**Instructions for Using P-Graph Model and run the case study found in the manuscript “Designing Cost-Effective Supply Chains for Plastics at the End-of-Life.”**

**Step 1: Collect Information (For new models)**

* **Sources (S1 to SN):** Identify various starting points where waste plastics are generated.
* **Transport to Collection Points (T\_S1\_CP1, T\_S2\_CP1, etc.):** Determine transportation links from sources to collection points.
* **Collection Points (CP1 to CP\_C):** Designate intermediate stations where plastics are gathered before being transported to treatment facilities.
* **Transport to Treatment Facilities:** Define transportation routes from collection points to treatment facilities.
* **Treatment Facilities (F1 to FK):** Specify facilities for specific types of plastic waste processing, recycling, or disposal.
* **Products (P\_J\_F\_1, P\_J\_FK):** Identify recycled products emerging from each treatment facility.

**Step 2: Prepare Units and Operations (For new models)**

* Prepare units, operations, and distances in an Excel file.
* Fill in matrix distances with suitable distances and the number of collection points.

**Step 3: Adding operations (For running the existing model)**

* Calculate CAPEX and OPEX costs (fixed and operational) for transportation using the provided formulas. (**Refer-Tab Transport**)
* Revise the approach for other operations at recycling facilities (**Refer-Tab Recycling facility**), landfills (**Refer-Tab Landfill**), sorting (**Refer-Tab Sorting**), baling (**Refer-Tab Baling**), granulating (**Refer-Tab Granulating**), and shredding (**Refer-Tab Shredding**).

**Step 4: Use P-Graph Software**

* Download the software P-graph studio from the official website : <http://p-graph.org/downloads.html> and follow the installation instructions.
* Open the P-graph software (to check existing model from a previous .pgsx file; open the file “File\_plastics\_2901\_JP.pgsx” for this work) or create a new file if you want to run another model.
* IMPORTANT: By default, the software opens the last session created regardless of the method use it to open. Therefore, if an already existing file is to be examined, please open the P-graph Studio software first, and then load the file by opening the corresponding .pgsx file using the options File > Open.
* In case a new model is to be created, create the structure desired in the drawing zone by connecting the suitable nodes.
* Insert values from the Excel file for each operation, ensuring accuracy in CAPEX and OPEX costs.

**Step 5: Verify Units and Values**

* Recheck all units and values, particularly CAPEX and OPEX costs.
* Select the algorithm ABB. Define the number of solutions to be generated in the box “solutions limit”.
* Generate the solutions by clicking in “solve problem”.

**Step 6: Extract Solutions**

* Information concerning the solutions can be verified on the left top corner of the P-Graph Studio by selecting each solution.
* Once a solution is selected the structure in the drawing zone is modified to show the structure of the solution; showing the included and excluded units and materials, as well as their concomitant material nodes.
* The structure related to each solution can be exported to distinct formats such as .png, .jpeg, or .svg for saving and printing using the option File> Export.
* Choose the Excel file to extract solutions for further analysis. This option allows to extract the data of the problem, any solution, or a summary of all solutions, for analysis as a spreadsheet.

**Step 7: Perform Cost Assessments**

* Make cost assessments from the generated structures and related costs.
* Conduct comparative analysis between structures and values to confirm cost-optimized routes.