D4.7 A pan-European simulation of selected interventions

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FSC	Foos Supply Chain
FW	Food Waste

Executive summary

REFRESH is a EU research project dedicated to contributing to the achievement of the Target 3 of Sustainable Development Goal 12, which aims to halve per capita food waste at the retail and consumer level as well as reducing food losses along the food chain by 2030. Partners across Europe are collecting data on methods to reduce or repurpose food waste.

In developed countries, an estimated 30 to 40% of food is wasted. About half of this waste stems from consumers, while the remaining part is lost through the other phases of the Food Supply Chain (FSC): farm practices, transport and processing, and the retail sector (FAO, 2011; Godfray et al., 2010). To meet target 12.3 of the Sustainable Development Goals, a better understanding of the drivers of food waste are needed, both at the consumer and at the retail level. More importantly, the effectiveness of interventions designed to reduce food waste at every level of the FSC needs to be assessed.

A pan-European simulation of selected interventions

This work is part of a collection of reports on household food waste prediction for EU28, Member Countries and European Regions. This collection consists of a methodological report, *REFRESH D4.8 - A roadmap to reduce food waste in Europe*, which represents the theoretical base for two additional reports, *REFRESH D4.6 Pan-European scenarios of food waste levels,* where food waste predictions are developed for each European Country and *REFRESH D4.7 A pan-European simulation of selected interventions*, where food waste scenarios for EU28 and for each European Country are elaborated.

In particular, *REFRESH D4.7 A pan-European simulation of selected interventions* consists in a series of reports developing estimates for household food waste levels under four different scenarios for each European Country and for the whole EU28.

The first scenario represents the baseline REFRESH scenario developed with the Road Map tool[1] and presented in *REFRESH D4.6 Pan-European scenarios of food waste levels*.

The second scenario provides food waste predictions in a situation with an increase of income per capita, tertiary instruction level and national employment rate.

The third and the fourth REFRESH scenarios take into account the impact of an intervention reducing food waste of 10% of for the average household. REFRESH scenario three simulates the impact of a policy intervention on the baseline scenario, while the REFRESH scenario fourth describes the impact of a policy intervention on REFRESH scenario 2, where income per capita, tertiary instruction level and national employment rate are increased.

[1] https://refresh-determinants-of-consumers-food-waste.shinyapps.io/predicted_food_waste/

The parameters used for the four scenarios are presented in the table below.

Parameters of scenarios estimation

Scenario	Income per capita (PPP)	Tertiary education level	National employment rate	Intervention impact on FW
REFRESH Baseline	Current	Current	Current	None
REFRESH 2: Socioeconomic improvement	110% of Current value	120% of Current value	110% of Current value	None
REFRESH 3: Intervention on current situation	Current	Current	Current	-10%
REFRESH 4: Intervention on socioeconomic improvement	110% of Current value	120% of Current value	110% of Current value	-10%

The intervention introduced in the model to simulate a reduction of food waste of 10% has been based on the work of Lorenz-Walther et al. (2019). The choice of using a specific intervention as a proxy for a more general impact assessment is due to the scarcity of literature on quantification of impact of external interventions on reduction of household food waste.

The study presented by Lorenz-Walther et al. represents one of the first attempts to measures the impact of interventions addressing food waste reduction. The study applies a quasi-experimental baseline-intervention design to analyse how the display of information posters and the reduction of portion sizes take an effect on personal, social and environmental determinants in a structural equation model.

Every single chapter of this work represents a single country report, where the predictions of household food waste level for the different scenarios are presented, on the basis of current and simulated values of Gross Domestic Product per capita (expressed in Purchasing Power Parity), tertiary education level and national employment level, as described in the previous table.

Method and limitations

The estimates are elaborated through the web-based tool developed within *REFRESH D4.8 - A roadmap to reduce food waste in Europe* which is built on *REFRESH D4.3 Model integration - Integrated socio-economic model on food waste* and *REFRESH D4.4 Behavioural Economics: Linking Bayesian and agent-based models to assess consumer food waste.*

These simulations represent a first attempt to develop food waste predictions in the European Union and its Member States.

The work had to face, among others, two important limitations in terms of data availability on food waste amounts and impact of interventions.

To overcome the first constraint related to the availability of data and gather data in a format suitable for the development of the model, UK data derived from WRAP (2013) *Household food and drink waste in the UK 2012* has been used. After a number of simulations this dataset proved to be the most reliable to address the needs of the hierarchical mixed-effects modelling approach.

The underlying assumption of this choice implies a general similarity between European countries. However, trends in UK data may not accurately reflect variations in household food waste elsewhere, considering the complexity of factors driving households' behaviour and decisions concerning food consumption and management. This because behaviours related to food waste are affected by several determinants related to economic, cultural and social factors, which are often influenced by the community where consumers belong.

Therefore, utilization of the UK dataset as a proxy to extend food waste data to other EU countries represents also a potential source of bias. In order to address this likely source of bias, a pan-European, standardized study design, – as also advocated by Reynolds et al (2019) - may improve generality, facilitate interpretation, and provide more robust predictions of household food waste that capture underlying socio-economic characteristics at national and regional scales.

However, beside this limitation the model provides a set of new and interesting information regarding the influence of a set of socio-economic determinants and of external interventions on food waste generation. This is potentially suggesting some of the targets that policy interventions might consider to prioritize.

To solve the second data weakness, the model builds on a study developed in a German university canteen (Lorenz-Walther et al., 2019) that has been used as a proxy to simulate the effectiveness of a policy intervention.

1 Introduction

Food waste (FW) is a widespread and complex problem, which relates to the functioning of the food supply chain (FSC) as a whole. Estimates suggest that, in the EU-28, annual FW amounts to 88 million tonnes, i.e. 173 kilograms per person (Stenmarck et al., 2016). Food waste has become a major global concern because of its diversified and interconnected implications on the different of the FCS (Canali et al., 2016; Parfitt et al., 2010; Piras et al., 2016).

The generation of food waste stems from a complex set of interacting behaviours of both food consumers and suppliers. Therefore, a complete approach to the problem requires an analysis of both sources of waste. This complexity can be tackled though a modelling approach that fits this purpose, allowing the study of complex systems. More precisely, a combination of approaches based on Bayesian Networks (BN) and Agent Based Models (ABM) can be an effective way to understand the drivers that underpin the FW phenomenon

While being powerful tools for the analysis of complex systems, these modelling approaches require reliable data to be able to produce robust predictions.

Following these approaches, integrated models of household food waste as an emergent property of a complex system were generated. Machine learnt Bayesian Networks and Agent Based Models were utilized to develop systems maps of the consumer food waste nexus. Through those models, different linkages were emphasised both in the retail environment and in the home predicted food waste. Therefore, modelling of consumer behaviour should not be restricted to a single environment and the key element for each of them should be identified.

Finally, an integrated whole-of-system modelling approach was built to allow the creation of a decision-relevant and dynamic support tool as base for the development of a road map to the reduction of European FW by 50% by 2030.

A first version of the integrated model was developed in (Grainger et al., 2018). As stated above, the use of a simulation approach is crucial for assessing food waste since empirical data are still limited in scale or have a high potential for bias (such as self-reported consumer food waste). This leads to high levels of uncertainty in the available data, additional to the complexity associated with understanding the socio-economic drivers of food waste.

Bayesian Networks (BNs) can incorporate uncertainty and complexity in the model structure, but are less effective at incorporating behavioural factors (i.e. specific biases of single actors, and interactions among actors) and temporal dynamics (interaction among variables or actors across time). For these types of information, Agent-Based Models (ABMs) are much better suited. To better represent food system complexity whilst incorporating the interactions among and within actors (businesses, consumers, etc.), there is a need for BNs and ABMs to interact dynamically.

These modelling developments represented the basis for the development of *REFRESH D4.8 - A roadmap to reduce food waste in Europe,* which is addressing food waste generation at the household level and allows simulations - based on a

Bayesian hierarchical mixed-effects modelling approach - that quantify the relationships between socioeconomic and demographic indicators and household food-waste.

These models allowed the development of a web based tool simulating food waste and the impact of interventions both at the Regional, National and European level. The web based tool allows to easy simulate a number of different scenario, based on a set of socioeconomic variables, such as income per capita, tertiary education rate and national employment rate.

Simulations are based on UK data (WRAP, 2013), therefore the extension to other European countries might suffer of bias related to specific UK patterns and dynamics. This choice is due to the statistical characteristics of WRAP dataset: while being UK specific, these data has the principal advantage of providing a validated measure of household food-waste. This aspect makes this dataset reliable for the simulation approach adopted in the roadmap, despite its limited territorial coverage.

This work builds on the baseline simulation developed in *REFRESH D4.6 Pan-European scenarios of food waste levels* to predict the impact of selected interventions.

The intervention introduced in the model to simulate a reduction of food waste of 10% has been based on the work of Lorenz-Walther et al. (2019). The choice of using a specific intervention as a proxy for a more general impact assessment is due to the scarcity of literature on quantification of impact of external interventions on reduction of household food waste.

The study presented by Lorenz-Walther et al. represents one of the first attempts to measures the impact of interventions addressing food waste reduction. The study applies a quasi-experimental baseline-intervention design to analyse how the display of information posters and the reduction of portion sizes take an effect on personal, social and environmental determinants in a structural equation model.

The parameters of the three REFRESH scenarios are presented in Table 1.

Table 1: Parameters of scenarios estimation

	Income per capita (PPP)	Tertiary education level	National employment rate	Intervention impact on FW
REFRESH Baseline	Current	Current	Current	None
REFRESH 2: Socioeconomic improvement	110% of Current value	120% of Current value	110% of Current value	None
REFRESH 3: Intervention on current situation	Current	Current	Current	-10%
REFRESH 4: Intervention on socioeconomic improvement	110% of Current value	120% of Current value	110% of Current value	-10%

In the following paragraphs 29 reports are presented, one for the whole EU28 and one for each of the 28 EU Member Countries. Each report is organized in the four scenarios described in table 1.

Methodological background

This work is part of a collection of reports on household food waste prediction for EU28, European Countries and European Regions. The collection consists of a methodological report, *REFRESH D4.8 - A roadmap to reduce food waste in Europe*, which is the theoretical base for two other reports, *REFRESH D4.6 Pan-European scenarios of food waste levels* and *REFRESH D4.7 A pan-European simulation of selected interventions*, where food waste scenarios for EU28 and for each European Country are presented.

Methodologies and results presented in *REFRESH D4.8 - A roadmap to reduce food waste in Europe* are based on the results presented in *REFRESH D4.3 Model integration - Integrated socio-economic model on food waste* and in *REFRESH D4.4 Behavioural Economics: Linking Bayesian and agent-based models to assess consumer food waste.*

Limitations and future developments

The hierarchical mixed-effects modelling approach utilized to develop these estimations represents a first attempt to predict food waste at the EU level using a simulation model and it had to face, among others, two important limitations in terms of data availability on food waste amounts and impact of interventions.

To overcome the first constraint related to the availability of data and gather data in a format suitable for the development of the model, UK data derived from WRAP (2013) Household food and drink waste in the UK 2012 has been used. After a number of simulations this dataset proved to be the most reliable to address the needs of the hierarchical mixed-effects modelling approach.

The underlying assumption of this choice implies a general similarity between European countries. However, considering the complexity of factors driving households' behaviour and decisions concerning food consumption and management, trends in UK data may not accurately reflect household food waste variations elsewhere. Food waste behaviours are affected by several determinants concerning economic, cultural and social factors, which are often in turn influenced by the community where consumers belong. Therefore, utilization of the UK dataset as a proxy to extend food waste data to other EU countries represents also a potential source of bias. In order to address this likely source of bias, a pan-European, standardized study design, – as also advocated by Reynolds et al. (2019) - may improve generality, facilitate interpretation, and provide more robust predictions of household food waste that capture underlying socio-economic characteristics at national and regional scales.

However, despite this limitation, the model provides a set of new information regarding the influence of socio-economic determinants and of selected interventions on food waste generation. Furthermore, the model can suggest some of the targets that policy interventions might consider to prioritize.

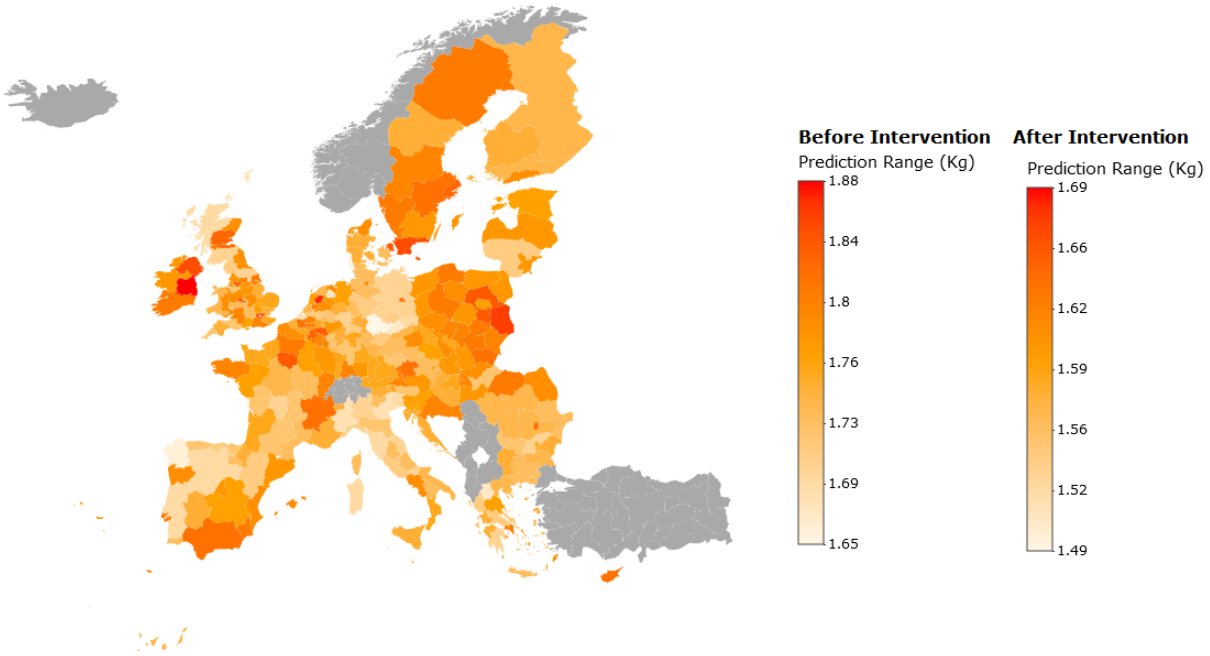
To solve the second data weakness, the model builds on a study developed in a German university canteen (Lorenz-Walther et al., 2019) that has been used as a proxy to simulate the effectiveness of a policy intervention.

To increase the reliability of the results obtained through the roadmap, future research should focus on obtaining more consistent national data on food waste and on the impact of food waste reduction measures. Research on the impact of interventions is particularly urgent since there is a scarcity of reliable and solid quantitative data able to improve the predictive capacity of the model.

2 European Union

According to 2017 Eurostat data, the EU population amounts to **511,373,278**. The Gross Domestic Product (GDP) per capita on purchasing power parity is **29,500** euro at the European level, with consistent regional differences, ranging from **14,500** euro per capita in Bulgaria to **74,500** euro per capita in Luxemburg.
There are **221,430,500** households, with an average size of **2.3** persons.
The average employment rate is **61.1%**, while the level of tertiary education is **32.3%.**

Figure 1: EU28 - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 2: European Union – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Austria	95.94	95.68	-0.3%	86.32	-10.0%	86.32	-10.0%
Belgium	98.54	98.54	0.0%	88.4	-10.3%	88.4	-10.3%
Bulgaria	95.16	94.64	-0.5%	85.28	-10.4%	85.28	-10.4%
Croatia	127.40	127.40	0.0%	114.92	-9.8%	114.92	-9.8%
Czech Republic	91.00	96.46	6.0%	86.84	-4.6%	86.8	-4.6%
Cyprus	131.04	131.04	0.0%	118.04	-9.9%	118.04	-9.9%
Denmark	96.98	96.72	-0.3%	87.36	-9.9%	86.84	-10.5%

Estonia	96.72	96.72	0.0%	87.36	-9.7%	86.84	-10.2%
Finland	96.46	96.46	0.0%	86.84	-10.0%	86.84	-10.0%
France	98.02	97.76	-0.3%	87.36	-10.9%	88.14	-10.1%
Germany	94.12	93.60	-0.6%	84.76	-9.9%	84.24	-10.5%
Greece	96.46	96.46	0.0%	86.84	-10.0%	86.84	-10.0%
Hungary	97.24	97.76	0.5%	87.36	-10.2%	87.36	-10.2%
Ireland	131.04	131.56	0.4%	117.52	-10.3%	118.04	-9.9%
Italy	94.64	94.12	-0.5%	85.02	-10.2%	84.76	-10.4%
Lithuania	97.76	97.76	0.0%	87.4	-10.6%	87.88	-10.1%
Luxembourg	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%
Latvia	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%
Malta	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%
the Netherlands	96,72	96,72	0,0%	91,52	-5,4%	86,84	-10,2%
Poland	129.48	129.22	-0.2%	116.48	-10.0%	115.44	-10.8%
Portugal	125.84	125.84	0.0%	113.36	-9.9%	112.84	-10.3%
Romania	127.92	127.66	-0.2%	120.64	-5.7%	114.92	-10.2%
Slovenia	97.76	97.50	-0.3%	87.88	-10.1%	87.88	-10.1%
Slovakia	128.96	128.96	0.0%	115.70	-10.3%	116.48	-9.7%
Spain	122.20	127.92	4.7%	114.92	-6.0%	114.92	-6.0%
Sweden	97.5	97.24	-0.3%	87.88	-9.9%	87.88	-9.9%
United Kingdom	103.48	97.50	-5.8%	87.88	-15.1%	87.88	-15.1%

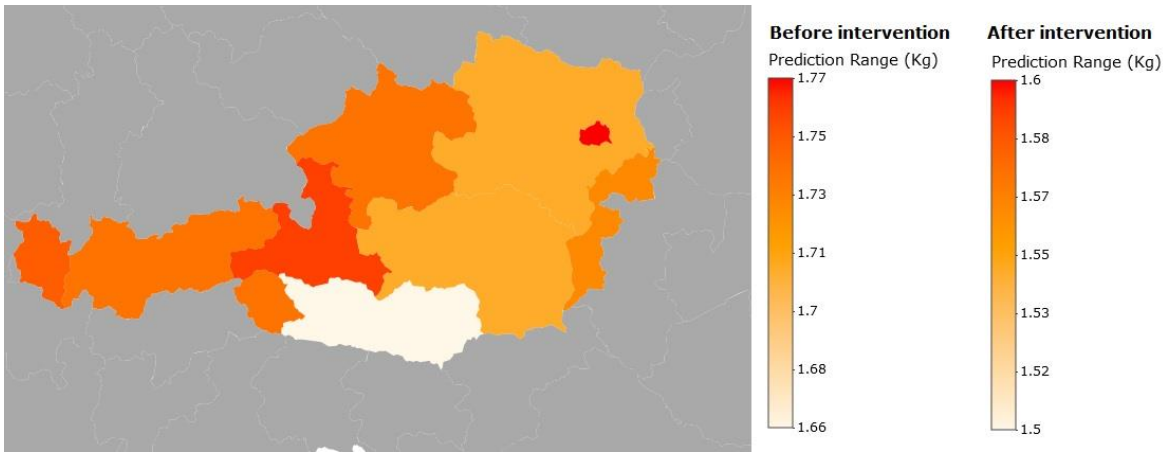
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in the European Union. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste that goes from the 4.6% of Czech Republic to the 15.1% of the United Kingdom

3 Austria

According to 2017 Eurostat data, the population of Austria amounts to **8,772,865** The Gross Domestic Product (GDP) per capita on purchasing power parity is **37,400** euro at the regional level, with consistent regional differences, ranging from **26,600** euro per capita in Burgenland to **44,500** euro per capita of the Salzburg region.
There are **3,915,500** households, with an average size of **2.3** persons. The average employment rate is **73%**, while the level of tertiary education is **32.7%**.

Figure 2: Austria - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 3: Austria – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Austria	95.94	95.68	-0.3%	86.32	-10.0%	86.32	-10.0%
Burgenland	96.20	95.68	-0.5%	86.32	-10.3%	86.32	-10.3%
Lower Austria	96.20	94.64	-1.6%	85.28	-11.4%	85.28	-11.4%
Vienna	99.58	98.28	-1.3%	88.40	-11.2%	88.40	-11.2%
Carinthia	96.46	92.04	-4.6%	83.20	-13.78%	82.68	-14.3%
Styria	94.64	94.12	-0.6%	85.28	-9.9%	84.76	-10.4%
Upper Austria	98.28	95.94	-2.4%	86.32	-12.2%	86.32	-12.2%
Salzburg	97.76	96.98	-0.8%	87.36	-10.6%	87.36	-10.6%
Tyrol	96.20	95.94	-0.3%	86.32	-10.23%	86.32	-10.3%
Voralberg	97.76	96.20	-1.6%	86.84	-11.2%	86.84	-11.2%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

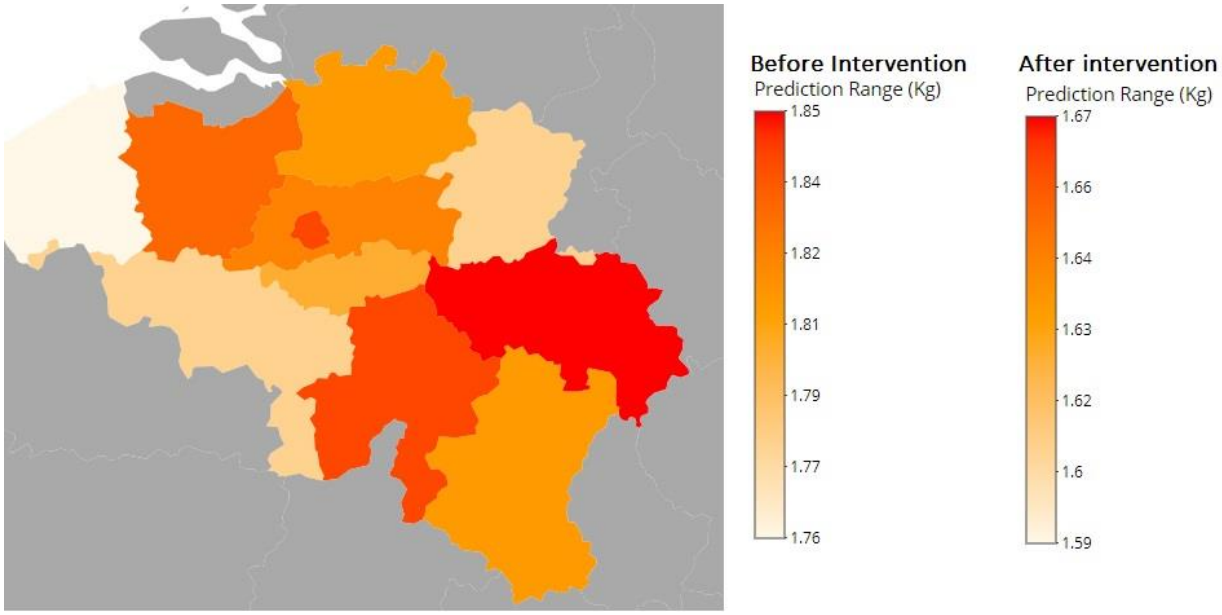
Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Austria. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.

In particular, the estimated reduction of FW for the whole country is 10%. The higher estimated reduction, compared to the baseline scenario, is registered for Carinthia region (-13.8% for Intervention on current situation scenario and -14.3% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction, excluding the national value, is registered in Burgenland and Tyrol regions.

4 Belgium

According to 2017 Eurostat data, the population of Belgium amounts to **11,351,727**. The Gross Domestic Product (GDP) per capita on purchasing power parity is **34,300** euro at the regional level, with consistent regional differences, ranging from **21,600** euro per capita in Luxembourg area to **57,700** euro per capita of the Brussels region. There are **4,761,700** households, with an average size of **2.3** persons.
The average employment rate is **61.1%**, while the level of tertiary education is **40.6%**.

Figure 3: Belgium - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 4: Belgium – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Belgium	98.54	98.54	0.0%	88.4	-10.3%	88.4	-10.3%
Bruxelles	103.48	101.40	-2.0%	91.52	-11.6%	91.26	-11.8%
Antwerpen	98.28	99.06	0.8%	89.18	-9.3%	88.92	-9.5%
Limburg(BE)	98.28	94.64	-3.7%	85.28	-13.2%	85.28	-13.2%
Oost-Vlaanderen	96.46	97.24	0.8%	87.62	-9.2%	87.36	-9.4%
Vlaams-Brabant	97.76	99.84	2.1%	89.96	-8.0%	89.96	-8.0%

West-Vlaanderen	93.08	95.42	2.5%	85.80	-7.8%	85.80	-7.8%
BrabantWallon	101.66	100.88	-0.8%	91.00	-10.5%	90.48	-11.0%
Hainaut	98.80	100.88	2.1%	91.00	-7.9%	91.00	-7.9%
Liège	99.32	96.20	-3.1%	86.32	-13.1%	87.88	-11.5%
Luxembourg	101.40	100.62	-0.8%	89.44	-11.8%	90.48	-10.8%
Namur	99.32	99.84	0.5%	88.40	-11.0%	88.40	-11.0%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Belgium. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.

In particular, the estimated reduction of FW for the whole country is 10.3%. The higher estimated reduction, compared to the baseline scenario, is registered for Bruxelles region (-11.6% for Intervention on current situation scenario and -11.8% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in West-Vlaanderen (-7.8%).

5 Bulgaria

According to 2017 Eurostat data, the population of Bulgaria amounts to **7,101,859**. The Gross Domestic Product (GDP) per capita on purchasing power parity is **14,500** euro at the regional level, with consistent regional differences, ranging from **9,100** euro per capita of Severozapaden area to **23,300** euro per capita of the Yugozapaden region.There are **2,905,400** households, with an average size of **2.3** persons.
The average employment rate is **66.9%**, while the level of tertiary education is **28.2%**.

Figure 4: Bulgaria - FW estimations before and after intervention

Note: graphical differences are not in the colours, but in the scale.

Table 5: Bulgaria – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Bulgaria	95.16	94.64	-0.5%	85.28	-10.4%	85.28	-10.4%
Severozapaden	92.56	92.30	-0.3%	83.2	-10.1%	83.20	-10.1%
Severen tsentralen	94.64	94.64	0.0%	85.28	-9.9%	85.28	-9.9%
Severoiztochen	96.72	96.2	-0.5%	86.84	-10.2%	86.84	-10.2%
Yugoiztochen	96.72	96.2	-0.5%	86.84	-10.2%	86.84	-10.2%
Yugozapaden	96.20	96.2	0.0%	86.32	-10.3%	86.32	-10.3%
Yuzhen tsentralen	92.82	92.04	-0.8%	83.72	-9.8%	83.20	-10.4%

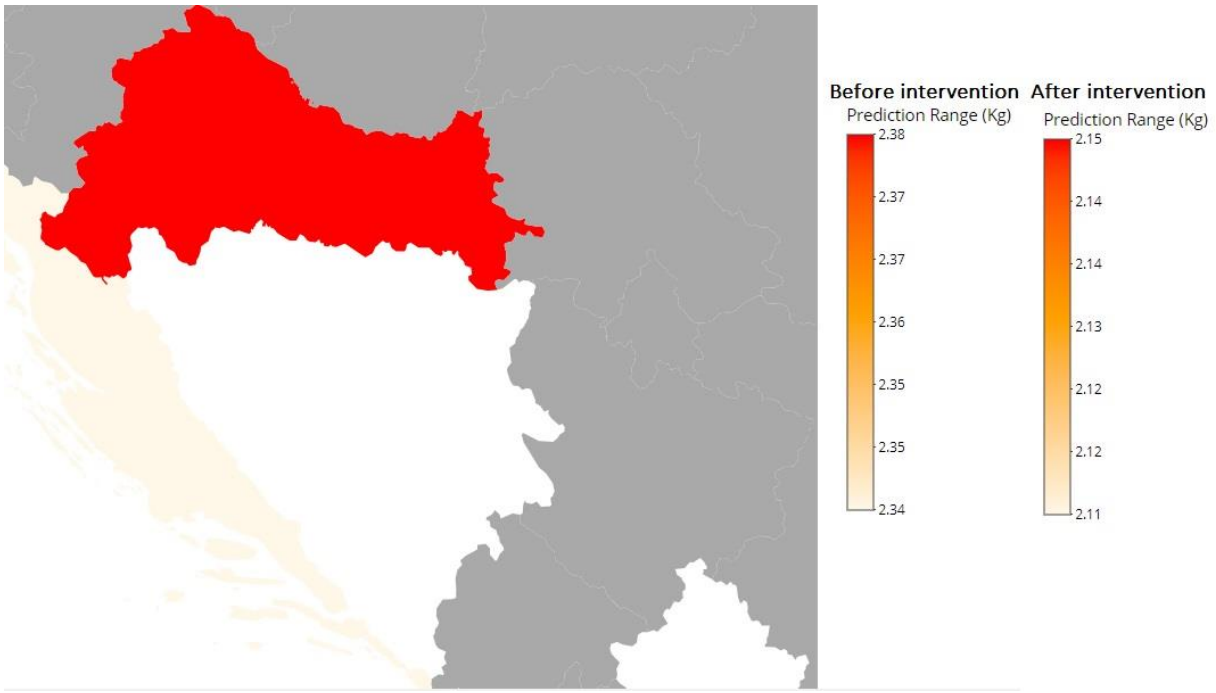
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Bulgaria. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.4%. The higher estimated reduction, compared to the baseline scenario, is registered for Yuzhen tsentralen region (--9.8% for Intervention on current situation scenario and -10.4% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Severen tsentralen region (-9.9%).

6 Croatia

According to 2017 Eurostat data, the population of Croatia amounts to **4,254,313.** The Gross Domestic Product (GDP) per capita on purchasing power parity is **18,200** euro, **17,500** euro per capita in Jadranska Hrvatska area and **18,200** euro per capita in the Kontinentalna Hrvatska region.There are **2,655,500** households, with an average size of **2.8** persons.
The average employment rate is **58.9%**, while the level of tertiary education is **25.4%**.

Figure 5: Croatia - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 6: Croatia – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Croatia	127.40	127.40	0.0%	114.92	-9.8%	114.92	-9.8%
Jadranska Hrvatska	132.08	125.32	-5.1%	112.84	-14.6%	112.84	-14.6%
Kontinentalna Hrvatska	127.40	129.74	1.8%	117.00	-8.2%	116.74	-8.4%

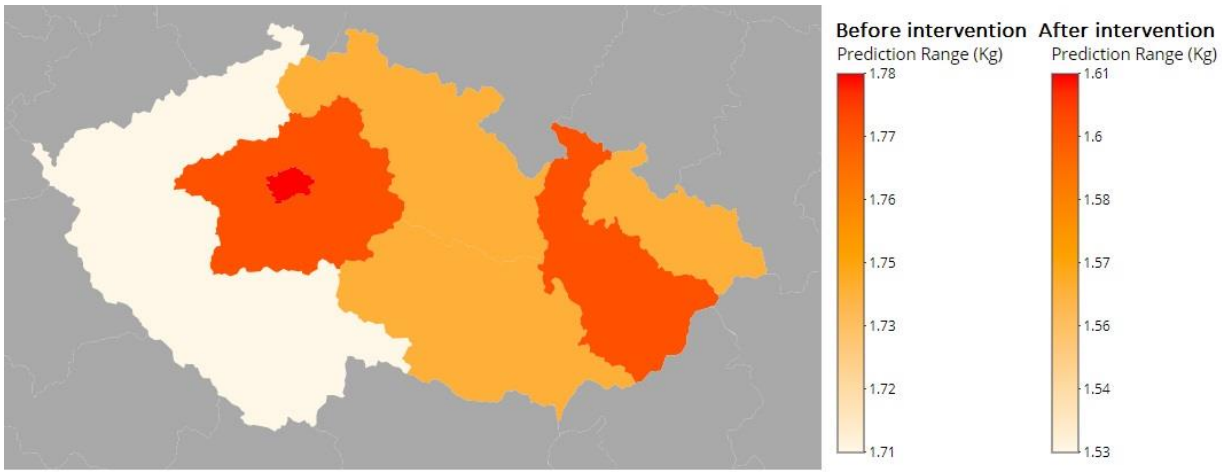
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Croatia. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste almost of 10%.
In particular, the estimated reduction of FW for the whole country is 9.8%. The higher estimated reduction, compared to the baseline scenario, is registered for Jadranska Hrvatska region (-14.6% for Intervention on current situation scenario and 3), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Kontinentalna Hrvatska region (-8.4%).

7 Czech Republic

According to 2017 Eurostat data, the population of Czech Republic amounts to **10,578,820**, The Gross Domestic Product (GDP) per capita on purchasing power parity is **26,400** euro, with some regional differences ranging from **18,700** euro per capita of Severozápad area to the **55,200** euro per capita of the Prague region. There are **4,699,000** households, with an average size of **2.3** persons.
The average employment rate is **73.6%**, while the level of tertiary education is **24.3%**.

Figure 6: Czech Republic - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 7: Czech Republic – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Czech Republic	91.00	96.46	6.0%	86.84	-4.6%	86.8	-4.6%
Prague	91.52	97.24	6.3%	87.88	-4.0%	87.4	-4.5%
Střední Čechy	91.52	96.98	6.0%	87.36	-4.5%	87.4	-4.5%
Jihozápad	90.48	95.68	5.7%	86.32	-4.6%	86.3	-4.6%
Severozápad	89.96	95.16	5.8%	85.8	-4.6%	85.8	-4.6%
Severovýchod	90.48	95.68	5.7%	86.32	-4.6%	86.3	-4.6%
Jihovýchod	91.52	96.72	5.7%	87.36	-4.5%	87.4	-4.5%
Střední Morava	92.56	97.76	5.6%	88.4	-4.5%	88.4	-4.5%
Moravskoslezsko	89.96	95.42	6.1%	86.32	-4.0%	85.8	-4.6%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Czech Republic. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food of almost 5%, while the increase of socioeconomic parameters causes an increase in food waste generated at the household level.

In particular, the estimated reduction of FW for the whole country is 4.6%, and all of the Czech regions register a similar amount of food waste at the household level

8 Cyprus

According to 2017 Eurostat data, the population of Cyprus amounts to **854,802**. The Gross Domestic Product (GDP) per capita on purchasing power parity is **25,000** euro. There are **321,200** households with an average size of **2.3** persons.
The average employment rate is **65.6%**, while the level of tertiary education is **44.1%**.

Table 8: Cyprus – results of FW scenarios simulations

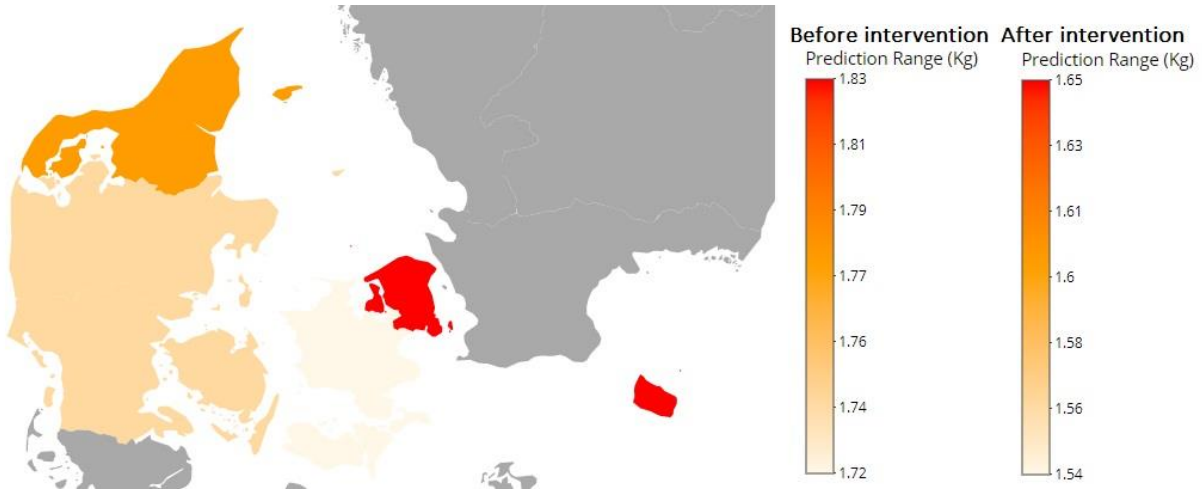
Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Cyprus	131.04	131.04	0.0%	118.04	-9.9%	118.04	-9.9%

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Cyprus. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%. In particular, the estimated reduction of FW for the whole country is 10.03%.

9 Denmark

According to 2017 Eurostat data, the population of Denmark amounts to **5,748,769.** The Gross Domestic Product (GDP) per capita on purchasing power parity is **37,700** euro, with some regional differences ranging from **25,800** euro per capita of Sjælland area to the **48,900** euro per capita of the Hovedstaden region. There are **2,395,900** households, with an average size of **2** persons.
The average employment rate is **74.2%**, while the level of tertiary education is **39.7%**.

Figure 7: Denmark - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 9: Denmark – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Denmark	96.98	96.72	-0.3%	87.36	-9.9%	86.84	-10.5%
Hovedstaden	101.92	101.4	-0.5%	91.52	-10.2%	91.52	-10.2%
Sjælland	93.6	94.12	0.6%	84.24	-10.0%	83.72	-10.6%
Syddanmark	94.12	104	10.5%	84.76	-9.9%	84.24	-10.5%
Midtjylland	98.8	98.28	-0.5%	88.92	-10.0%	88.4	-10.5%
Nordjylland	96.72	96.2	-0.5%	86.84	-10.2%	86.84	-10.2%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Denmark. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.

In particular, the estimated reduction of FW for the whole country is 10.5%. The higher estimated reduction, compared to the baseline scenario, is registered for Sjælland region (-10.6% for Intervention on current situation scenario and -10% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Hovedstaden and Nordjylland regions (-10.2%).

10 Estonia

According to 2017 Eurostat data, the population of Estonia amounts to **1,315,635.** The Gross Domestic Product (GDP) per capita on purchasing power parity is **23,200** euro. There are **584,000 households** with an average size of **2.1** persons.
The average employment rate is **66.9%**, while the level of tertiary education is **44.1%**.

Table 10: Estonia – results of FW scenarios simulations

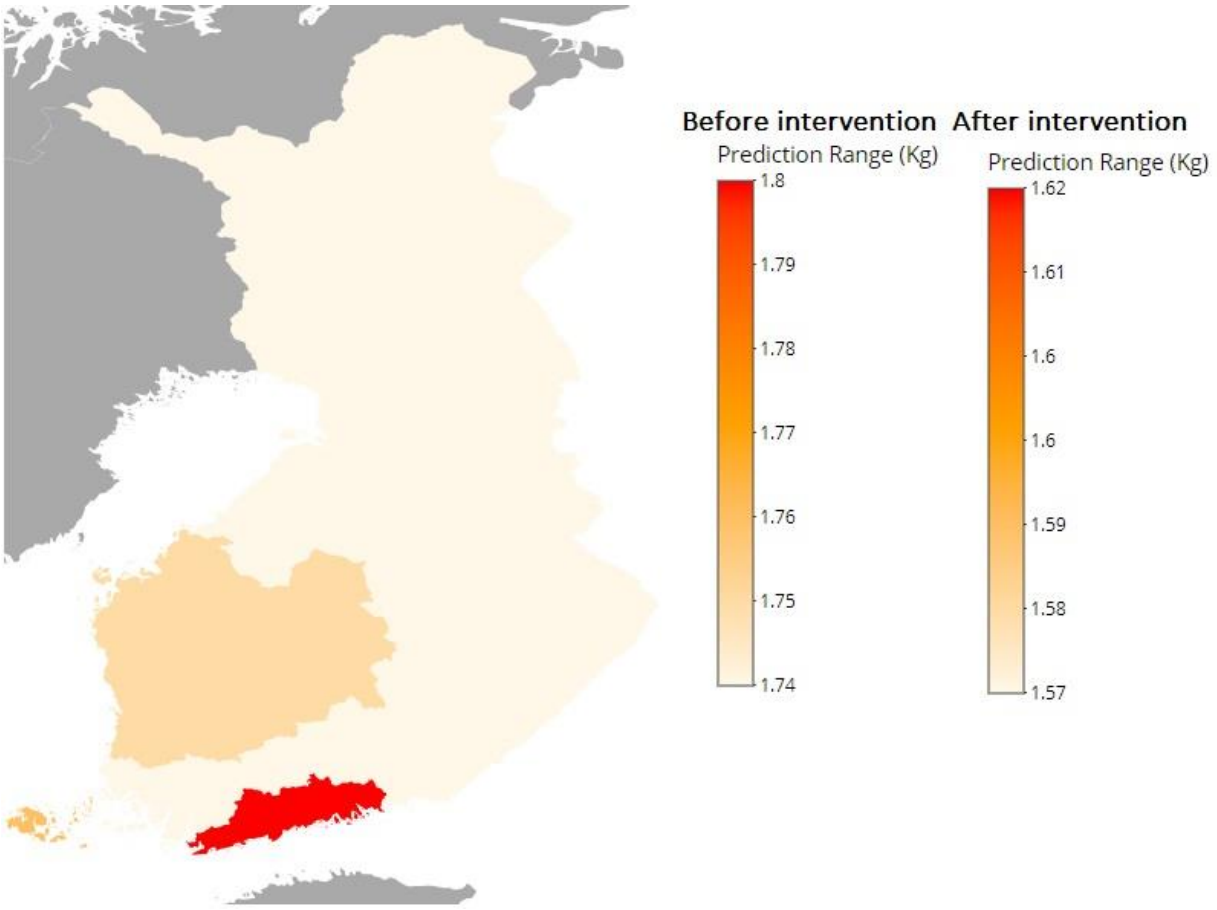
Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Estonia	96.72	96.72	0.0%	87.36	-9.7%	86.84	-10.2%

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Estonia. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 10.2%%.

11 Finland

According to 2017 Eurostat data, the population of Finland amounts to **5,503,297** The Gross Domestic Product (GDP) per capita on purchasing power parity is **32,100** euro, with relevant regional differences ranging from **26,700** euro per capita of North & East Finland area to **41,600** euro per capita of the Helsinki-Uusimaa region. There are **2,655,500** households, with an average size of **2.1** persons. The average employment rate is **70%**, while the level of tertiary education is **44.5%**.

Figure 8: Finland - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 11: Finland – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Finland	96.46	96.46	0.0%	86.84	-10.0%	86.84	-10.0%
Länsi-Suomi	97.50	97.50	0.0%	93.08	-4.5%	87.88	-9.9%
Helsinki-Uusimaa	99.06	100.10	1.0%	89.18	-10.0%	89.96	-9.2%
Etelä-Suomi	93.86	93.60	-0.3%	84.24	-10.2%	84.24	-10.2%
Pohjois- ja Itä-Suomi	94.90	94.64	-0.3%	85.28	-10.1%	85.28	-10.1%
Åland	95.16	95.16	0.0%	85.80	-9.8%	85.80	-9.8%

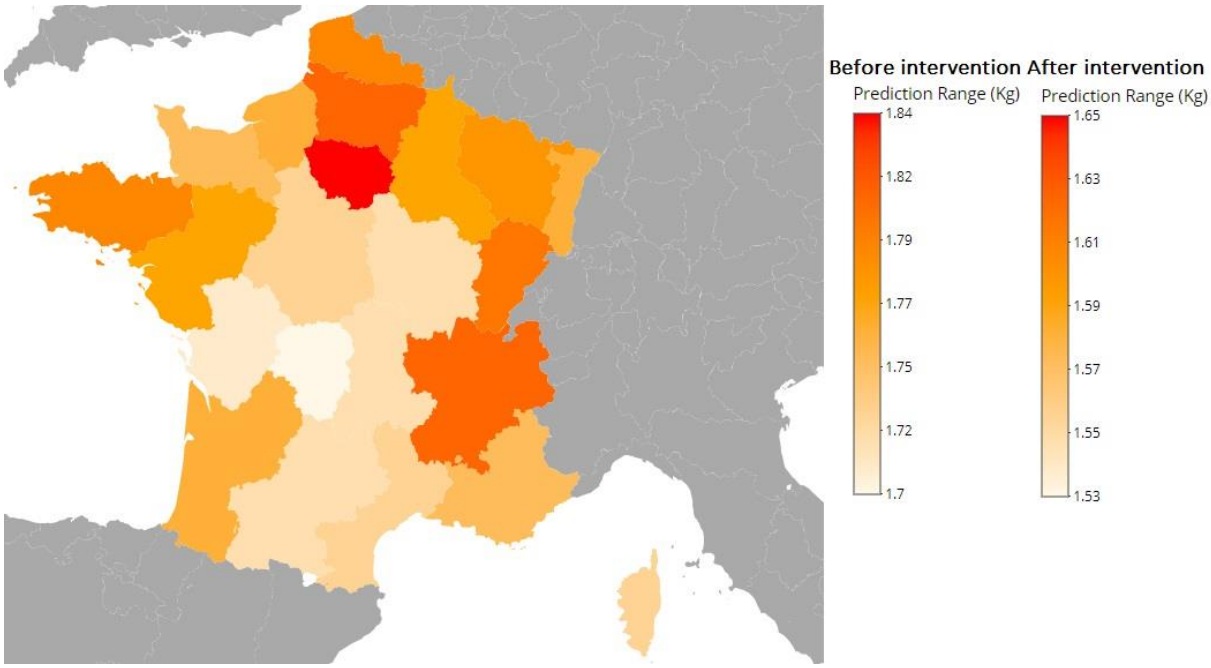
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Finland. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 10%.
The higher estimated reduction, compared to the baseline scenario, is registered for Etelä-Suomi region (-10.2%), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Helsinki-Uusimaa (-9.2% in Intervention and socioeconomic improvement scenario).

12 France

According to 2017 Eurostat data, the population of France amounts to **66,804,121** The Gross Domestic Product (GDP) per capita on purchasing power parity is **36.600** euro, with relevant regional differences ranging from **10,100** euro per capita of Mayotte overseas area to **52,100** euro per capita of the Île de France region. There are **2,655,500** households, with an average size of **2.1** persons.
The average employment rate is **64.7%**, while the level of tertiary education is **36.9%**.

Figure 9: France - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 12: France – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
France	98.02	97.76	-0.3%	87.36	-10.9%	88.14	-10.1%
Île de France	101.92	101.66	-0.3%	90.22	-11.5%	91.52	-10.2%
Champagne-Ardenne	94.64	94.64	0.0%	84.24	-11.0%	85.28	-9.9%
Picardie	96.20	95.94	-0.3%	85.80	-10.8%	86.32	-10.3%
Haute-Normandie	98.54	98.28	-0.3%	87.88	-10.8%	88.40	-10.3%
Centre	98.28	98.02	-0.3%	87.36	-11.1%	88.40	-10.1%
Basse-Normandie	96.72	96.72	0.0%	86.32	-10.8%	86.84	-10.2%

Bourgogne	99.32	99.32	0.0%	88.40	-11.0%	89.44	-9.9%
Nord - Pas-de-Calais	97.24	97.24	0.0%	86.84	-10.7%	87.36	-10.2%
Lorraine	97.76	97.50	-0.3%	86.84	-11.2%	87.88	-10.1%
Alsace	97.76	97.50	-0.3%	86.84	-11.2%	87.88	-10.1%
Franche-Comté	95.16	94.90	-0.3%	84.76	-10.9%	85.28	-10.4%
Pays de la Loire	98.54	98.28	-0.3%	87.88	-10.8%	88.40	-10.3%
Bretagne	98.28	98.28	0.0%	86.84	-11.6%	88.40	-10.1%
Poitou-Charentes	96.72	96.72	0.0%	85.80	-11.3%	86.84	-10.2%
Aquitaine	94.64	92.56	-2.2%	82.16	-13.2%	83.20	-12.1%
Midi-Pyrénées	97.50	97.24	-0.3%	86.84	-10.9%	87.62	-10.1%
Limousin	97.24	96.98	-0.3%	86.32	-11.2%	87.36	-10.2%
Rhône-Alpes	99.32	99.32	0.0%	87.88	-11.5%	89.44	-9.9%
Auvergne	95.94	95.68	-0.3%	85.28	-11.1%	86.32	-10.0%
Languedoc-Roussillon	99.58	99.32	-0.3%	88.40	-11.2%	89.44	-10.2%
Provence-Alpes-Côte d'Azur	97.76	97.76	0.0%	86.84	-11.2%	87.88	-10.1%
Corse	97.24	96.98	-0.3%	86.32	-11.2%	87.36	-10.2%
Guadeloupe	96.46	96.20	-0.3%	86.32	-10.5%	86.84	-10.0%
Martinique	92.56	92.30	-0.3%	82.68	-10.7%	83.20	-10.1%
Guyane	104.78	104.52	-0.2%	93.60	-10.7%	94.12	-10.2%
La Réunion	100.88	100.62	-0.3%	90.22	-10.6%	90.48	-10.3%
Mayotte	107.38	107.12	-0.2%	95.68	-10.9%	91.00	-15.3%

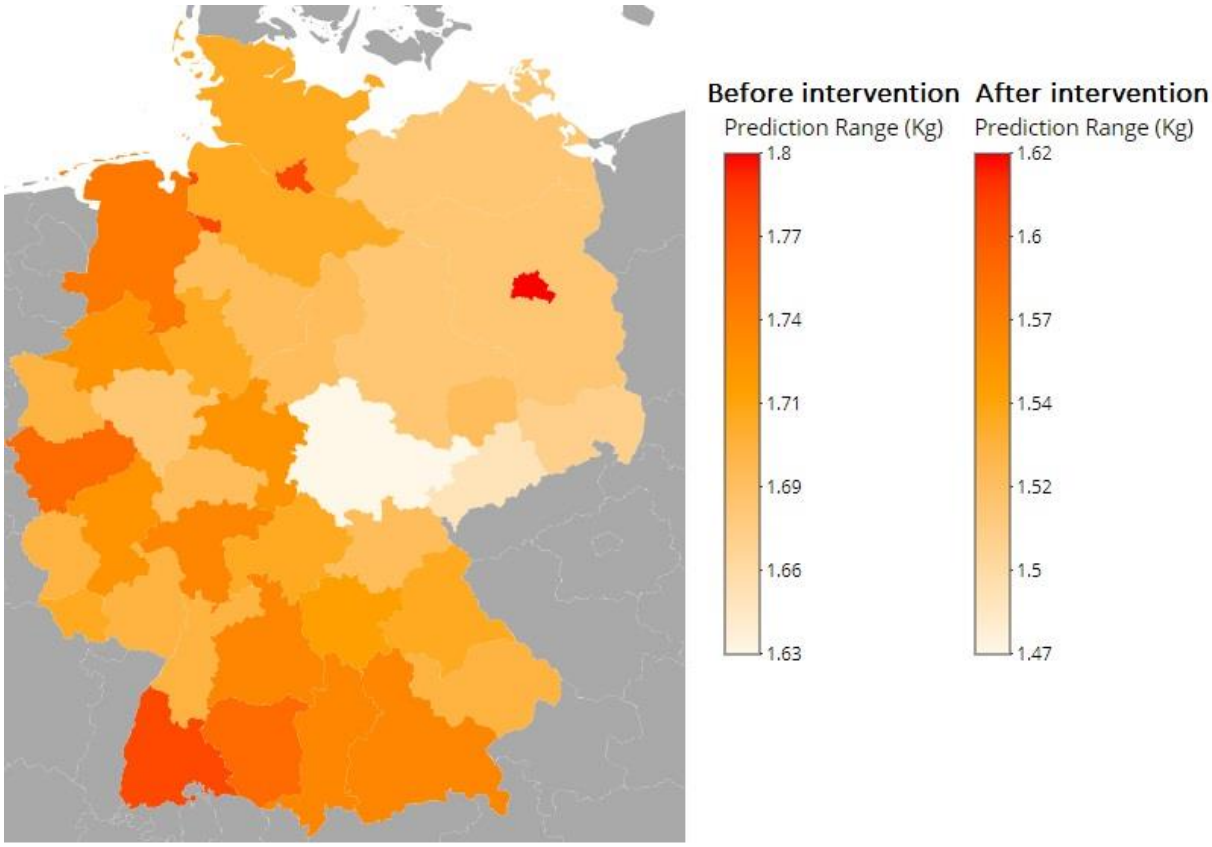
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in France. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.1%. The higher estimated reduction, compared to the baseline scenario, is registered for Mayotte region (-15.3% for Intervention and socioeconomic improvement scenario and -10.9% for Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Champagne-Ardenne and Bourgogne regions (-9.9% in Intervention and socioeconomic improvement scenario).

13 Germany

According to 2017 Eurostat data, the population of Germany amounts to **82,521,653** The Gross Domestic Product (GDP) per capita on purchasing power parity is **36,400** euro, with consistent regional differences ranging from **24,500** euro per capita of Mecklenburg-Vorpommern area to **59,500** euro per capita of the Hamburg region. There are **40,722,600** households, with an average size of **2** persons, and the number of households is, according to Eurostat data.
The average employment rate is **75.2%**, while the level of tertiary education is **29.1%**.

Figure 10: Germany - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 13: Germany – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Germany	94.12	93.60	-0.6%	84.76	-9.9%	84.24	-10.5%
Stuttgart	96.20	96.20	0.0%	86.84	-9.7%	86.32	-10.3%
Karlsruhe	94.38	94.12	-0.3%	85.02	-9.9%	84.76	-10.2%
Freiburg	94.64	94.12	-0.5%	85.28	-9.9%	84.76	-10.4%
Tübingen	96.72	96.20	-0.5%	86.84	-10.2%	86.84	-10.2%
Oberbayern	95.68	95.16	-0.5%	85.80	-10.3%	85.80	-10.3%
Niederbayern	95.68	95.68	0.0%	86.32	-9.8%	85.80	-10.3%
Oberpfalz	92.56	92.56	0.0%	83.72	-9.6%	83.20	-10.1%
Oberfranken	93.60	93.60	0.0%	84.24	-10.0%	84.24	-10.0%
Mittelfranken	94.12	94.12	0.0%	85.28	-9.4%	84.76	-9.9%
Unterfranken	92.30	92.04	-0.3%	83.20	-9.9%	82.68	-10.4%
Schwaben	96.72	96.72	0.0%	87.36	-9.7%	86.84	-10.2%
Berlin	98.28	98.28	0.0%	88.40	-10.1%	88.40	-10.1%
Brandenburg	90.48	90.22	-0.3%	81.64	-9.8%	81.12	-10.3%
Bremen	95.94	95.68	-0.3%	86.32	-10.0%	85.80	-10.6%
Hamburg	97.76	97.24	-0.5%	87.88	-10.1%	87.36	-10.6%
Darmstadt	95.94	95.42	-0.5%	86.32	-10.0%	85.80	-10.6%
Gießen	95.16	94.64	-0.5%	85.28	-10.4%	85.28	-10.4%
Kassel	94.12	94.12	0.0%	84.76	-9.9%	84.76	-9.9%
Mecklenburg-Vorpommern	90.22	89.96	-0.3%	81.12	-10.1%	80.60	-10.7%
Braunschweig	93.60	93.60	0.0%	84.24	-10.0%	84.24	-10.0%
Hannover	91.52	91.52	0.0%	82.68	-9.7%	82.16	-10.2%
Lüneburg	92.56	92.56	0.0%	83.46	-9.8%	83.20	-10.1%
Weser-Ems	92.56	92.56	0.0%	83.72	-9.6%	83.20	-10.1%
Düsseldorf	92.82	92.82	0.0%	83.72	-9.8%	83.20	-10.4%
Köln	95.42	95.42	0.0%	86.32	-9.5%	85.80	-10.1%
Münster	93.08	93.08	0.0%	84.24	-9.5%	83.72	-10.1%
Detmold	95.94	95.68	-0.3%	86.32	-10.0%	86.32	-10.0%
Arnsberg	93.86	93.60	-0.3%	84.76	-9.7%	84.24	-10.2%
Koblenz	93.60	93.08	-0.6%	84.24	-10.0%	83.72	-10.6%
Trier	93.34	93.08	-0.3%	84.24	-9.7%	83.72	-10.3%
Rheinhessen-Pfalz	97.76	97.76	0.0%	87.88	-10.1%	87.88	-10.1%
Saarland	92.04	91.78	-0.3%	82.68	-10.2%	82.68	-10.2%
Dresden	90.48	89.96	-0.6%	81.12	-10.3%	81.12	-10.3%
Chemnitz	88.92	88.92	0.0%	80.08	-9.9%	80.08	-9.9%
Leipzig	94.12	93.60	-0.6%	84.76	-9.9%	84.24	-10.5%

Sachsen-Anhalt	89.96	89.70	-0.3%	81.12	-9.8%	80.60	-10.4%
Schleswig-Holstein	93.08	92.82	-0.3%	83.72	-10.1%	83.72	-10.1%
Thüringen	92.56	92.04	-0.6%	83.20	-10.1%	82.68	-10.7%

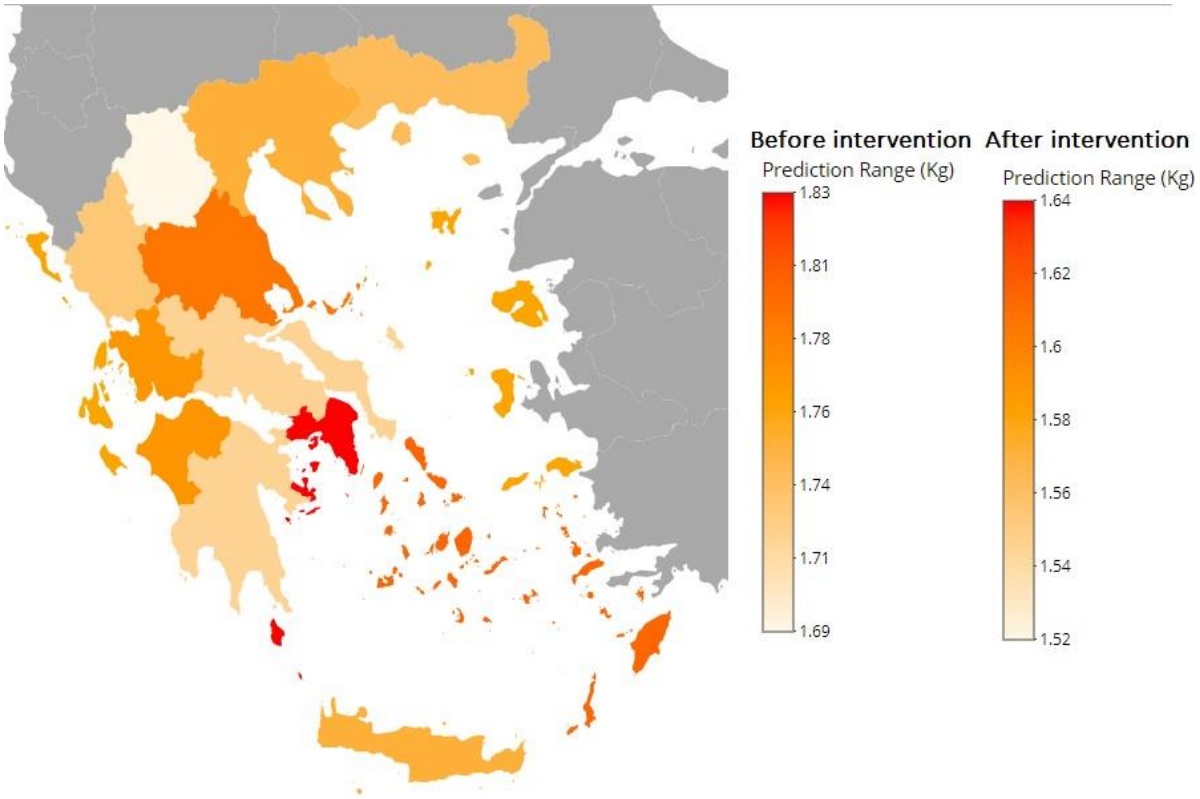
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Germany. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.5%. The higher estimated reduction, compared to the baseline scenario, is registered for Thüringen region (-10.7% for Intervention and socioeconomic improvement scenario and -10.1% for Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Mittelfranken region (-9.9%).

14 Greece

According to 2017 Eurostat data, the population of Greece amounts to **10,738,193** The Gross Domestic Product (GDP) per capita on purchasing power parity is **19,800** euro, with some regional differences ranging from **13,600** euro per capita of Eastern Macedonia and Thrace area to the **26,800** euro per capita of the Attica region. There are **4,393,900** households, with an average size of **2.3** persons. The average employment rate is **53.5%**, while the level of tertiary education is **31.7%**.

Figure 11: Greece - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 14: Greece – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Greece	96.46	96.46	0.0%	86.84	-10.0%	86.84	-10.0%
Attica	96.98	96.72	-0.3%	86.84	-10.5%	87.36	-9.9%
South Aegan	99.32	99.32	0.0%	84.24	-15.2%	89.44	-9.9%
North Aegan	96.72	96.2	-0.5%	86.84	-10.2%	86.84	-10.2%

Crete	98.28	98.02	-0.3%	88.4	-10.1%	88.4	-10.1%
Eastern Macedonia and Trace	97.24	97.24	0.0%	87.36	-10.2%	87.36	-10.2%
Central Macedonia	97.5	97.24	-0.3%	87.62	-10.1%	87.36	-10.4%
Western Macedonia	96.2	95.94	-0.3%	86.32	-10.3%	86.32	-10.3%
Epirus	93.34	93.34	0.0%	83.72	-10.3%	83.72	-10.3%
Thessaly	95.16	95.16	0.0%	85.28	-10.4%	85.28	-10.4%
Ionian Island	93.86	93.6	-0.3%	84.24	-10.2%	84.24	-10.2%
Western Greece	95.16	95.16	0.0%	85.8	-9.8%	85.8	-9.8%
Central Greece	96.2	95.68	-0.5%	86.84	-9.7%	86.32	-10.3%
Peloponnese	96.2	96.2	0.0%	86.58	-10.0%	86.32	-10.3%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

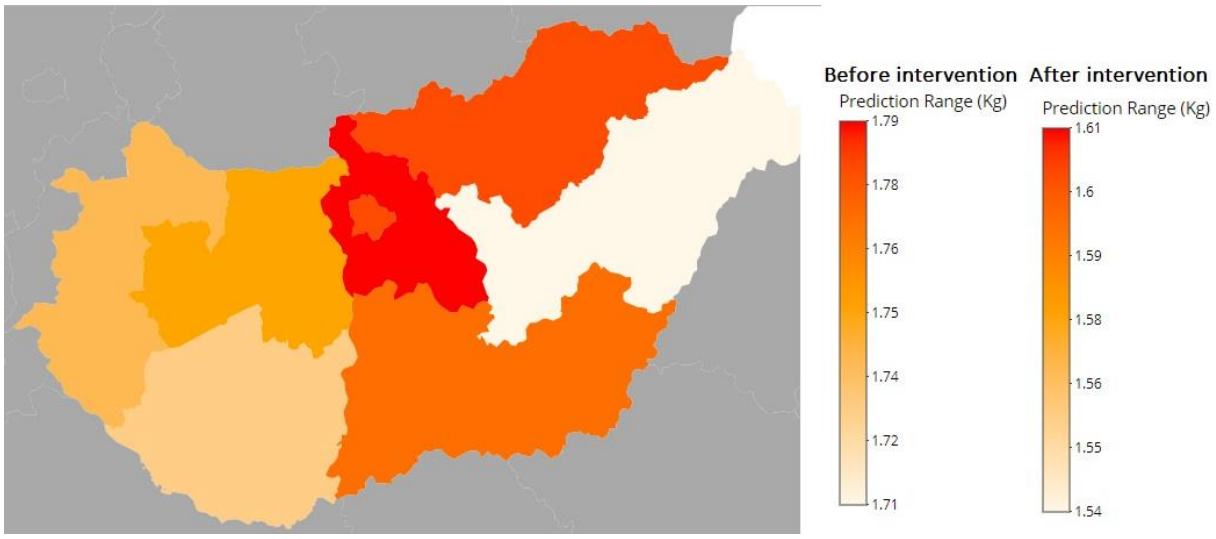
Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Greece. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food of 10%.

The higher estimated reduction, compared to the baseline scenario, is registered for Central Macedonia region (-10.4% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Western Greece region (-9.8% in Intervention and socioeconomic improvement scenario).

15 Hungary

According to 2017 Eurostat data, the population of Hungary amounts to **9,797,561** The Gross Domestic Product (GDP) per capita on purchasing power parity is **20,000** euro, with relevant regional differences ranging from **12,700** euro per capita of Northern Great Plain area to **41,100** euro per capita of the Budapest region. There are **4,131,400** households, with an average size of **2.3** persons.
The average employment rate is **68.2%**, while the level of tertiary education reaches **25.1%**.

Figure 12: Hungary - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 15: Hungary – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Hungary	97.24	97.76	0.5%	87.36	-10.2%	87.36	-10.2%
Budapest	99.32	100.88	1.6%	89.44	-9.9%	90.48	-8.9%
Pest	97.76	98.02	0.3%	89.96	-8.0%	87.88	-10.1%
Central Transdanubia	97.24	97.50	0.3%	87.36	-10.2%	87.88	-9.6%
Western Transdanubia	97.50	97.76	0.3%	87.88	-9.9%	87.36	-10.4%
Southern Transdanubia	93.60	93.60	0.0%	84.24	-10.0%	83.72	-10.6%
Northern Hungary	96.20	96.72	0.5%	86.84	-9.7%	86.32	-10.3%
Northern Great Plain	95.94	96.20	0.3%	86.32	-10.0%	85.80	-10.6%

Southern Great Plain	98.28	98.54	0.3%	88.4	-10.1%	88.40	-10.1%

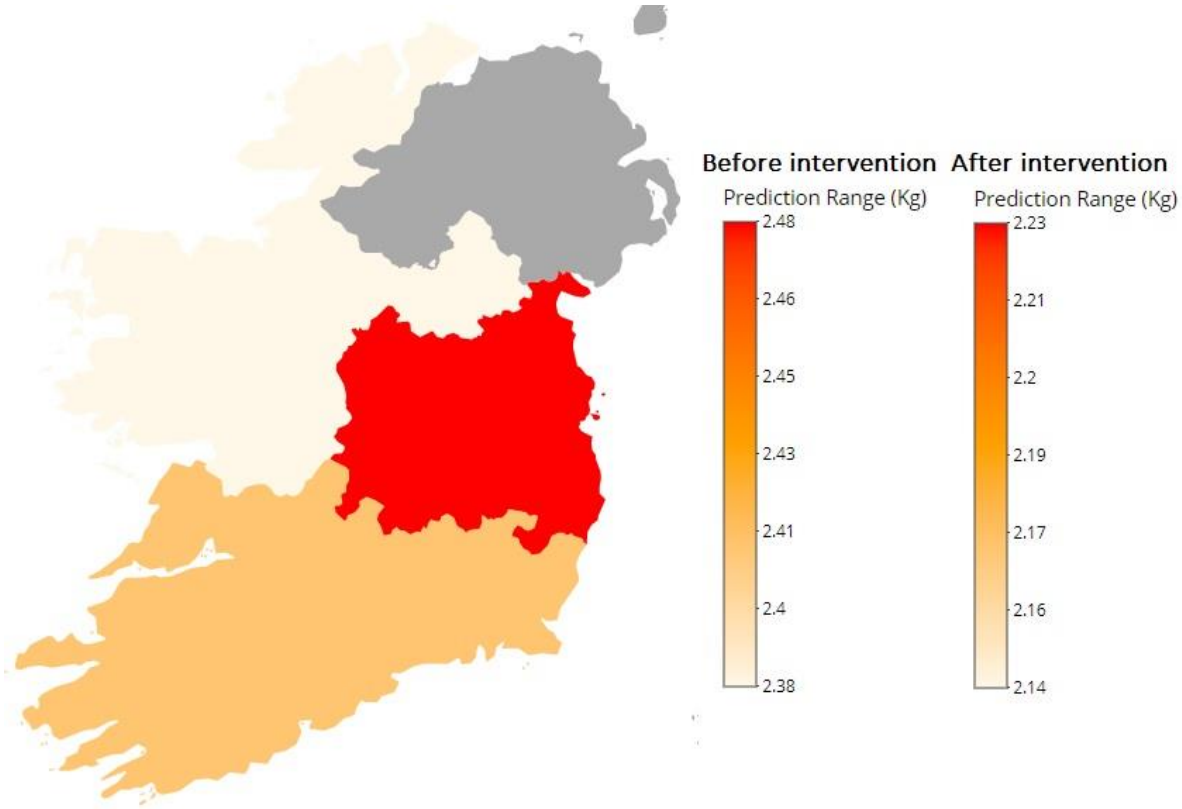
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Hungary. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.2%. The higher estimated reduction, compared to the baseline scenario, is registered for Northern Great Plain region (-10.6% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Central Transdanubia region (-9.6% in Intervention and socioeconomic improvement scenario).

16 Ireland

According to 2017 Eurostat data, the population of Ireland amounts to **4,784,383** The Gross Domestic Product (GDP) per capita on purchasing power parity is **53,500** euro, with relevant regional differences ranging from **24,700** euro per capita of Northern and Western Ireland area to **65,000** euro per capita of the Southern Ireland region. There are **1,795,000** households, with an average size of **2.6** persons.
The average employment rate is **67.7%**, while the level of tertiary education is **46.9%**.

Figure 13: Ireland - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 16: Ireland – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Ireland	131.04	131.56	0.4%	117.52	-10.3%	118.04	-9.9%
Northern and Western	130.00	130.00	0.0%	116.48	-10.4%	117.00	-10.0%
Southern	130.52	130.26	-0.2%	117.00	-10.4%	117.00	-10.4%
Eastern and Midland	132.08	131.82	-0.2%	118.56	-10.2%	118.56	-10.2%

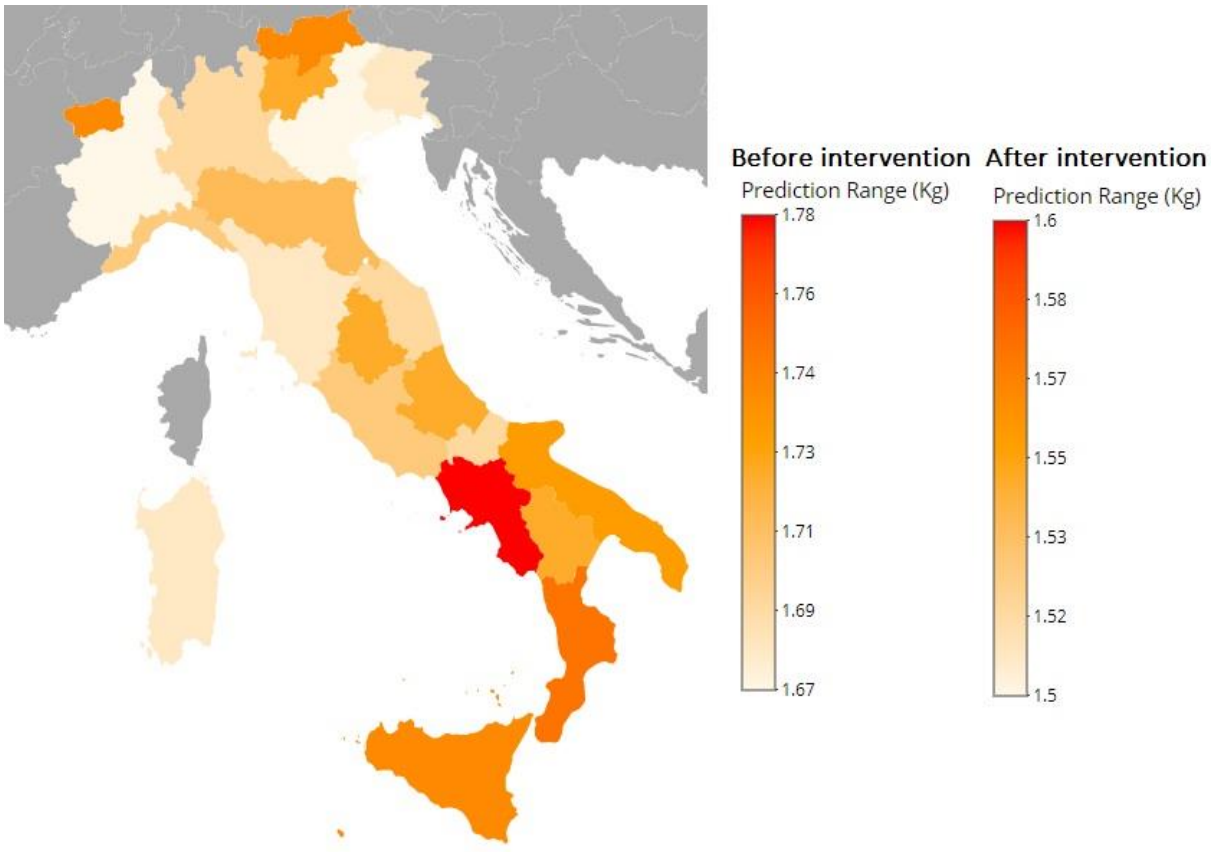
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Ireland. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food of almost 10%.
In particular, the estimated reduction of FW for the whole country is 9.9%. The higher estimated reduction, compared to the baseline scenario, is registered for Southern region (-10.4% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Northern and Western region (-10% in Intervention and socioeconomic improvement scenario).

17 Italy

According to 2017 Eurostat data, the population of Italy amounts to **60,589,445**, The Gross Domestic Product (GDP) per capita on purchasing power parity is **28,400** euro, with relevant regional differences ranging from **17,100** euro per capita of Calabria area to **42,200** euro per capita of the South Tyrol region.
There are **25,864,500** households, with an average size of **2.3** persons. The average employment rate is **58%**, while the level of tertiary education is **19.3%**.

Figure 14: Italy - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 17: Italy – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Italy	94.64	94.12	-0.5%	85.02	-10.2%	84.76	-10.4%
Piemonte	92.82	93.08	0.3%	83.72	-9.8%	83.20	-10.4%
Valle d'Aosta	95.42	95.16	-0.3%	85.80	-10.1%	85.80	-10.1%
Liguria	89.44	89.44	0.0%	80.60	-9.9%	80.60	-9.9%
Lombardia	94.12	94.12	0.0%	84.76	-9.9%	84.76	-9.9%
Abruzzo	94.64	94.12	-0.5%	85.28	-9.9%	84.76	-10.4%
Molise	92.04	92.04	0.0%	83.20	-9.6%	80.60	-12.4%
Campania	96.98	96.72	-0.3%	87.36	-9.9%	86.32	-11.0%
Puglia	96.20	95.68	-0.5%	86.32	-10.3%	85.80	-10.8%
Basilicata	93.86	93.60	-0.3%	84.24	-10.2%	84.24	-10.2%
Calabria	96.72	96.20	-0.5%	86.84	-10.2%	86.84	-10.2%
Sicilia	96.20	95.94	-0.3%	85.28	-11.4%	86.32	-10.3%
Sardegna	95.16	95.16	0.0%	85.80	-9.8%	85.28	-10.4%
Bolzano/Bozen	95.16	94.64	-0.5%	85.80	-9.8%	85.28	-10.4%
Trento	96.20	95.94	-0.3%	86.32	-10.3%	86.32	-10.3%
Veneto	94.64	94.12	-0.5%	84.76	-10.4%	84.76	-10.4%
Friuli-Venezia Giulia	94.64	94.38	-0.3%	85.28	-9.9%	84.76	-10.4%
Emilia-Romagna	95.94	95.68	-0.3%	86.32	-10.0%	86.32	-10.0%
Toscana	91.52	91.52	0.0%	82.16	-10.2%	82.16	-10.2%
Umbria	94.64	94.64	0.0%	85.28	-9.9%	85.28	-9.9%
Marche	93.60	93.34	-0.3%	84.24	-10.0%	84.24	-10.0%
Lazio	94.38	94.12	-0.3%	84.76	-10.2%	84.76	-10.2%

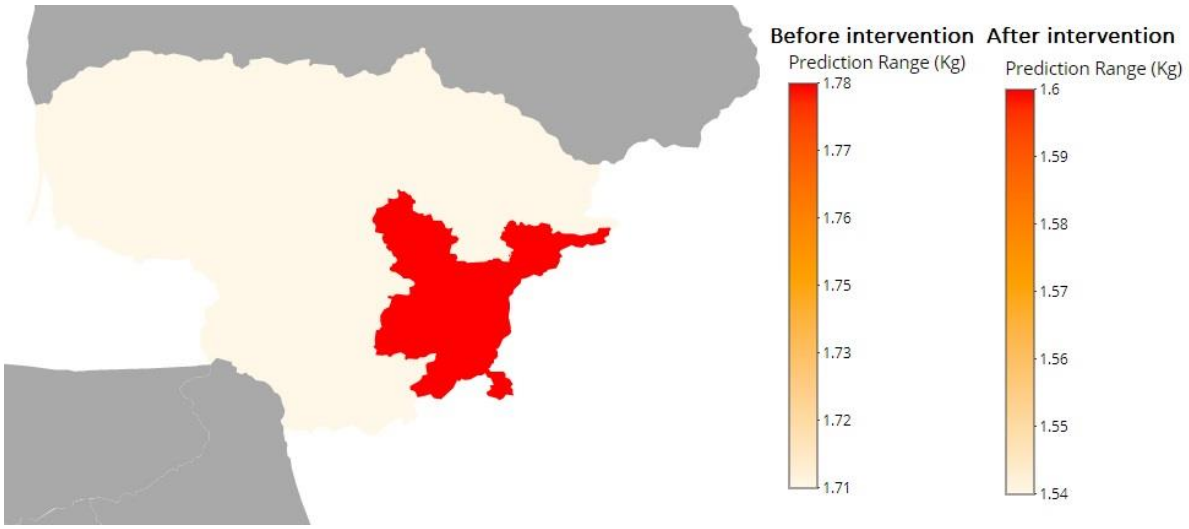
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Italy. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.4%. The higher estimated reduction, compared to the baseline scenario, is registered for Veneto region (-10.4%), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Liguria, Lombardia and Umbria regions (-9.9%).

18 Lithuania

According to 2017 Eurostat data, the population of Lithuania amounts to **2,847,904** The Gross Domestic Product (GDP) per capita on purchasing power parity is **23,000** euro, **33,000** euro per capita in Sostinės regionas area and **19,100** euro per capita in the Vidurio ir vakarų region. There are **1,357,000** households, with an average size of **2.1** persons, and the number of households is, according to Eurostat data.
The average employment rate is **70.4%**, while the level of tertiary education is **41.7%**.

Figure 15: Lithuania - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 18: Lithuania – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Lithuania	97.76	97.76	0.0%	87.4	-10.6%	87.88	-10.1%
Sostinės regionas	98.28	98.02	-0.3%	88.4	-10.1%	88.40	-10.1%
Vidurio ir vakarų	96.98	96.72	-0.3%	87.4	-9.9%	87.36	-9.9%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Lithuania. According to the data presented in Table 3, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.

In particular, the estimated reduction of FW for the whole country is 10.1%. The higher estimated reduction, compared to the baseline scenario, is registered for Sostienes Region (-10.1% for Intervention on current situation scenario and Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Vidurio ir vakarų region (-9.9%).

19 Luxembourg

According to 2017 Eurostat data, the population of Luxembourg amounts to **590,667** The Gross Domestic Product (GDP) per capita on purchasing power parity is **74,500** euro. There are **242,400** households with an average size of **2.4** persons.
The average employment rate is **66.3%**, while the level of tertiary education is **44.1%**.

Table 19: Luxembourg – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Luxembourg	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Luxembourg. According to the data presented in Table 3, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 10%

20 Latvia

According to 2017 Eurostat data, the population of Latvia amounts to **1,950,116**, according to 2017 Eurostat data. The gross domestic product (GDP) per capita on purchasing power parity is **19,600** euro.
There are **850,100** households with an average size of **2.2** persons.
The average employment rate is **70.1%**, while the level of tertiary education is **33.9%**.

Table 20: Latvia – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Latvia	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Latvia. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 10%

21 Malta

According to 2017 Eurostat data, the population of Malta amounts to **460,297**, according to 2017 Eurostat data. The gross domestic product (GDP) per capita on purchasing power parity is **28,700** euro. There are **183,400** households with an average size of **2.5** persons
The average employment rate is **68%**, while the level of tertiary education is **26.3%**.

Table 21: Malta – results of FW scenarios simulations

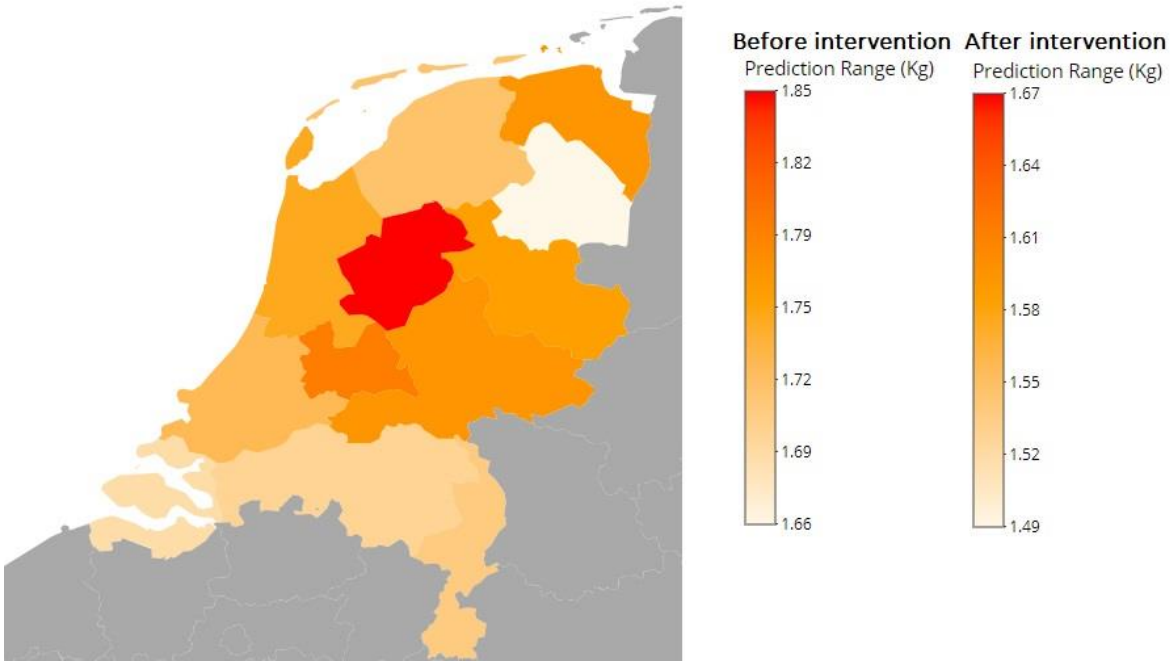
Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Malta	98.8	99.32	0.5%	88.92	-10.0%	88.92	-10.0%

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Malta. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 10%

22 The Netherlands

According to 2017 Eurostat data, the population of the Netherlands amounts to **17,081,507** The Gross Domestic Product (GDP) per capita on purchasing power parity is **37,700** euro, with some regional differences ranging from **25,800** euro per capita of Drente area to **48,900** euro per capita of the Hovedstaden region. There are **7,819,000** households, with an average size of **2.2** persons.
The average employment rate is **75.8%**, while the level of tertiary education is **38.3%**.

Figure 16: the Netherlands - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 22: the Netherlands – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
the Netherlands	96,72	96,72	0,0%	91,52	-5,4%	86,84	-10,2%
Groningen	97,24	96,98	-0,3%	87,36	-10,2%	87,36	-10,2%
Friesland (NL)	96,20	95,94	-0,3%	86,32	-10,3%	86,32	-10,3%
Drenthe	93,08	92.82	-0.3%	83.72	-10.1%	83.72	-10.1%
Overijssel	96.20	95.94	-0.3%	86.32	-10.3%	86.32	-10.3%
Gelderland	94.64	94.64	0.0%	85.28	-9.9%	85.28	-9.9%
Flevoland	99.84	99.32	-0.5%	89.96	-9.9%	89.44	-10.4%

Utrecht	98.80	98.80	0.0%	88.92	-10.0%	88.92	-10.0%
Noord-Holland	96.20	96.20	0.0%	86.84	-9.7%	86.32	-10.3%
Zuid-Holland	99.32	99.06	-0.3%	89.44	-9.9%	89.44	-9.9%
Zeeland	95.16	94.64	-0.5%	85.28	-10.4%	85.28	-10.4%
Noord-Brabant	97.24	97.24	0.0%	87.36	-10.2%	87.36	-10.2%
Limburg (NL)	96.46	96.20	-0.3%	86.84	-10.0%	86.84	-10.0%

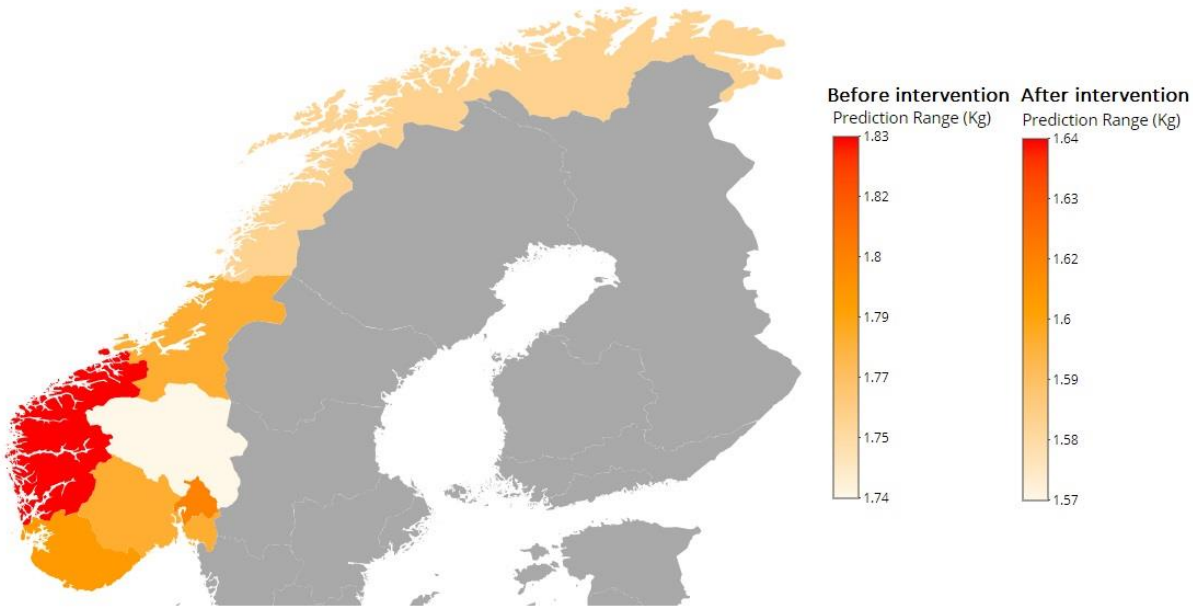
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in the Netherlands. According to the data presented above. the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular. the estimated reduction of FW for the whole country is 10.2%. The higher estimated reduction. compared to the baseline scenario. is registered for Flevoland region (-10.4% for Intervention on current situation scenario and -9.9% for Intervention and socioeconomic improvement scenario). while the lowest amount of food waste reduction after the intervention. excluding the national value. is registered in Gelderland region (-9.9% in Intervention and socioeconomic improvement scenario).

23 Norway

According to 2017 Eurostat data, the population of Norway amounts to **5.258.317** The Gross Domestic Product (GDP) per capita on purchasing power parity is **42.300** euro. with some regional differences ranging from **28.100** euro per capita of Hedmark og Oppland area to **49.700** euro per capita of the Oslo og Akershus region. There are **2.390.100** households, with an average size of **2.2** persons. The average employment rate is **74%** while the level of tertiary education is **43.7%**.

Figure 17: Norway - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 23: Norway – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Norway	98.02	98.02	0.0%	99.06	1.1%	87.36	-10.9%
Oslo og Akershus	100.88	101.40	0.5%	91.00	-9.8%	90.48	-10.3%
Hedmark og Oppland	93.60	93.34	-0.3%	84.24	-10.0%	83.98	-10.3%
Sør-Østlandet	95.16	94.64	-0.5%	85.80	-9.8%	85.28	-10.4%
Agder og Rogaland	99.84	99.58	-0.3%	89.96	-9.9%	89.44	-10.4%
Vestlandet	99.84	99.84	0.0%	89.96	-9.9%	89.96	-9.9%
Trøndelag	99.58	99.32	-0.3%	89.44	-10.2%	89.44	-10.2%

Nord-Norge	98.28	98.02	-0.3%	88.40	-10.1%	88.40	-10.1%

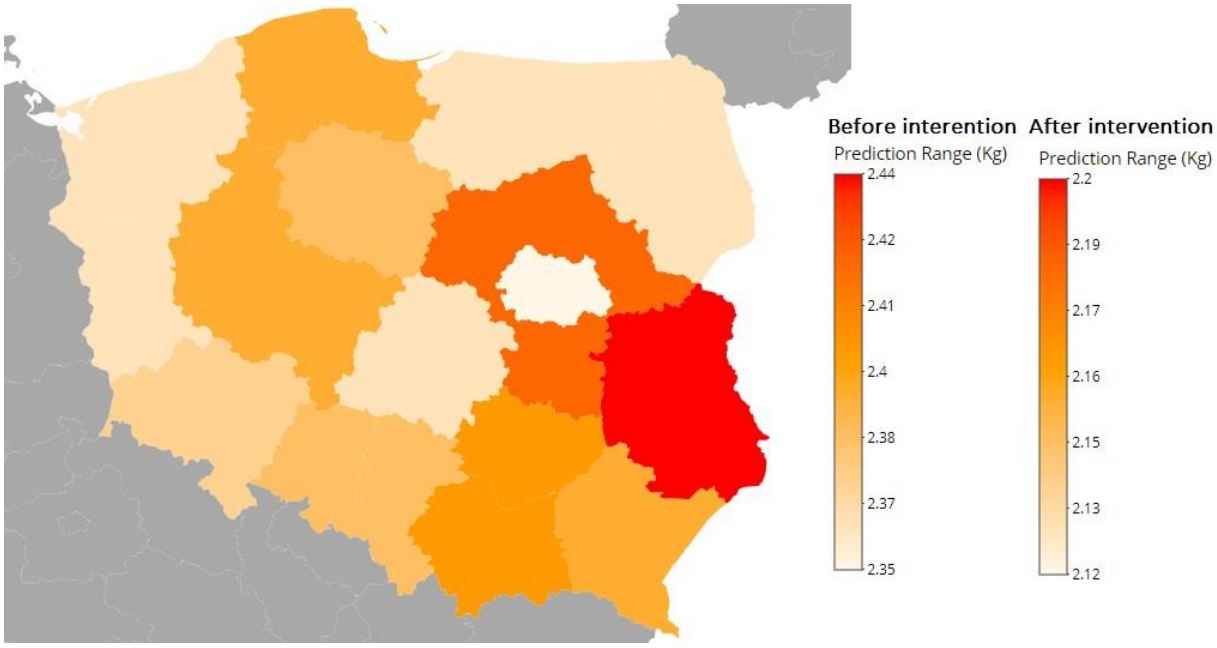
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Norway. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.9%. The higher estimated reduction, compared to the baseline scenario, is registered for Carinthia region (-10.4% for Intervention and socioeconomic improvement scenario and -9.9% for Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Vestlandet region (-9.9%).

24 Poland

According to 2017 Eurostat data, the population of Poland amounts to **37.972.964** The Gross Domestic Product (GDP) per capita on purchasing power parity is **20.500** euro. with relevant regional differences ranging from **14.100** euro per capita of Lubelskie area to **44.900** euro per capita of the Warszawski stołeczny region. There are **14.465.800** households, with an average size of **2.6** persons.
The average employment rate is **66.1%,** while the level of tertiary education is **30.9%**.

Figure 18: Poland - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 24: Poland – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Poland	129.48	129.22	-0.2%	116.48	-10.0%	115.44	-10.8%
Małopolskie	130.52	128.44	-1.6%	115.96	-11.2%	115.44	-11.6%
Śląskie	127.92	129.22	1.0%	115.44	-9.8%	114.92	-10.2%
Wielkopolskie	131.04	130.78	-0.2%	118.04	-9.9%	117.52	-10.3%
Zachodniopomorskie	130.00	129.48	-0.4%	117.00	-10.0%	116.48	-10.4%
Lubuskie	128.44	127.92	-0.4%	115.44	-10.1%	115.44	-10.1%
Dolnośląskie	129.22	128.96	-0.2%	116.48	-9.9%	115.96	-10.3%

Opolskie	129.74	129.48	-0.2%	117.00	-9.8%	116.48	-10.2%
Kujawsko-pomorskie	127.14	126.88	-0.2%	114.40	-10.0%	114.40	-10.0%
Warmińsko-mazurskie	129.74	129.48	-0.2%	117.00	-9.8%	116.48	-10.2%
Pomorskie	130.52	130.26	-0.2%	117.52	-10.0%	117.00	-10.4%
Łódzkie	128.96	128.70	-0.2%	115.96	-10.1%	115.96	-10.1%
Świętokrzyskie	128.44	128.18	-0.2%	115.44	-10.1%	115.44	-10.1%
Lubelskie	128.44	128.44	0.0%	115.44	-10.1%	115.44	-10.1%
Podkarpackie	130.52	130.26	-0.2%	117.52	-10.0%	117.00	-10.4%
Podlaskie	129.48	129.48	0.0%	116.48	-10.0%	116.48	-10.0%
Warszawski stołeczny	130.78	130.52	-0.2%	117.52	-10.1%	117.52	-10.1%
Mazowiecki regionalny	130.00	129.48	-0.4%	117.00	-10.0%	116.48	-10.4%

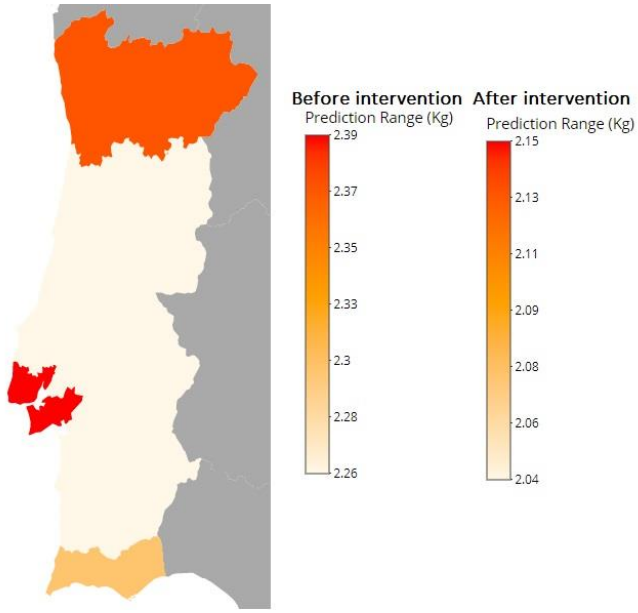
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Poland. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.8%. The higher estimated reduction, compared to the baseline scenario, is registered for Małopolskie region (-11.6% for Intervention and socioeconomic improvement scenario and -11.2% for Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value. is registered in Kujawsko-pomorskie and Podlaskie regions (-10%).

25 Portugal

According to 2017 Eurostat data, the population of Portugal amounts to **10.309.573** The Gross Domestic Product (GDP) per capita on purchasing power parity is **22.600** euro. with some regional differences ranging from **19.100** euro per capita of Norte area to **29.600** euro per capita of the Área Metropolitana de Lisboa region. There are **4.102.700** households, with an average size of **2.5** persons.
The average employment rate is **67.8%**, while the level of tertiary education is **25%**.

Figure 19: Portugal - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 25: Portugal – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Portugal	125.84	125.84	0.0%	113.36	-9.9%	112.84	-10.3%
Norte	124.54	124.28	-0.2%	111.8	-10.2%	111.80	-10.2%
Algarve	127.14	127.14	0.0%	114.4	-10.0%	113.88	-10.4%
Centro (PT)	124.02	124.28	0.2%	111.8	-9.9%	111.28	-10.3%
Lisboa	126.88	126.88	0.0%	113.88	-10.2%	113.88	-10.2%
Alentejo	123.24	123.24	0.0%	110.76	-10.1%	110.76	-10.1%
Região Autónoma dos Açores	127.92	127.92	0.0%	115.44	-9.8%	114.92	-10.2%
Região Autónoma da Madeira	126.10	126.10	0.0%	113.36	-10.1%	113.36	-10.1%

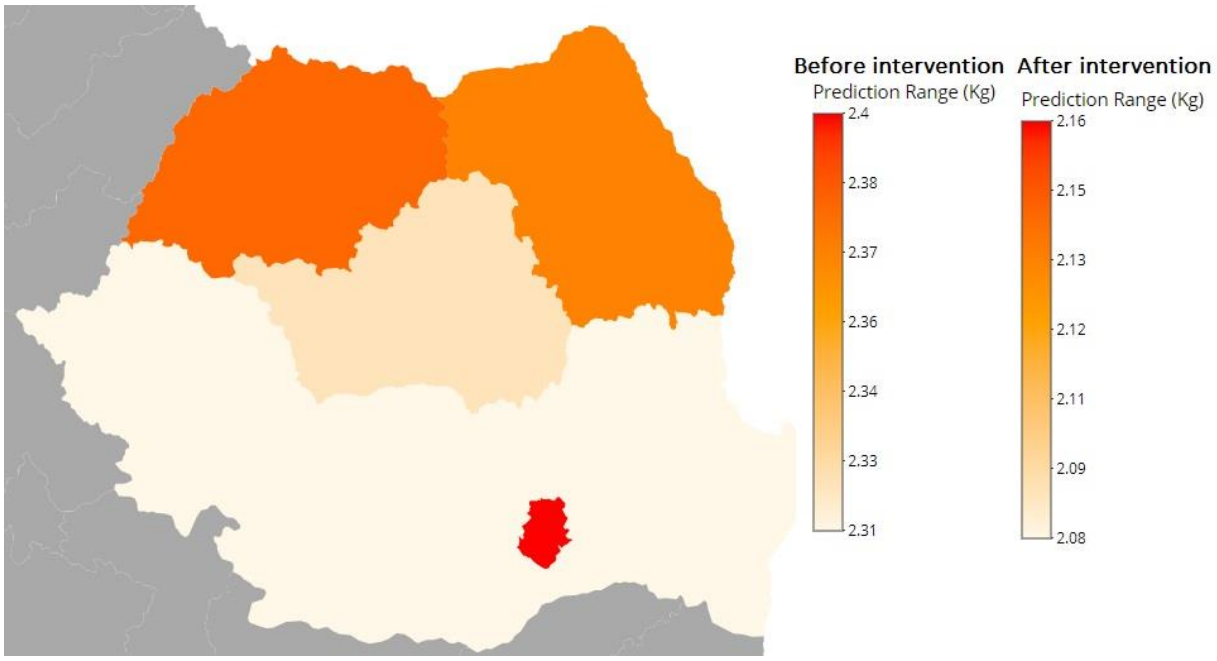
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Portugal. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.3%. The higher estimated reduction, compared to the baseline scenario, is registered for Algarve region (-10.4% for Intervention and socioeconomic improvement scenario and -10% for Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Alentejo and Região Autónoma da Madeira (-10.1%).

26 Romania

According to 2017 Eurostat data, the population of Romania amounts to **19.644.350** The Gross Domestic Product (GDP) per capita on purchasing power parity is **18.400** euro. with some regional differences ranging from **11.400** euro per capita of Nord-Est area to **42.400** euro per capita of the București-Ilfov region. There are **7.482.400** households, with an average size of **2.6** persons.
The average employment rate is **63.9%**, while the level of tertiary education is **17.8%**.

Figure 20: Romania - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 26: Romania – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Romania	127.92	127.66	-0.2%	120.64	-5.7%	114.92	-10.2%
Nord-Vest	127.92	127.92	0.0%	115.18	-10.0%	114.92	-10.2%
Centru	128.44	127.92	-0.4%	115.44	-10.1%	114.92	-10.5%
Nord-Est	127.40	126.88	-0.4%	114.40	-10.2%	114.40	-10.2%
Sud-Est	127.92	127.92	0.0%	115.44	-9.8%	114.92	-10.2%
Sud - Muntenia	127.14	126.88	-0.2%	114.40	-10.0%	114.40	-10.0%
Bucureşti - Ilfov	129.48	129.48	0.0%	116.48	-10.0%	116.48	-10.0%
Sud-Vest Oltenia	125.84	125.84	0.0%	113.36	-9.9%	113.10	-10.1%
Vest	129.48	128.96	-0.4%	116.48	-10.0%	115.96	-10.4%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Romania. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 10.2%. The higher estimated reduction, compared to the baseline scenario, is registered for Centru region (-10.1% for Intervention on current situation scenario and -10.5% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Sud - Muntenia and Bucureşti - Ilfov regions (-10%).

27 Slovenia

According to 2017 Eurostat data, the population of Slovenia amounts to **2.065.895** The Gross Domestic Product (GDP) per capita on purchasing power parity is **25.100** euro. **20.600** euro per capita in Vzhodna Slovenija area and **30.000** euro per capita in the Zahodna Slovenija region. There are **881.100** households, with an average size of **2.3** persons.
The average employment rate is **71.6%**, while the level of tertiary education is **44.5%**.

Figure 21: Slovenia - FW estimations before and after intervention

Note: graphical differences are not in the colours, but in the scale.

Table 27: Slovenia – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Slovenia	97.76	97.50	-0.3%	87.88	-10.1%	87.88	-10.1%
Vzhodna Slovenija	96.72	96.72	0.0%	86.84	-10.2%	86.84	-10.2%
Zahodna Slovenija	98.80	98.80	0.0%	88.92	-10.0%	88.92	-10.0%

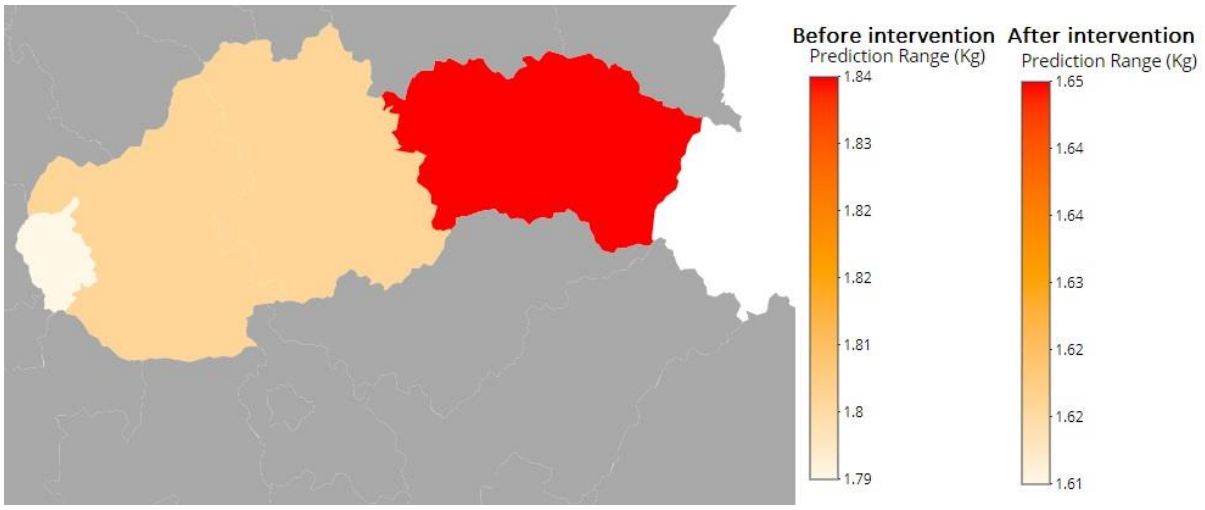
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Slovenia. According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%. In particular, the estimated reduction of FW for the whole country is 10.1%. The higher estimated reduction, compared to the baseline scenario. is registered for Vzhodna Slovenija region (-10.2%). while the lowest amount of food waste reduction after the intervention. excluding the national value. is registered in Zahodna Slovenija (-10%).

28 Slovakia

According to 2017 Eurostat data, the population amounts to **5.434.343** The Gross Domestic Product (GDP) per capita on purchasing power parity is **22.400** euro. with consistent regional differences ranging from **17.900** euro per capita of Stredné Slovensko area to **52.800** euro per capita of the Bratislavský kraj region. There are **1.874.500** households, with an average size of **2.7** persons.
The average employment rate is **71.6%**, while the level of tertiary education is **44.5%**.

Figure 22: Slovakia - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 28: Slovakia – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Slovakia	128.96	128.96	0.0%	115.70	-10.3%	116.48	-9.7%
Bratislavský kraj	129.48	129.48	0.0%	110.76	-14.5%	117.00	-9.6%
Západné Slovensko	128.44	127.92	-0.4%	116.48	-9.3%	114.92	-10.5%
Stredné Slovensko	129.22	128.96	-0.2%	116.48	-9.9%	115.96	-10.3%
Východné Slovensko	129.48	128.96	-0.4%	116.48	-10.0%	116.48	-10.0%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Slovakia. According to the data presented above. the

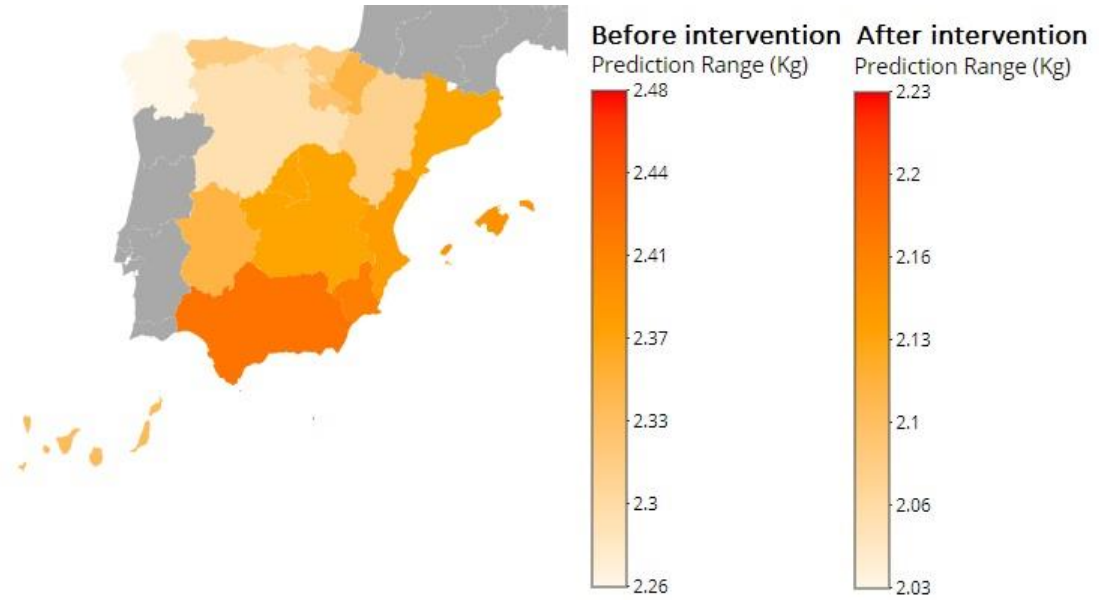
presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of almost 10%.

In particular, the estimated reduction of FW for the whole country is 10.03%. The higher estimated reduction, compared to the baseline scenario, is registered for Bratislavský kraj region (-14.5% Intervention on current situation scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Východné Slovensko region (-10%).

29 Spain

According to 2017 Eurostat data, the population of Spain amounts to **46.528.024** The Gross Domestic Product (GDP) per capita on purchasing power parity is **27.100** euro. with some regional differences ranging from **19.000** euro per capita of Extremadura area to **36.600** euro per capita of the Madrid region. There are **18.512.500** households, with an average size of **2.5** persons.
The average employment rate is **53.5%,** while the level of tertiary education is **31.7%**.

Figure 23: Spain - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 29: Spain – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Spain	122.20	127.92	4.7%	114.92	-6.0%	114.92	-6.0%
Galicia	120.12	125.58	4.5%	113.36	-5.6%	112.84	-6.1%
Principado de Asturias	118.04	124.02	5.1%	111.80	-5.3%	111.80	-5.3%
Cantabria	120.12	126.10	5.0%	113.36	-5.6%	113.36	-5.6%
País Vasco	119.60	125.32	4.8%	112.84	-5.7%	112.84	-5.7%
Comunidad Foral de Navarra	122.72	128.96	5.1%	115.96	-5.5%	115.96	-5.5%
La Rioja	122.72	128.44	4.7%	115.96	-5.5%	115.44	-5.9%
Aragón	121.16	126.88	4.7%	113.88	-6.0%	113.88	-6.0%

Comunidad de Madrid	122.72	128.44	4.7%	115.44	-5.9%	115.44	-5.9%
Castilla y León	118.56	125.32	5.7%	112.84	-4.8%	112.84	-4.8%
Castilla-La Mancha	121.68	127.40	4.7%	114.66	-5.8%	114.92	-5.6%
Extremadura	119.60	125.84	5.2%	113.36	-5.2%	113.36	-5.2%
Cataluña	120.64	127.66	5.8%	114.92	-4.7%	114.92	-4.7%
Comunidad Valenciana	122.20	127.66	4.5%	114.92	-6.0%	114.92	-6.0%
Illes Balears	122.72	128.44	4.7%	115.96	-5.5%	115.44	-5.9%
Andalucía	122.20	127.66	4.5%	114.92	-6.0%	114.92	-6.0%
Región de Murcia	123.24	128.44	4.2%	115.96	-5.9%	115.96	-5.9%
Ciudad Autónoma de Ceuta	127.92	133.64	4.5%	120.64	-5.7%	120.12	-6.1%
Ciudad Autónoma de Melilla	127.92	133.38	4.3%	120.12	-6.1%	120.12	-6.1%
Canarias	122.20	127.92	4.7%	115.44	-5.5%	114.92	-6.0%

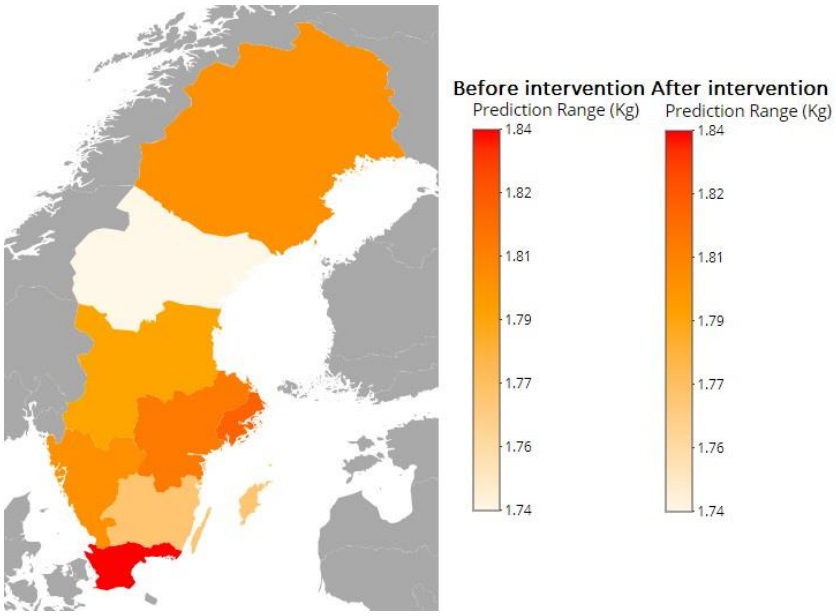
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Spain.
According to the data presented above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of 6%, while the only increase of socioeconomic parameters causes an increase in food waste generated at the household level
The higher estimated reduction, compared to the baseline scenario, is registered for Ciudad Autónoma de Melilla (-6.1%). while the lowest amount of food waste reduction after the intervention. excluding the national value. is registered in Cataluña region (-4.7%).

30 Sweden

According to 2017 Eurostat data, the population of Sweden amounts to **9.995.153** The Gross Domestic Product (GDP) per capita on purchasing power parity is **35.600** euro. with some regional differences ranging from **28.600** euro per capita of Norra Mellansverige area to **48.800** euro per capita of the Stockholm region. There are **4.862.700** households, with an average size of **1.8** persons.
The average employment rate is **76.9%**, while the level of tertiary education is **43.3%**.

Figure 24: Sweden - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 30: Sweden – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
Sweden	97.5	97.24	-0.3%	87.88	-9.9%	87.88	-9.9%
Stockholm	98.80	98.80	0.0%	88.92	-10.0%	88.92	-10.0%
Östra Mellansverige	98.28	98.28	0.0%	88.40	-10.1%	88.40	-10.1%
Småland med öarna	95.68	95.16	-0.5%	85.80	-10.3%	85.80	-10.3%
Sydsverige	100.62	100.36	-0.3%	90.48	-10.1%	90.48	-10.1%
Västsverige	96.72	96.46	-0.3%	86.84	-10.2%	86.84	-10.2%
Norra Mellansverige	94.64	94.12	-0.5%	85.28	-9.9%	84.76	-10.4%
Mellersta Norrland	98.28	98.02	-0.3%	88.40	-10.1%	88.40	-10.1%
Övre Norrland	96.72	96.72	0.0%	87.36	-9.7%	86.84	-10.2%

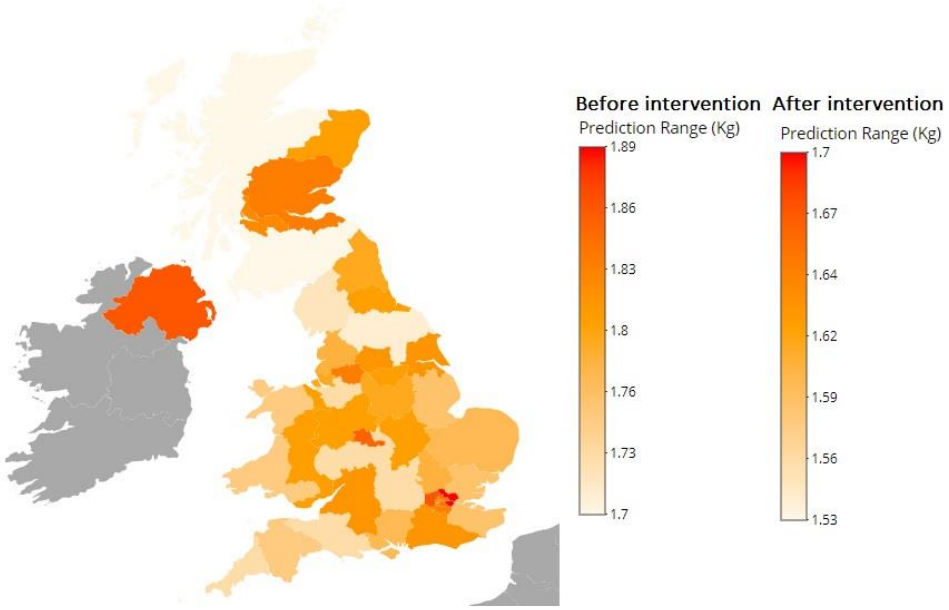
Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in Sweden. According to the data presented in Table 3. the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste of almost 10%.
In particular, the estimated reduction of FW for the whole country is 9.9%. The higher estimated reduction, compared to the baseline scenario, is registered for Norra Mellansverige region (-10.4% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Stockholm region (-10%).

31 United Kingdom

According to 2017 Eurostat data, the population of United Kingdom amounts to **65.844.122** The Gross Domestic Product (GDP) per capita on purchasing power parity is **31.100** euro. with consistent regional differences ranging from **19.000** euro per capita of Southern Scotland area to the **49.600** euro per capita of the Inner London — East region (with the relevant exception of the Inner London – West region. with a GDP of **184.600** euro per capita).
There are **28.830.100** households, with an average size of **2.3** persons, and the number of households is, according to Eurostat data.
The average employment rate is **74.1%**, while the level of tertiary education is **43.2%**.

Figure 25: United Kingdom - FW estimations before and after intervention



Note: graphical differences are not in the colours, but in the scale.

Table 31: United Kingdom – results of FW scenarios simulations

Region	Baseline	Socioeconomic improvement scenario		Intervention on current situation scenario		Intervention and socioeconomic improvement scenario	
	Household FW (kg/year)	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline	Household FW (kg/year)	Difference with baseline
United Kingdom	103.48	97.50	-5.8%	87.88	-15.1%	87.88	-15.1%
Tees Valley and Durham	101.92	96.20	-5.6%	86.84	-14.8%	86.32	-15.3%
Northumberland and Tyne and Wear	101.40	98.02	-3.3%	88.40	-12.8%	88.40	-12.8%
Cumbria	100.88	96.72	-4.1%	87.36	-13.4%	86.84	-13.9%
Greater Manchester	100.88	101.14	0.3%	91.00	-9.8%	91.00	-9.8%

Lancashire	99.84	96.72	-3.1%	87.36	-12.5%	86.84	-13.0%
Cheshire	99.32	95.68	-3.7%	86.32	-13.1%	85.80	-13.6%
Merseyside	99.06	96.72	-2.4%	87.36	-11.8%	86.84	-12.3%
East Yorkshire and Northern Lincolnshire	98.80	96.72	-2.1%	87.36	-11.6%	87.36	-11.6%
North Yorkshire	98.80	95.16	-3.7%	85.80	-13.2%	85.28	-13.7%
South Yorkshire	98.80	98.02	-0.8%	88.40	-10.5%	88.40	-10.5%
West Yorkshire	98.28	99.06	0.8%	89.44	-9.0%	88.92	-9.5%
Derbyshire and Nottinghamshire	98.28	98.54	0.3%	88.92	-9.5%	88.66	-9.8%
Leicestershire. Rutland and Northamptonshire	98.28	96.98	-1.3%	87.36	-11.1%	87.36	-11.1%
Lincolnshire	98.28	96.46	-1.9%	86.84	-11.6%	86.84	-11.6%
Herefordshire. Worcestershire and Warwickshire	98.28	95.68	-2.6%	86.32	-12.2%	86.32	-12.2%
Shropshire and Staffordshire	98.02	94.12	-4.0%	84.76	-13.5%	84.76	-13.5%
West Midlands	97.76	98.80	1.1%	88.92	-9.0%	88.92	-9.0%
East Anglia	97.24	96.72	-0.5%	86.84	-10.7%	86.84	-10.7%
Bedfordshire and Hertfordshire	97.24	99.84	2.7%	89.96	-7.5%	89.96	-7.5%
Essex	97.24	97.76	0.5%	88.40	-9.1%	87.88	-9.6%
Inner London - West	97.24	100.36	3.2%	91.00	-6.4%	90.48	-7.0%
Inner London - East	96.98	102.44	5.6%	93.08	-4.0%	92.56	-4.6%
Outer London - East and North East	96.72	100.62	4.0%	90.48	-6.5%	90.48	-6.5%
Outer London - South	96.72	101.92	5.4%	92.04	-4.8%	91.52	-5.4%
Outer London - West and North West	96.72	100.36	3.8%	90.48	-6.5%	90.48	-6.5%
Berkshire. Buckinghamshire and Oxfordshire	96.72	97.76	1.1%	87.88	-9.1%	87.88	-9.1%
Surrey. East and West Sussex	96.46	96.20	-0.3%	86.84	-10.0%	86.84	-10.0%
Hampshire and Isle of Wight	96.20	96.20	0.0%	86.84	-9.7%	86.58	-10.0%
Kent	96.20	97.24	1.1%	87.88	-8.6%	87.36	-9.2%
Gloucestershire. Wiltshire and Bristol/Bath area	96.20	97.24	1.1%	87.36	-9.2%	87.36	-9.2%
Dorset and Somerset	96.20	92.56	-3.8%	83.72	-13.0%	83.46	-13.2%
Cornwall and Isles of Scilly	95.94	94.64	-1.4%	85.28	-11.1%	85.28	-11.1%
Devon	95.68	95.94	0.3%	86.32	-9.8%	86.32	-9.8%
West Wales and The Valleys	95.68	94.12	-1.6%	85.02	-11.1%	84.76	-11.4%

East Wales	95.16	98.28	3.3%	88.40	-7.1%	88.40	-7.1%
North Eastern Scotland	95.16	95.16	0.0%	85.80	-9.8%	85.28	-10.4%
Highlands and Island	94.64	95.68	1.1%	86.32	-8.8%	86.32	-8.8%
Eastern Scotland	94.64	97.76	3.3%	88.40	-6.6%	88.14	-6.9%
West Central Scotland	94.12	97.76	3.9%	88.40	-6.1%	87.88	-6.6%
Southern Scotland	93.08	95.94	3.1%	86.32	-7.3%	86.32	-7.3%
Northern Ireland	93.08	98.54	5.9%	88.92	-4.5%	88.40	-5.0%
Tees Valley and Durham	101.92	96.20	-5.6%	86.84	-14.8%	86.32	-15.3%
Northumberland and Tyne and Wear	101.40	98.02	-3.3%	88.40	-12.8%	88.40	-12.8%
Cumbria	100.88	96.72	-4.1%	87.36	-13.4%	86.84	-13.9%
Greater Manchester	100.88	101.14	0.3%	91.00	-9.8%	91.00	-9.8%
Lancashire	99.84	96.72	-3.1%	87.36	-12.5%	86.84	-13.0%
Cheshire	99.32	95.68	-3.7%	86.32	-13.1%	85.80	-13.6%
Merseyside	99.06	96.72	-2.4%	87.36	-11.8%	86.84	-12.3%
East Yorkshire and Northern Lincolnshire	98.80	96.72	-2.1%	87.36	-11.6%	87.36	-11.6%
North Yorkshire	98.80	95.16	-3.7%	85.80	-13.2%	85.28	-13.7%
South Yorkshire	98.80	98.02	-0.8%	88.40	-10.5%	88.40	-10.5%
West Yorkshire	98.28	99.06	0.8%	89.44	-9.0%	88.92	-9.5%
Derbyshire and Nottinghamshire	98.28	98.54	0.3%	88.92	-9.5%	88.66	-9.8%
Leicestershire. Rutland and Northamptonshire	98.28	96.98	-1.3%	87.36	-11.1%	87.36	-11.1%
Lincolnshire	98.28	96.46	-1.9%	86.84	-11.6%	86.84	-11.6%
Herefordshire. Worcestershire and Warwickshire	98.28	95.68	-2.6%	86.32	-12.2%	86.32	-12.2%

Note: differences among the national values estimation and the sum of single regional values are due to computational approximations.

Results from simulations highlight the relevance of policy interventions for the reduction of food waste in United Kingdom. According to the data above, the presence of an intervention having an impact on the 10% of the population leads to a reduction of food waste greater than 10%.
In particular, the estimated reduction of FW for the whole country is 15.1%. The higher estimated reduction, compared to the baseline scenario, is registered for Tees Valley and Durham region (-15.3% for Intervention and socioeconomic improvement scenario), while the lowest amount of food waste reduction after the intervention, excluding the national value, is registered in Northern Ireland region (-5%).

References

Canali, M., Amani, P., Aramyan, L., Gheoldus, M., Moates, G., Östergren, K., Silvennoinen, K., Waldron, K., Vittuari, M., 2016. Food Waste Drivers in Europe, from Identification to Possible Interventions. Sustainability 9, 37. https://doi.org/10.3390/su9010037

FAO, 2011. Global food losses and food waste – Extent, causes and prevention.

Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M., Toulmin, C., 2010. Food Security: The Challenge of Feeding 9 Billion People. Science (80-.). 327, 812–818. https://doi.org/10.1126/science.1185383

Grainger, M., Piras, S., Righi, S., Setti, M., Stewart, G., Vittuari, M., 2018. Behavioural economics: Linking Bayesian and agent-based models to assess consumer food waste.

Lorenz-Walther, B.A., Langen, N., Göbel, C., Engelmann, T., Bienge, K., Speck, M., Teitscheid, P., 2019. What makes people leave LESS food? Testing effects of smaller portions and information in a behavioral model. Appetite 139, 127–144. https://doi.org/10.1016/j.appet.2019.03.026

Parfitt, J., Barthel, M., Macnaughton, S., 2010. Food waste within food supply chains: quantification and potential for change to 2050. Philos. Trans. R. Soc. B Biol. Sci. 365, 3065–3081. https://doi.org/10.1098/rstb.2010.0126

Piras, S., Righi, S., Setti, M., Vittuari, M., 2016. Business behavioural typologies and interrelationships. Implications for food waste.

Stenmarck, Å., Jensen, C., Quested, T., Moates, G., 2016. Fusions: Estimates of European food waste levels.

Van Geffen, L., Van Herpen, E., Van Trijp, H., Quested, T., Díaz-Ruiz, R., 2017. Quantified consumer insights on food waste Pan-European research for quantified consumer food waste understanding. EU Refresh Proj.

WRAP, 2013. Household food and drink waste in the UK 2012 | WRAP UK [WWW Document]. URL http://www.wrap.org.uk/content/household-food-and-drink-waste-uk-2012 (accessed 4.8.19).