Technical Appendices:

The economic case for plant-forward public procurement in the EU

About the research

This research quantifies the economic, environmental, and health cost savings from a strategic shift toward plant-forward public food procurement in key institutions across the EU. This economic analysis across all 27 Member States demonstrates that shifting institutional meals is a vital fiscal and strategic tool. The analysis employs a novel unit of measure, Animal Product Annual Consumption Equivalents (APACEs), to estimate the consumption requirements of 54 million institutional users based on official Eurostat and household budget data. These data are analyzed across three shift scenarios using established methodologies, including True Cost Pricing and the OECD's Value of a Statistical Life framework. Ultimately, these findings can help transform institutional food procurement into a cross-cutting policy opportunity that cuts procurement spending while helping ensure the EU functions within planetary boundaries and enhances the well-being of its citizens.

These Technical Appendices detail the comprehensive methodology, data sources, and underlying economic modeling for this research project, commissioned by **ProVeg International** and performed by **Bryant Research**. Data collection and modelling took place between October 2025 and February 2026.

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Key findings

Technical Appendix 1: Baseline consumption and scale

- Across the EU, public institutions allocate approximately **42.6% to 43.2%** of their food procurement budgets to animal-source foods.
- EU public institutions serve an estimated **54 million people** daily across institutions.
- Institutional catering accounts for approximately **2.69%** of the total animal-source food consumption across the EU27.
- Shifting to an **85% plant-source** budget target requires a **64.8% reduction** in current animal-source food spending.

Technical Appendix 2: Budget savings

- Entirely plant-source menus are typically **25% less expensive** at the ingredient level than omnivorous diets.
- Implementing an 85% plant-source procurement target would generate **€3.16 billion** in annual direct budget savings for EU public institutions.

Technical Appendix 3: Environmental externalities

- The consumption of animal-source foods in EU institutions currently imposes **€8.43 billion per year** in hidden environmental costs.
- Climate change impacts (**32.4%**) and air pollution (**26.4%**) represent the largest drivers of environmental damage, followed by land use (**22.5%**) and water pollution (**15.0%**).
- Shifting to the 85% target would avoid **€4.37 billion** in annual environmental externalities.

Technical Appendix 4: Social health cost savings

- Red and processed meat consumption in targeted institutional populations (care homes, universities, military personnel, and prisons) accounts for an annual social health cost of **€6.3 billion**.
- A transition to 85% plant-source procurement would prevent **€4.08 billion** in annual social health costs by reducing the incidence of dietary diseases.
- Under the 85% plant-based procurement target, spend-based institutional healthcare savings total €200 million
- In the school system, this dietary shift is projected to prevent approximately **396,187 future cases** of adult obesity once the policy is fully implemented.

Technical Appendix 5: Carbon equivalency

- The environmental savings from the proposed shift are equivalent to removing **4.44 million cars** from European roads.
- This represents a reduction of **8.89 million tonnes** of CO_2-equivalent per year.

Table of contents

Technical Appendix 1: Quantifying the level of diet change *6*

1.1 The percentage of EU food budget that goes towards plant-source foods **6**

1.1.1: Using Tenders Electronic Daily 6

1.1.2: Using The European household budget survey 6

1.1.3 Assumptions and caveats 7

1.2 How our proposed budget re-allocations translate into purchases of plant- vs animal-source foods **7**

1.3 Translating percentage targets into weight of food changes **8**

1.3.1: Animal Product Annual Consumption Equivalents (APACEs) 8

1.3.2 Our general APACE calculation method 9

1.3.3 Consumption factors 9

1.3.4 Prisoners 11

1.3.5 Military personnel 11

1.3.6 Hospital patients 11

1.3.7 School children (aged 5-18) 12

1.3.8 University students 12

1.3.9 Care beds 13

1.3.10 What share of national animal-source food consumption occurs in public institutions? 14

1.4 Converting APACEs into weight of animal-source foods consumed **15**

1.4.1 Assumptions and caveats 15

Technical Appendix 2: Food cost savings *17*

2.1 How much do EU public institutions spend on food? **17**

2.1.1 Assumptions 17

2.2 How much cheaper are plant-based meals? **17**

2.2.1 Assumptions and caveats 17

2.3 Calculating savings **19**

2.3.1 Budget savings by scenario 19

Technical Appendix 3: Environmental cost savings *20*

3.1 Environmental factors modelled **20**

3.2 Calculation method **20**

3.3 Estimating the environmental impacts of specific categories of animal-source foods **21**

3.3.1 Estimating the environmental impacts of seafood 21

3.3.2 Estimating the environmental impacts of eggs 22

3.3.3 Estimating the environmental impacts of the mutton/goat/lamb category 23

3.3.4 Estimating the environmental impacts of butter and cream 23

3.3.5 Estimating the environmental impacts of plant-based replacements 23

3.4 Calculated per-kilo environmental costs **24**

3.4.1 Adjusting costs to 2025 euros 24

3.5 Replacement mapping..... 26
3.6 Calculating total institutional environmental costs..... 27
3.7 Results..... 27
3.7.1 Environmental costs..... 27
3.7.2 Environmental costs breakdown by institution type..... 28
3.7.3 Country variation of environmental costs..... 29
3.7.4 Scenario savings from environmental externalities..... 29
3.8 Assumptions and caveats..... 31
Technical Appendix 4: Health cost savings..... 33
4.1 Populations modelled..... 33
4.2 Food replacement..... 33
4.2.1 Processed meat replacement..... 34
4.2.2 Food replacement implications..... 34
4.3 Food waste..... 34
4.4 Quantifying the negative health effects of red and processed meat..... 35
4.4.1 Adjusting for overlap between red meat and processed meat DALYs..... 35
4.4.2 Monetising DALYs..... 36
4.5 Allocating national health costs to institutions..... 36
4.6 Social health costs and scenario savings..... 36
4.6.1 EU27 health costs..... 37
4.6.2 Social health cost breakdown by institution type..... 37
4.6.3 Social health cost country variation..... 38
4.6.4 Scenario savings..... 40
4.7 Assumptions..... 40
4.8 Secondary analysis A: healthcare system burden approach..... 42
4.8.1 Method..... 42
4.8.2 Healthcare expenditure data..... 42
4.8.3 Healthcare system costs..... 42
4.8.4 Scenario savings..... 44
4.8.5 Validation of assumptions..... 44
4.9 Secondary analysis B: childhood obesity implications..... 45
4.9.1 Method..... 45
4.9.2 Results..... 46
4.9.3 Assumptions and caveats..... 47
Technical Appendix 5: Carbon dioxide reduction equivalent to cars removed from EU roads..... 49
Endnotes..... 50

Technical Appendix 1: Quantifying the level of diet change

1.1 The percentage of EU food budget that goes towards plant-source foods

In order to understand how much animal-source food must be shifted to plant sources to achieve 65%, 75%, or 85% plant-based public food procurement budget scenarios across EU institutions, first we estimated the current percentage of EU public food procurement budget that goes towards plant- vs animal-source foods.

1.1.1: Using Tenders Electronic Daily

For our analysis, we use a subsample of the Tenders Electronic Daily (TED) database made available for research by the EU.[1] TED is the official European Union public procurement database that publishes all government tender notices above a specified financial threshold.

This data is incomplete in that TED is estimated to only contain one third of public procurement contracts by value.[2] Furthermore, most contracts in this dataset use vague or catch-all procurement codes from which it cannot be determined what percentage of the contract is used to purchase plant-source foods. As such we used only the classifiable contracts that explicitly mention plant- or animal-source foods: 8,524 of 39,688 food contracts (21.5%), representing €5.1 billion of value. We identified relevant food items by filtering the data to Common Procurement Vocabulary (CPV) codes starting with 03 (agricultural products) and 15 (food and beverages). We excluded countries where animal-source-food spending was exactly 0% or 100% of classifiable food contracts, as these extreme values likely reflect data quality issues, specific country reporting quirks, or very limited procurement data rather than genuine procurement patterns. The excluded countries were: The Netherlands, Cyprus, Hungary, and Malta. From this data **we estimate that 43.2% of EU public food procurement goes toward animal-source foods, and 56.8% toward plant-source foods**.

1.1.2: Using The European household budget survey

Given that the TED dataset was limited in several ways, we calculated another estimate for robustness. Here we used the percentage of a European *household's* food budget that was spent on animal- vs plant-source foods as a proxy for institutions, on the assumption that institutions prefer not to serve food that deviates significantly from the home diets of the populations they serve. We used the latest wave of the Eurostat household budget survey[3] (EHBS) (2020). This gives the percentage of household budget spent on various foods, split by country. For each country, we took the percentage of the household budget spent on animal-source foods and food and drink as a whole. Then we recalculated the percentage of budget spent on animal-source foods as a percentage of household food and drink spend.

To get an EU-wide number, we re-weighted these percentages by the level of government spending for each country from Eurostat. [4] This accounts for the fact that countries can have very different

procurement budgets. The latest data was available for 2023 or 2024 depending on the country. We used the "Classification of the Functions of Government" (COFOG) codes for governmental departments directly relevant to our public food procurement: this includes defence, healthcare, education, prisons, and care homes.

Encouragingly, **the governmental spend-weighted, EU-wide average percentage of household food budget was 42.6%**, only 0.5 percentage points lower than the estimate for public food procurement from TED to 1 decimal place. This gave us confidence that our assumptions are reasonable.

Note: While both datasets yielded nearly identical EU-wide averages (~43%), we used the EHBS estimate for all further analyses. Unlike the TED data, which contained significant gaps and reporting errors for certain Member States, the EHBS provides a consistent and complete dataset across all 27 countries. This allows for the high-precision, country-by-country economic modeling presented in this report.

1.1.3 Assumptions and caveats

- The latest year of EHBS data was 2020, except for Sweden where data was from 2015.
- Using TED contracts rather than all food contracts, and based on the fact that we are limiting our analyses to only contracts that specifically mentioned meat or non-animal product items, our analysis is biased towards bigger more professional buyers as well as buyers that procure raw ingredients rather than bundled catering services.
- Our analysis is also likely to exclude a lot of catering service contracts because they do not split their lots into animal-source and non-animal products, simply grouping them all together as catering services. However, this exclusion only biases our findings if catering service contracts consistently allocate a higher or lower proportion of their budget to animal-source foods than the specific food-item contracts used in our analysis. It is not obvious why this would be the case, but we cannot guarantee our analysis is unbiased in this way.
- We also assume that the data sets included in our TED data are representative of the types of contracts that are not in the TED. While they are by definition not representative in terms of contract price, we assume they are representative in terms of the percentage of allocation to animal- vs plant-source foods.
- Some public institutions in some countries may serve more or less animal-source foods than our TED or EHBS calculations suggest. Assuming the bias does not overly point in one direction, this dataset is appropriate and will give a reasonable estimate.

1.2 How our proposed budget re-allocations translate into purchases of plant- vs animal-source foods

From section 1.1, we estimate that 42.6% of the EU public procurement budget is spent on animal-source foods. This means that **to meet a target of 85% plant-forward budget allocation, spending on animal-source foods would have to decrease by 27.6 percentage points**, or 64.8% from current value.

Scenario	Change in animal-source food from current baseline
Baseline (~57% PB)	0%
65% PB	~18% reduction
75% PB	~42% reduction
85% PB (proposed target)	~64.8% reduction

Table 1: Our three proposed scenarios for plant-based (PB) public procurement and the level of animal-source food reduction required to meet that target.

1.3 Translating percentage targets into weight of food changes

Having established percentage targets, we next calculate the costs associated with the current diets of EU institutions, and the cost reductions that would be realised from meeting our proposed targets. To do this, we first calculated the quantity of animal-source foods consumed in each institution of interest for each EU country.

1.3.1: Animal Product Annual Consumption Equivalents (APACEs)

Precise food-served data for most public institutions in most countries are not available. In the absence of this, **we use the annual consumption of animal-source foods by average citizens** as a proxy.

To simplify calculations, we quantify the total animal-source food consumption from all people in an institution in terms of the equivalent number of average citizen's worth of yearly animal-source food consumption. We call these “Animal Product Annual Consumption Equivalents" or APACEs. One APACE is equivalent to the full animal-source food consumption of one average adult per institution per country. We calculate an institution's total APACEs using the following formula:

Institutional APACEs = Institutional Headcount × Occupancy rate (where relevant) × Meal coverage proportion × Consumption factor

This takes into account:

- **Occupancy rates**: Not all positions in an institution are filled at any given time. For example, not all hospital beds have patients in them on a given day, and meals are not served to empty beds.
- **Meal coverage proportion**: A person may not receive all of their meals from a given institution. For example, school children typically receive only lunch from their school.
- **Consumption factor**: The people in some institutions may eat more or less than others. For example, active military personnel eat more than the average person, whereas children eat less.

For an institution that feeds a given number of average adults all their meals for a year (consumption factor = 1.0, occupancy = 100%, meal coverage = 100%), the number of APACEs equals the number of people.

APACEs have convenient properties that make other calculations clearer to understand. For example, dividing the total APACEs for an institution by the country's total population gives you the percentage of that country's total animal-source food consumption that occurs within that institution. For example, if the Polish military has 100,000 APACEs in it, and the Polish population is 10 million, then we can hypothetically estimate that the Polish military represents 100,000 / 10 million = 1% of Poland's animal-source food consumption.

1.3.2 Our general APACE calculation method

- We obtained the number of people per institution per country from Eurostat.
- Typically, the data on the number of people is from earlier years, typically 2023. As such, we adjust the number to 2025 by investigating previous trends and extrapolating where necessary.
- For institutions such as hospitals and care homes, we obtain the number of places available and determine the number of people in the system by multiplying by the occupancy rate.
- We consider the number of meals that a given person is likely to receive in their institution.
- To account for the fact that different types of people eat different amounts of food, we apply a consumption factor.

1.3.3 Consumption factors

Our analysis covers diverse “clients” of institutional meals, all of whom eat different amounts of food. To account for this, we adjust the APACEs by a consumption factor, determined by relative caloric needs. This is typically calculated using the European Food Safety Authority’s recommended caloric intakes (EFSA, Appendix 16).[5]

The EFSA gives caloric recommendations for multiple age groups and genders. To obtain a baseline (consumption factor of 1) we average the male and female needs for the 30-39 age bracket (which assumes a 50:50 male:female split).

- For **school-age children**, we take the caloric requirements for children aged 11 as this is the mid-point of the 5-18 age group.
- For **care home residents**, we use the 70-79 age bracket, as this is in the middle of ages 60-80.
- For **prisoners**, we use a weighted average of 95% of the 30-39 male bracket and 5% female age bracket, as prisoners in the EU are 94.6% men.[6]
- Calorie needs of **hospital patients** is a complex issue dependent on a large number of factors discussed below, with conflicting guidelines. While reduced activity, older age, and healthy-eating initiatives reduce hospital patients’ food consumption, other factors such as recovery demands, standardised portions, and supplementation can increase the average

caloric demand of patients. We assume these factors broadly cancel out, setting the consumption factor for hospital patients to 1.0 in our calculations.

- For **military personnel**, we take into account the higher caloric needs of soldiers and the caloric needs of support staff. For soldiers, we use the NATO caloric guidelines[7] for troops not in active combat of 3600 calories (a consumption factor of 1.54), but for non-active personnel (the support staff who make up the bulk of military headcount) we apply a consumption factor of 1.0. *Combining a soldier share of 16.4% with a non-soldier share of 83.6% yields a blended military consumption factor of 1.09*, which is what we apply to total military headcount when calculating APACEs.

Client type	**Consumption factor**
Average citizen	**1.0**
Prisoners	**1.1**
Military Personnel	**1.09**
Care home residents	**0.88**
Hospital residents	**1.0**
University students	**1.0**
School children	**0.84**

Table 2: The consumption factors used to calculate APACEs for each target institution.

Notes on determining a conversion factor for hospital patients.

There are a number of factors that make determining a working conversion factor for hospital patients difficult. These are discussed in the 2021 European Society for Clinical Nutrition and Metabolism (ESPEN) guide[8], and The British Dietetic Association's Nutrition Standards[9]:

- Patients with some illness or injury may require more calories for recovery. In extreme cases, such as hypermetabolism in burn victims, calorie requirements can double.
- Patients in hospitals are typically much more sedentary than in their daily lives (with an average Physical Activity Level (PAL) of 1.2 versus 1.6 or higher for active adults). So for any given patient, their caloric needs reduce slightly when in hospital compared to their regular needs.
- Hospital patients skew older, and the elderly typically have different average caloric needs than adults.
- Most hospitals operate on a "standard tray" system. Even if a patient needs more, the baseline tray served is usually standardized to control costs, with supplements added only by prescription.

- Some patients are fed "therapeutic diets" to achieve specific nutritional outcomes (low salt, gluten free, texture modified / liquid diets) and these may have fewer or more calories than standard diets.
- Hospitals may procure more food than necessary, to guarantee enough food availability to meet patient nutritional needs.
- Some hospitals provide lower calorie diets due to healthy-eating initiatives.

These factors pull in different directions, but as it is unclear whether the net effect should be increased or decreased calories, we assume a consumption factor of 1.

1.3.4 Prisoners

- There were 498,950 prisoners in the EU in 2023.
    - To be conservative, we assume that prisoner numbers in 2025 will be roughly the same as 2023, and we assume that prisoner numbers are relatively stable. Looking at historical data, prisoner numbers remained roughly stable from 2018-2019, dropped sharply in 2020, then rebounded in years since.
- We assume all prisoners receive all their food from the prison.
- This gives 548,845 APACEs.

1.3.5 Military personnel

- There were 1,913,000 military personnel in the EU in 2020. As Eurostat does not keep up-to-date numbers of military personnel by country, we used data from The World Bank.[10]
    - The data was last collected in 2020, however we assume that personnel numbers are the same in 2025. This is because despite increasing recruitment efforts, European militaries are struggling to retain and replace recruits.[11] [12] Additionally, unlike other public institutions that tend to scale with population size or GDP, military numbers tend to scale with constantly changing geo-political situations, and so extrapolation is likely to be inappropriate.
- We assume they eat at their barracks for every day of the year that they are not on leave.
    - We estimate leave to be around 30 days per year. The EU has a minimum leave entitlement of 20 days, plus an additional 9 to 14 days of public holidays, depending on the country.
- We assume that while on duty they are served all their food by the institution.
- This amounts to 1,913,786 APACEs

1.3.6 Hospital patients

- There were 2,290,991 hospital beds available across the EU in 2023 according to Eurostat.[13]
- Hospital beds at the EU level have remained stable in the last ten years, so we assume no change in numbers to 2025.
- We use an EU wide estimated occupancy rate of 74% of beds from 2019.[14]
    - Hospital occupancy rates were relatively stable between 2012 and 2019. They declined sharply during the pandemic but have been rising ever since, with the latest

figures of 66% for 2022. We use the pre-pandemic level because we assume that levels have continued towards pre-pandemic levels in 2023-2025.

- We used beds and occupancy rates rather than the total number of patients admitted per year to calculate APACEs for hospitals across the EU. Unless we knew the exact length of every hospital stay, using total actual patients admitted over a year would not accurately reflect the hospital's food demand. Since we assume that anyone in a hospital bed receives all of their meals for the duration of their stay, a bed occupied 74% of the time mathematically translates to 0.74 of a person eating full-time for a year.
- We assume anyone in a hospital bed is given all their meals for the duration of their stay.
- This amounts to 1,695,333 APACEs.

1.3.7 School children (aged 5-18)

- There were 69,729,436 students in public and private government-dependent primary and secondary institutions in the EU in 2023.[15]
    - We extrapolate to 2025 by taking, for each country, the median year on year percentage change in student numbers between 2014-2023.
    - Portugal and Greece did not report numbers of pre-primary school children to Eurostat in the last five years. However, this is because of differences in classification,[16] not because these programmes do not exist. The data on these children from 2014 to 2018 was volatile, so we impute their number of children by assuming the percentage of children that are pre-primary in these countries is the same as the EU overall.
- They are fed lunch for an average of 180 school days.[17]
- Additionally public school meal coverage varies hugely by country, so we adjusted this using the Global Survey of School Meal Programs.[18]
    - We imputed Germany using this 2019 study[19] on 2017 data, as this was the only data available at the time.
- Note that our estimate is likely conservative, as some EU countries' school meal programmes also provide breakfast (e.g. Sweden, Finland), which we do not track. We assume lunch only across all countries.
- This amounts to 4,365,255 APACEs.

1.3.8 University students

- There are 15,252,773 students in public and private government-dependent universities as of 2023. [20]
- We use the latest available year of data for each country from Eurostat, extrapolating to 2025 where needed using the median year on year percentage increase from 2014 to 2023.
- A number of countries were imputed to have zero short cycle tertiary education students. These included Bulgaria, Estonia, Greece, and Romania who have never reported data on short cycle tertiary education students to Eurostat. Additionally, Finland stopped providing data in 2014 with only 21 students and Italy consistently reported 0 students before data collection ceased in 2021, suggesting they previously had programmes but discontinued them.

- We estimate that students are on campus for an average of ~32 weeks (though we note high variation between countries).[21]
- Many students eat lunch a few times a week in their university canteen. In some universities, they may also eat their evening meal. We estimate that the average student eats in the canteen for ~5.8% of their total annual meals. This is calculated as 32 weeks × 2 canteen meals per week ÷ (365 days × 3 meals per day) = 64 ÷ 1,095 = 5.8%. This averages over many students who almost never eat in the canteen with students who eat multiple times a week.
- This amounts to 892,915 APACEs.

1.3.9 Care beds

- In 2023 there were 3.68 million care beds.[22]
    - Portugal does not report care bed numbers to Eurostat because of the way it structures its care sector, which is mostly through private non-profit homes. We estimate the number publicly funded and/or non-profit care beds in Portugal for 2023 form two data sources: The National Network for Integrated Continuing Care (RNCCI — Rede Nacional de Cuidados Continuados Integrados) and residential care homes (ERPIs — Estruturas Residenciais para Pessoas Idosas). A 2024 report on RNCCI capacity by The Health Regulatory Authority (ERS) noted 9,557 fully publicly funded beds.[23] For ERPIs, the Carta Social published by the Strategy and Planning Office (GEP — Gabinete de Estratégia e Planeamento) recorded 110,000 places across all funding types, with for-profit providers accounting for a growing but still minority share. We assume the same percentage of these beds are publicly funded in some way as the rest of Europe (see below). We combine both the RNCCI and the ERPI numbers.
- We extrapolate the number of care beds at a growth rate of 1% a year based on EU-wide trends over the past 11 years. This yields 3.75 million care beds in 2025.
- We assume a sector-wise average occupancy rate of 90.8%, based on data from the multinational care company Clariane (1220 facilities across France, Germany, Belgium, Italy, Netherlands, and Spain).[24]
- We assume that any EU public procurement mandates would cover public care homes as well as private non-profit care homes, but not fully private care homes. A 2021 report from the European social network (page 29) finds that these represent 42%, 22%, and 36% of care beds respectively.[25] Thus we assume 64% of beds are in scope.
- This yields 2,402,127 in-scope beds.
- We assume care residents get all their meals from their care home.
- Note on country-level accuracy: The growth rate (1%/yr), occupancy rate (90.8%), and public/private split (64% in-scope) are EU-level averages applied uniformly to every country. In reality these parameters vary considerably across the EU27 (e.g. Scandinavian countries have large public care systems, while Southern and Eastern European countries have larger private sectors). The EU-wide total should be approximately correct, but individual country figures are rough approximations and should be treated as such.
- This amounts to 1,919,396 APACEs.

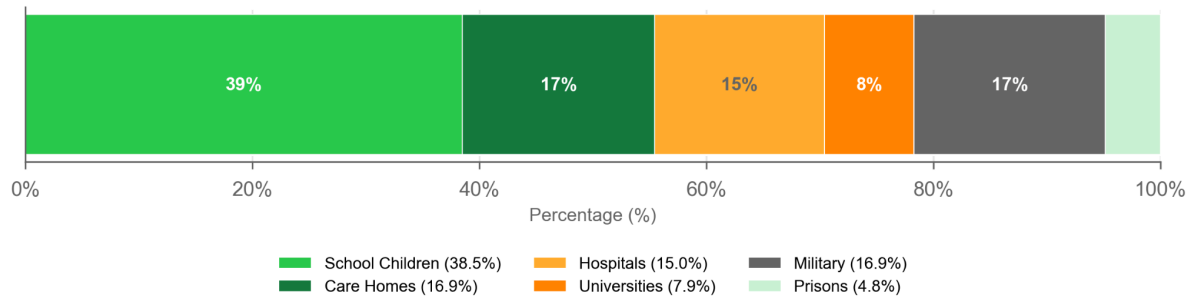

Figure 1: The composition of Animal Product Annual Consumption Equivalents (APACEs) across EU public institutions.

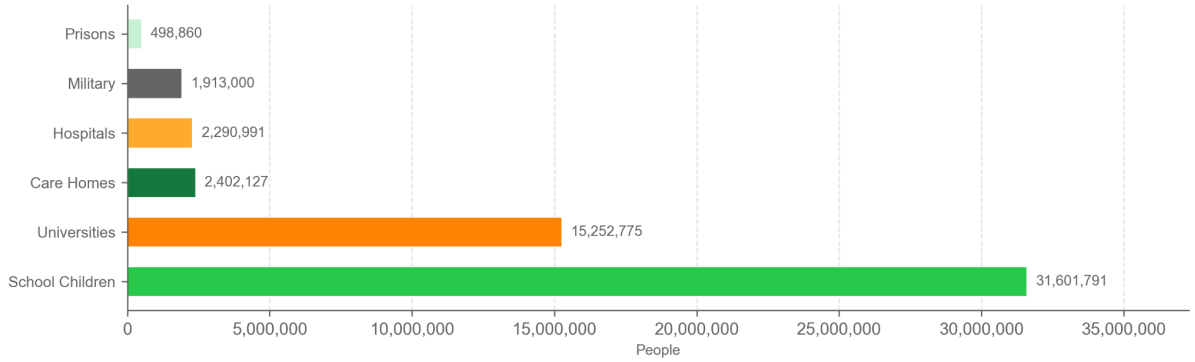

Figure 2: Number of people served per institution per year across the EU27. Note: For hospitals and care homes, number of people represent bed occupancy per year (see 1.3.6 & 1.3.9).

1.3.10 What share of national animal-source food consumption occurs in public institutions?

To contextualise the scale of the proposed intervention, we calculated what percentage of each country's total animal-source food consumption occurs in the public institutions covered by this study. This is done by dividing the total institutional APACEs for a country by its total population. Since one APACE represents one adult-equivalent year of animal-source food consumption, this ratio gives the share of national consumption that takes place in institutional settings.

Across the EU-27, public institutions account for approximately 2.51% of total animal-source food consumption (11.33 million APACEs out of a population of 450.6 million). In raw headcount terms, these systems cover around 54 million institutional users. At the country level, coverage ranges from 4.59% (Sweden) to 1.16% (Denmark), with a median of 2.82%. The relatively tight distribution suggests that most EU countries have broadly comparable levels of institutional meal provision relative to their population size.

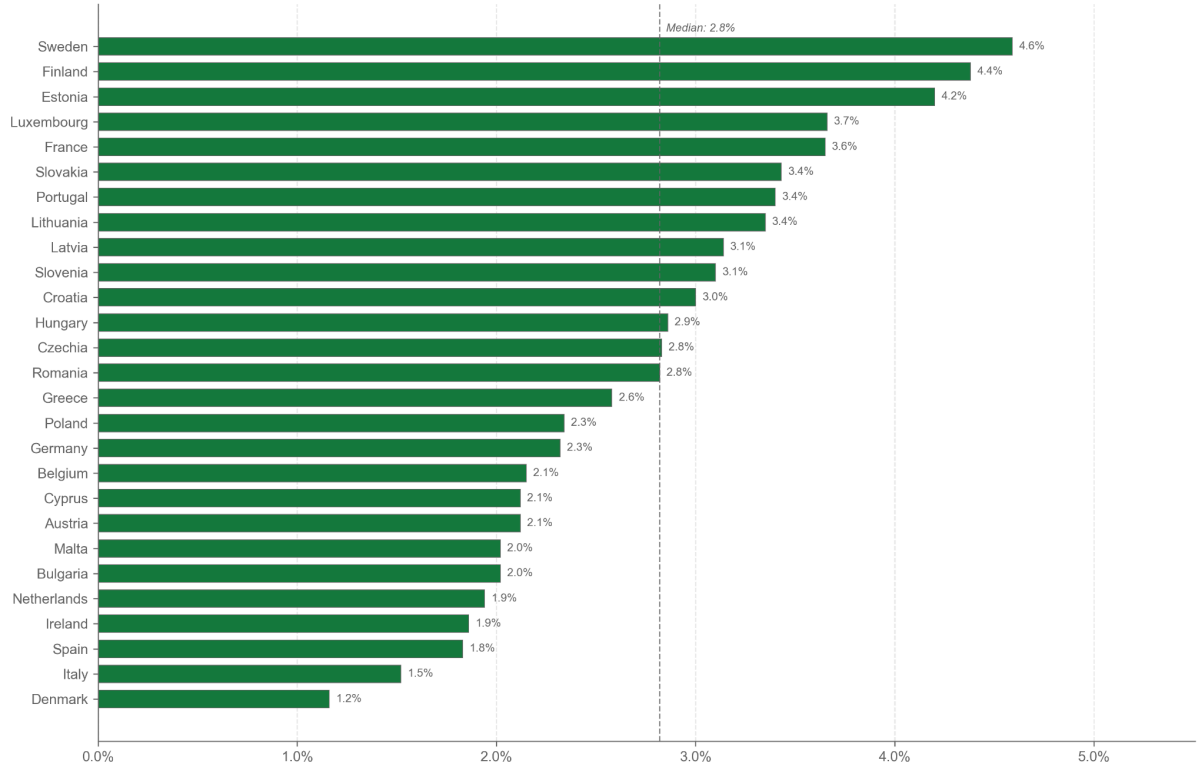

Figure 3: The percentage of each EU country's total animal-source food consumption that occurs in its public institutions.

1.4 Converting APACEs into weight of animal-source foods consumed

Finally, we convert APACEs to raw weight of animal-source foods procured by these institutions. We do this by multiplying average, per capita annual animal-source food consumption for a country by the number of APACEs in each institution.

We obtained data on animal-source food consumption for each category of animal-source foods for each country of Europe from the FAOSTAT Food Balance Sheets.[26]

1.4.1 Assumptions and caveats

- This assumes that all people in these institutions are fed meals with levels of animal-source foods proportionate to those seen in the average diet for a person from that country.
- We model the reduction as an equal proportional swap across all animal-source food categories, i.e. a flat reduction in beef, dairy, pork, poultry, eggs, and seafood. In practice, plant-based budget targets could be achieved by reducing some animal-source foods more and others less (e.g. eliminating beef entirely while retaining some dairy). Different compositions of reduction would have different implications for both the environmental and health cost savings.
- We assume that any special nutritional needs required by hospital or care patients, or military personnel, can all be made consistent with any plant-based budget policies. For example, we assume that if a policy were to require public hospitals to spend 60% of their food budget on plant-source foods, that a healthy and appropriate diet could be made for all patients following these rules.

- FAOSTAT food balance sheet data represents food available to the population. It is not a precise measure of average consumption, which needs to account for food waste and cooking. We account for food waste differently depending on the analysis (see Technical Appendix 4).

Technical Appendix 2: Food cost savings

If plant-source foods have different costs to animal-source foods, then a budget shift towards plant-forward procurement could result in changes to the overall budget, assuming that the number of meals are kept the same.

2.1 How much do EU public institutions spend on food?

The total amount spent on food in EU public procurement has been estimated as €33 billion in 2019, 60% of the total value of food + food services.[27] We scaled this to 2025 euros using the Eurostat Harmonised Index of Consumer Prices (HICP) for food and non-alcoholic beverages (CP01), scaling by the 2025 annual average index / 2019 index. This leads to an **estimated EU-wide public food procurement budget of €45.76 billion per year.**

2.1.1 Assumptions

- We assume that, while food prices have increased due to inflation, the volume of food purchased has not changed systematically in the years 2019 to 2025. Given that the number of people in the many institutions under study have not changed significantly in that time (see Technical Appendix 1), this assumption does not seem unreasonable. However, this assumption is likely to underestimate the cost savings.
- Country-level budget allocations are estimated by distributing the EU-wide public food budget proportionally by each country's total government expenditure on defence, public order, health, education, and social protection (Eurostat COFOG data). This assumes that public food procurement scales roughly linearly with overall government spending in these categories.

2.2 How much cheaper are plant-based meals?

Literature on cost savings from plant-forward procurement was extremely sparse. A thorough literature review yielded only a handful of unrepresentative case studies of individual institutions in specific countries. In order to get the most reliable estimate possible, we broadened our search of the peer-reviewed and grey literature for any study that quantified differences in food cost between omnivorous, low-meat, vegetarian, flexitarian, or vegan diets, whether institutional or not. We identified 13 such studies, ranging widely from studies of ingredient costs of a UK university canteen,[28] to representative diet surveys of the Portuguese population,[29] to randomized controlled trials of overweight individuals assigned to a plant-based diet. One study directly commissioned by a vegan charity was omitted to be conservative. These studies were reasonably consistent (except 1 study that showed plant-based diets were more expensive) in the strength of their effects and showed an average cost saving of 25% from moving to an entirely plant-based diet.[30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40]

2.2.1 Assumptions and caveats

- Most of the studies we reviewed measured the reductions in *ingredients* cost that would be achieved from a more plant-based diet. This does not account for differences in the labour

required to produce food, which can increase the cost in a procurement setting. For example, if plant-based meals require more labour to prepare in food service settings, then this may diminish any cost savings.

- Additionally, differences in food waste might affect cost savings: if they spoil faster, then food waste from animal-source foods may be greater, which would increase the cost savings from plant-forward procurement.
- In the event that these procurement policies trigger large shifts in demand for plant- vs animal-source foods in a given local area, this may have effects on market prices. If supply of plant-source foods cannot scale to match the increased demand, plant-source food prices may rise, reducing the realised budget savings. We do not model such price effects.

2.3 Calculating savings

Total EU public food procurement budget: €45.76B

Current spend on animal-source foods: €19.51B (42.7%)

2.3.1 Budget savings by scenario

We model four scenarios reflecting different degrees of shift toward plant-forward procurement:

Scenario	Animal Spend Reduction	Value Swapped (€B)	Budget Savings (€B)
Baseline ~57% plant-based (PB)	0%	0.00	**0.00**
65% PB	17.9%	3.50	**0.88**
75% PB	41.4%	8.08	**2.02**
85% PB (Target)	64.8%	12.65	**3.16**

Table 3: Quantifying the budget savings of our three scenarios in € billions

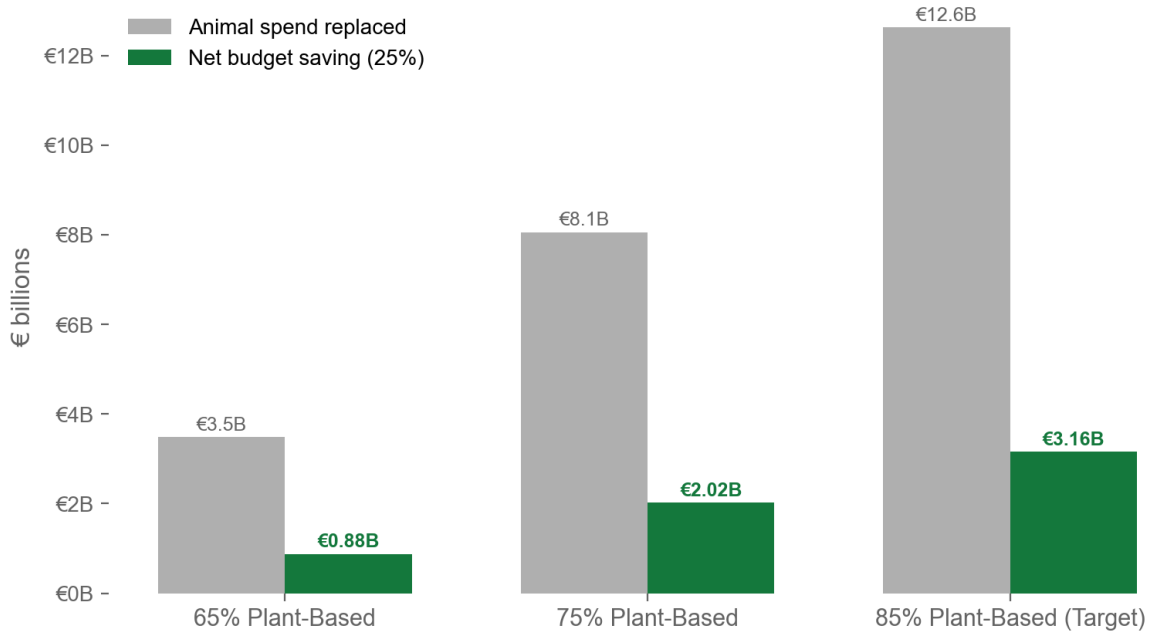

Figure 4: EU27 spending shifted and budget savings under each plant-based procurement scenario.

Technical Appendix 3: Environmental cost savings

To calculate the environmental cost savings associated with plant-forward public procurement, we took the approach of calculating the current costs of animal-source food consumption in public institutions and then modelled the reduction in those costs that could be achieved with substitution with plant-source foods.

We used True Cost Pricing methodology which quantifies the monetary costs of externalities such as pollution, resource use, and contribution to climate change. We drew heavily from a 2024 report by The Impact Institute, which calculated the per-kilo true costs of various animal-source foods on several environmental metrics.[41]

3.1 Environmental factors modelled

We consider the following impacts:

- **Air pollution:** The costs of agricultural air pollutants on human health, soil health, animals, and plants. This is often referred to as "terrestrial acidification," which includes "acid rain." Terrestrial acidification strips away vital soil nutrients (like calcium and magnesium) and releases toxic elements (like aluminum) into nature, harming biodiversity. The primary air pollution from animal agriculture comes from Ammonia (NH3) release from manure. Ammonia reacts with other pollutants to form fine particulate matter (PM2.5), which poses severe human health risks. Additionally, Nitrogen Oxides (NOx) and Nitrous Oxide (N2O) pollution is created from the application of nitrogen based fertilizers on land used to grow animal feed.
- **Land use (Lost ecosystem services):** The opportunity cost of using the land. These are the ecosystem services benefits that would be gained if the land were returned to its natural state. Ecosystem services include but are not limited to crop pollination, carbon sequestration, flood control, and water purification.
- **Water pollution (marine and freshwater eutrophication)**: The cost of cleaning up bodies of water polluted by agriculture. The primary drivers of these costs are nitrogen and phosphorus imbalances caused by the discharge of manure into surface waters, atmospheric ammonia deposition, and nutrient leaching from agricultural soils used to cultivate animal feed.
- **Contribution to climate change:** The future costs of climate change for health, agriculture, and economy due to greenhouse gas emissions.
- **Fresh water extraction:** The cost of extracting water from freshwater ecosystems with limited amounts of water.

3.2 Calculation method

For each country and institution type:

1. We multiply the per-kg environmental cost of each animal-source food by the number of kilograms consumed in that institution per year, yielding the total environmental cost of current animal-source food consumption.
2. Under each scenario, we reduce consumption by the scenario-specific percentage and calculate the environmental cost of the remaining animal-source foods.
3. For the quantity of animal-source foods removed, we calculate the environmental cost of replacing them with plant-based alternatives. We assume per kg environmental costs of EU-grown, human edible soyabeans. We calculate the amount of plants required using dry-field-pea protein parity for meat/eggs/seafood (valued with soya proxy environmental factors), soya milk for milk (protein-equivalent), and raw soyabeans for butter/cream (fat-equivalent). This methodology is explained in more detail below.
4. The net environmental cost saving is:

(baseline animal-source food cost) – (reduced animal-source food cost) – (replacement plant-source food cost)

3.3 Estimating the environmental impacts of specific categories of animal-source foods

Several categories of animal-source foods were not modelled by the Impact Institute, so we estimate them below. These include:

- Seafood
- Eggs
- Mutton/goat/lamb
- Butter/Cream

3.3.1 Estimating the environmental impacts of seafood

We model seafood as two groups:

1. Fish
2. Crustaceans

Seafood can either be produced by farming (aquaculture) or by catching wild fish and crustaceans. For wild-caught seafood, we assume zero environmental cost for non-climate impact categories (air pollution, land use, water pollution, scarce water use), but retain the full climate impact. We address this in the assumptions section below.

Farmed fish represent 29% of fish consumed in the EU,[42] with 58% of crustaceans being wild-caught. We estimate this latter number from a 2024 report from the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) run by the European Commission.[43] They estimate that 84% of the value of the European crustacean market is shrimp (which we use as a proxy), of which around 50% are farmed. The remaining 16% are primarily crab, langoustine

(Nephrops), and lobster, which are typically wild-caught. We assume for simplicity that all non-shrimp crustaceans are wild-caught.

To compute the cost per kg of seafood product, we multiply the environmental usage per kg (i.e. metres squared of land, or litres of freshwater withdrawn) by the euro cost of environment use (known as the monetization factor), such as the cost of 1 square metre of land used. For example, if one kilo of fish produces 2 kilos of water pollution, and one kilo of pollution is valued at €3 then the cost per kilo of seafood is €6.

We use the environmental footprint of farmed seafood in Poore and Nemecek (2018),[44] accessed via Our World in Data[45]:

- Land use (m^2/kg)
- GHG emissions (kg CO_2eq/kg)
- Eutrophication (g PO_4eq/kg)
- Scarcity-weighted water (L eq/kg)

For air pollution (acidification), Poore & Nemecek (2018) do not report a per-kg-product metric in the standard OWID dataset, but they do report mean acidifying emissions per 100g of protein:

- Poultry 102.4 g SO_2eqg
- Farmed fish 65.9 g SO_2eq
- Farmed crustaceans 133.1 g SO_2eq

We convert these to per-kg-product acidification using OWID protein densities (g protein per 100g product: poultry 17.3, farmed fish 22.8, farmed prawns 22.8), then derive a monetization factor (€ per g SO_2eq) from the Impact Institute's chicken air pollution cost:

€0.74/kg ÷ 177.15 g SO_2eq/kg = €0.00418/g SO_2eq

Applying this monetization factor to the per-kg acidification of fish and crustaceans gives us their air pollution costs directly.

We reverse-engineer the cost of aquaculture's environmental use from the Impact Institute's numbers, using poultry as a proxy. Specifically, for each non-air-pollution impact category we take the ratio of environmental usage per kg (from Poore & Nemecek (2018)) between the seafood product and chicken, and multiply that by the Impact Institute's per-kg chicken cost. For air pollution, we use the acidification-based derivation described above. Poultry and farmed seafood are both intensive, grain/soya-fed, monogastric systems, making poultry the best available biological proxy for this scaling approach.

3.3.2 Estimating the environmental impacts of eggs

We find that the environmental impacts of eggs per kilo of product are equal to chicken, based on essentially identical feed conversion ratios per kilo of final product, and so use the Impact Institute's numbers for chicken directly.

A kilogram of chicken and a kilogram of eggs use different bird breeds that live for different amounts of time and produce different products. However, the environmental impacts of any chicken-based system are primarily driven by the amount of feed consumed and waste produced. The amount of waste produced is mostly dependent on the amount of feed consumed. Therefore, the environmental impact of a chicken-based system, whether broiler or layer, is proportional to their feed conversion ratio (FCR): the ratio of feed in to final product out.

We calculate the FCR for a kg of chicken meat to be 2.13, following a 2024 report by the European poultry industry body AVEC/ADAS.[46] This was calculated by taking the FCR of live chicken per kilo of body weight (1.55) and dividing it by the carcass yield of 72.65%, giving the feed required per kg of edible meat.

For layer hens, we use data from the Lohmann Brown Classic,[47] one of the most common breeds in the EU. The Lohmann Brown Classic gives a cumulative FCR at 72 weeks of 2.14 for colony/cage housing, which is the dominant production system in EU institutional supply chains. Since eggs are already a final product (no carcass yield adjustment is needed), both FCRs are in comparable units: kg of feed per kg of product.

The broiler FCR (2.13) and colony/cage layer FCR (2.14) are effectively identical, giving a scaling factor of 2.14 / 2.13 = 1.005. We therefore treat eggs as having the same per-kg environmental impact as chicken.

3.3.3 Estimating the environmental impacts of the mutton/goat/lamb category

We use the environmental cost factors for beef. This is because they are all ruminants with similar production systems (enteric fermentation, extensive grazing). This is likely a slight overestimate for goat (which has somewhat lower emissions than beef), but appropriate for mutton.

3.3.4 Estimating the environmental impacts of butter and cream

We use concentration factors derived from UK DEFRA milk utilisation data.[48] Butter requires approximately 20.5 kg of milk per kg of butter, and cream requires approximately 10 kg of milk per kg of cream. We therefore multiply the per-kg environmental cost of milk by these concentration factors to estimate the per-kg environmental cost of butter (×20.5) and cream (×10).

3.3.5 Estimating the environmental impacts of plant-based replacements

To model the reductions in environmental costs, we need to take into account the environmental costs of the plant proteins that would replace the animal proteins. We use the environmental impact of food-grade, EU-grown soya as a proxy for all the plant-source foods that could replace animal-source foods in our scenarios. We do this because:

1. Environmental impacts for soya have already been estimated by the Impact Institute
2. Environmental impacts for soya are expected to be on the higher end of plant foods making this a conservative assumption.

3. We expect that much of the animal-source foods will be replaced with legumes and pulses in order to ensure adequate protein intake.

3.4 Calculated per-kilo environmental costs

3.4.1 Adjusting costs to 2025 euros

The costs in the Impact Institute paper were given in 2023 euros. We adjusted them to 2025 euros using aggregate EU27 Nominal GDP growth, sourced from the AMECO database maintained by the European Commission's Directorate-General for Economic and Financial Affairs.[49] We use GDP growth rather than inflation (as is typical) because the cost attached to environmental damage by society is dependent on income as well as prices. As incomes rise, the 'Shadow Price' (willingness to pay) for health and ecosystem services increases. Using standard inflation would underestimate the value European citizens place on health and environmental protection in 2025.

The table below shows the per-kilo environmental costs in 2025 euros, scaled from 2023 Impact Institute values using a GDP growth factor of 1.0884 (an 8.84% increase in EU27 aggregate nominal GDP from 2023 to 2025, sourced from the AMECO database). For seafood products, costs shown are for farmed aquaculture only; the model applies the farmed/wild-caught weighting (retaining climate costs for all seafood, other costs only for the farmed fraction) when calculating total costs.

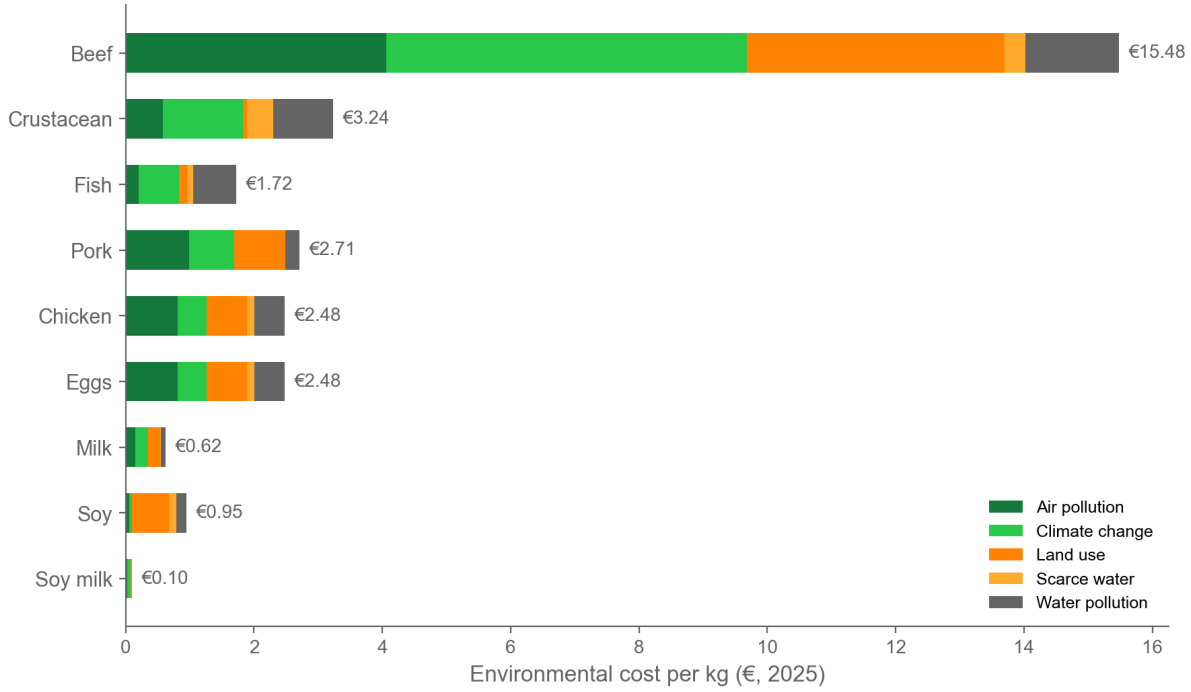

Figure 5: Per-kilogram environmental externality costs of animal-source foods compared to soya and soya milk.

Impact Category	**Beef**	**Chicken**	**Eggs**	**Milk**	**Pork**	**Fish**	**Crustacean**	**Plant protein***	**Soya milk**
Air pollution	€4.06	€0.81	€0.81	€0.15	€0.99	€0.68	€1.38	€0.05	€0.02
Contributions to climate change	€5.62	€0.46	€0.46	€0.20	€0.70	€0.63	€1.24	€0.04	€0.06
Land use	€4.02	€0.63	€0.63	€0.19	€0.81	€0.43	€0.15	€0.58	€0.01
Scarce water use	€0.33	€0.11	€0.11	€0.01	€0.00	€0.32	€0.98	€0.12	€0.00
Water pollution	€1.46	€0.48	€0.48	€0.08	€0.22	€2.31	€2.23	€0.15	€0.01
Grand Total	**€15.48**	**€2.48**	**€2.48**	**€0.62**	**€2.71**	**€4.38**	**€5.99**	**€0.95**	**€0.10**

Table 4: The per kilogram environmental externalities of different food products in euros.

**Here we use the environmental cost factors of soya (explained below)*

3.5 Replacement mapping

While we make no prescriptions about how institutions replace animal-source foods with plant-source foods, we believe it is an unrealistic assumption that they would replace the foods on a kilo-by-kilo basis. Given animal-source foods' central perceived importance as a protein source, we assume that institutions would be more likely to replace animal-source foods with plant-source foods to attain a similar level of protein. The two exceptions are butter and cream which are likely to be replaced with equivalent fats. As such, it makes sense to model replacement on a grams of protein/ fat basis.

To calculate the average environmental cost of replacement plant-source foods, we modelled the average environmental cost of these plant proteins/fats as equivalent to dry soya beans. This is primarily because soya is the only protein crop for which environmental costs were readily available in the Impact Institute (2024) report. However, this also likely represents a conservative assumption, as soya has some of the highest environmental impacts relative to plant foods specifically according to Poore & Nemecek (2018). However, one way in which using soyabean might bias our calculations in favour of plant proteins is that soya beans have very high amounts of protein per 100g. To avoid this, we penalised plant proteins by using the lower average protein content of dry field peas. Field peas are an appropriate alternative because they are one of the primary plant protein sources [50] grown in the EU alongside faba beans. We selected field peas over faba beans as they had the least protein, making the most conservative assumption.

To summarise our method, we are comparing animal protein to a hypothetical plant protein that has the relatively high environmental footprint of soyabeans, and the moderately lower but realistic protein content of field peas. These conservative assumptions increase the likelihood that our scenario calculations *underestimate*, rather than overestimate, the environmental cost savings of plant-forward food procurement budgets.

- Meat, eggs, and seafood are replaced with dry field peas on a protein-equivalent basis.
- Milk is replaced with an equal amount of soya milk.
- Butter and cream are replaced with a fat-equivalent amount of plant-derived fats, with soyabean oil used as a conservative proxy.

Protein matching animal- and plant-source foods used nutrient values from USDA FoodData Central. We used this data source because it was the most respected publicly available source containing the food categories of interest.

- Mutton & goat meat: lamb, ground, raw[51] = 16.56 g protein/100g
- Fish & mollusks: an unweighted average of the top 3 fish consumed in the EU in 2023 from EUMOFA (tuna 24.4,[52] salmon 20.4,[53] Alaska pollock 17.17 g/100g[54]) = 20.66 g protein/100g

- Shellfish: shrimp, raw[55] = 20.1 g protein/100g
- Field pea: 23.1[56] protein/100g

Butter and cream are treated differently from milk in replacement calculations. Because they are high-fat products, we map them to raw soyabeans on a fat-equivalent basis using USDA FoodData Central nutrient values:

- Soyabeans, mature seeds, raw[57]: total fat = 19.94 g/100g (199.4 g/kg)
- Butter, without salt[58]: total fat = 81.11 g/100g (811.1 g/kg)
- Cream, fluid, heavy whipping[59]: total fat = 36.08 g/100g (360.8 g/kg)

3.6 Calculating total institutional environmental costs

To calculate the total environmental cost for each institution, we multiply the per-kilogram environmental cost of each animal-source food (from Table 4) by the total kilograms of that product consumed by that institution (from the APACE-based consumption estimates in Technical Appendix 2). For each institution in each country, the total environmental cost is the sum across all animal-source foods:

Total environmental cost = Σ (per-kg environmental cost × total consumption in kg)

For scenarios where animal-source food consumption is reduced, we calculate the net environmental cost as:

Scenario environmental cost = (remaining animal-source food environmental cost) + (replacement plant-source food environmental cost)

The replacement plant-source food environmental cost is calculated using the nutrient-equivalent replacement mapping described in section 3.5 above. For each kilogram of animal-source food replaced, the replacement mass of plant-source food is determined by the protein or fat equivalence ratio, and the environmental cost of that replacement mass is calculated using the per-kg soya or soya milk costs from Table 4.

The environmental cost saving for each scenario is the difference between the baseline and scenario environmental costs:

Environmental cost saving = Baseline environmental cost − Scenario environmental cost

3.7 Results

3.7.1 Environmental costs

The total environmental externality cost of animal-source foods consumed in EU27 public institutions is €8.4 billion per year.

Impact category	Cost (€M)	Share of total
Contributions to climate change	2,614.1	31.0%
Air pollution	2,292.9	27.2%
Land use	2,238.3	26.5%
Water pollution	1,098.5	13.0%
Scarce water use	188.6	2.2%
Total	**8,432.4**	**100%**

Table 5: Estimated costs and proportion of EU27 environmental externalities from public food procurement across in-scope institutions by impact category.

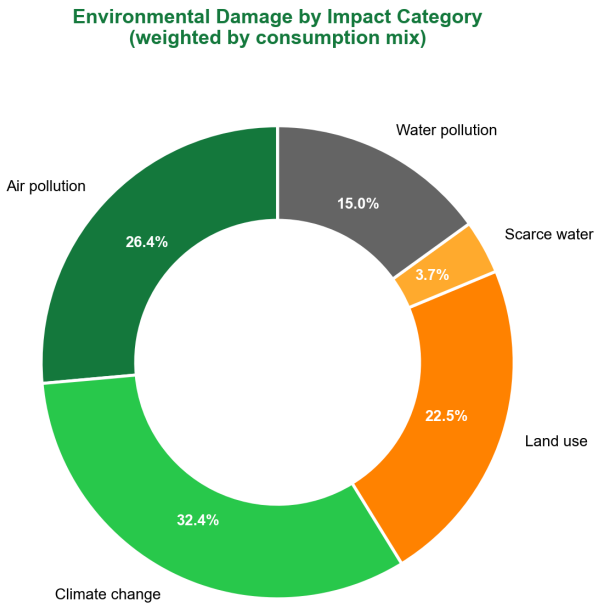

Figure 6: Breakdown of EU27 institutional environmental costs by impact category.

3.7.2 Environmental costs breakdown by institution type

Institution	Environmental cost (€M)	Share of institutional total
School children	3,366.9	39.9%

Institution	Environmental cost (€M)	Share of institutional total
Care homes	1,461.0	17.3%
Military	1,359.4	16.1%
Hospitals	1,193.7	14.2%
University students	667.0	7.9%
Prisons	384.5	4.6%
Total	**8,432.4**	**100%**

Table 6: Institutional environmental costs by institution type.

School children bear the largest share of institutional environmental costs because they represent the largest institutional population by APACEs. Care home residents are second: although the resident population is smaller than the school cohort, every meal is provided in-house, so each resident contributes a full year of APACEs.

3.7.3 Country variation of environmental costs

Per-capita institutional environmental cost rates (total environmental cost divided by APACEs) range from €396/APACE/year (Bulgaria) to €1,069/APACE/year (Denmark), with variation driven primarily by differences in per-capita animal-source food consumption patterns across countries.

Rank	Country	Environmental cost (€M)
1	France	2,376.4
2	Germany	1,342.9
3	Spain	631.3
4	Italy	616.4
5	Poland	427.6

Table 7: The top 5 countries by total institutional environmental cost

3.7.4 Scenario savings from environmental externalities

Under each procurement scenario, the yearly environmental cost savings EU-wide are:

Scenario	Baseline cost (€B)	Scenario cost (€B)	Savings (€B)	Cost- reduction percentage
65% (PB)	8.43	7.23	1.21	14.3%
75% PB	8.43	5.64	2.79	33.1%
85% PB	8.43	4.06	4.37	51.8%

Table 8: EU27 institutional environmental costs and savings under each plant-based (PB) public food procurement spending scenario, and degree of cost-reduction in percentage.

Under the 85% plant-based procurement target, environmental cost savings total €4.37 billion, broken down by institution type:

Institution	Environmental cost savings (€M)
School children	1,750.2
Care homes	759.9
Military	701.1
Hospitals	615.3
University students	346.3
Prisons	197.1
Total	**4,369.9**

Table 9: Environmental cost savings by institution type under the 85% plant-based scenario.

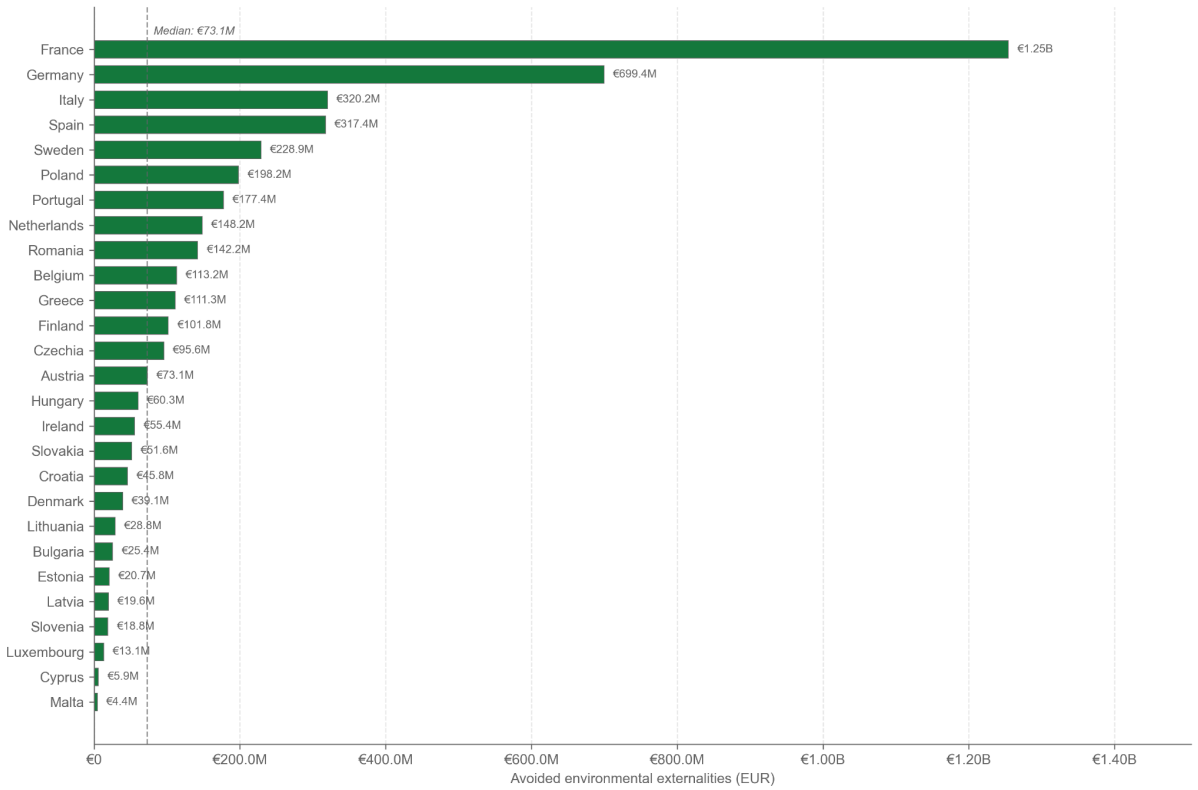

Figure 7: EU countries ranked by total environmental cost savings under the 85% plant-based scenario.

3.8 Assumptions and caveats

Cradle-to-gate boundary: The environmental costs calculated by the Impact Institute use a "cradle-to-gate" methodology, meaning they include only farm-level impacts (feed production, farm operations, manure management, land use), excluding all post-farm stages including transport, processing, retail distribution, refrigeration, and cooking. In reality, these downstream stages add environmental costs, particularly for energy-intensive activities like refrigerated transport and cold-chain storage. **Excluding post-farm stages makes our environmental costs estimates conservative**, and so our calculations likely underestimate environmental cost savings.

We assumed all replacement plant-source foods had the high environmental cost factors of soya. This is a conservative assumption, as soya has some of the highest environmental impacts of all plant-source foods (notably for land use at €0.53/kg, comparable to chicken). Replacing animal-source foods with other plant foods such as grains, vegetables, or pulses would typically yield greater savings.

Wild-caught seafood simplification: We conservatively assume 0 environmental costs for wild-caught seafood (except climate). In reality there are additional costs such as from trawling (habitat disruption), fuel use (air pollution), and bycatch. We believe these costs to be relatively small enough to exclude from our analysis.

Fishmeal environmental impact: We assume that the environmental impact of fishmeal production used in aquaculture feed is captured within the Poore & Nemecek per-kg environmental usage figures for farmed fish and crustaceans.

Plant-based meat alternatives: We do not assume a given amount of animal-source food is replaced with plant-based meat alternatives. Replacing animal-source foods with processed plant-based meat analogues would have higher environmental costs than raw soya, but still substantially lower than the animal-source foods they replace.[60] [61]

Mutton/goat/lamb environmental-cost mapping: Using beef costs for mutton and goat meat likely overestimates the environmental cost of goat meat specifically.

Fish & mollusks protein proxy averaging: The fish & mollusks replacement protein density uses an unweighted average of the EU top three consumed fish species (tuna, salmon, Alaska pollock). This is transparent and reproducible, but not share-weighted and does not include mollusk-specific protein composition.

Technical Appendix 4: Health cost savings

Next we modelled the health cost savings associated with our proposed shifts towards plant-forward public food procurement.

4.1 Populations modelled

We focussed our modelling on care homes, universities, military, and prisons, as these are all populations for whom reducing animal-source foods might be expected to improve health outcomes.

For the military, we calculate health impacts only for non-soldiers. Military personnel are selected and initially trained for high fitness and so likely see fewer health benefits from a more plant-forward diet. However, recent European evidence suggests that this advantage attenuates with service and overweight and obesity levels soon approach that of the general population, especially for non-soldiers.[62] [63] [64] To remain conservative, we assume personnel in soldier/combat roles receive no significant health benefit from a plant-forward dietary shift, while non-soldier personnel do. **We estimate the percentage of non-soldier personnel in EU militaries to be 83.6%,** averaging 88.4% in the Dutch military,[65] and 86.4% in the German military,[66] 76% for France.[67]

We did not model health effects on hospital patients because most hospital stays are very short term (only a few days) and it is unclear whether this is short enough to accumulate positive health effects. Additionally, while some people stay in hospital for many weeks (long enough to see positive health changes from diet), these patients are, by definition, in significantly worse health than the average person, and maybe on an extreme therapeutic diet that is hard to reconcile with our plant-forward procurement target. In order not to bias our findings, we make these conservative assumptions that health benefits from hospital patients are negligible.

Lastly, we model the health benefits on school children in a separate analysis, where we estimate reductions in rates of adult obesity. This is because the benefits of plant-forward diets for children with heart disease, diabetes, and cancer are long term. There are however more short- and medium-term benefits from weight management and reduced levels of childhood and adult obesity.

4.2 Food replacement

We model healthcare cost savings from reductions in red and processed meat specifically, but not of any other animal-source foods. This is because overconsumption of red and processed meat is widely considered to have negative health effects, whereas the effects of other animal-source foods are less certain.

4.2.1 Processed meat replacement

FAOStat Food Balance Sheet data on the amount of processed meat eaten by European Citizens was not available. As such we estimated the amount of processed meat eaten by taking a percentage of red and white meat. We combine two imperfect datasets

1. 2013 data from 448,568 Europeans.[68]
2. 2021 data from The UK National Diet and Nutrition Survey.[69]

The estimates were very similar (33.4% vs 31.1%), giving an average of 32.25% processed meat consumption.

4.2.2 Food replacement implications

The data used in this analysis are drawn from the Global Burden of Disease (GBD) study, which derives its estimates from large observational cohorts comparing populations with varying levels of red and processed meat consumption.[70] Crucially, these studies do not prescribe or control what foods replace meat. Individuals who consume less meat substitute it with whatever they choose, which in practice includes a mixture of healthier options (such as legumes, whole grains, and vegetables) and less healthy alternatives (such as refined carbohydrates and added sugars).

This has an important implication for interpreting our estimates. Because the risk ratios reflect an average across all real-world substitution patterns, the modelled health benefits of meat reduction are not contingent on any specific replacement food. This makes our estimates broadly applicable and arguably conservative: they represent what happens when ordinary people simply eat less meat, rather than when they follow an optimised dietary plan. It follows that targeted substitution with nutritionally favourable alternatives, such as legumes and other plant-source proteins, would likely yield health benefits greater than those modelled here.

4.3 Food waste

Food that is wasted is not eaten and so does not have negative health effects. As food waste can be a substantial percentage of food weight, it is important to account for food waste in our calculations. We used FAOStat Food Balance Sheet data (FAO FBS), which measures the food available to consumers in a country, but does not fully address food waste. The FAO FBS data accounts for food loss in production, processing, transport, storage, and retail. However, it does not account for plate waste in food service settings and also does not account for losses within institutional kitchens (such as food that is not served or overordered). To estimate food waste unaccounted for, we draw on a 2025 systematic review[71] of 74 food waste studies focussing on foodservice:

- **The overall average was 26.1%** (n = 74 studies), which we use for prisons, care homes, and military bases.

- Data for universities specifically was provided (n = 11 studies, 21% waste)

4.4 Quantifying the negative health effects of red and processed meat

We quantified health impacts using disability adjusted life years (DALYs), which are considered best practice for population health analyses. DALYs can be thought of as "years of healthy life lost" to a disease or because of a certain risk factor (such as processed meat consumption). The GBD calculates DALYs for many countries, years, demographics, diseases, and risk factors. The “total DALY burden" of a country is the sum of DALYs from all causes, effectively representing the total volume of ill health in a country.

We use the GBD data to calculate the DALYs attributable to red and processed meat consumption in each EU27 country. These DALYs represent the total effect of red and processed meat on all diseases for which there is strong empirical evidence for an effect.

The data the GBD is based on does not prescribe which foods replace red and processed meat.

4.4.1 Adjusting for overlap between red meat and processed meat DALYs

Red meat and processed meat affect many of the same diseases: cardiovascular disease, colorectal cancer, and type 2 diabetes among them. They do so through overlapping biological pathways. Simply summing the two GBD risk-factor DALY columns therefore risks double-counting part of the shared disease burden.

The standard method for correcting this is to apply a population-attributable fraction (PAF) modifier disease by disease. For each disease *d*, the overlap-adjusted combined DALYs would be:

$$\textbf{Adjusted DALYs}_d = \textbf{DALYs}_d \times (1 - \textbf{PAF}_{overlap,d})$$

where $PAF_{overlap}$ captures the fraction of disease burden that is jointly attributable to both risk factors and would otherwise be counted twice. In practice, this requires disease-specific PAF estimates for every condition covered by the GBD, a large number of endpoints for which these joint PAFs are not readily available.

As a conservative approximation, we apply a flat 10% reduction to each DALY column before summing. This is consistent with the range of per-disease PAF overlaps we would expect, which typically fall between 2% and 15% depending on the disease. This discount is applied to the red meat and processed meat DALY columns individually, such that the combined total is also reduced by 10% relative to the naive sum. This is likely to be a conservative correction; the true overlap may be larger for some meat-linked diseases where both risk factors are well-established causes.

4.4.2 Monetising DALYs

To translate DALYs into a monetary figure, we use the concept of the Value of a Life Year (VOLY).[72] This is the monetary value of one year of healthy life, widely used in EU cost-benefit analyses of health effects. The VOLY is derived from the Value of Statistical Life (VSL), a health economics concept representing the amount that the people are willing to pay to reduce their risk of dying by a small amount.[73] This is then scaled up to the equivalent of saving one life. The VSL is not a price placed on any individual's life, but rather an expression of aggregated societal preference for risk reduction.

The VOLY is calculated by dividing the VSL by the number of life years lived on average. Specifically, the difference between average life expectancy and median age:

> **VOLY = VSL / (life expectancy − median age)**

This is the approach used by the Impact Institute in their 2023 true-cost pricing work, which we also use. However, we use updated data. For the VSL, we draw on a 2025 OECD meta-analysis of 2,400 VSL estimates from 49 countries over the period 2009–2023, which reports an EU average VSL of USD 8.4M (€9.89M).[74] EU life expectancy is 81.7 years and EU median age is 44.9 years, giving 36.8 remaining life years.[75] [76] This yields a VOLY of €268,750 per DALY.

The total social health cost attributable to red and processed meat for each country is then:

> **Social health cost = DALYs attributable to red and processed meat × €268,750**

4.5 Allocating national health costs to institutions

We allocate national health costs to each institution in proportion to that institution's share of the country's population, adjusted for food waste:

> **Institutional health cost = National health cost × (APACEs / population) × (1 − food waste rate)**

APACEs (Animal Product Annual Consumption Equivalents) already incorporate differences in caloric needs and meal coverage across institution types, so the ratio APACEs / population gives each institution's share of national consumption. For military personnel, we further multiplied by 83.6% as we are only measuring health benefits to non-soldiers. We then apply a food waste rate to account for food produced but not eaten.

4.6 Social health costs and scenario savings

4.6.1 EU27 health costs

The total social health cost attributable to red and processed meat consumption across all EU27 countries is €791.3 billion (from the GBD 2023 DALYs monetised at €268,750 per DALY). Of this, €6.3 billion falls on the health-modelled institutional populations in care homes, universities, prisons, and non-soldier military personnel. This is approximately 0.8% of the EU27 national social health burden.

4.6.2 Social health cost breakdown by institution type

Institution	Social health cost (€M)	Share of institutional total
Care homes	2,491.5	39.6%
Military	1,887.5	30.0%
Universities (students)	1,201.9	19.1%
Prisons	715.7	11.4%
Total	**6,296.7**	**100.0%**

Table 10: Institutional social health costs and percentage share by institution type.

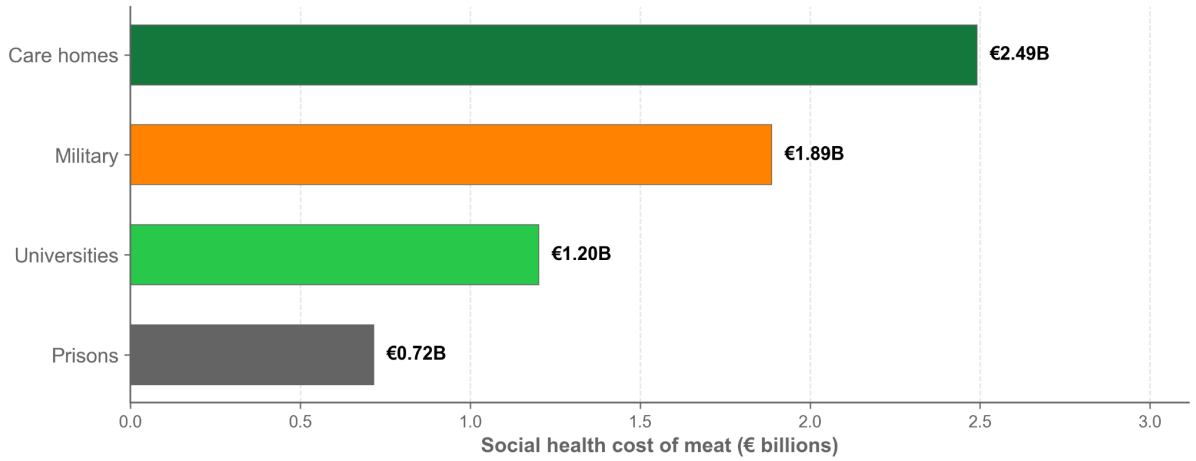

Figure 8: Social health costs attributable to red and processed meat in EU public institutions, by institution type (VSL approach).

Care homes bear the largest institutional social health cost burden because they have the highest APACEs among the civilian health-relevant institutions and receive all meals in-house. University students have lower APACEs because only a small fraction of meals are eaten in canteens (~5.8%). Prisoners have the smallest population but high per-person consumption (consumption factor 1.1) and all meals provided.

4.6.3 Social health cost country variation

Per-capita national social health cost rates (covering all meat-attributable health burden divided by population) range from €1,136/person/year (Netherlands) to €4,044/person/year (Lithuania), with variation driven by per-capita red and processed meat consumption patterns and the DALY burden from associated diseases in each country.

The top 5 countries by institutional social health cost are:

Rank	**Country**	**Institutional social health cost (€M)**
1	Germany	1,528.8
2	France	851.8
3	Italy	672.4
4	Spain	611.1
5	Poland	454.3

Table 11: Top five countries by institutional social health cost attributable to red and processed meat using VSL methodology.

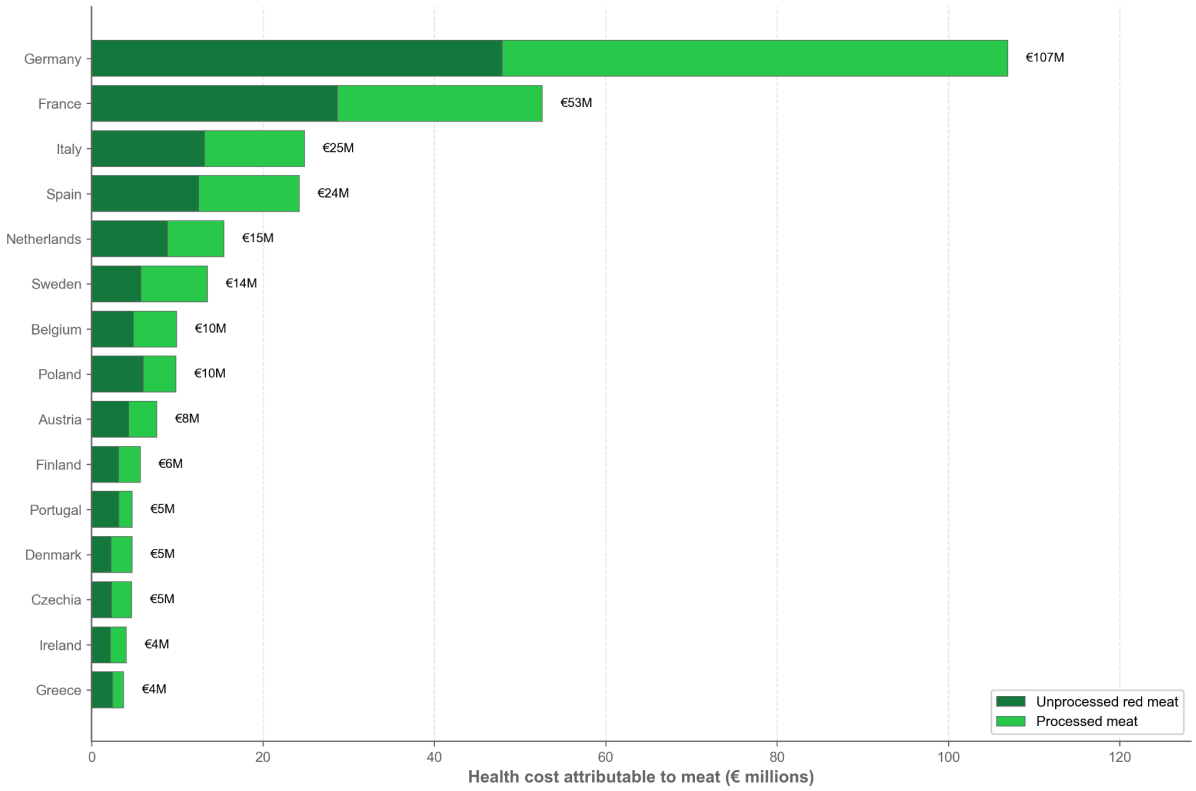

Figure 9: The top EU countries by institutional social health cost attributable to red and processed meat using VSL methodology.

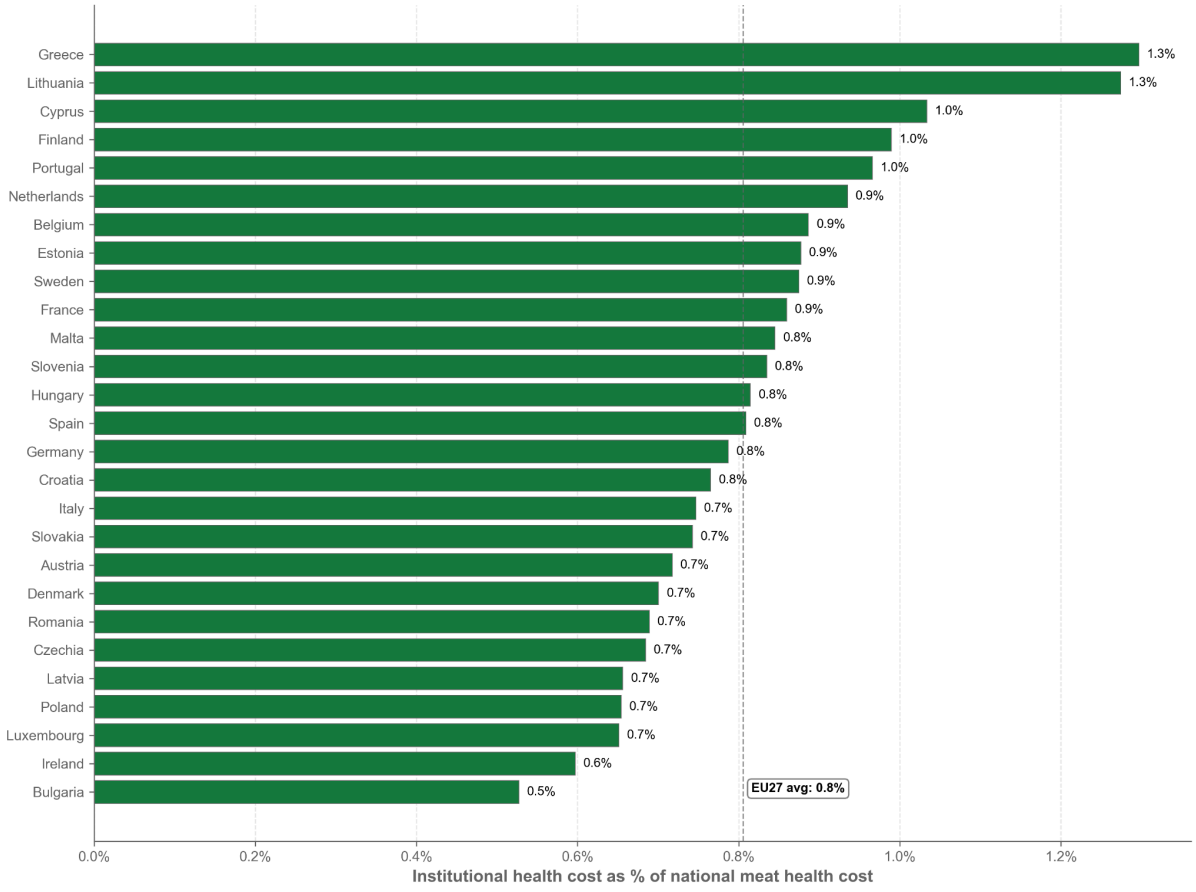

Figure 10: Per-capita social health cost rates attributable to red and processed meat consumption using VSL methodology, by EU country.

4.6.4 Scenario savings

Under the 85% plant-based procurement target, institutional social health cost savings total €4.08 billion:

Institution	**Social health cost savings (€M)**
Care homes	1,614.8
Military	1,223.3
Universities	779.0
Prisons	463.9
Total	**4,081**

Table 12: Institutional social health cost savings by institution type under the 85% plant-based scenario.

4.7 Assumptions

- **Long-term nature of health benefits:** These health cost estimates represent the social cost of health damage from current institutional red and processed meat consumption. Thus, the calculated savings are not immediate annual budgetary savings. Cardiovascular benefits from dietary change emerge over 5-10 years; cancer risk reduction requires 10-20+ years of sustained change. The figures presented estimate the annualised social cost attributable to current consumption patterns; actual cost reductions would be phased in over these periods as disease incidence is prevented.
- **Uniform VOLY across countries:** We apply the same €268,750 per DALY across all EU27 countries. In practice, willingness to pay for risk reduction varies with national income levels. Whether to adjust for national income is a subject of debate; some argue it implies that citizens of lower-income Member States have less valuable health outcomes, which conflicts with the EU principle of equal treatment. We follow the EU Commission's standard practice of applying a single EU-average VOLY for cross-country policy appraisals, consistent with the Better Regulation Toolbox methodology. This also avoids an asymmetry where the policy mandate is uniform across Member States but the benefits are valued unequally.
- **DALY scope:** The GBD 2023 DALYs used for these calculations capture multiple disease endpoints attributable to red and processed meat (cardiovascular disease, colorectal, and other cancers, type 2 diabetes, and others). This is broader than analyses that model only a handful of diseases, and may produce higher estimates as a result.

4.8 Secondary analysis A: healthcare system burden approach

While true cost analyses using VOLYs are standard in health economics, they are sometimes criticised for not mapping to real-world healthcare spending. Instead, they reflect how much the population thinks *should* be spent to treat ill health, whether the cost is actually affordable or not.

To address this, we conducted a secondary analysis, which also estimated health costs, but used observed healthcare expenditure. This provides a more conservative estimate anchored to what health systems currently spend, rather than the full social value of health loss. This method follows a method outlined in a 2025 report by Zero Cost Analytics.[77]

4.8.1 Method

We used the GBD data to calculate the percentage of a country's total DALY burden that is attributable to red and processed meat, as above (see 4.4.1). Then, we multiplied this number by that country's total healthcare spending to give us a proxy of the amount that red and processed meat costs their healthcare system:

> **Healthcare burden = (Meat DALYs / Total all-cause DALYs) x Total healthcare expenditure**

4.8.2 Healthcare expenditure data

We obtained each country's total healthcare spending from the Eurostat health accounts dataset.[78]

Since the most recent complete year in the Eurostat data precedes our 2025 analysis year, we extrapolated healthcare expenditure to 2025 using the median year-on-year percentage growth from the last seven years of data (excluding 2020 and 2021 as anomalies due to COVID-19).

Institutional allocation, meat pathway classification, and food waste adjustments are identical to the primary VSL approach detailed in the social health cost methods above.

4.8.3 Healthcare system costs

The total healthcare system burden attributable to red and processed meat consumption across all EU27 countries is €38.3 billion. Of this, €308.5 million falls on institutional populations in care homes, universities, prisons, and non-soldier military personnel. This is approximately 0.8% of the EU27 national spend-based healthcare system burden.

Institution	Healthcare system burden (€M)	Share of institutional total
Care homes	142.4	46.2%
Military	74.8	24.3%
Universities (students)	61.1	19.8%
Prisons	30.2	9.8%
Total	**308.5**	**100.0%**

Table 13: Spend-based institutional healthcare burden and percentage of burden share by institution type.

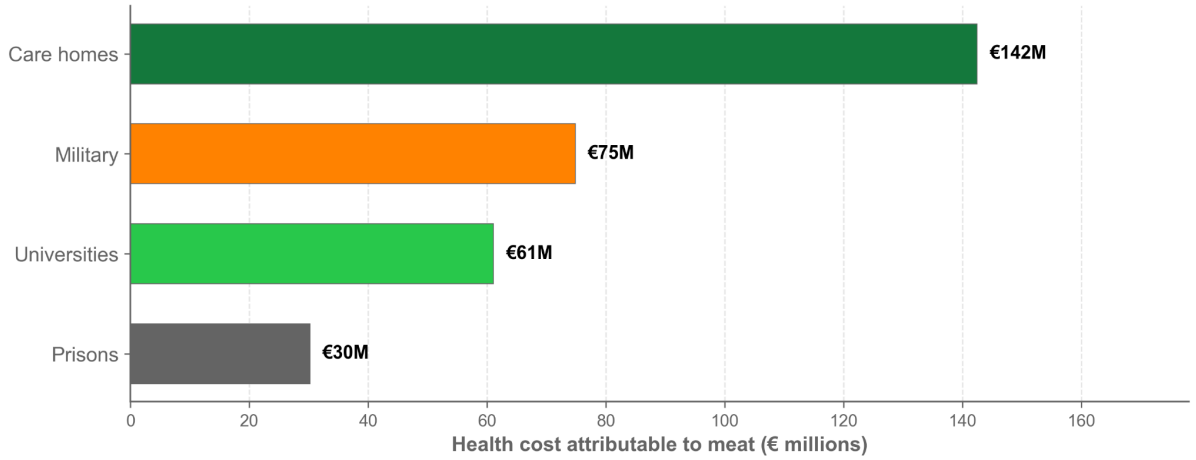

Figure 11: Healthcare system costs attributable to red and processed meat in EU public institutions, by institution type (using recorded healthcare spend).

Per-capita national spend-based health cost rates range from €22.5/person/year (Romania) to €172.2/person/year (Luxembourg).

Rank	Country	Healthcare system burden (€M)
1	Germany	106.9
2	France	52.6
3	Italy	24.8
4	Spain	24.2
5	Netherlands	15.4

Table 14: Top five countries by spend-based institutional healthcare burden.

Under each procurement scenario, the spend-based healthcare savings EU-wide are:

Scenario	Baseline burden (€M)	Scenario burden (€M)	Savings (€M)	Cost reduction
65% PB	308.5	253.3	55.2	17.9%
75% PB	308.5	181.0	127.6	41.4%
85% PB	308.5	108.6	200.0	64.8%

Table 15: EU-wide spend-based healthcare system burden, savings, and percentage of cost reduction under each plant-based (PB) procurement scenario.

4.8.4 Scenario savings

Under the 85% plant-based procurement target, **spend-based institutional healthcare savings total €200 million**, broken down by institution type:

Institution	Healthcare system savings (€M)
Care homes	92.3
Military	48.5
Universities	39.6
Prisons	19.6
Total	**200.0**

Table 16: Spend-based institutional healthcare savings by institution type under the 85% plant-based scenario.

4.8.5 Validation of assumptions

This method carries a significant assumption: it assumes that healthcare spending on groups of diseases are proportional to their DALY burden. For example, if stroke was responsible for 10% of the total DALY burden for a country, it assumes they are allocating approximately 10% of their healthcare budget to stroke.

While this method may hold in aggregate over several diseases and countries, it may not always be true in every case. For example, lower back pain has a large DALY burden because it causes pain and rarely kills, but is relatively cheap to treat (painkillers, physiotherapy).

To investigate the robustness of this method, we compared it to an analysis that used confirmed healthcare costs of red and processed meat consumption for the UK, a comparable country where data is readily available.

A previous report by the Conservative Animal Welfare Foundation and Bryant Research estimated the savings to the UK health care system from a reduction in red and processed meat.[79] They used standard methods, including risk ratios from meta-analyses of meat consumption on specific diseases such as cardiovascular disease, obesity, stroke, and cancer. They combined this with more direct estimates of the cost of these diseases to the UK health care system. Using their model, we estimate that removing all red and processed meat from the UK diet would save the NHS £6.2B a year.[80]

To test the robustness of our method for estimating healthcare costs, we applied our method to the UK and then compared it to the result from the above report (note all figures are for 2023):

- Total DALYs for the UK: 22,303,082
- Meat DALYs for the UK: 219,761 red meat, 295,450 processed meat, for a total of 515,211
- Applying our 10% overlap reduction (to avoid double-counting shared disease burdens) leaves 463,690 DALYs
- Therefore, the DALY burden of meat is 2.08%
- Healthcare spending in the UK in 2023 was £292 billion[81]
- Therefore, we estimate that removing all red and processed meat from the UK diet would save the NHS approximately £6.07 billion.

This means the result from applying our method to the UK underestimates by approximately 2.1%, an encouragingly close estimate.

4.9 Secondary analysis B: childhood obesity implications

Our proposed policy of increasing budget allocation for plant-source foods in schools would not have immediate health benefits or healthcare cost savings. However, it would have longer-term effects by reducing the proportion of children who become obese in adulthood. We model this reduction using a steady-state approach, which estimates the drop in adult obesity rates that would be achieved once all current children have graduated through a school meal system that adheres to our target scenario of 85% budget allocation.

4.9.1 Method

- We use the same red/processed meat framework defined earlier (see 4.2), based on FAOSTAT 2023 data, and express intake in g/day.

- We use precomputed school APACEs described in Technical Appendix 1. These APACEs already include child consumption needs, school meal coverage, and the share of annual meals eaten at school
- Using the 1.10 per 85g serving relative risk (RR) to apply the dose-response at the individual level, we normalize APACEs by total school children (APACEs / total_school_children).
- We apply that exposure factor to health-relevant meat intake to estimate school-attributable meat intake per child, then apply a 26.1% food waste adjustment.
- We apply each policy scenario's reduction percentage to estimate the resulting per-child meat reduction from school meals.
- We convert the reduction into 85 g/day serving units and apply the dose-response relationship: a protective RR of 1/1.10^s, where *s* is the number of servings reduced, giving an RR reduction of 1 − (1/1.10^s).
- We translate RR reduction into absolute obesity reduction using each country's baseline adult obesity prevalence from the World Obesity Federation[82] and estimate future steady-state adult cases prevented using the adult population.

4.9.2 Results

Across the EU27, the steady-state model estimates that **an 85% plant-based budget procurement policy in schools would prevent approximately 396,187 future cases of adult obesity** once fully implemented.

The population-weighted average reduction in adult obesity prevalence is 0.09 percentage points, with a median country-level reduction of 0.09 pp. The effect ranges from zero (Denmark, which has not historically provided publicly funded school meals) to 0.30 pp (Finland).

Country	Baseline obesity	Reduction (pp)	Future obesity cases prevented
France	15.2%	0.15	105,470
Germany	19.0%	0.08	70,333
Poland	13.9%	0.07	26,258
Portugal	15.8%	0.24	25,712
Spain	15.2%	0.05	24,527

Table 17: Top five countries by future obesity cases prevented.

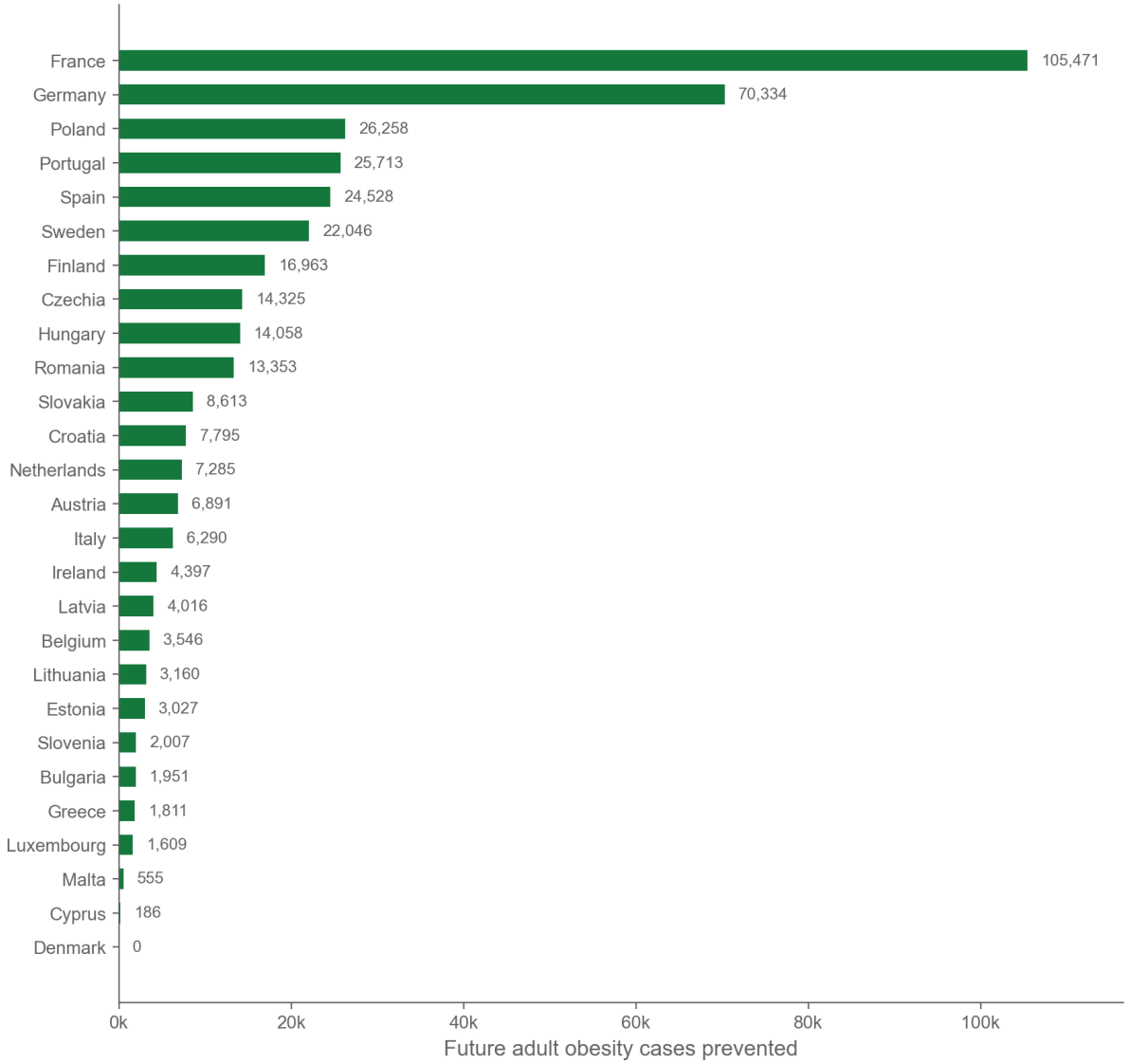

Figure 12: Estimated future adult obesity cases prevented by EU countries under an 85% plant-based budget scenario for public school food procurement.

France leads primarily due to its combination of large population and high school meal APACE share. Germany's large population drives its position despite a lower school meal APACE share. Countries with higher school meal APACE shares (Portugal, Sweden, Finland, Luxembourg) show the largest per-capita reductions. Denmark shows zero effect because school meal APACEs are zero.

4.9.3 Assumptions and caveats

- **Linear dose-response**: We assume a linear relationship between red/processed meat reduction and obesity risk reduction. We believe this is justifiable because we are modelling a small reduction in total diet, and all non-linear relationships become linear when restricted to a small enough range. Additionally, Schlesinger et al. (2019) find in their paper that the relationship is likely linear.[83]

- **We only model the health effects of reduced red and processed meat:** This likely understates the benefits because plant-forward diets have other nutritional benefits, such as increased fibre.
- **Abdominal obesity as proxy**: Schlesinger's RR is for abdominal obesity (waist circumference). We apply it to obesity defined by body-mass index. The two measures are of course strongly correlated, but not exactly the same.
- **Steady-state assumption**: Results reflect a world where all adults have passed through a school meal system that adheres to the 85% plant-based budget scenario. This is conservative in that it does not count benefits accumulated during implementation, but optimistic in that it assumes the full policy remains in place for around 18 years.
- **No compensation**: We assume children do not eat more animal-source foods at home to offset school meal reductions.
- **Same RR for processed meat**: The RR in Schleisinger et al. was derived from unprocessed red meat; we apply it to processed meat as well, justified by findings in Rouhani et al. (2014) of near-identical associations.[84]
- **Food waste**: We apply a 26.1% overall food waste rate taken from a review of 74 studies (detailed in section 4.3), as school-specific waste rate was not available.
- **Static baseline**: Cases prevented are calculated using observed obesity rates (2022-2024 survey data from the World Obesity Federation[85]) and 2025 population. Our estimates may be conservative if obesity rates continue to rise over the coming decades (the long-run EU trend has been upward), in which case the absolute number of cases prevented would be larger. Conversely, our estimates may overstate the absolute effect if the European population declines, as is projected by 2050.
- **We use a risk ratio for the effect of meat on obesity derived from observational data**: The Schlesinger et al. RR of 1.10 per 85g/day is derived from observational prospective cohort studies. While medical science suggests that meat causally increases obesity, Schlesinger et al. (2019) suggests but does not prove it. Long-term, large sample randomised control trials of meat reduction on obesity would provide stronger evidence, but were not available.
- **We assume that equal proportions of red and white meat** in the FAO stat data are processed (32.5%). Processed poultry (e.g. chicken nuggets) is likely to be less common than processed red meat (e.g. bacon and sausages). However, we were unable to find any recent, credible estimates of the percentage breakdown of processed meat into white and red meat.

Technical Appendix 5: Carbon dioxide reduction equivalent to cars removed from EU roads

For communication of results, it may be compelling to frame the carbon savings of an 85% plant-forward public food procurement scenario in terms of equivalent cars removed from EU roads.

The number of cars equivalent is derived from the CO_2e savings divided by the annual CO_2 emissions of a typical EU passenger car. We estimate the latter at 2.0 tonnes CO_2/year:

- Passenger cars account for 61% of the 749 Mt of CO_2 emitted from EU road transport in 2023 (Eurostat via Destatis),[86] yielding ~457 Mt.
- Dividing by the 256 million passenger cars in the EU fleet (ACEA 2025 [87]) and excluding the 2.3% that are battery-electric gives ~1.83 tonnes CO_2/year per petrol/diesel car, which the code rounds up to 2.0 tonnes/year for conservative reporting.

This is also consistent with real-world on-board fuel monitoring data showing 166–170g CO_2/km for petrol/diesel vehicles at 10,800–12,000 km/year average mileage.

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