkanlığı Tarım ve Gıda Politikaları Kurulu) could therefore be stakeholders in this mechanism.[287] An FLW commitment to be announced at COP31 could be built in three steps. It could start with a measurement timeline and the setting of a base year, add a measurable target once the base year has been measured, and continue with annual reporting after the COP. Such a commitment could turn the experience Türkiye has built up since 2013 into a model that other countries can also draw on.

283 It is also recommended that loss and waste commitments be tracked separately. The assessment is this report's own. For its basis, see COP31 Türkiye Presidency, "Food Security" (focus areas "Climate-Resilient Agriculture" and "Food-Water-Climate Nexus"); COP31 Türkiye Presidency, "Zero Waste" (focus area "Preventing Food Waste"). This focus area of the Zero Waste theme covers the entire chain from production to consumption.

284 "Global NGOs Deliver Call to Action on Food Waste for COP31", WRAP, press release, June 23, 2026, accessed October 12, 2026, https://www.wrap.ngo/media-centre/press-releases/global-ngos-deliver-call-action-food-waste-cop31.

285 This is an assessment of the literature discussed in the second section. Dinesh et al., "Has Process Hijacked Purpose?", 100-101, 104.

286 MoAF and FAO, *Ulusal Strateji* [National Strategy], 20; Climate Law, art. 4/1.

287 In the National Strategy, the responsible and cooperating institutions for the measurement actions include MoAF, TurkStat and the Ministry of Trade. See MoAF and FAO, *Ulusal Strateji* [National Strategy], 21. For the work of the Council, see the fourth section.

BOX 4. Food Banking and Donation: Current Incentives and the Next Step

Tax incentives for food banking have been in force in Türkiye since 2004. Law No. 5035 on Amendments to Certain Laws (Bazı Kanunlarda Değişiklik Yapılması Hakkında Kanun) added provisions to the Income Tax Law. Under these provisions, the cost of food donated to associations and foundations that run food banks to help the poor can be recorded as an expense in determining commercial income and deducted from declared income. The same donations are also exempt from Value Added Tax.[288] According to a tax inspector's assessment, the other deductions section of the Corporate Tax Law contains no clause specific to food banking.[289] According to the National Strategy, food banking was regulated in Law No. 5179. However, Veterinary Services, Plant Health, Food and Feed Law No. 5996, which repealed that law, does not cover the subject.[290] The guide prepared for hotels and restaurants, in turn, sets launching organized food donation operations in these sectors as one of its aims.[291] Action 2.8.2 of NCESAP provides for preparing a legal framework to speed up the sale of products close to their dates and to donate them through food banking. Date labels are an important component of this framework. According to TurkStat's 2025 data, 61.45 percent of households think that a product should never be consumed after its best-before date.[292] In the food use-not-loss-or-waste hierarchy adopted by the Strategy, redistribution comes after source reduction. Donation does not replace prevention.[293] In light of the experience of France and Italy, it is recommended that the legal framework cover the capacity of food rescue organizations, and that possible donation agreements be assessed together with oversight and impact measurement.

288 Law No. 5035, art. 8, 12, 14; Income Tax Law No. 193, art. 40/1-10 and 89/1-6; Value Added Tax Law No. 3065, art. 17/2-b (current text on mevzuat.gov.tr, accessed October 14, 2026).

289 Serhat Özdemir, "Gıda Bankacılığı Faaliyetinde Bulunan Dernek ve Vakıflara Yapılan Bağış ve Yardımların Vergi Kanunları Karşısındaki Durumu" [The Status under Tax Laws of Donations and Aid to Associations and Foundations Engaged in Food Banking], Alomaliye, December 28, 2024, accessed October 12, 2026, https://www.alomaliye.com/2024/12/28/gida-bankaciligi-faaliyetinde-bulunan-dernek-ve-vakiflara-yapilan-bagis-ve-yardimlar/amp/.

290 MoAF and FAO, *Ulusal Strateji* [National Strategy], 30.

291 Metro Türkiye et al., *Gıda İsrafı ile Mücadele Kılavuzu* [Guidelines on the Prevention of Food Waste], 8.

292 MoEUCC, *UDESEP*, 22-23, 64-65; TurkStat, "Gıda İsrafı Göstergeleri" [Food Waste Indicators], 2025 column. According to a survey commissioned by the Ministry and cited by Minister of Agriculture and Forestry Pakdemirli in 2020, 65 percent of the public do not know the difference between the use-by date and the best-before date. See Palabıyık, "Gıdanı Koru Kampanyası" [Save Your Food Campaign].

293 MoAF and FAO, *Ulusal Strateji* [National Strategy], 9 (food use-not-loss-or-waste hierarchy).

CONCLUSION

Four main findings emerge from this report. First, preventing FLW can serve climate and food security goals together, but the tools that serve the two goals are not the same. In terms of emissions, the most reliable improvement lies in reducing consumption-stage waste and methane from organic waste. Loss reduction lowers land and water use. Its emission effect, however, varies with the product, price pass-through and the energy source of the cold chain, and in some cases it can increase total emissions. The most direct positive effect of loss reduction is on the food security side. In OECD modeling of halving FLW by 2030, a 4 percent reduction in direct emissions from agriculture comes together with a reduction in hunger. In the same modeling, however, agricultural net value added falls by about 4 percent, which creates costs for producers. It is therefore recommended that FLW prevention not be seen as a cost-free win-win measure but be treated as a tool whose gains and costs vary by stage of the chain.

Second, turning FLW into a trackable item in climate policy depends on measurement. Without measurement, a target in the NDC cannot be tracked. Declaring finance needs in the NDC also depends on cost estimates. Writing FLW into the NDC does not secure the outcome. Its contribution is to bring measured progress into the transparency framework. The example of the United Kingdom shows that progress can be tracked even without a numerical target in the NDC. Still, a commitment tied

to measurement is easier to track across NDC cycles. Today, measurement, measurable commitments in NDCs and declarations of finance needs are in place only to a limited extent at the global level.

Third, agriculture and food security have been institutionalized in the climate regime through the process from Koronivia to the SJWA, but FLW has found only a limited place in this process. Among the negotiated texts reviewed, FLW appears only in the paragraph of 3/CP.27 that notes the Koronivia conclusions. It does not appear in the first global stocktake, the Global Mutirão decision or the SB64 conclusions. FLW language has developed mainly in voluntary channels such as the COP28 UAE Declaration and the COP29 Declaration on Reducing Methane from Organic Waste.

Fourth, Türkiye has more than a decade of institutional experience in this area, from the Campaign to Prevent Bread Waste launched in 2013 to the Climate Law. Türkiye included FLW in its 2023 updated NDC. The OECD survey covering 42 countries and the European Commission cited it as one of three countries to do so, and Türkiye also supported the COP28 and COP29 declarations. The same NDC states that agricultural methane will be managed through policies that do not put food security at risk, and that advanced methane policies require additional international finance. The NDC itself thus establishes the link between methane, food security and finance. The framework this report proposes can be read as the next step of Türkiye's own framework. In Türkiye, an upper-middle-income country, the contribution of FLW prevention to food security can be expected mainly through the access and stability dimensions. The food groups that households waste most are fresh fruit and vegetables and bread. The next step for this experience is measurement. Once a national measurement system is in place, the estimates for Türkiye in international monitoring systems could move from modeling to the country's own data.

The gains COP31 can deliver for FLW should be assessed within this picture. The negotiations are led by the President of Negotiations from Australia, while Türkiye runs the COP31 Presidency, the World Leaders' Summit and the Action Agenda. The Action Agenda rests on voluntary initiatives and is not intended to create new obligations for countries. In this report's assessment, the realistic aim for FLW in Antalya is not a new obligation but commitments that are tied to measurement and tracked beyond COP31.

In the negotiated processes, the Parties will decide. If the Parties decide to continue the SJWA or to establish a successor framework, the language of 3/CP.27 para. 2(t), which they have already noted, could offer a ready basis for FLW. If the mitigation work programme is extended, food waste and methane from organic waste could be one of the topics of its global dialogues. Because food does not appear in the mitigation section of the first global stocktake, this gap could be filled in GST2. To this end, it is recommended that Türkiye and other stakeholders make a submission on FLW, treating loss and waste separately, to the information collection phase of GST2 by February 28, 2027.

At the Presidency level, a mechanism that links the Zero Waste and Food Security themes through FLW is recommended for the COP31 Presidency and the Climate High-Level Champion. This mechanism could be set up under the Zero Waste Istanbul Platform for Climate Action. It could include commitments on a measurement timeline and a base year first, numerical targets after the base year has been measured, and annual reporting after the COP. It is recommended that loss and waste commitments be tracked separately in the mechanism, and that the loss strand be linked to the Food Security theme's focus areas on climate-resilient agriculture and the food-water-climate nexus. A joint FLW message linking November 9 (Food, Agriculture and Health) and November 11 (Zero Waste), and a joint reporting template based on existing methods such as UNEP's Food Waste Index, could strengthen this mechanism. It is also recommended that the Ministry of Culture and Tourism and hoteliers' associations launch waste measurement pilots in all-inclusive hotels in Antalya on the occasion of COP31. Interventions found effective in the hotel experiment in Norway, such as smaller plates and information signs, could be tested alongside these pilots.[294]

At the national level, the path proposed for Türkiye consists of three priorities, and their order matters. The first priority is measurement. It is recommended that the Ministry of Agriculture and Forestry and TurkStat establish a national FLW measurement system under Action 1.2.1 of the

294 A 2020 study of all-inclusive hotels in Antalya states that kitchen food waste was not measured quantitatively at that time. See Okumus et al., "Tackling Food Waste", 4. For the experiment in 52 hotels in Norway, see Reynolds et al., "Review", 16.

National Strategy. The division of tasks is already set out in the Strategy. According to UNEP, the probable reason why most countries with high-confidence data have data for every sector is that at least one institution is explicitly responsible for measurement.[295] For waste, the system could rely on direct national measurement in households, food service and retail. For loss, it could rely on official data reporting to FAO. Its first components could be adding a quantity module to TurkStat's household waste indicators, reporting food waste as a separate item in the Zero Waste Information System, and expanding the separate collection of biowaste at source. Measuring post-harvest and storage losses separately from production declines after climate shocks such as drought and agricultural frost could also make the link between climate adaptation and loss reduction visible.

The second priority is linking measurement to commitments and finance. The Directorate of Climate Change could quantify the mitigation effect of waste measures in the second or the next BTR, and show measures on FLW and on methane from organic waste separately. It is recommended that, in the next NDC update, the 2023 reference to FLW be turned into a measurable action or target with a base year, set separately for loss and for waste. Such a step also aligns with the COP31 Presidency's encouragement to integrate waste methane into NDCs with measurable targets. The National Strategy could also be updated under its annual review provision. It could first include a measurement timeline and, after the base year has been measured, a numerical target. The National Platform envisaged in the Strategy could take on monitoring and annual reporting after COP31. Institutions and municipalities covered by the Climate Law could also include FLW and organic waste in the legislative and planning adjustments they are to make by the end of 2027. On the finance side, it is recommended that the Ministry of Agriculture and Forestry, the Directorate of Climate Change and the Ministry of Treasury and Finance carry out a cost-benefit analysis in the NDC implementation plan. It is recommended that this analysis also cover producer income and that these institutions declare finance needs. This step could make it easier to link FLW projects to channels such as World Bank instruments and green bonds. Adding an FLW indicator to the new agri-

295 UNEP, *Food Waste Index Report 2024*, 23; MoAF and FAO, *Ulusal Strateji* [National Strategy], 21 (Action 1.2.1).

cultural support model could also be considered, as could directing general services support to storage, measurement and cold chain infrastructure that meets the conditions set out below.

The third priority is separate tools for loss and for waste. On the loss side, it is recommended that post-harvest storage and cold chain investments in fresh fruit and vegetable chains be supported on condition that they use renewable energy and low global warming potential refrigerants and measure loss. These chains hold the highest food security potential of FLW reduction. The conditions in the recommendation stem from the fact that the net climate effect of cold chains varies by context. The recommendation can build on the Twelfth Development Plan's measure on cold chain logistics and on action AGR12 of the Climate Change Adaptation Strategy.[296] On the waste side, a voluntary sector agreement with interim targets and data reporting is recommended. It would involve the retail, food industry and hotel-restaurant sectors, under the leadership of the Ministry of Agriculture and Forestry and the Ministry of Environment, Urbanization and Climate Change. The Courtauld Commitment in the United Kingdom shows that such agreements can produce a long data series, and the agreement in Norway shows that a design with interim targets is possible. The Guidelines on the Prevention of Food Waste at Hotels, Restaurants and Other Public Consumption Points (Otel, Restoran ve Diğer Toplu Tüketim Yerlerinde Gıda İsrafı ile Mücadele Kılavuzu) could be the starting point for this agreement. It is recommended that the food banking framework to be prepared under NCESAP be addressed together with the work of the Presidential Agriculture and Food Policies Board. It is also recommended that the framework cover simplifying date labels, the capacity of food rescue organizations and measuring the impact of donations. Once oversight and impact measurement are in place, an obligation for large retailers to offer donation agreements could also be considered. It is recommended that the framework rest on the principle that donation does not replace prevention.

The lasting contribution of Türkiye's hosting in the field of FLW depends on whether the commitments announced in Antalya are measured

296 Cattaneo et al., "Reducing Food Loss and Waste", 5 (citing Kuiper and Cui); FAO, *Achieving SDG 2*, 29; Heard and Miller, "Potential Changes", abstract; Friedman-Heiman and Miller, "Impact of Refrigeration", 1; SBB, *On İkinci Kalkınma Planı* [Twelfth Development Plan], 100, para. 495.1; MoEUCC Directorate of Climate Change, *Climate Change Adaptation Strategy*, 148-149 (AGR12).

and reported beyond COP31. Such a commitment would start with a measurement timeline and a base year, add a measurable target once the base year has been measured, and continue with annual reporting after the COP. A commitment built this way could turn the experience Türkiye has built up since 2013 into a model that other countries can also draw on.

ULUÇ KARAKAŞ

Uluç Karakaş is pursuing doctoral studies in Global Governance and Human Security at the University of Massachusetts Boston and conducts research on the European Union's research and innovation policies. He also works as Corporate Strategy Team Leader at ULAK Haberleşme A.Ş., where he coordinates strategic planning, monitoring and reporting activities and processes related to European Union and NATO projects. He completed his undergraduate studies at the Department of International Relations of the Faculty of Political Science, Ankara University, and his master's degree at the Department of International Relations, Bilkent University. He has presented papers at various national and international academic conferences and workshops, taken part in panels and published articles in indexed academic journals. His academic interests include security studies, food security and climate change, food policy and governance, and science, technology and innovation policy and governance.

BAŞAR BAYSAL

Başar Baysal is an associate professor at the Institute of Area Studies, Social Sciences University of Ankara. After graduating from the Turkish Military Academy in 2007, Baysal served as a platoon and company commander in various posts, including Kosovo, Bosnia and Herzegovina, Istanbul, Ankara, Diyarbakır, Hakkari and northern Iraq. He retired in 2019. Baysal completed his master's degree at the Department of International Relations, Marmara University, and received his PhD from Bilkent University in 2017. His research interests include Critical Security Studies, Peace and Conflict Processes, the Climate-Security Nexus, Defense Studies, Environmental Security, Conflict Economies, Latin American Studies and Securitization Theory. Baysal previously worked as a visiting researcher at Universidad del Rosario in Colombia under the TÜBİTAK 2219 International Postdoctoral Research Fellowship Program. In 2020-2021, he conducted field research on the implementation of the Colombian peace process. In 2023-2024, he carried out a research project on Climate Security Perceptions in Türkiye at the Istanbul Policy Center of Sabancı University. Baysal is the author of the book *Securitization and Desecuritization of FARC in Colombia: A Dual Perspective Analysis*, and his articles have appeared in journals such as Peacebuilding, Uluslararası İlişkiler and International Journal.

REPORT

FOOD WASTE, FOOD SECURITY AND CLIMATE DIPLOMACY: A Roadmap for Türkiye Ahead of COP31

ULUÇ KARAKAŞ, BAŞAR BAYSAL

Food loss and waste (FLW) is a problem at the intersection of the climate change and food security agendas. According to the Intergovernmental Panel on Climate Change (IPCC), FLW contributed 8-10 percent of total anthropogenic greenhouse gas emissions in 2010-2016. According to a joint 2026 report by UN agencies, an estimated 645 million people faced hunger in 2025. Preventing FLW can therefore serve two goals at once.

The report argues that this depends on two conditions. The first is addressing loss and waste through separate policies. The second is turning FLW into a trackable item in climate policy. This, in turn, rests on national measurement, a measurable commitment in the nationally determined contribution and a declaration of finance needs.

The report traces the course of food in climate diplomacy from Koronivia to COP31, examines selected country models and assesses Türkiye's institutional experience of more than a decade. COP31, which Türkiye is hosting in Antalya on November 9-20, 2026, is a fitting moment to tie this experience to measurement-based commitments. To this end, the report offers policy recommendations that range from establishing a national measurement system to annual reporting after the COP.

SETA

ANKARA • ISTANBUL • WASHINGTON D.C. • BERLIN • BRUSSELS

9 786255 703996