Technical Report

An introduction to the Single-Use Plastics Assessment Framework

This report introduces the single-use plastics assessment frameworks and explains the workings of the model

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Our mission is to accelerate the move to a sustainable resource-efficient economy through re-inventing how we design, produce and sell products; re-thinking how we use and consume products; and re-defining what is possible through re-use and recycling.

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Executive summary

This report introduces the single-use plastic assessment framework used to assess the impacts of Northern Ireland's proposed policies to reduce the consumption of certain single-use plastic items, in line with the NI Executive Commitment to create a plan to eliminate plastic pollution. As well as providing an overview of the construction of the model. The model was created by Red Scientific.

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Glossary

GHG – Green House Gas

NI – Northern Ireland
SU Non-P – Single-Use Non-Plastic
SUP – Single-Use Plastic
AQA – Analytical quality assurance
EU – European Union
NI – Northern Ireland
MU – Multi-use
SNE - small and medium-sized enterprises

1.0 Introduction

This document introduces the Single-Use Plastics Assessment Framework. As such, this document describes how the SUP Assessment Framework is structured, the roles of its major components, the inputs that it requires and the outputs that it generates.

2.0 Background

Waste & Resources Action Programme (WRAP) commissioned RED Scientific Limited and Eunomia to build a model to help Northern Ireland's Department of Agriculture, Environment and Rural Affairs (DAERA) to compare different policies for dealing with single-use plastics. At the time, DAERA planned to use this model in support of its January 2020 New Decade, New Approach agreement. RED Scientific would develop the toolset needed to assess vying policies while Eunomia would advise on the data needed to parameterise different policies and the behaviour of consumers, retailers and manufacturers in response to any new initiatives. DAERA would then use the findings from the model to inform its planned consultation exercise with stakeholders across Northern Ireland (NI).

3.0 Overview

Figure 1 shows the design chosen by RED Scientific for development of the SUP Assessment Framework. It is a three-level layered structure. At the bottom level are a set of demand models whose role is to forecast the demand for (SUP, single-use non-plastic and multi-use) containers in a series of scenarios, with each scenario representing a policy or initiative of interest to DAERA. The output from each model is a year-by-year prediction for the number of containers that will be issued, used or discarded (as waste/recyclate) over the course of the investigation period.

The middle layer of the framework consists of a series of matching scenario models; "*matching*" in the sense that each of the bottom layer's demand models drives a separate scenario model in the middle layer[1]. Each scenario model combines the associated demand profile with a range of user-specified performance parameters in order to generate estimates for volumes of containers classified in terms of:

- The type of material(s) used in their construction;
- The extent to which they fall within the scope of the policy of interest;
- How consumers dispose of the containers after consuming their contents; and
- Where those containers eventually end up in the environment.

Each scenario model generates forecasts for numbers of containers (commonly referred to as "*volumes*"), associated costs and benefits.

The top layer features a single options analysis tool. This tool brings together and compares the results from all scenarios, typically comparing the effects of each DAERA scenario to a common counterfactual or "*baseline*" scenario.

The overall role of the assessment framework is to present the user with sufficient comparative information to make an informed and reasoned judgment about the best.

[1] *At the time of compiling this document, the demand models at the bottom level of the assessment framework were all housed within a single Excel workbook and the development team were still considering their replacement by separate and different representations of multi-use containers.*

The remainder of this document considers each of the layers within the SUP assessment framework in turn.

4.0 Bottom layer demand models

Each demand model generates estimates for the number of containers, of different types, that are expected within the scenario of interest. Each demand model considers three types of container:

- Single-use plastic (SUP) containers;
- Single-use non-plastic (SU Non-P) containers; and
- Multi-use (MU) containers.

The user must supply the demand model with a year-by-year forecast of the numbers of servings that will be sold in these containers over the entire duration of interest. They must also provide data describing such factors as the split of servings between the different types of data, the ways in which multi-use containers are used, are forgotten, decay or are discarded. Data sets collected in the bottom layer are passed up to the assessment tools in the middle layer of the SUP assessment framework.

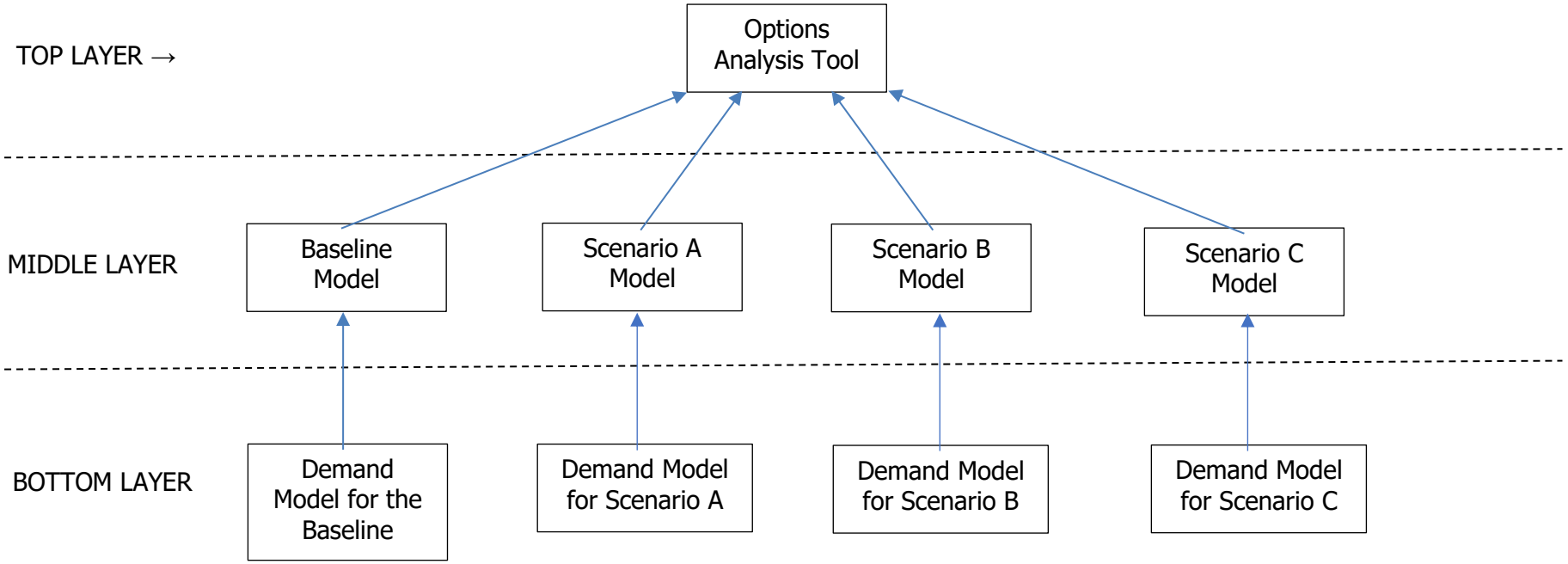
5.0 Middle layer assessment models

Each assessment model starts with the demand and multi-use container figures supplied by their partner in the bottom layer of the assessment framework. Then more user-specified is collected describing financial and performance parameters. The middle layer assessment models output a worksheet, showing financial details and performance parameters derived after combining demand figures with user-specified financial and performance parameters for the chosen policy.

6.0 Top layer analysis tool

The top layer consists of a single options analysis tool. This provides the user with a report that compares the results from a specified scenario with the (counterfactual) baseline.

Figure 1: **Layered Structure of the Single-Use Plastics Assessment Framework**



Annex A

Each demand model focuses on a single scenario. It expects the user to provide predictions for the number of servings to be dealt with each year using the types of containers under investigation. For example, in the case of a scenario focused on beverage cups, the demand model expects the user to predict the aggregate number of cupfuls that consumers will purchase from retailers each year. The demand model also expects the user to specify data items describing such factors as:

- The split of servings or sales between different types of container;
- The variation in the population of the geographical region under consideration;
- The effects of the policy itself on demand for servings; and
- Details of multi-use container usage, including the average usage lifetime, the average number of uses, the physical lifetime of an MU container and the chances of the container's owner "forgetting" about it each year.

The demand model will typically take a slightly different form in alternative scenarios. However, irrespective of the precise scenario details, the output will be the same:

- A year-by-year breakdown of the demand for servings by container type;
- The number of new multi-use containers issued in sales each year;
- The number of multi-use containers in circulation and use each year;
- The number of MU containers forgotten (but not throw away) each year; and
- The number of MU containers discarded as waste each year

Annex B

Each scenario model expects to be provided with the outputs from its associated (bottom layer) demand model. It also expects the user to specify a raft of parameters describing:

- Whether different types of container fall within the scope of the policy under investigation;
- The size of organisation that sells the containers to consumers, i.e. large or small and medium-sized enterprises (SMEs);
- The numbers of containers of different types at various stages of their lifecycles;
- The physical attributes of different types of container, e.g. their volume and weight;
- The arrangements for collecting containers; and
- The final destinations of containers, e.g. as landfill or as (land) litter.

The scenario model uses these data to trace the movement of containers from retailers through to their final resting places over the duration of the time period under investigation, distinguishing between different types of container and keeping track of whether they fall within scope of the policy under review.

At this point, the scenario model uses a second set of parameters specified by the user; this time focusing on the financial and ecological aspects of dealing with them, for example:

- Unit costs for producing containers;
- Unit costs for transporting containers from manufacturers to retailers;
- Unit costs for supplying containers to retailers;

- Levies on certain types of container at the point of sale;
- Container prices paid by consumers;
- Greenhouse gas (GHG) emissions estimates for containers sent to landfill;
- Disamenity costs et cetera.

The scenario model combines the results from its volumetric calculations (i.e. container numbers) with data such as those listed above in order to estimate a number of metrics from the following perspectives:

- Northern Ireland Government and local authorities;
- Retailers;
- Manufacturers;
- Consumers; and
- Waste Industry.