Strengthening European Food Chain Sustainability by Quality and Procurement Policy

Deliverable: 10.6

CREATION OF TECHNICAL SUPPORT SYSTEMS AND DECISION-MAKING TOOLS FOR AGRI-FOOD CHAIN PRACTITIONERS AND POLICY MAKERS FOR IMPACT MEASUREMENT

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This deliverable provides an overview of the four tools developed as part of the Strength2Food project to help with practitioner and policy makers' decision making and impact measurement. The four tools are:

a) meal analyser tool
b) Strength2Food variant of LM3
c) sustainability indicators
d) menu and procurement planning tool

The **meal analyser tool** enables a food service provider or procurer to enter simple information which is readily available and to calculate impacts relating to carbon, waste and economic effects. In doing so two key metrics are achieved, the first being the total carbon impact of the meal service, and the second the public value in economic terms of that service. However, the tool goes further by showing the improvement that could be achieved by making achievable changes to practice.

The **Strength2Food variant of LM3** measures public value within communities. Specifically, it measures the total economic value of expenditure within a local economy (local multiplier effect). It tracks the money that leaves the local economy and then also follows how much of this is later returned. This makes it possible to show the multiplier for an area and the difference in contribution generated from local and non-local suppliers. This ability coupled with the spatial nature of the tool and the use of ratios make the tool particularly useful for cross project comparisons.

The **sustainability indicators toolkit** is a framework comprising of 24 indicators to assess the effectiveness, efficiency, relevance and consistency of Food Quality Schemes (FQS) namely; organic, PDO and PGI. This tool assesses the impact that FQS have in different geographical locations and can be used by policymakers, academics and practitioners. The 24 sustainability indicators aim to assess FQS from a holistic perspective; capturing the economic, environmental and social effects of FQS through a multi-level analysis (farm, processing and retail level). The indicators have been applied to 27 certified food value chains, as part of WP5, which provided a means to test and refine the indicators. A methodological guide, detailing the formula, data requirements and how to interpret each indicator, accompanies the excel spreadsheet-based tool.

The **menu and procurement planning tool** achieves Strength2Food's aim of evaluating the impact of public sector food procurement strategies. The initial excel tool has been developed for Serbian primary schools but may later be adapted for other institutions or modified for use in other countries. The purpose of the meal planner tool is to develop knowledge and deliver tailored recommendations to schools and parents to improve their current meal plan. The tool synergistically combines the analysis of the nutritional value of school meals with the financial and carbon costs of the food procured; accounting for the impact of food plate waste.

Tools are available via the Strength2Food website, under the 'resources' tab:

https://www.strength2food.eu/resources/

List of Tables

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

BP	Bargaining Power
FAO	Food and Agriculture Organisation
FQS	Food Quality Scheme
Impment	Impact Management Ltd
MEAT	Most Economically Advantageous Tender
NEF	New Economics Foundation
OJEU	Official Journal of the European Union
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PSFP	Public Sector Food Procurement
SAFA	Sustainability Assessment of Food and Agricultural Systems
UNED	University of Edinburgh
WHO	World Health Organization
WP	Work Package

1. INTRODUCTION

This deliverable outlines the creation of technical support systems and decision-making tools created for agri-food chain practitioners and policy makers for impact measurement as part of the Strength2Food project. The deliverable provides an overview of the four tools created, as well as links to the Web platform page, providing access to the tools and other data sources. All of the tools are available for use.

The tools were designed to create, based on empirical and academic research of the project, practical value for policy makers and practitioners in impact measurement and aid the delivery of food policy, thus providing tangible benefits for the end user/practitioners.

It is not surprising that the majority of these outcomes relate to the public procurement strand of the project as this forms the most significant route to improving public value. In doing so we have always been aware of the regulatory mechanisms contained within the procurement process. Care has been taken to ensure that all of the tools provided are blind to outcomes. In addition, all data and consequent calculations are transparent, and fully auditable. This makes it possible for the tools to be further developed for use within public procurement processes. Limitations and opportunities for future development of the tools are noted.

The deliverable concludes with a short discussion regarding how the tools fufil the objectives of this task and reflects on the nature of this type of output within the broader context of the project.

2. DESCRIPTION OF TOOLS

2.1 Meal analyzer tool

2.1.1 Overview

The meal analyzer tool has been developed as a direct consequence of the work undertaken by WP6 and led by University of Edinburgh. It was developed by Adam Wilkinson in conjunction with Prof. Angela Tregear at the University of Edinburgh (UNED). The purpose of the tool is to enable a food service provider or procurer to enter simple information which is readily available and then to calculate the following impacts:

- Carbon
- Waste
- Economic

In doing so two key metrics are achieved, the first being the total carbon impact of the meal service, and the second the public value in economic terms of that service. However, the tool goes further by showing the improvement that could be achieved by making achievable changes to practice.

2.1.2 Research starting point

The carbon footprints depicted in Figure 1, and extracted from Deliverable 6.3, form the empirical basis for the tool and are the starting point for calculating the coefficients used in the final model. They summarise the scope of the research and the data captured.

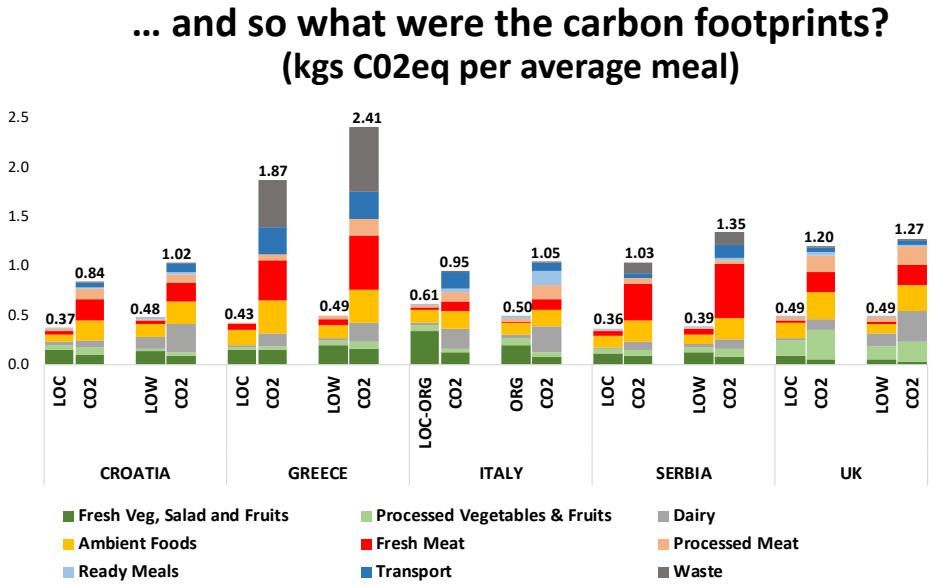


Figure 1. Carbon footprints as calculated as part of WP6

This slide shows the starting point for the tool by demonstrating an intrinsic part of the methodology developed by Work Package (WP) 6 to create a robust carbon methodology for the calculation of the food weight served by category in schools.

Figure 2 shows a similar summary of the empirical results for the food waste calculations.

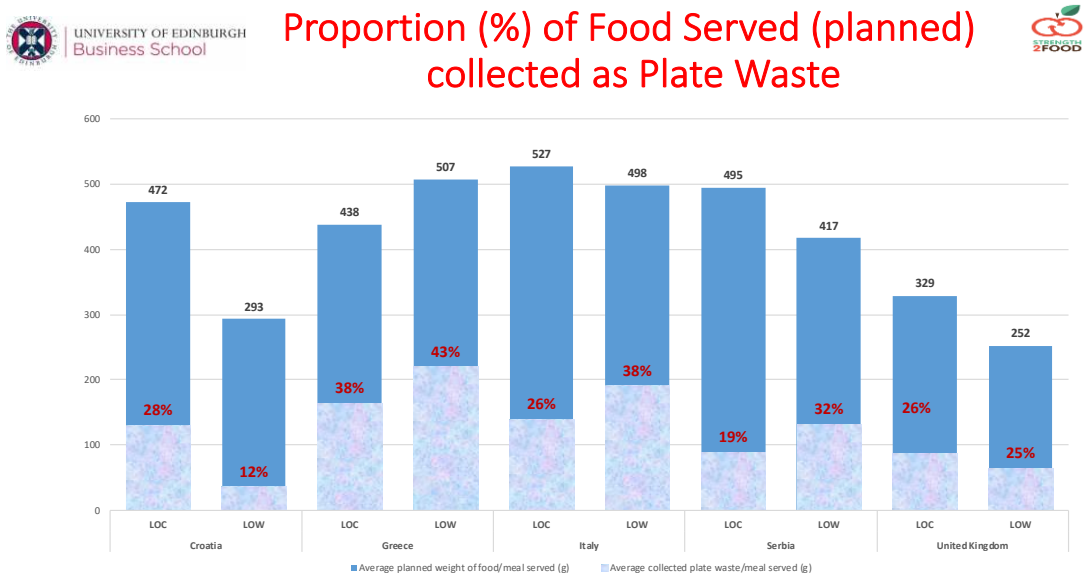


Figure 2. Plate waste data calaculated by UNED research team

The third component of the tool calculates an indicative Local economic impact of the food service. Figure 3 demonstrates how the economic impact of the food service is calculated using a simplified variant of the LM3 tool.

Economic Impact of School Meals Service in Durham (LOC)

- Number of jobs supported by contract:
  - ➢600 (catering service) + x (suppliers)
- Importance of contract to suppliers:
  - ➢Small % of total turnover, but strategically important
- **LM3 ratio = 2.50**

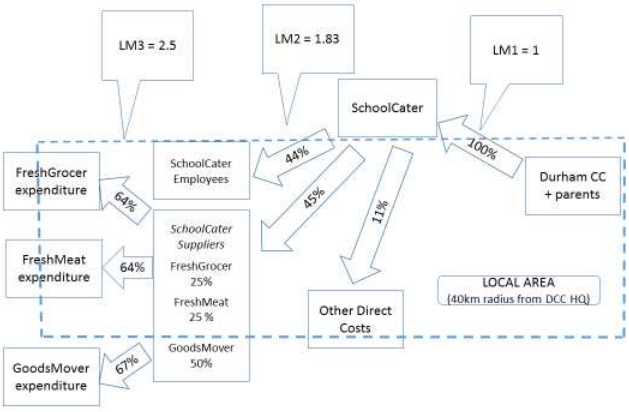


Figure 3. Economic impacts of the food service in Durham, analysis from UNED

It is these three components which form the basis of the meal analyzer tool.

2.1.3 Meal analyser tool methodology

The methodology for the tool is deliberately made as simple as possible. It forms two parts. First all relevant data from the research work was restated as a simple coefficient for example Kg of Carbon per Kg of food weight. These were then matched against a simple data entry process in the tool itself. A section of this is shown below in Figure 4.

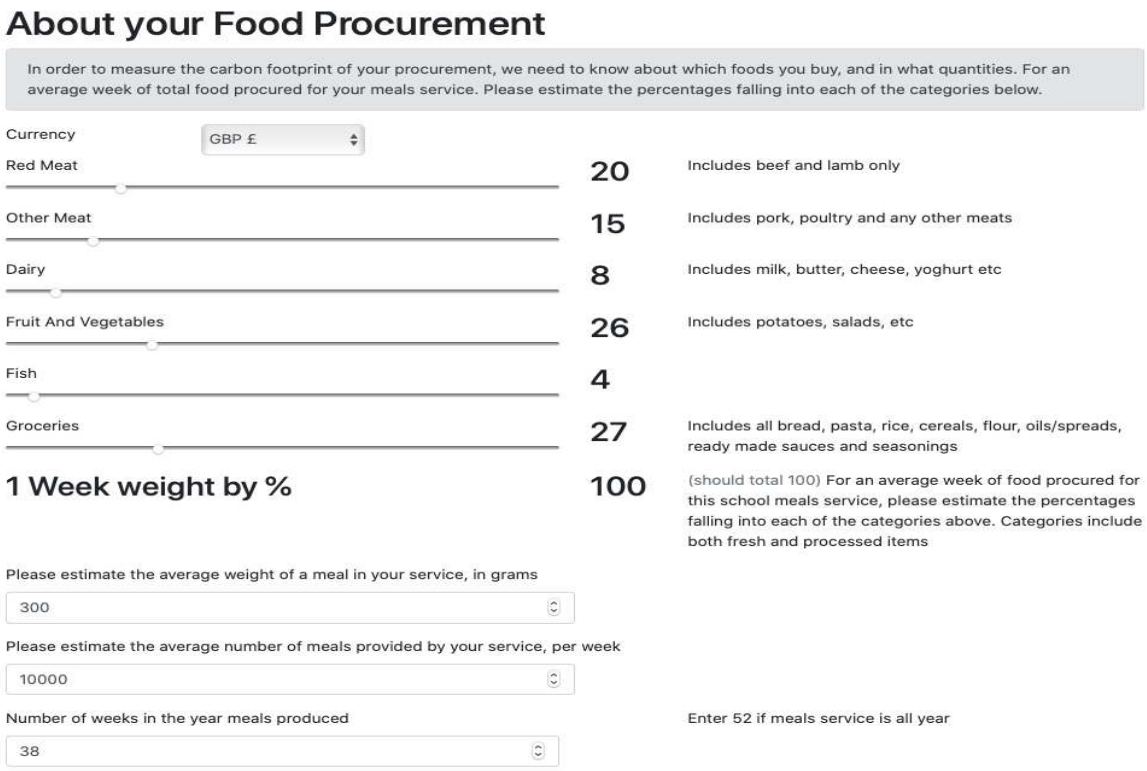


Figure 4. User data entry screen

Once these two are achieved a fairly simple of set of calculations can run in the background to transform these two elements into the results that are then displayed. These calculations are then integrated into an interactive series of web pages to make the tool functional.

2.1.4 Results

The results are calculated in real time and displayed as illustrated below. In all cases the intention has been to highlight the key findings to make it as easy as possible for the practitioner to understand the various impacts of their food services. A good example of this is the slide below with the main food weight against carbon outputs shown by category but with proportional bar charts (see Figure 5).

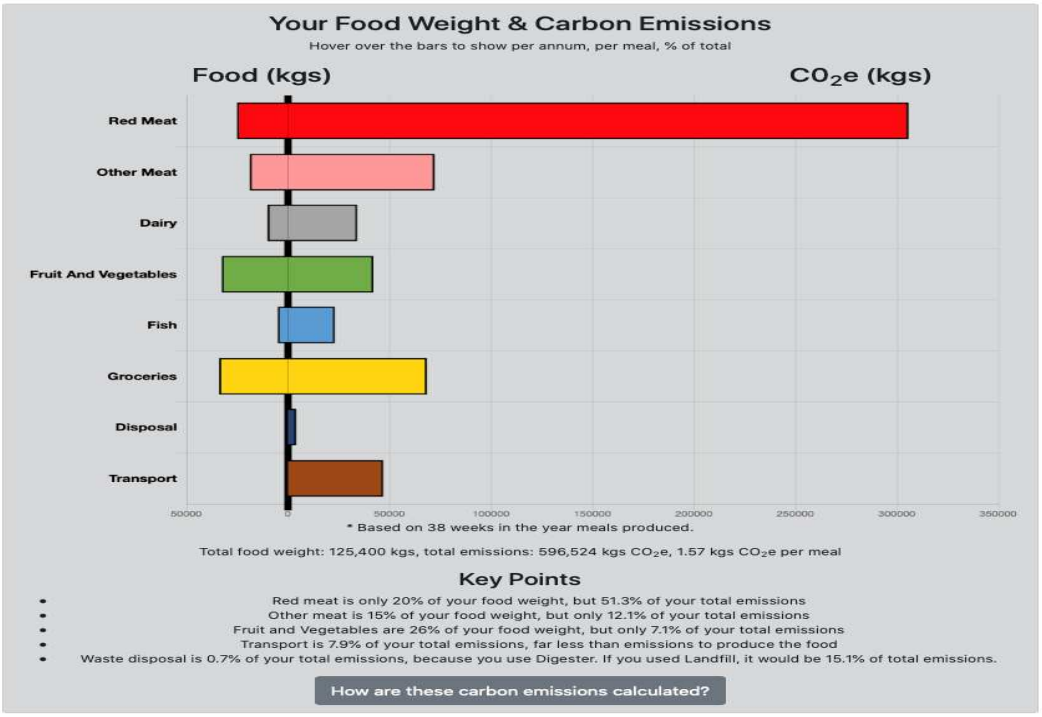


Figure 5. Main results screen

One additional benefit of the research base is that we can show not only carbon impact but also economic impact of the activity. A good example is shown below where not only is the carbon cost shown but the economic loss of waste to the food service (and public purse) is also shown (Figure 6).

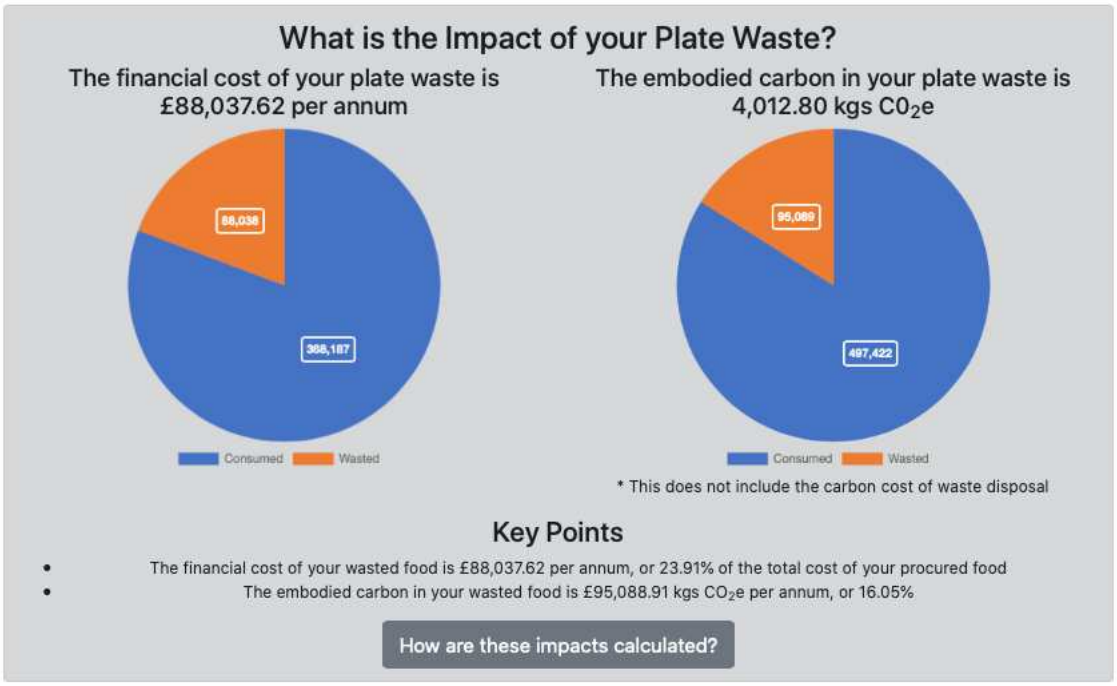


Figure 6. Waste data

Source: https://food.impactmeasurement.net

We have also created the opportunity to benchmark performance against others in the sector (Figure 7). This section, however, cannot be implemented until the tool is fully developed.

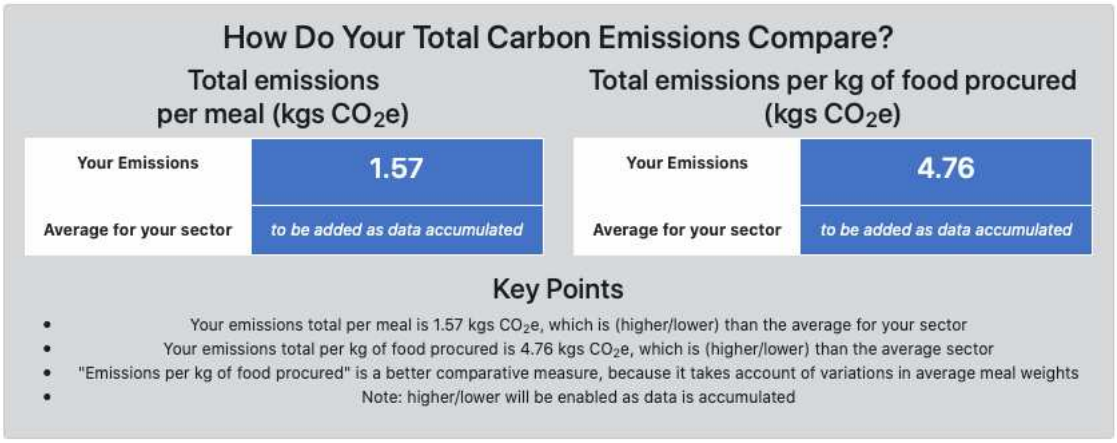


Figure 7. Benchmarking sector comparisons

The economic impact of the local economy is also shown by using a simplified LM3 variant (Figure 8).

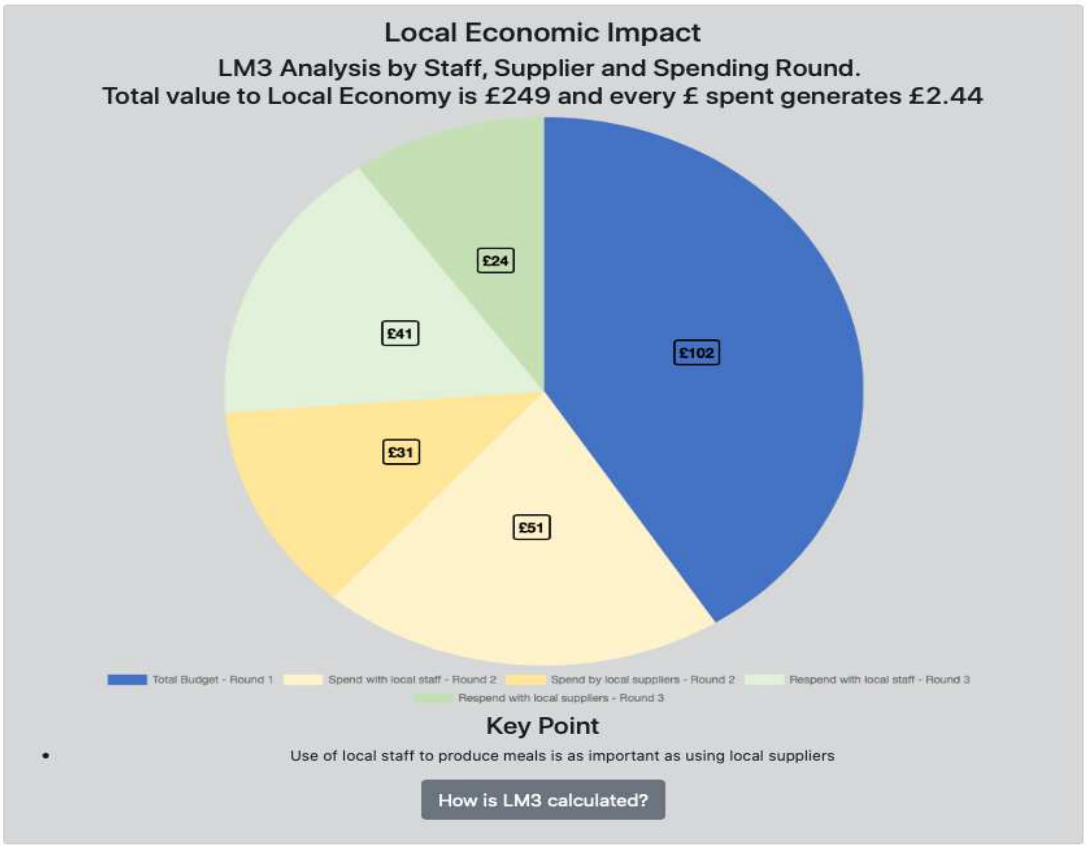


Figure 8. Indicative economic impact for LM3 variant

Finally, the 'What if' Section (Figure 9) gives examples of the key ways to improve value and calculates the impact of these for the user if they were to be made.

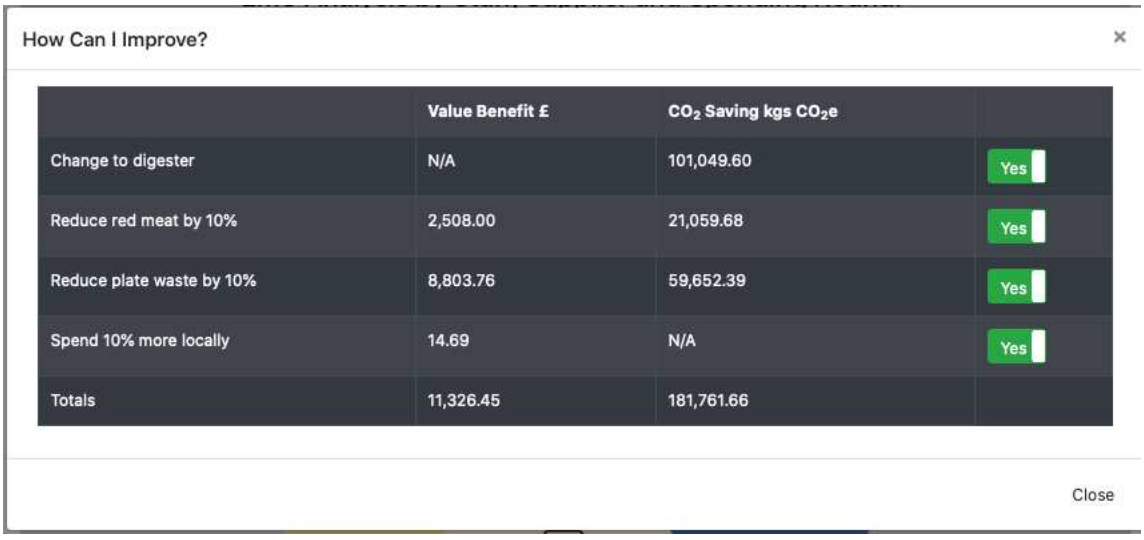


Figure 9. 'What if' demonstrator

2.1.5 Limitations and opportunities

This deliverable has been used to develop a fully functional 'proof of concept' tool. The components being the software framework which embeds the methodology developed, and the coefficients which are then applied to that methodology. There are however two principle limitations on the existing tool which will need to be addressed before it can be more widely adopted. First, the data from which the coefficients were generated are collected from a limited number of primary schools across Europe. These should be checked and verified if applied to other sectors or sub sectors, for example secondary education, or hospitals. The structure of the tool means that it can be easily developed to hold different sets of coefficients for different sectors. To maintain the credibility of the tool this updating and verification of sets would be needed if the tool was to be used extensively within public procurement or other public value process.

Second, the software component of the tool is currently very limited in its functionality. For full use a parallel development of the software would also be needed to bring it to full functionality. For example, the ability to swap and manage different sector coefficients and to have full user management processes.

The proof of concept does show clearly the value of linking the research directly to practitioners and the tools ability to help both translate and contribute to public policy and procurement in the field of public value.

Both the opportunity and the limitations have been recognised by the Public Sector Caterers Association in the UK. A series of discussions between the Strength2Food UNED team and Impact Management Ltd are now in progress around how to bring the tool to full functionality to measure public sector catering carbon and economic impacts for the UK public sector.

2.2 Strength2Food variant of LM3

The second developed tool is the LM3 variant for Strength2Food. The tool, originally developed by the New Economics Foundation (NEF), has been further developed by Impact Management Ltd (Impment) with the cooperation of NEF with reference to its use in demonstrating public value within communities. A current example is its use by EDF Energy, as the evidence base for demonstrating the value to the South West economy accruing from a £22.5b construction project (Hinkley Point C). Further information can be found at www.lm3online.com together with a demonstration version of the full tool. A further example of its advanced use can be found at the EDF website.

2.2.1 Base methodology

The calculation method is as follows:
Select your local economy area. This could be a county, or where most of the organisation staff live, or any geographical area that makes sense for the purpose of this exercise. Then the spending is tracked within and outside of the local area for three rounds of spending which are typically:

> **Round 1 -** The turnover or project cost including procurement and employee wages and other forms of cost.
> **Round 2** - How much and with whom the company spends that money inside and outside the local area.
> **Round 3** - How much and how suppliers and employees re-spend their incomes inside and outside the local area.

Then money that remains inside the local area is then summed over the three rounds:

R1+R2+R3 = Total economic value of the original spend to the local economy.

A ratio (or multiplier) is derived by dividing the sum of R1+R2+R3 by the value of R1. This produces a ratio which is the amount of value achieved for every single € spent. For example, an **LM3** score of **1.50** would indicate that for every **€1** earned by your organsation generates an additional **€0.50** for your local area.

The more developed version of the model also tracks money that leaves the local economy and then also follows how much of this is later returned. This makes it possible to not only show the multiplier for an area but critically the **difference** in contribution generated from local and non-local suppliers. This ability, coupled with the spatial nature of the tool, and the use of ratios to allow cross project comparisons, are of particular significance for the Strength2Food project.

How does this tool calculate the impact?

The variant used for this project recognised that it was unlikely that the empirical research would be able to track three generations of spending and utilises the existing LM3 Online database of projects to predict the 3 generation. For R3 we apply the value achieved across all projects run by LM3 clients.

As a worked example if R1 = 10, and 60% is respent locally in R2, and the LM3 data shows 55% for R3 local resepend, then the calculation is as follows:

R1 = 10

R2 = 6

R3 = 3.3

Total = 19.3 The LM3 ratio = 1.93

Further information can be found at www.lm3online.com together with a demonstration version of the full tool.

2.2.2 Results

The LM3 tool was used across the Strength2Food project as a single mechanism for capturing economic impact of activity, and the various outcomes are presented in the reports for each of these WPs (WP5 on Food Quality Schemes, WP6 on Public Procurement and WP7 on Short Food Supply Chains). This section illustrates the standard results from the use of the downloadable tool. The following figure, taken from the Fal Oyster example from WP5,, illustrates the process (Figure 10).

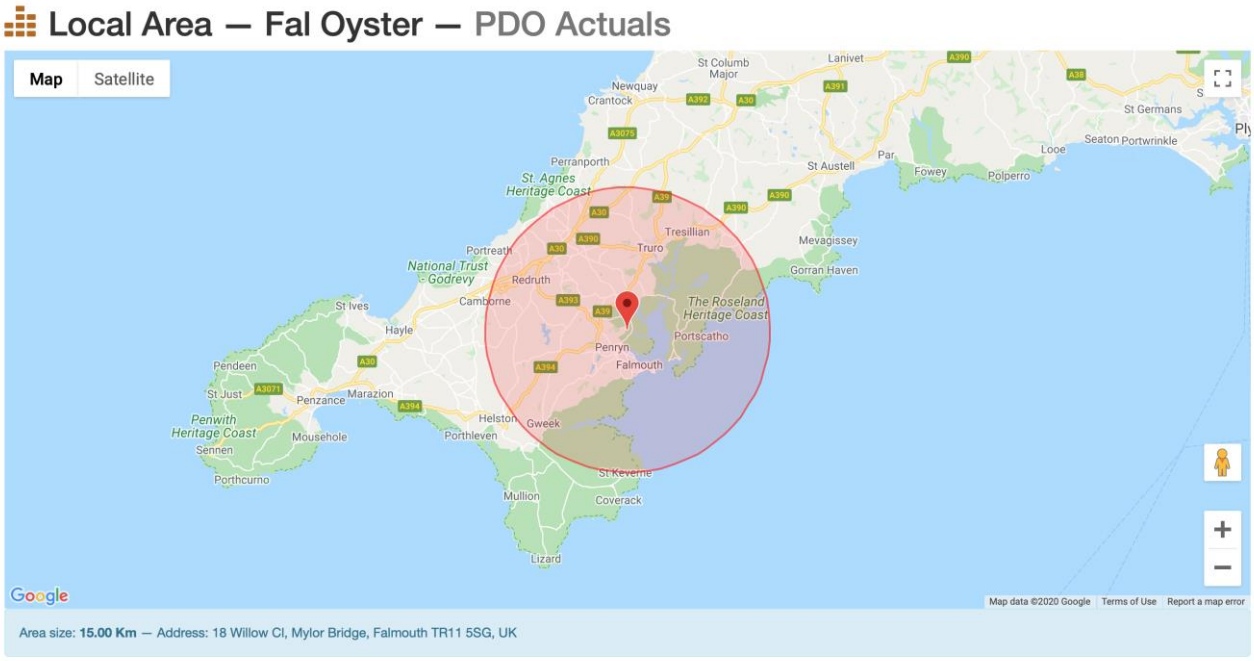


Figure 10. Fal Oyster local area

The first decision is the definition of the local area. In this case the key criterion was the definition of how far away a 'local' supplier was deemed to be, and a radius of 15 kilometres was agreed as shown above.

Once basic budget and supplier spending information is entered the tool then automatically calculates both the total actual economic impact and the LM3 ratio which in this case is shown to be 2.33. This means that every £1.00 spent results in an extra £1.33 in the local economy and is the gross LM3 output (Figure 11).

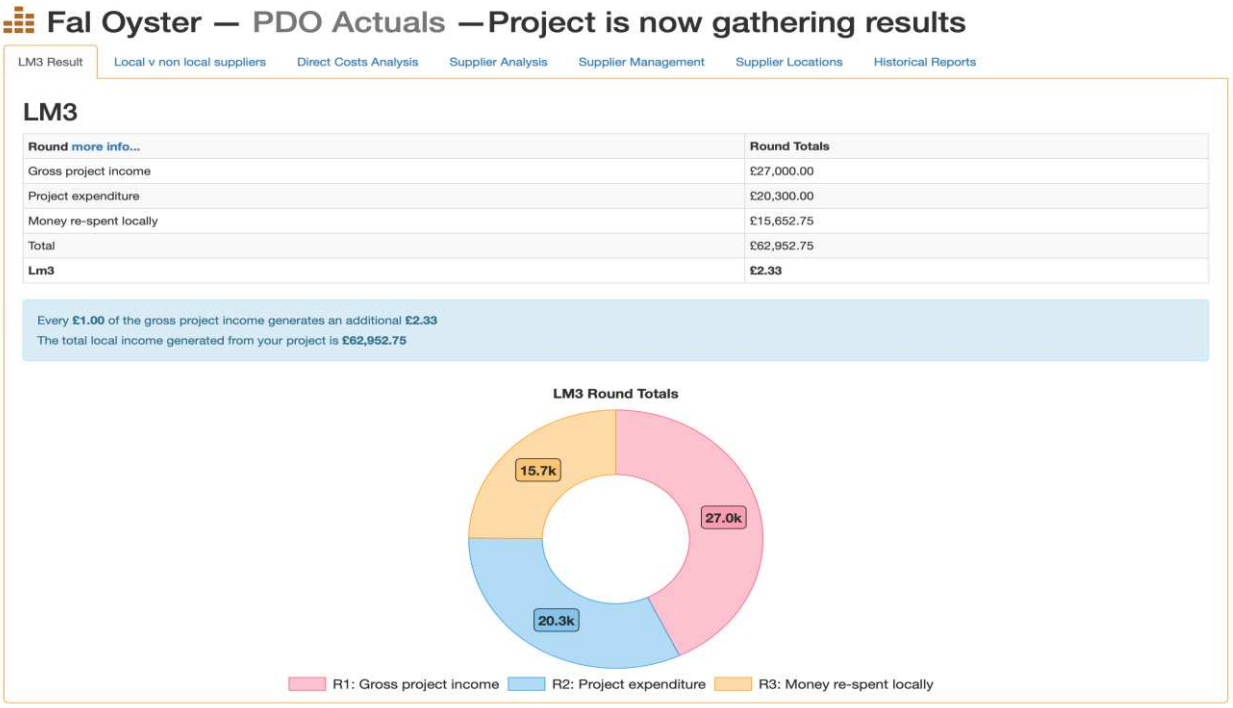
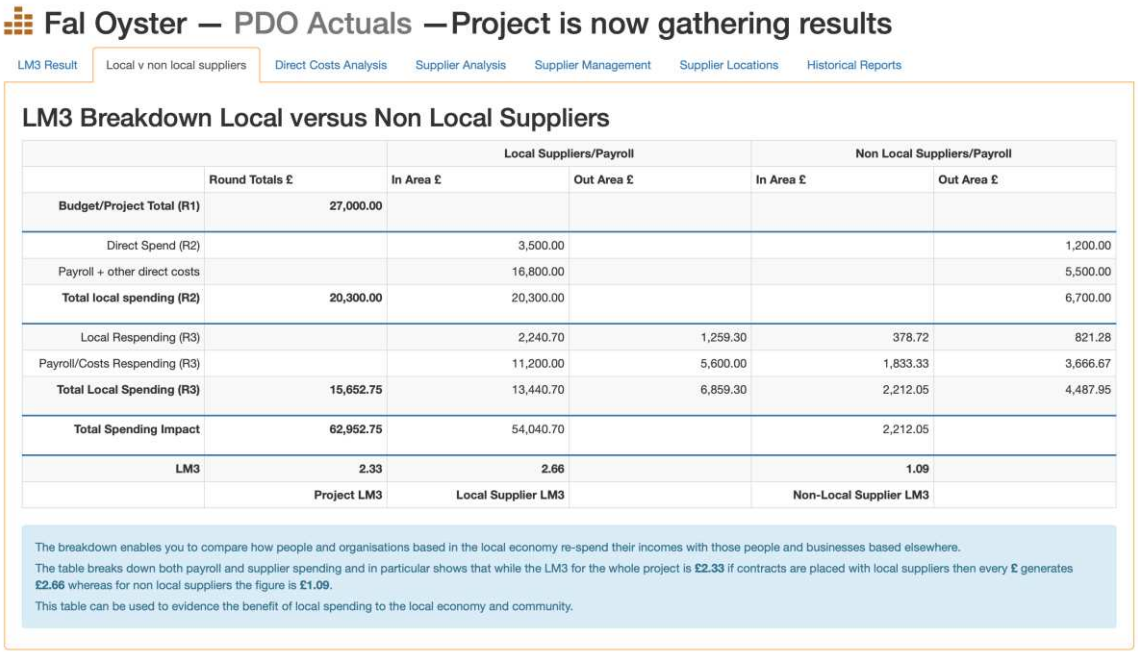


Figure 11. LM3 summary of results

Figure 12 shows that, while for the whole project the LM3 ratio is 2.33, local suppliers contribute an extra £1.66 of this amount while non-local suppliers generate an extra £0.09 pence. It is this ability to demonstrate the difference in contribution to public value to the local area that makes the use of LM3 a powerful tool in assessing economic activity in a way that measures a real impact on communities.



Fal Oyster — PDO Actuals —Project is now gathering results

LM3 Result | Local v non local suppliers | Direct Costs Analysis | Supplier Analysis | Supplier Management | Supplier Locations | Historical Reports

LM3 Breakdown Local versus Non Local Suppliers

		Local Suppliers/Payroll		Non Local Suppliers/Payroll	
	Round Totals £	In Area £	Out Area £	In Area £	Out Area £
Budget/Project Total (R1)	**27,000.00**				
Direct Spend (R2)		3,500.00			1,200.00
Payroll + other direct costs		16,800.00			5,500.00
Total local spending (R2)	**20,300.00**	20,300.00			6,700.00
Local Respending (R3)		2,240.70	1,259.30	378.72	821.28
Payroll/Costs Respending (R3)		11,200.00	5,600.00	1,833.33	3,666.67
Total Local Spending (R3)	**15,652.75**	13,440.70	6,859.30	2,212.05	4,487.95
Total Spending Impact	**62,952.75**	54,040.70		2,212.05	
LM3	**2.33**	**2.66**		**1.09**	
	Project LM3	**Local Supplier LM3**		**Non-Local Supplier LM3**	

The breakdown enables you to compare how people and organisations based in the local economy re-spend their incomes with those people and businesses based elsewhere.

The table breaks down both payroll and supplier spending and in particular shows that while the LM3 for the whole project is **£2.33** if contracts are placed with local suppliers then every **£** generates **£2.66** whereas for non local suppliers the figure is **£1.09**.

This table can be used to evidence the benefit of local spending to the local economy and community.

Figure 12. Difference between local and non-local supplier contributions

The tool in the form shown above is available for download via the Strength2Food website https://www.strength2food.eu/resources

2.3 Sustainability indicators

Led by Dr Valentin Bellassen and colleagues at INRA, and Prof. Filippo Arfini's team at the University of Parma, a framework comprising of 24 indicators has been created in order to assess the effectiveness, efficiency, relevance and consistency of Food Quality Schemes (FQS) namely: organic, Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI). This tool assesses the impact that FQS have in different geographical locations and can be used by policymakers, academics and practitioners. The 24 sustainability indicators aim to assess FQS from a holistic perspective; capturing the economic, environmental and social effects of FQS through a multi-level analysis (farm, processing and retail level). The indicators have been applied to 27 certified food value chains, which provided a means to test and refine the indicators. The tool provides the means for a comprehensive assessment of FQS sustainability while recognising limitations on data and time for calculation. A guide, detailing the formula, data requirements and how to interpret each indicator, accompanies the excel spreadsheet-based tool.

2.3.1 Details of the sustainability indicators

The 24 indicators, sourced from a literature review, seek to capture the economic, environmental and social performance of FQS (see Table 1 for full breakdown of indicators). The aim was to create a framework for multi-criteria analysis of FQS when compared to a similar non-certified reference product, based on the FAO's Sustainability Assessment of Food and Agricultural Systems (SAFA). The indicators have been designed so that the required

variable data can be obtained from existing studies, reports and databases, as well as some limited primary data. The indicators can be used in a multi-level analysis of the FQS value chain at farm level, processing level and retail level: attempting to capture a holistic perspective, involving all relevant stakeholders who are affected directly, or indirectly, by the FQS.

Economic indicators

Economic indicators assess the FQS effectiveness and capacity to deliver added value to the food chain, compared to standard counterparts. The price indicator tests whether the FQS products benefit from a price premium, reflecting that consumers may be willing to pay more for these products given their superior quality attributes. Three classic analytical accounting indicators (Gross Value-Added, Gross Operating Margin, Net result) reflect the actual profitability of the FQS; accounting for the costs incurred. The indicator analysing the ratio of products exported (volume or turnover) to total production provides some information on market dynamism. Finally, the local multiplier indicator analyses where most of the value is added in the supply chain and the extent to which the benefits are retained in the local area.

Environmental indicators

Environmental indicators assess the impact that the FQS has on the ecosystem, compared to standard counterparts. The carbon footprint indicates the amount of carbon dioxide the product generates throughout the supply chain. A separate indicator is used to account for the environmental impact caused from transporting the product; using both the distance travelled and the related carbon emissions generated per kilogram of product. Finally, the water footprint indicator analyses the impact that FQS has upon fresh surface/ groundwater (blue water), water requirements for crops (green water) and resulting polluted water (grey water).

Social indicators

Social indicators analyse the impact, and role, that the FQS asserts within the local labour market when compared to standard counterpart food chain actors. Employment indicators reflect the labour opportunities that the FQS provides. Two ratios are used: labour to production (reflecting labour requirements for a unit of physical output) and turnover to labour (reflecting labour productivity and retention of workers). The Bargaining Power (BP) indicator demonstrates the capacity of individual stakeholders to capture value created throughout value chains; in other words, this concerns the repartition of bargaining power among individual actors. Thus, an evenly distributed bargaining power between levels is expected to be more socially and economically sustainable. Educational attainment, being key to the creation of social capital and greater educational achievement, allows to indirectly measure some components of social capital within the FQS. Finally, generational change and gender equality assess the age and gender distribution of the workforce employed within the FQS.

A full breakdown of the individual indicators is presented in Table 1.

Table 1. Full list of sustainability indicators

	Sustainability pillar	Indicator type	Indicator sub-type (code)	Level of analysis along the value chain
Systematic	Economic	Price Premium	Price Premium (Ec1.1)	One value per level of the food chain
		Profitability and value-added distribution	Gross operating margin (Ec1.3)	
		Trade	Share of value exported within Europe (Ec1.5)	Single value for the whole value chain
		Local multiplier	Local Multiplier (Ec2.1)	
	Environmental	Food Miles	Distance Travelled per unit of product (En2.1)	Single value for the whole value chain
		Carbon Footprint	Carbon footprint per unit of product (En1.1)	
		Water footprint	Blue water footprint (surface and groundwater consumption, En3.3)	
			Grey water footprint (water pollution by nitrates, En3.2)	
	Social	Employment	Labour to production ratio (So1.1)	One value per level of the food chain
		Governance	Bargaining power distribution (So2.1)	Single value for the whole value chain
		Social capital	Educational attainment (So3.1)	One value per level of the chain
			Generational Change (So5.1)	
			Gender Equality (So5.2)	
Complementary	Economic	Profitability and value-added distribution	Gross Value-added (Ec1.2)	One value per level of the value chain
		Profitability and value-added distribution	Net result (Ec1.4)	
		Trade	Share of value exported outside Europe (Ec1.6)	Single value for the whole chain
			Share of volume exported within Europe (Ec1.7)	
			Share of volume exported outside Europe (Ec1.8.)	

	Environmental	Food-miles	Emissions from transportation per unit of product (En2.2)	One value per level of the food chain
		Carbon Footprint	Carbon footprint per hectare (En1.2)	
		Water footprint	Green Water footprint (rainwater consumption, En3.1)	
	Social	Employment	Turnover to labour ratio (So.1.2)	One value per level of the food chain
		Governance	Stability of the value chain level (So2.2)	
		Social capital	Wage level (So3.2)	
			Gender equality index (So5.3)	

The resulting data can then be presented in a radar chart for simple and effective communication of the analysis for each FQS to practitioners and policy makers (see Figure 13).

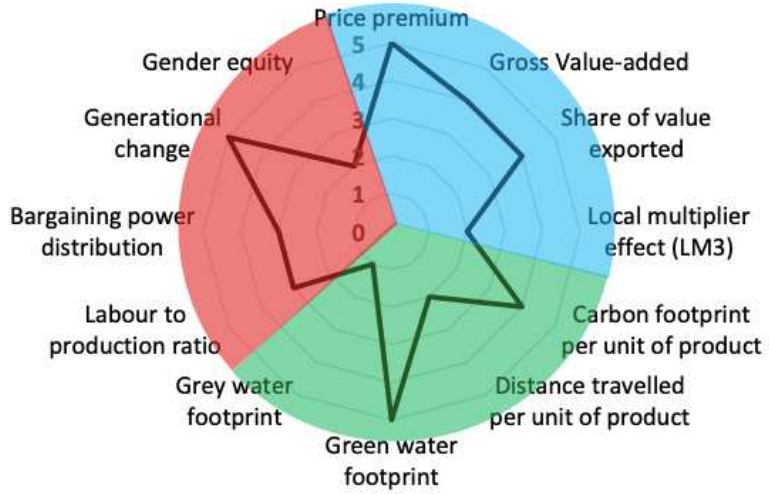


Figure 13. Example radar chart

Source: Strength2Food methodological handbook

2.3.2. Application of the sustainability indicators

Strength2Food has used the developed indicators to assess the sustainability of 27 certified food value chains (8 organic, 8 PDO and 11 PGI) against 27 conventional reference products within their defined geographic origin. The products used in the analysis vary widely so that the indicators can measure the impact that FQS have upon food products in different geographic locations and those with different characteristics (fresh, processed, organic, designated by

Geographic indication and conventional). The analysis has been conducted by a number of expert researchers to increase the accuracy of assessing the sustainability of that particular FQS.

A forthcoming publication designed to support policymakers, experts and relevant stakeholders is being processed by the following academics:

- Price, profitability and export: Monier-Dilhan et al.
- Local multiplier: Donati et al.
- Land and carbon footprint: Ballassen et al.
- Food-miles: Drut et al.
- Water footprint: Bodini et al.
- Employment: Hilal et al.
- Bargaining power: Muller et al.
- Educational attainment: Hilal et al.

The excel tool for indicator calculation is available from here:

https://cesaer-datas.inra.fr/index.php/s/6GFcOrhZ7M0fsc8

The latest version of the accompanying documentation detailing how the indicators are estimated is available from the following:

https://cesaer-datas.inra.fr/index.php/s/1cpiUuVcJ9tGs4Z

2.4 School menu and procurement planning tool

2.4.1 Introduction

The excel tool for 'Menu and Procurement Planning' was developed by Prof. S. Quarrie from the European Training Academy (EUTA) in Belgrade, Serbia. The tool has been created for the specific needs of agri-food chain practitioners in Serbian primary schools (but can also be relevant for other institutions providing meals). Serbian schools are uniquely challenged with an autonomous food procurement procedure, unlike other European countries where food procurement is done centrally or through local authorities. The meal planning tool seeks to inform Serbian schools and parents of the ways in which to improve the nutritional quality and cost efficiency of each meal and reduce the carbon footprint of the food procured whilst also accounting for the impact of food plate waste.

2.4.2 Details of the menu and procurement planning tool

The tool is the product of action research conducted by the Strength2Food project in 28 Serbian schools who each make their own meals, as opposed to purchasing ready-made meals from external providers. The tool collates research from various project inputs in Serbia including: data from the Strength2Food environmental impact study (to assess the carbon footprint of food categories) and data from the Strength2Food plate waste study.

The nutritional recommendations are based upon the Serbian Ministry of Education, Science and Technological Development's nutritional regulations introduced in 2018 based on WHO

guidelines for boys and girls age 7-10 years. This national data is supplemented by the FoodExplorer by EuroFIR national composition database (license held by Newcastle University).

The excel tool is comprised of seven spreadsheets which guide the user through the process, along with several hidden spreadsheets of database information and calculations. The user inputs food prices and procurement data (ingredients and quantity/unit weight requirements for each school meal for up to four meals per day from Monday to Friday) in the first three spreadsheets. The data is then presented in a summarised table and graphically to provide visual clarity on the school's current meal standards (covering nutrition, costs and carbon footprint). Following on from creating a benchmark of current meal standards, the tool then suggests unique and tailored recommendations to improve the nutritional, economic and environmental standards for that individual Serbian primary school's meal plan.

The seven spreadsheet pages are as follows:

- Introduction: general background information, sources of information, spreadsheet information, instructions & explanation of outputs provided by meal planner
- Ingredient prices: entered by school
- Meal Entry Week One: entered by school
- Meal Entry Week Two
- Charts and graphs (see section 2.4.3.1)
- Recommendations (see section 2.4.3.2)
- Quantities of food Items (see section 2.4.3.3)

2.4.3 Output information

2.4.3.1 Charts and Graphs

The following charts, illustrated in Figure 14, have been extracted from the meal planner tool for demonstration. The graphs will be tailored to the individual school producing unique insights for each meal entered, as well as allowing comparisons between weeks, meals, and prices (organic/conventional). The first table summarises the percentage recommended of 23 macro/micro-nutrients within the meals provided. Cells are shaded in red if nutrient contents for a meal are less than 80% of recommended values, or greater than 120% of recommended values for saturated fats and sodium content. The following bar charts demonstrate the total nutrients available to children within school meals compared to actual consumption (% of recommended amounts).

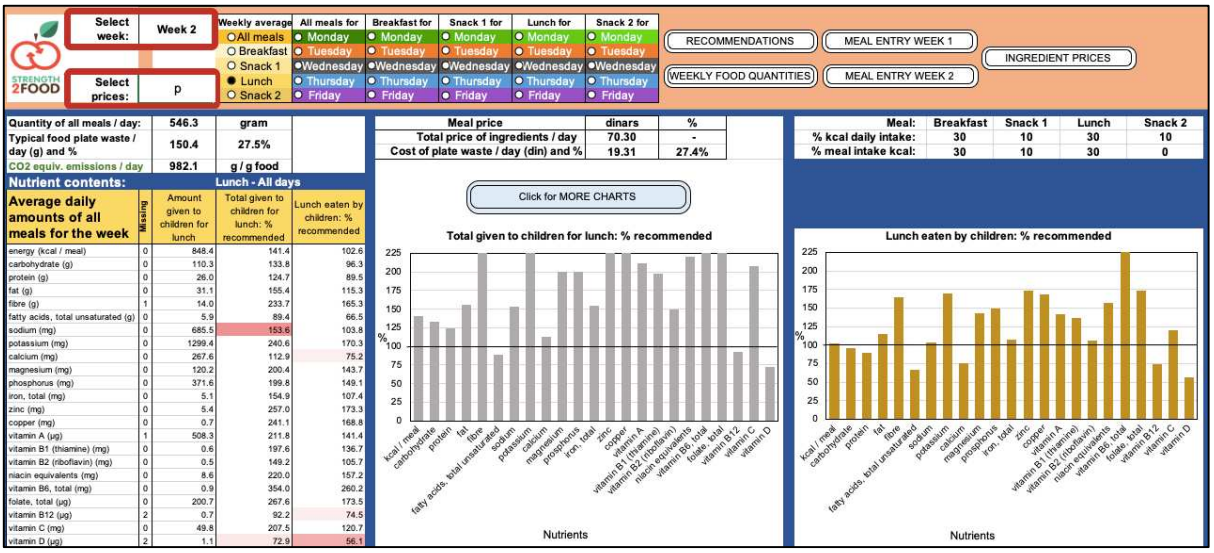


Figure 14. Tables and bar charts of meal nutritional output

Figure 15 displays cumulative bar charts of the average cost of 16 food categories per meal (in Serbian Dinar), cumulative weight of food categories per meal (g) and food contribution to global warming.

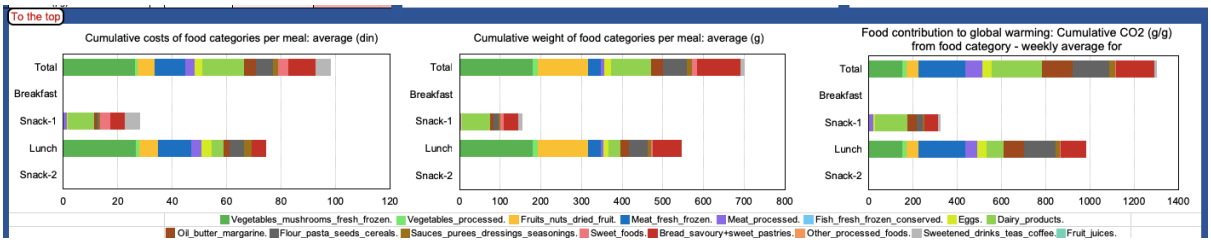


Figure 15. Cumulative bar charts of meal costs, weight and CO2 emissions

Figure 16 demonstrates meal component contribution to price (%) of each of the 16 food categories, weight of food items (% of total food weight), CO_2 emissions of food items (% of total)

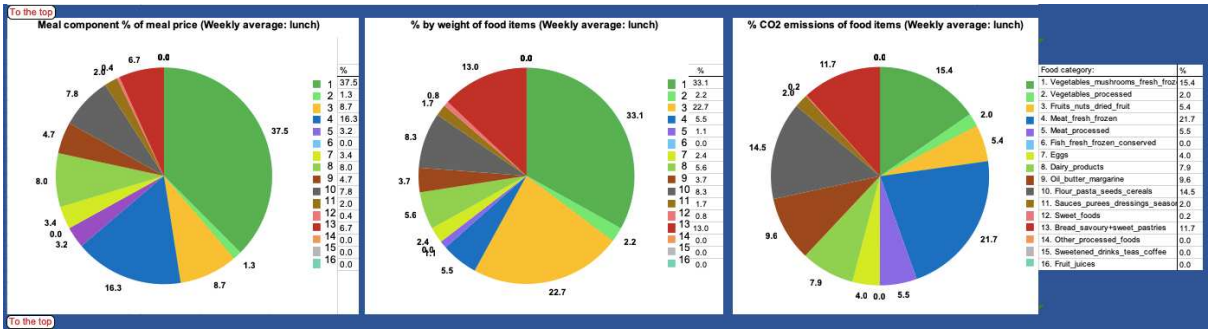
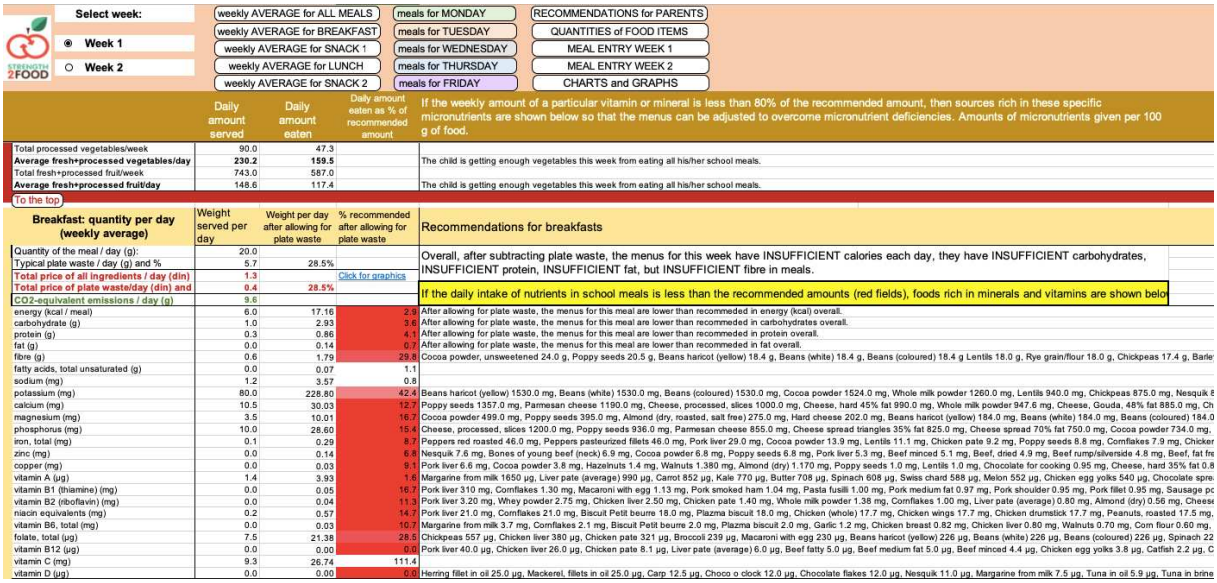


Figure 16. Pie charts of meal component costs, weights and CO2 emissions

2.4.3.2 Recommendations

The below spreadsheet (Figure 17) details recommendations for schools and parents on improving food meals quality and overcome nutrient/food category deficiencies. Summary macronutrient recommendations are given for each day and meal type. If weekly averages for micronutrients are less than 80% of the recommended quantities for daily and weekly averages and meal type, cells in the nutrient table are shaded red. A list of foods rich in the defined deficient micronutrients is provided adjacent to the relevant micronutrient for individual adjustment of school menus or for parental supplementation outside of school meals.



Select week: | Week 1 | Week 2

weekly AVERAGE for ALL MEALS | weekly AVERAGE for BREAKFAST | weekly AVERAGE for SNACK 1 | weekly AVERAGE for LUNCH | weekly AVERAGE for SNACK 2

meals for MONDAY | meals for TUESDAY | meals for WEDNESDAY | meals for THURSDAY | meals for FRIDAY

RECOMMENDATIONS for PARENTS | QUANTITIES of FOOD ITEMS | MEAL ENTRY WEEK 1 | MEAL ENTRY WEEK 2 | CHARTS and GRAPHS

	Daily amount served	Daily amount eaten	Daily amount eaten as % of recommended amount	If the weekly amount of a particular vitamin or mineral is less than 80% of the recommended amount, then sources rich in these specific micronutrients are shown below so that the menus can be adjusted to overcome micronutrient deficiencies. Amounts of micronutrients given per 100 g of food.
Total processed vegetables/week	90.0	47.3		
Average fresh+processed vegetables/day	**230.2**	**159.5**		The child is getting enough vegetables this week from eating all his/her school meals.
Total fresh+processed fruit/week	743.0	587.0		
Average fresh+processed fruit/day	148.6	117.4		The child is getting enough vegetables this week from eating all his/her school meals.

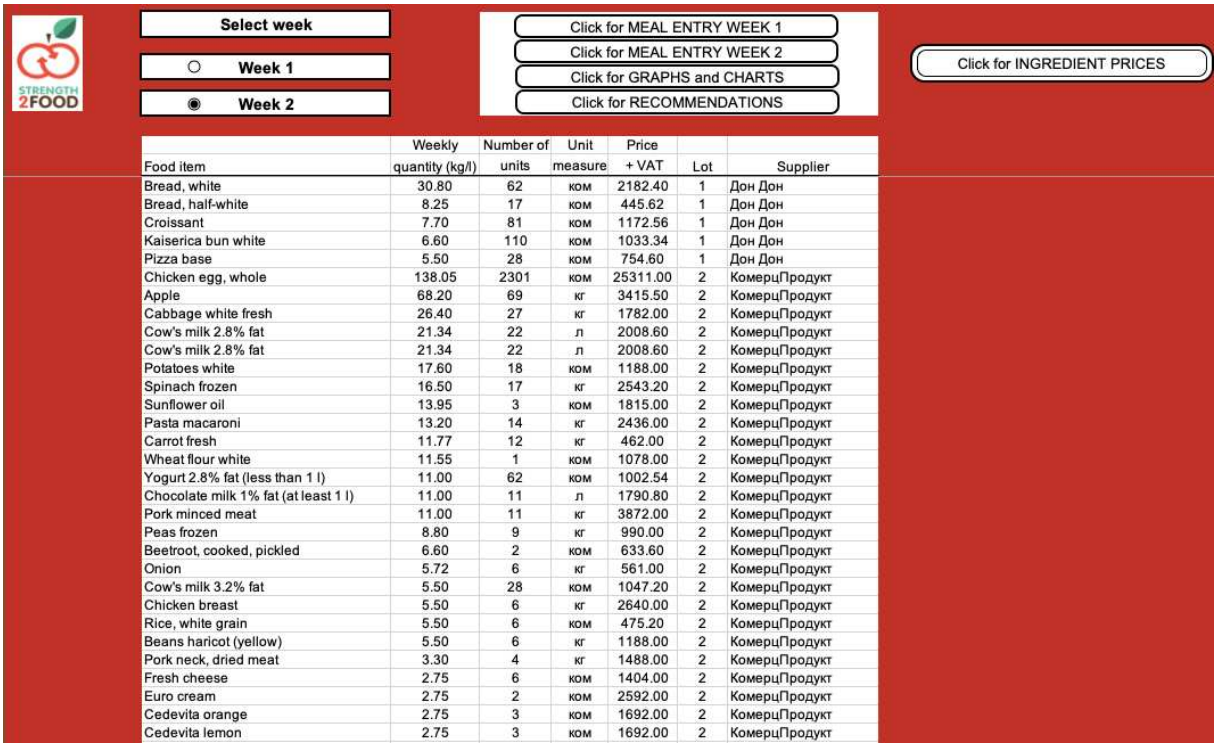
To the top

Breakfast: quantity per day (weekly average)	Weight served per day	Weight per day after allowing for plate waste	% recommended after allowing for plate waste	Recommendations for breakfasts
Quantity of the meal / day (g):	20.0			Overall, after subtracting plate waste, the menus for this week have INSUFFICIENT calories each day, they have INSUFFICIENT carbohydrates, INSUFFICIENT protein, INSUFFICIENT fat, but INSUFFICIENT fibre in meals.
Typical plate waste / day (g) and %	5.7	28.5%		
Total price of all ingredients / day (din)	1.3		Click for graphics	
Total price of plate waste/day (din) and	0.4	28.5%		If the daily intake of nutrients in school meals is less than the recommended amounts (red fields), foods rich in minerals and vitamins are shown belo
CO2-equivalent emissions / day (g)	9.6			
energy (kcal / meal)	6.0	17.16	2.9	After allowing for plate waste, the menus for this meal are lower than recommeded in energy (kcal) overall.
carbohydrate (g)	1.0	2.93	3.6	After allowing for plate waste, the menus for this meal are lower than recommeded in carbohydrates overall.
protein (g)	0.3	0.86	4.1	After allowing for plate waste, the menus for this meal are lower than recommeded in protein overall.
fat (g)	0.0	0.14	0.7	After allowing for plate waste, the menus for this meal are lower than recommeded in fat overall.
fibre (g)	0.6	1.79	29.8	Cocoa powder, unsweetened 24.0 g, Poppy seeds 20.5 g, Beans haricot (yellow) 18.4 g, Beans (white) 18.4 g, Beans (coloured) 18.4 g Lentils 18.0 g, Rye grain/flour 18.0 g, Chickpeas 17.4 g, Barle
fatty acids, total unsaturated (g)	0.0	0.07	1.1	
sodium (mg)	1.2	3.57	0.8	
potassium (mg)	80.0	228.80	42.4	Beans haricot (yellow) 1530.0 mg, Beans (white) 1530.0 mg, Beans (coloured) 1530.0 mg, Cocoa powder 1524.0 mg, Whole milk powder 1260.0 mg, Lentils 940.0 mg, Chickpeas 875.0 mg, Nesquik
calcium (mg)	10.5	30.03	12.7	Poppy seeds 1357.0 mg, Parmesan cheese 1190.0 mg, Cheese, processed, slices 1000.0 mg, Cheese, hard 45% fat 990.0 mg, Whole milk powder 947.6 mg, Cheese, Gouda, 48% fat 885.0 mg, Ch
magnesium (mg)	3.5	10.01	16.7	Cocoa powder 499.0 mg, Poppy seeds 395.0 mg, Almond (dry, roasted, salt free) 275.0 mg, Hard cheese 202.0 mg, Beans haricot (yellow) 184.0 mg, Beans (white) 184.0 mg, Beans (coloured) 184.0
phosphorus (mg)	10.0	28.60	15.4	Cheese, processed, slices 1200.0 mg, Poppy seeds 936.0 mg, Parmesan cheese 855.0 mg, Cheese spread triangles 35% fat 825.0 mg, Cheese spread 70% fat 750.0 mg, Cocoa powder 734.0 mg,
iron, total (mg)	0.1	0.29	8.7	Peppers red roasted 46.0 mg, Peppers pasteurized fillets 46.0 mg, Pork liver 29.0 mg, Cocoa powder 13.9 mg, Lentils 11.1 mg, Chicken pate 9.2 mg, Poppy seeds 8.8 mg, Cornflakes 7.9 mg, Chicker
zinc (mg)	0.0	0.14	6.8	Nesquik 7.6 mg, Bones of young beef (neck) 6.9 mg, Cocoa powder 6.8 mg, Poppy seeds 6.8 mg, Pork liver 5.3 mg, Beef minced 5.1 mg, Beef, dried 4.9 mg, Beef rump/silverside 4.8 mg, Beef, fat fre
copper (mg)	0.0	0.03	9.1	Pork liver 6.6 mg, Cocoa powder 3.8 mg, Hazelnuts 1.4 mg, Walnuts 1.380 mg, Almond (dry) 1.170 mg, Poppy seeds 1.0 mg, Lentils 1.0 mg, Chocolate for cooking 0.95 mg, Cheese, hard 35% fat 0.8
vitamin A (µg)	1.4	3.93	1.6	Margarine from milk 1650 µg, Liver pate (average) 990 µg, Carrot 852 µg, Kale 770 µg, Butter 708 µg, Spinach 608 µg, Swiss chard 588 µg, Melon 552 µg, Chicken egg yolks 540 µg, Chocolate spre
vitamin B1 (thiamine) (mg)	0.0	0.05	16.7	Pork liver 310 mg, Cornflakes 1.30 mg, Macaroni with egg 1.13 mg, Pork smoked ham 1.04 mg, Pasta fusilli 1.00 mg, Pork medium fat 0.97 mg, Pork shoulder 0.95 mg, Pork fillet 0.95 mg, Sausage pc
vitamin B2 (riboflavin) (mg)	0.0	0.04	11.3	Pork liver 3.20 mg, Whey powder 2.75 mg, Chicken liver 2.50 mg, Chicken pate 1.40 mg, Whole milk powder 1.38 mg, Cornflakes 1.00 mg, Liver pate (average) 0.80 mg, Almond (dry) 0.56 mg, Cheese
niacin equivalents (mg)	0.2	0.57	14.7	Pork liver 21.0 mg, Cornflakes 21.0 mg, Biscuit Petit beurre 18.0 mg, Plazma biscuit 18.0 mg, Chicken (whole) 17.7 mg, Chicken wings 17.7 mg, Chicken drumstick 17.7 mg, Peanuts, roasted 17.5 mg,
vitamin B6, total (mg)	0.0	0.03	10.7	Margarine from milk 3.7 mg, Cornflakes 2.1 mg, Biscuit Petit beurre 2.0 mg, Plazma biscuit 2.0 mg, Garlic 1.2 mg, Chicken breast 0.82 mg, Chicken liver 0.80 mg, Walnuts 0.70 mg, Corn flour 0.60 mg,
folate, total (µg)	7.5	21.38	28.5	Chickpeas 557 µg, Chicken liver 380 µg, Chicken pate 321 µg, Broccoli 239 µg, Macaroni with egg 230 µg, Beans haricot (yellow) 226 µg, Beans (white) 226 µg, Beans (coloured) 226 µg, Spinach 22
vitamin B12 (µg)	0.0	0.00	0.0	Pork liver 40.0 µg, Chicken liver 26.0 µg, Chicken pate 8.1 µg, Liver pate (average) 6.0 µg, Beef fatty 5.0 µg, Beef medium fat 5.0 µg, Beef minced 4.4 µg, Chicken egg yolks 3.8 µg, Catfish 2.2 µg, C
vitamin C (mg)	9.3	26.74	111.4	
vitamin D (µg)	0.0	0.00	0.0	Herring fillet in oil 25.0 µg, Mackerel, fillets in oil 25.0 µg, Carp 12.5 µg, Choco o clock 12.0 µg, Chocolate flakes 12.0 µg, Nesquik 11.0 µg, Margarine from milk 7.5 µg, Tuna in oil 5.9 µg, Tuna in brine

Figure 17. Spreadsheet 'Recommendations'

2.4.3.3 Quantities of food items

A further spreadsheet (Figure 18) lists each food used in the week's menus in decreasing rank quantity, with the supplier for each lot identified. For fresh foods (vegetables, fruit, meat, fish) quantities take account of food preparation waste (such as potato peelings). The cost of each food for the week is also given.



Food item	Weekly quantity (kg/l)	Number of units	Unit measure	Price + VAT	Lot	Supplier
Bread, white	30.80	62	ком	2182.40	1	Дон Дон
Bread, half-white	8.25	17	ком	445.62	1	Дон Дон
Croissant	7.70	81	ком	1172.56	1	Дон Дон
Kaiserica bun white	6.60	110	ком	1033.34	1	Дон Дон
Pizza base	5.50	28	ком	754.60	1	Дон Дон
Chicken egg, whole	138.05	2301	ком	25311.00	2	КомерцПродукт
Apple	68.20	69	кг	3415.50	2	КомерцПродукт
Cabbage white fresh	26.40	27	кг	1782.00	2	КомерцПродукт
Cow's milk 2.8% fat	21.34	22	л	2008.60	2	КомерцПродукт
Cow's milk 2.8% fat	21.34	22	л	2008.60	2	КомерцПродукт
Potatoes white	17.60	18	ком	1188.00	2	КомерцПродукт
Spinach frozen	16.50	17	кг	2543.20	2	КомерцПродукт
Sunflower oil	13.95	3	ком	1815.00	2	КомерцПродукт
Pasta macaroni	13.20	14	кг	2436.00	2	КомерцПродукт
Carrot fresh	11.77	12	кг	462.00	2	КомерцПродукт
Wheat flour white	11.55	1	ком	1078.00	2	КомерцПродукт
Yogurt 2.8% fat (less than 1 l)	11.00	62	ком	1002.54	2	КомерцПродукт
Chocolate milk 1% fat (at least 1 l)	11.00	11	л	1790.80	2	КомерцПродукт
Pork minced meat	11.00	11	кг	3872.00	2	КомерцПродукт
Peas frozen	8.80	9	кг	990.00	2	КомерцПродукт
Beetroot, cooked, pickled	6.60	2	ком	633.60	2	КомерцПродукт
Onion	5.72	6	кг	561.00	2	КомерцПродукт
Cow's milk 3.2% fat	5.50	28	ком	1047.20	2	КомерцПродукт
Chicken breast	5.50	6	кг	2640.00	2	КомерцПродукт
Rice, white grain	5.50	6	ком	475.20	2	КомерцПродукт
Beans haricot (yellow)	5.50	6	кг	1188.00	2	КомерцПродукт
Pork neck, dried meat	3.30	4	кг	1488.00	2	КомерцПродукт
Fresh cheese	2.75	6	ком	1404.00	2	КомерцПродукт
Euro cream	2.75	2	ком	2592.00	2	КомерцПродукт
Cedevita orange	2.75	3	ком	1692.00	2	КомерцПродукт
Cedevita lemon	2.75	3	ком	1692.00	2	КомерцПродукт

Figure 18. Spreadsheet 'Quantities of food items'

The 'Menu and Procurement Planning Tool', plus other relevant information (including a webinar demonstrating how to navigate the tool) can be found here:

https://www.strength2food.eu/2020/06/04/the-impacts-of-public-sector-food-procurement-strategies-and-tools-for-better-management/

2.4.4 Next steps

The meal and procurement planning tool and its application to the Serbian case demonstrates proof of concept. While other school meal planners exist, they typically focus on nutrition and cost elements, and do not consider food waste and carbon emissions. The tool thus has the potential to be a more comprehensive management aid than those already available to procurement managers. It could also be used by managing authorities for public procurement either as part of the bidding process, so that MEAT (Most Economically Advantageous Tender) Criteria are incorporated into the tendering process for school meal contracts, or after award to evaluate the outcomes of school meal contracts. While designed with the Serbian case in mind, and fitting with the pilot actions in Tasks 9.1 and 9.5, the tool can be adapted for use elsewhere and project partners are promoting its wider uptake.

3. TOOLS WEBPAGE

To improve access and dissemination of the tools, a 'resources' tab has been created on the Strength2Food website (Figure 19). This provides links to the four tools discussed in this deliverable along with links to the ethnographic fieldwork gallery (Task 8.2) and the educational resources developed as part of WP10:

https://www.strength2food.eu/resources/

Figure 19. Screenshot of the resources page of the Strength2Food website

4. CONCLUSIONS

The aim of this Deliverable is to present the tools developed for practitioners and policy makers, which are freely available via the Strength2Food website. The tools developed meet the aims of Task 10.4, specifically providing:

a) a platform for indicators used in the Strength2Food project. These include social, economic, environmental, and nutritional information.

b) a standard data collection tool for public and other procurements to systematically gather, process, and manage the data for PSFP across Europe.

c) acting as an integral part of the public procurement process with specific reference to MEAT, by being able to assess and score the competing tenders with reference to the sustainability impacts.

Before making a specific analysis of how the above objectives have been met it is worth reflecting for a moment on how these aims sit against firstly the broader objectives of the Strength2Food project and those of the H2020 programme and public procurement directives and constraints.

The H2020 programme seeks to carry out innovative research to inform public policy, strategy and implementation, in this case in the area food production, procurement and sustainability. This particular deliverable breaks out of the research conducted and demonstrates how the project can not only help to inform policy but also evaluate it. This chimes with the broader desire of H2020 to seek partnership between the academic world and that of business, and delivery.

Table 2 below sets out in short form how the various outputs (tools and resources webpage) meet the objectives of the deliverable:

Table 2. Outputs against objectives

Objective/Tool	Meal Analyser	LM3	Sustainability indicators	Menu and procurement planning tool	Strength2Food website
a. Act as a Platform	✖	✖			✖
b. Data collection and analysis tool	✖	✖	✖	✖	
c. Part of procurement process	✖	✖		✖	

As demonstrated in Table 2, each of above objectives are met either wholly or in part by one of more of the outputs from the system.

Output A is met in part by all of the various outputs. All the tools are either a platform or hosted on a platform and this is drawn together by the resources page in the Strength2Food website which acts a single point of access.

Output B is met by all tools, all of which already possess data capture capabilities. However, it should be stressed that because some tools are at proof of concept stage (meal analyser and menu and procurement planning tool) there are limitations to the data management aspects. This is particularly true of the meal analyser tool in its current form, which has great potential for informing public procurement decisions, acting on all three objectives of the deliverable, but needs to be developed beyond proof of concept to realise this potential.

Output C is perhaps in some ways more obvious in that all of these tools capture the indicators and by their nature are measuring outcomes from different forms of behaviour. For example, if in a procurement process, Tender A uses landfill as waste disposal and Tender B uses a digester. Tender B will score more highly in an assessment. However, while this is not the place to go into the intricacies of public procurement processes, for this to be used as qualifying and scored

criteria within an OJEU process, then a number of additional tests would need to be met. For example, is it transparent and auditable?

All the tools are completely transparent in their methodologies and all of them are ‘blind’ in terms of outcome. LM3 has been used in a public procurement process and is now widely recommended by procurement frameworks in the UK as a way to measure socio-economic impact. Strengtth2Food partners are promoting uptake of the tool and exploring pathways and mechanisms for continuing development of the work into practice beyond the lifetime of the project.

The Strength2Food project in a nutshell

Strength2Food is a five-year, €6.9 million project to improve the effectiveness of EU food quality schemes (FQS), public sector food procurement (PSFP) and to stimulate Short Food Supply Chains (SFSC) through research, innovation and demonstration activities. The 30-partner consortium representing 11 EU and four non-EU countries combines academic, communication, SMEs and stakeholder organisations to ensure a multi-actor approach. It will undertake case study-based quantitative research to measure economic, environmental and social impacts of FQS, PSFP and SFSC. The impact of PSFP policies on nutrition in school meals will also be assessed. Primary research will be complemented by econometric analysis of existing datasets to determine impacts of FQS and SFSC participation on farm performance, as well as understand price transmission and trade patterns. Consumer knowledge, confidence in, valuation and use of FQS labels and products will be assessed via survey, ethnographic and virtual supermarket-based research. Lessons from the research will be applied and verified in 6 pilot initiatives which bring together academic and non-academic partners. Impact will be maximised through a knowledge exchange platform, hybrid forums, educational resources and a Massive Open Online Course.

www.strength2food.eu