



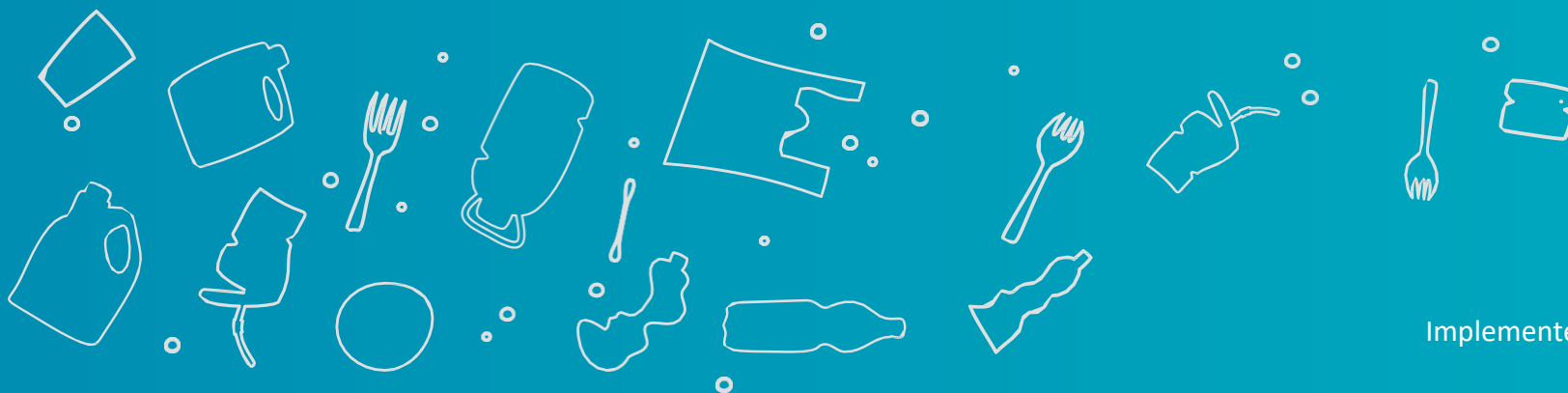
NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION



T5

Modelling Regional Hotspots

September
2020



Implemented with



NATIONAL GUIDANCE FOR PLASTIC POLLUTION HOTSPOTTING AND SHAPING ACTION

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Authorship



Alexandre Bouchet – EA
Paola Paruta – EA
Guillaume Billard – EA
Julien Boucher – EA

Quantis

Laura Peano – Quantis

HOW TO READ THIS DOCUMENT



MODULE

Modules are the instruction for the tools. Each module is composed of one or several tools. Technical modules focus on generating hotspot information by the technical team. Strategic modules focus on generating interventions and instruments by involving a wider group of stakeholders.



TECHNICAL MODULE



STRATEGIC MODULE



TOOL REFERENCE

Tools are the building blocks of the guidance. Tools are of three categories: input tools (for data collection), assessment tools (to generate the hotspots, interventions and instruments) and output tools (to provide summarised information and shareable data repository).



INPUT TOOL



ASSESSMENT TOOL



OUTPUT TOOL

White background

WORKFLOW SLIDE

Describes key stages and main actions to run the module and associated tools.

Grey background

SUPPORTING INFORMATION

Provides supporting information, references of background data.

Blue background

DEFINITIONS AND DESCRIPTIONS

Provides key definitions and high level objectives of the modules and tools.



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OBJECTIVES OF THE MODULE

The main objective of this module is to identify the areas which are likely to present a risk of plastic leaking into the marine environment. To do so, it uses plastic waste management data as well as environmental data from numerous sources.

METHODS AND DATA SOURCES

This module relies on GIS resources. The mapping software (QGIS) is free, and presents high quality open source tutorials and data to help the user navigate through it. It requires a limited amount of mapping software knowledge.

The following criteria are accounted for in the model.

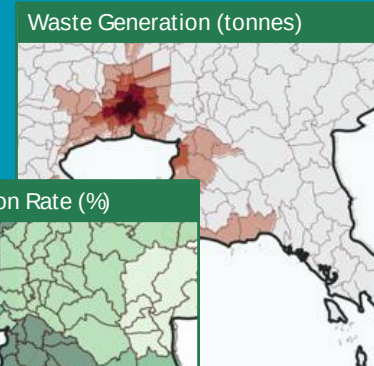
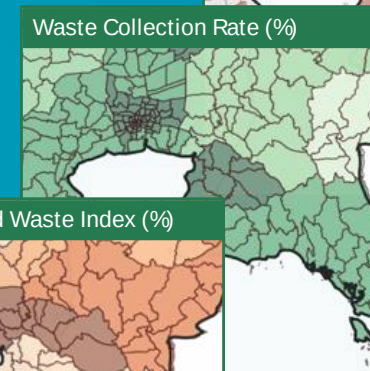
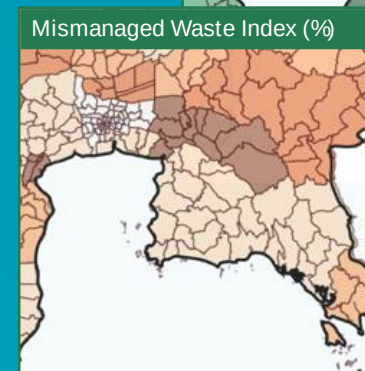
- Waste management rate
- Waste collection rate
- MWI (mismanagement waste index)
- Distance to shore (ocean and main rivers)
- Catchment run-off of watersheds

Depending on the level of information available, data can be included in the model at different granularity

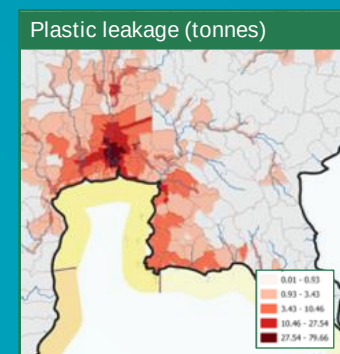
IMPORTANT DISCLAIMER

This methodology relies on some qualitative assumptions. Therefore, a level of sound ground-truthing is advised in order to validate the outputs of the method.

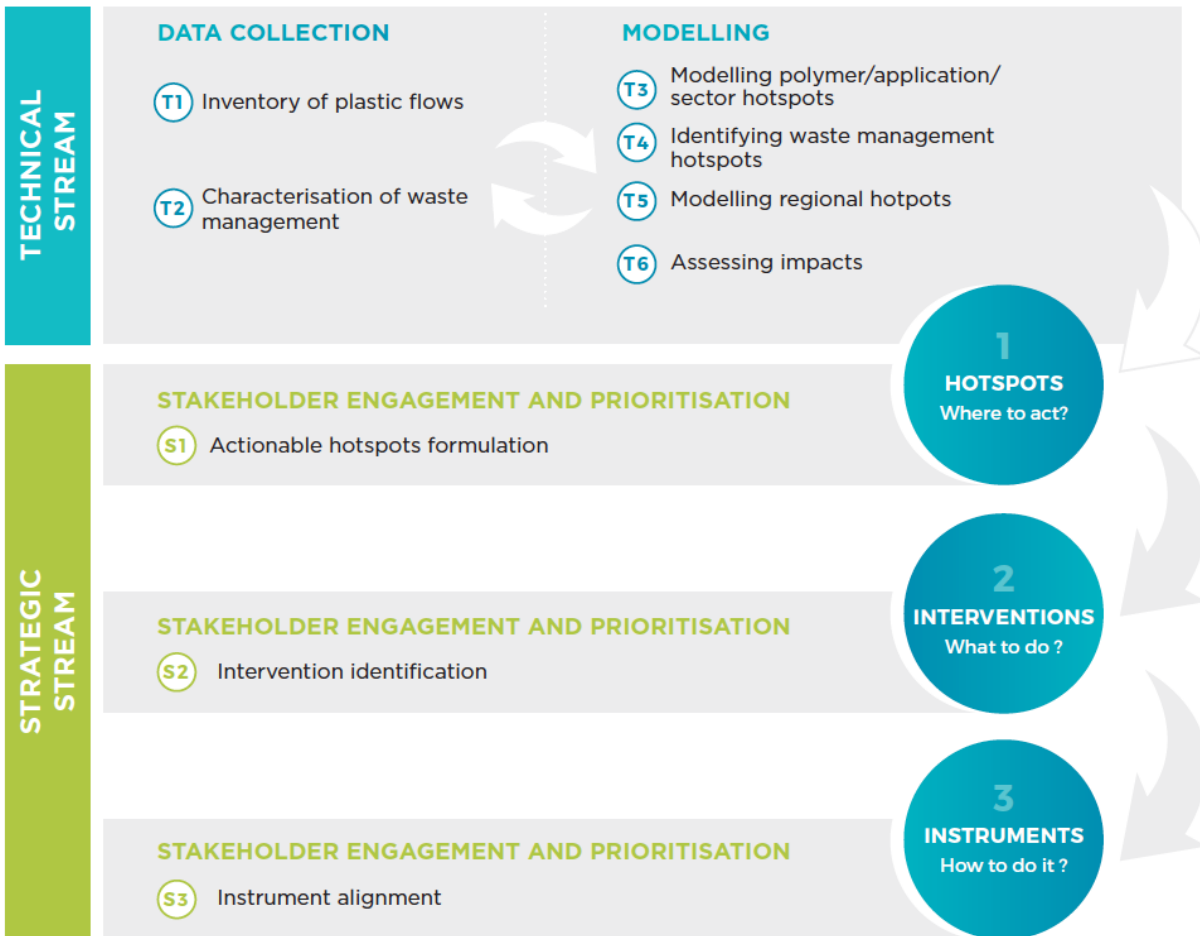
1) Overlaying different information available at city / district / sub-district level and/of modelled through archetypes...



2) ... and using geographic, hydrographic and demographic information...



3) ... allows to compute a leakage map and identify regional hotspots



RELATIONSHIP OF MODULE T5 WITH OTHER MODULES

Module T5 is a modelling tool of the technical work stream. It guides the user to the generation of geographical waste management maps. Ultimately, the module leads to the creation of the leakage map and the identification of geographical hotspots.

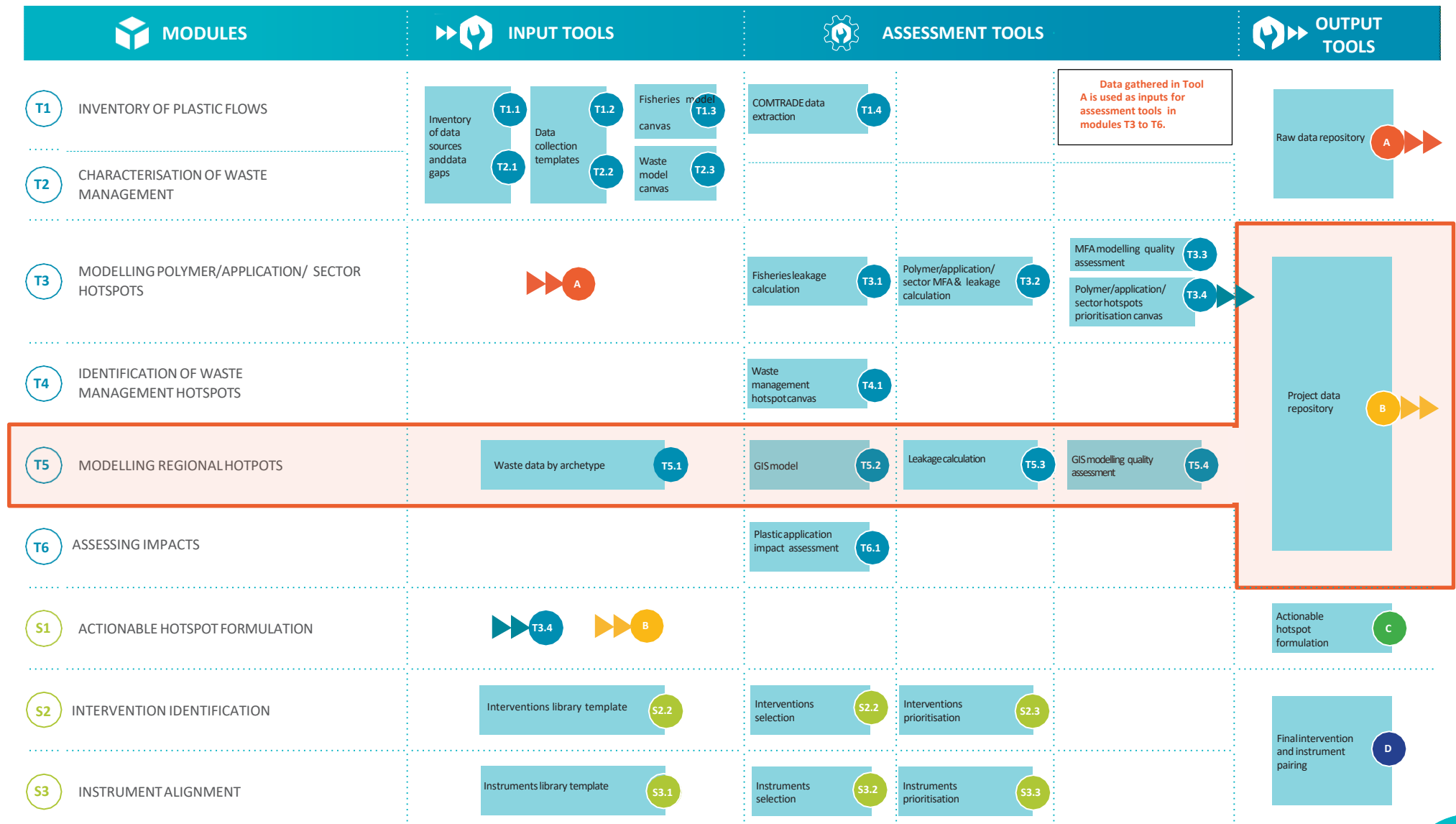
Module T5 take input from both module T2, tool A, and from module T3, tool T3.2. It also provides tool T3.2 with total amount of plastic properly managed and improperly managed in the country. Finally, waste management data, both existing and modelled, are gathered in the output tool B.

In addition to Microsoft Excel, the module requires the knowledge of the geographical software QGIS and Python programming language.



T5

TOOLS ASSOCIATED WITH MODULE T5



T5.1

[illegible]

Allows to calculate the total plastic leakage from fisheries including direct gear loss at sea, overboard littering by fishermen and mismanaged gears on land.

T5.2



Allows to generate a map of hydrological, geographical and demographic data in the region of interest.

T5.3


```

[150]: MR_avg = df_ML["leakout"].sum()/sum(df_ML["unleaked"])

print("The average release rate of the country is {:.2f}%".format(MR_avg*100))

315520.876856958
The average release rate of the country is 8.3%

[151]: #Group Share of collected and share of uncollected by name 2
df_ML["collected"] = df_ML["generated"]*np.isnan(df_ML["VALUE"]+df_ML["Share of collected"])/2000
df_ML["Missungner"] = df_ML["generated"]*np.isnan(df_ML["VALUE"]+df_ML["Share of Missungner"])/2000

df_shares = df_ML["NAME_1"] = "VALUE", "generator", "collected", "Missungner", "leakout"].groupby("NAME_1").sum()

df_shares["Share of Collector"] = df_shares["collected"]/df_shares["generator"]
df_shares["Share of Missungner"] = df_shares["Missungner"]/df_shares["generator"]

#to remove the zero value
df_shares = df_shares[!:]

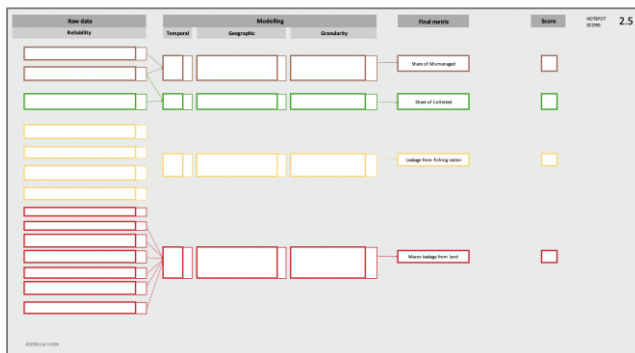
[152]:
```

	NAME_1	VALUE	Generated	Collected	Missungner	Leaked	Share of Collector	Share of Missungner
	An Giang	2.225334e+06	145789.847262	33568.992724	137610.547078	16719.441748	0.230256	0.943897
	Bà Rịa - Vũng Tàu	1.014544e+06	86788.900000	60884.866244	42269.293995	4033.022721	0.685839	0.475840
	Bình Dương	2.360281e+06	284825.693131	150561.103961	134284.587370	14960.050128	0.285838	0.471462
	Bình Phước	1.124948e+06	78238.974262	5667.580710	76437.654909	8435.694549	0.071672	0.976077
	Bình Thuận	1.266028e+06	46483.570743	44846.467237	62168.030134	6691.274710	0.527829	0.802866
	Bà Rịa - Vũng Tàu	1.009359e+06	920670.984676	978171.995098	13399.879505	1378.485727	0.855373	0.144377
	Bà Rịa - Vũng Tàu	1.009359e+06	30102.714120	3047.781936	34462.726098	3766.984205	0.193676	0.366661
	Bà Rịa - Vũng Tàu	1.205970e+06	39155.264005	39995.450405	96139.224550	10247.165699	0.386675	0.498443
	Bến Hải	3.173144e+06	208015.423493	58055.297098	149960.138487	16393.479961	0.279091	0.720909

Python script that combines geographical and demographic data from tool T5.2 and plastic waste management data from tool T5.1 to determine country leakage.

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T5.4



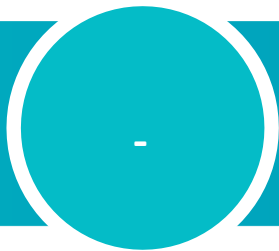
It offers a framework to keep track of sources of data and modelling assumptions, in order to assess the quality of the results of module T5.

B

[illegible]

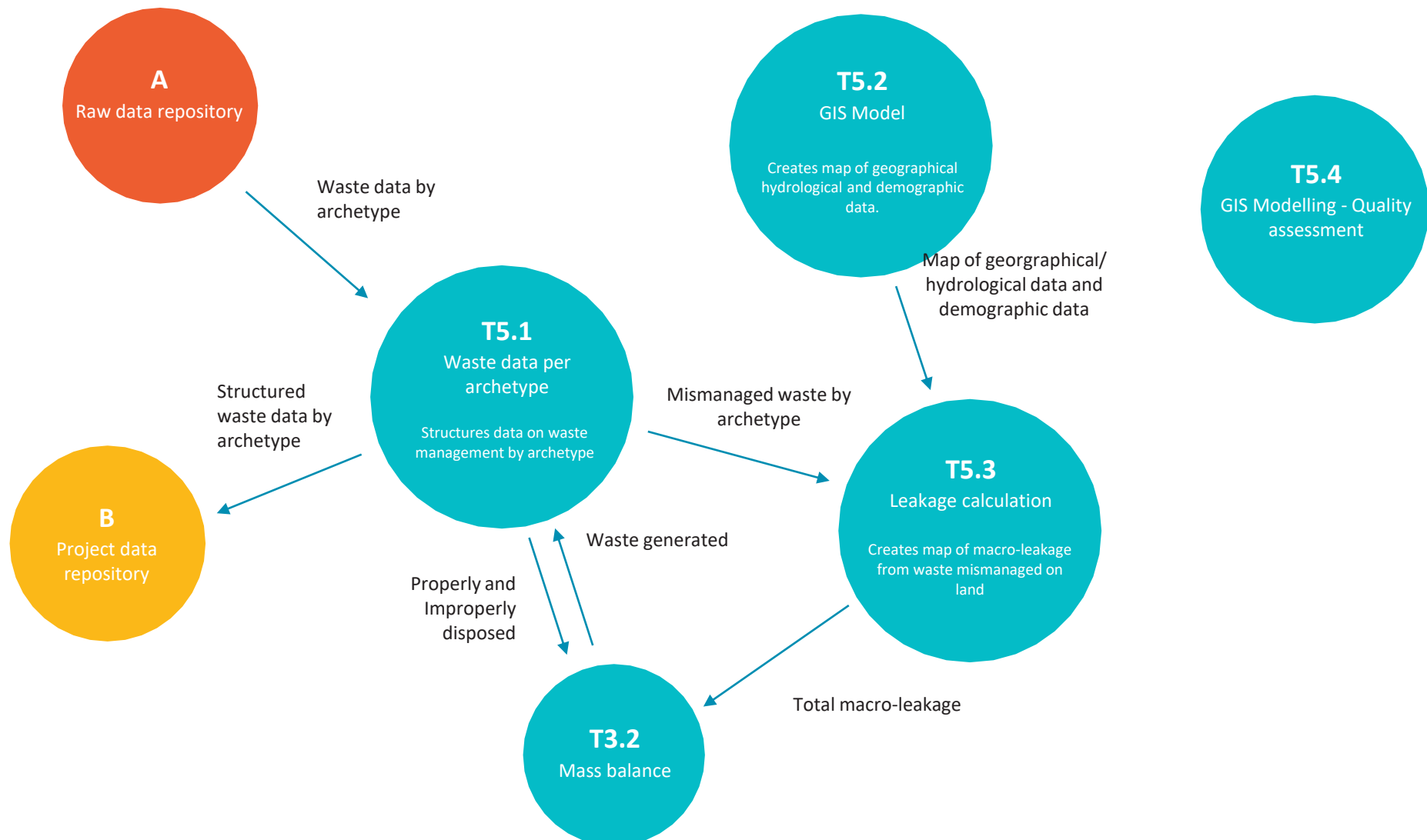
Complements the project data repository (tool B) with waste management data by archetype.

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Modelling process overview

MODELLING IN THIS MODULE – Visual overview



MODELLING IN THIS MODULE – Descriptive overview

Here we describe the chart of the previous slide. In order to better understand how module T5 functions, and in particular its inputs and outputs, we illustrate the interactions between tools in module T5 and other tools outside of module T5.

The main source of input for module T5 is tool A, which consists in a raw data repository of waste management data, organised by geographical archetype. **Tool T5.1** gathers these archetype specific data as well as the total plastic waste generated in the country, in order to recover a **coherent picture of plastic waste management** in the study region, across archetype. The outcomes of this tool go to complement project data repository (tool B). Other two tools benefit from outputs of T5.1: tool T3.2 uses the total amount of properly and improperly disposed plastic waste, while tool T5.3 needs the mismanaged waste quantity by archetype in order to compute the country leakage.

Tool T5.2 consists in a **QGIS** (Geographic Information System software) model that allows the user to create a map with **population** density data as well as **geographical and hydrological data per km²**. These data are then extracted passed onto tool T5.3 (in the form of a .csv file).

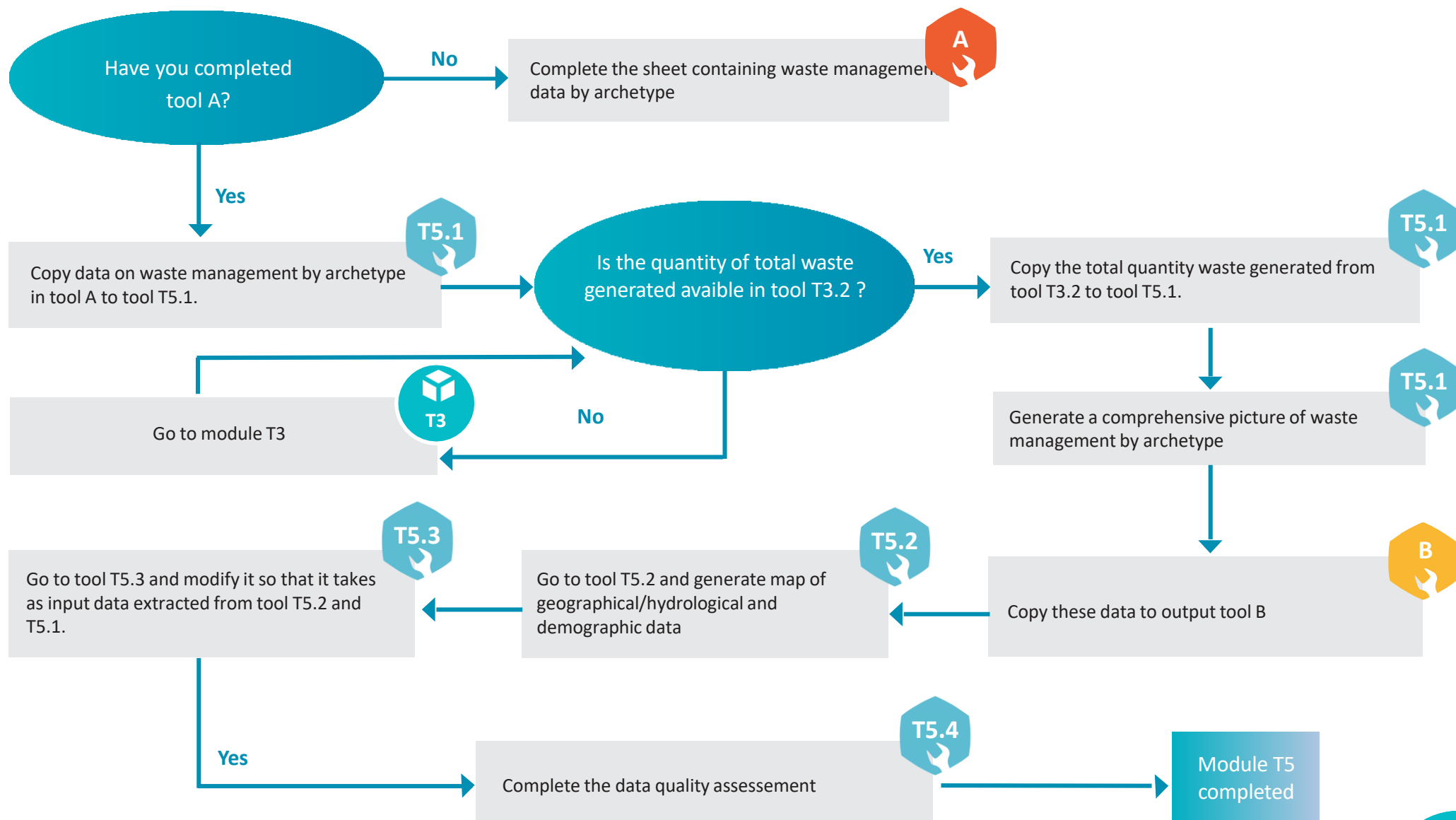
Tool T5.3 is a Python script that reads input from both tool T5.1 and tool T5.2 in order to compute a **map of the macro-leakage** from waste mismanagement. This allows to identify regional hotspots. The total macro-leakage is also used by tool T3.2 to create an overview of leakage by polymer, application and sector.

Tool T5.4 is the quality assessment tool and it is can be filled in parallel with the other tool of module T5, to keep track of data sources and modelling assumptions.



T5

HOW TO USE THIS MODULE?



TOOL

T5.1

Waste data by archetype



HOW TO USE THIS TOOL ?

a. Start with going to tool A and copy the content of “T2_Waste_Input_for_T5.1” sheet to sheet “ToolA_WasteMngmt_ByArchetype” in tool T5.1. The sheet contains all of the waste management data by archetype found in literature or from interview with stakeholders. The data should include information of waste collection quantities (or share), and indication of portion of waste going to sanitary landfill or unsanitary landfill/dumpsite



Waste data by archetype				
Gather waste management data by archetype Examples of regional classification by archetype are: Rural / Urban, Regions, Provinces, Coastal / Rural / Remote / Mega city etc Depending on the country different type of data can be available Collect here all available data on: - Waste generation by archetype - Share of collection by archetype - Sanitary landfill capacity by archetype - Share of plastic in the Waste stream				
Example from South Africa "National guidance for plastic pollution hotspotting and shaping action", IUCN, 2020 Archetype: Provinces				
Waste generation rates (kg/cap/day) in provinces by income level Final choice				
Province	waste generation low income	waste generation middle income	waste generation high income	
Limpopo	0.32	0.4	0.7	
Mpumalanga	0.37	0.78	1.52	
Gauteng	0.38	0.66	0.99	
North West	0.37	0.78	1.52	
Free State	0.41	0.74	1.29	
KwaZulu-Natal	0.37	0.78	1.52	
Northern Cape	0.41	0.74	1.29	
Eastern Cape	0.37	0.78	1.52	
Western Cape	0.41	0.74	1.29	
Raw data				
Province	Municipality	waste generation low income	waste generation middle income	waste generation high income Source
South Africa		0.41	0.74	1.29 South African Department of Environmental Affairs and Tourism (DEAT). South Africa environment outlook. A report on the state of the environment. Pretoria: DEAT; 2006.
South Africa		0.2	0.7	1.5 North West Provincial Government Department of Agriculture, Conservation and Environment. Provincial integrated waste management plan (PIWMP) status quo report. Rustenburg: North West Department of Agriculture, Conservation and Environment; 2009.
Limpopo		0.32	0.4	0.7 Ogoja, Chimukal, Tshivhase. Management of municipal solid wastes: A case study in Limpopo Province, South Africa. In: Kumar S, editor. Integrated Waste Management. Volume I. IntechOpen; 2011. https://doi.org/10.5772/intechopen.100000
Gauteng		0.38	0.66	0.99 Gauteng Department of Agriculture and Rural Development. General waste minimisation plan for Gauteng. Johannesburg: Gauteng Department of Agriculture and Rural Development; 2009.
Eastern Cape	Buffalo City	0.37	0.78	1.52 Buffalo city municipality (Eastern Cape) WM flagship report 2018 (SA_r10)
North West	JB Marks	0.37	0.78	1.52 JB Marks Local municipality (North West) WM flagship report 2018 (SA_r11)
Eastern Cape	King Sabata Dalindyebo	0.37	0.78	1.52 SA_r12_King Sabata Dalindyebo municipality (Eastern Cape) WM flagship report 2018
Limpopo	Mogilim	0.37	0.78	1.52 SA_r13_Mogilim (Limpopo) WM flagship report 2018
KwaZulu-Natal	Newcastle	0.37	0.78	1.52 SA_r14_Newcastle Municipality (KwaZulu Natal) WM flagship report 2018
Mpumalanga	Steve Tshwete	0.37	0.78	1.52 SA_r15_Steve Tshwete LM (Mpumalanga) WM flagship report 2018
Share of plastic in landfill MSW				

Sheet “T2_Waste_Input_for_T5.1”

HOW TO USE THIS TOOL ?

b. Go to tool T3.2 "T3-T5_Data_Exchange" sheet and copy total waste and waste collected for recycling quantities to tool T5.1 sheet "T3.2_Tot_WasteGeneration".

T3.2

Waste management

GIS and Waste management data - WARNING every country has different sources

1) Input to T5

Use data below (generated by this TOOL) on total waste generation and recycling as an input to TOOL T5.1

Waste	Collected for recycling
4727	258

2) Go to Module T5 and complete it

3) Copy here Output from T5

From Module T5.1 gather data on properly and improperly disposed waste in country (all plastics). From Module T.3 gather data on total macro-plastic leakage from land

Waste management type	Locally produced + Imported not recycled	Locally produced	Share	
Collected	1682	1682		
Properly managed	1155	1155		69% From T5.1
Improperly managed	527	527		31% from T5.1
Leaked	521	521		Leaked - taken from T5.3

Focus	Import of waste	Net input	Stock	Waste generated	Recycled of imported	Recycled	Export of	Properly managed
Polymer		872	6718	1991	4727	872	61	196.7
Sector		6720	1991	4729		61	196.7	1155

Error: 0
CHECK: OK

Sheet: T3-T5_Data_Exchange

T5.1

	Total waste generated t	Total waste collected for recycling t
From tool T3.2		

Sheet: T3.2_Tot_WasteGeneration

[illegible]

Sheet: Recap_for_T5.3

HOW TO USE THIS TOOL ?

d. Go to sheet “WasteMngmt_Data_for_toolB”. Here the information at step **c** are slightly rearranged to then be added to the project data repository in tool B.

T5.1

[illegible]



HOW TO USE THIS TOOL ?

e. In sheet “Properly_&_Improperly_for_T3.2” the amount of waste properly and improperly disposed has been automatically generated by the tool. Copy the values to tool T3.2 “T3-T5_Data_Exchange” sheet.

Total plastic properly managed t	Total plastic improperly managed t

T5.1

T3.2

Waste management

GIS and Waste management data - WARNING every country has different sources

1) Input to T5

Use data below (generated by this TOOL) on total waste generation and recycling as an input to TOOL T5.1

Waste	Collected for recycling
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Leaked	521	521	Leaked - taken from T5.3

Focus

Import of waste

Net input

Stock

Waste generated

Recycled of imported

Recycled

Export of

Properly managed

Improperly managed

Polymer	872	6718	1991	4727	872	61	196.7	1155
Sector		6720	1991	4729		61	196.7	1155

Error

CHECK

0

OK



TOOL

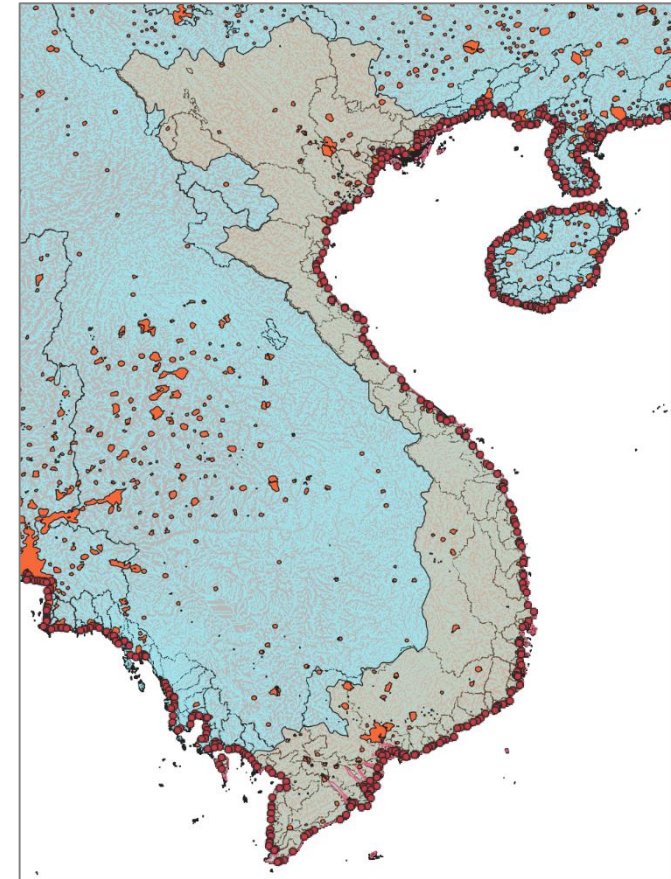
T5.2

GIS model

HOW TO USE THIS TOOL ?

a. Open QGIS software. Load the following files from online sources:

- Country: <https://www.diva-gis.org/gdata>
- Population: <https://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-count-rev11>
- Watersheds: <https://www.hydrosheds.org/>
- Runoff: <https://www.nature.com/articles/ncomms15611>
- Rivers: <https://www.hydrosheds.org/page/hydrorivers>
- Administrative boundaries: <https://www.diva-gis.org/gdata>
- Urban extent: <https://www.naturalearthdata.com/downloads/10m-cultural-vectors/10m-urban-area/>
- Coastline:
generate the country coastline on QGIS starting from country polygons

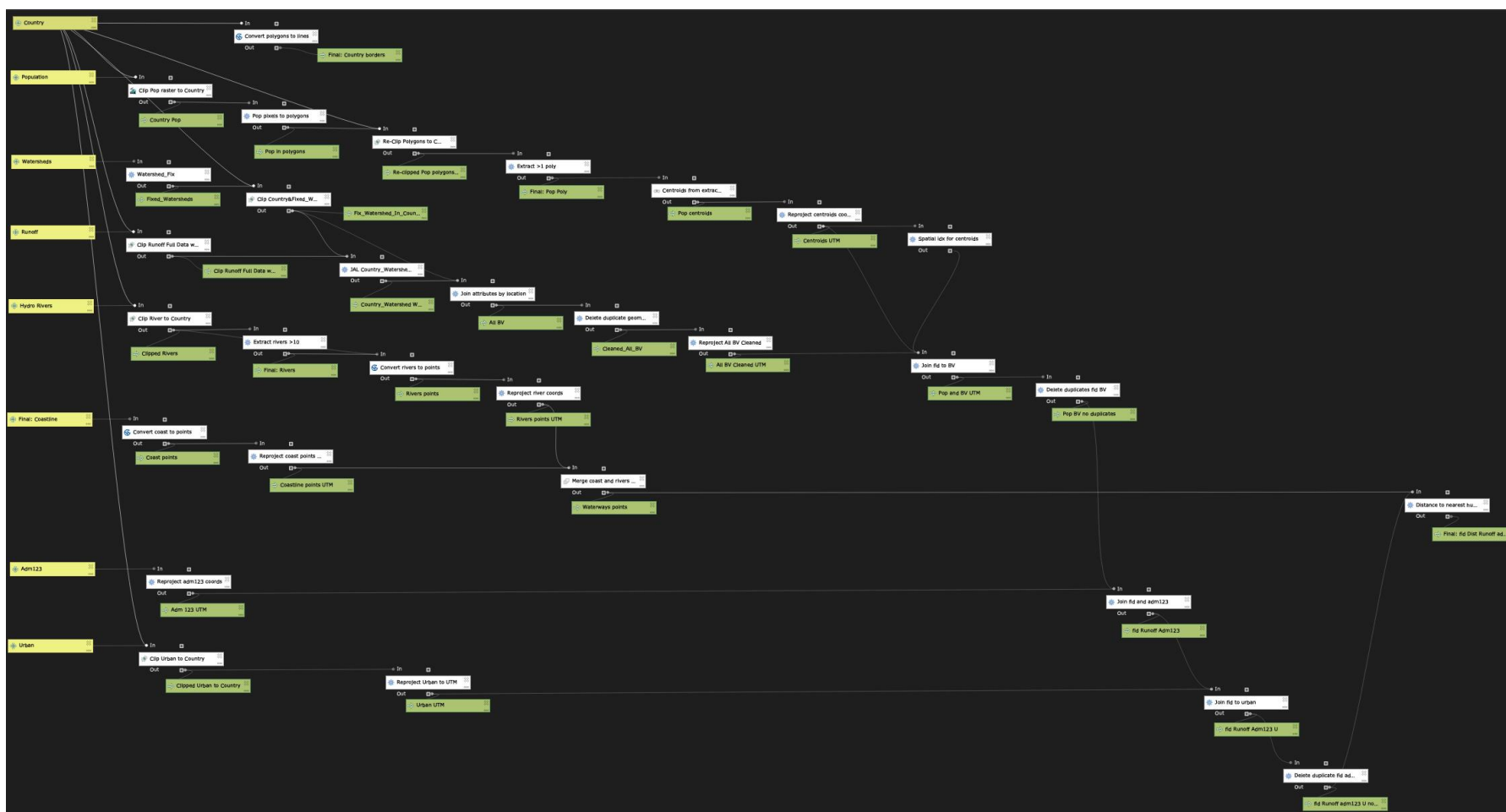


Example of output on QGIS when loading all files
(case of Vietnam)



HOW TO USE THIS TOOL ?

b. In QGIS open the graphical modeler and load tool T5.2.

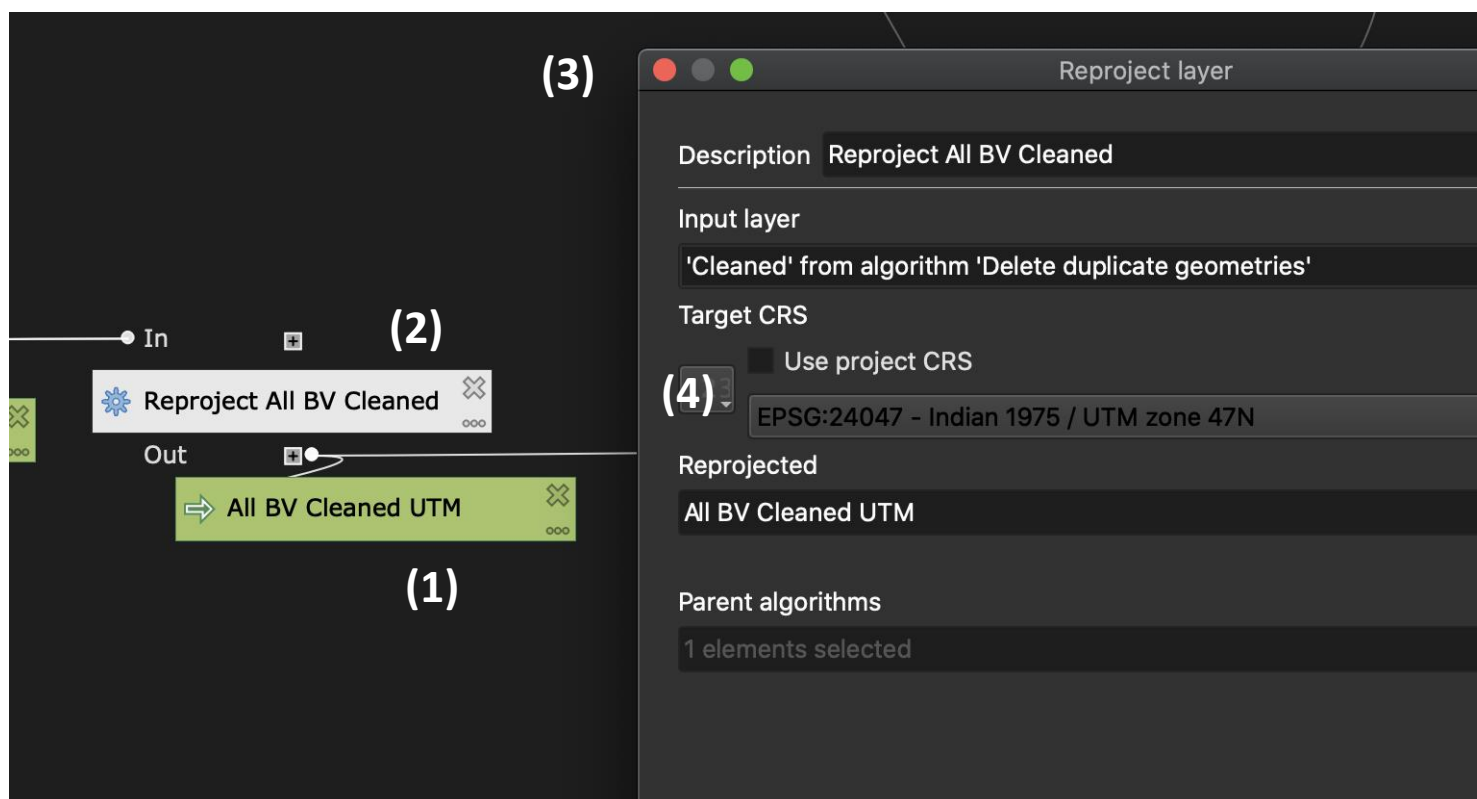


Visualisation of tool T5.2 in QGIS graphical modeler



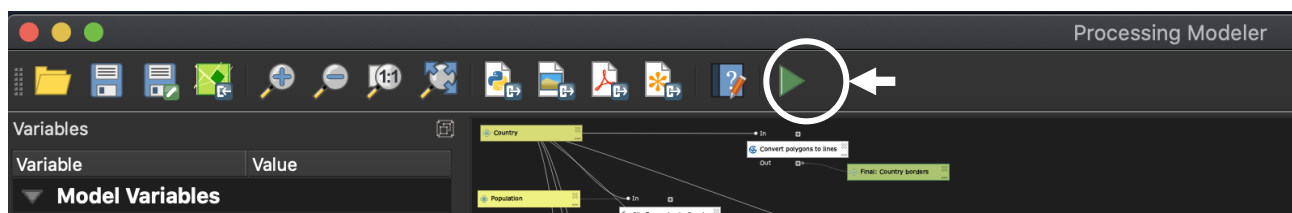
HOW TO USE THIS TOOL ?

- c. Look within the graphical modeler for all green boxes (output) that have UTM included in their name **(1)**, click on the white box above **(2)** and in the drop down menu that appears **(3)** select the “Target CRS” to match that of the region of interest **(4)**

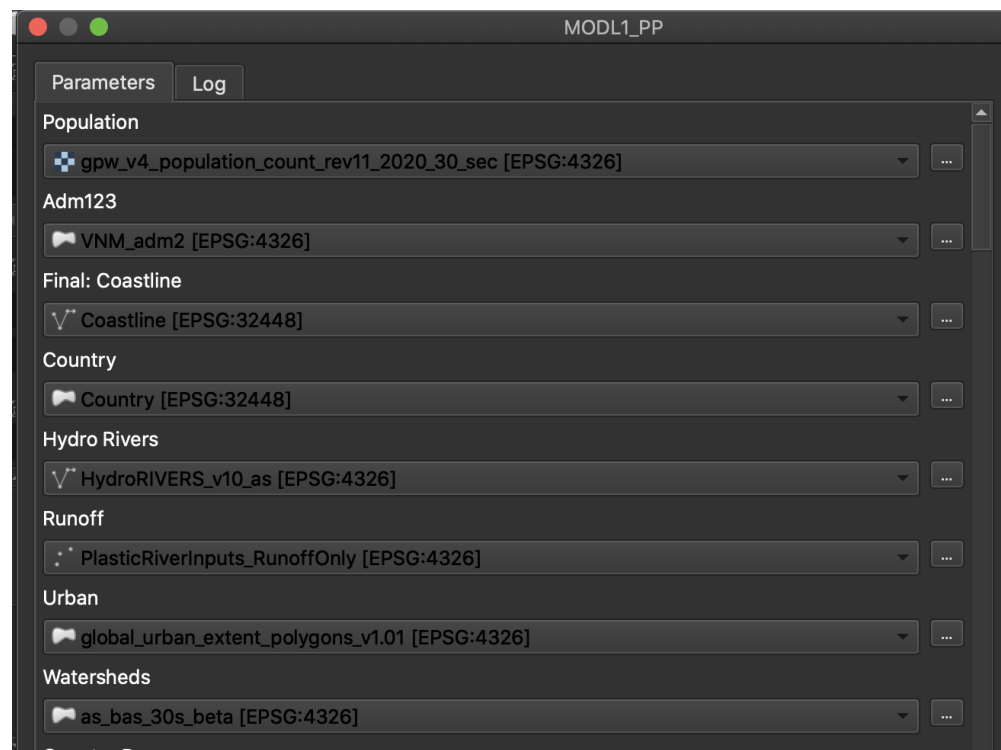


HOW TO USE THIS TOOL ?

d. Press run model in the processing modeler.



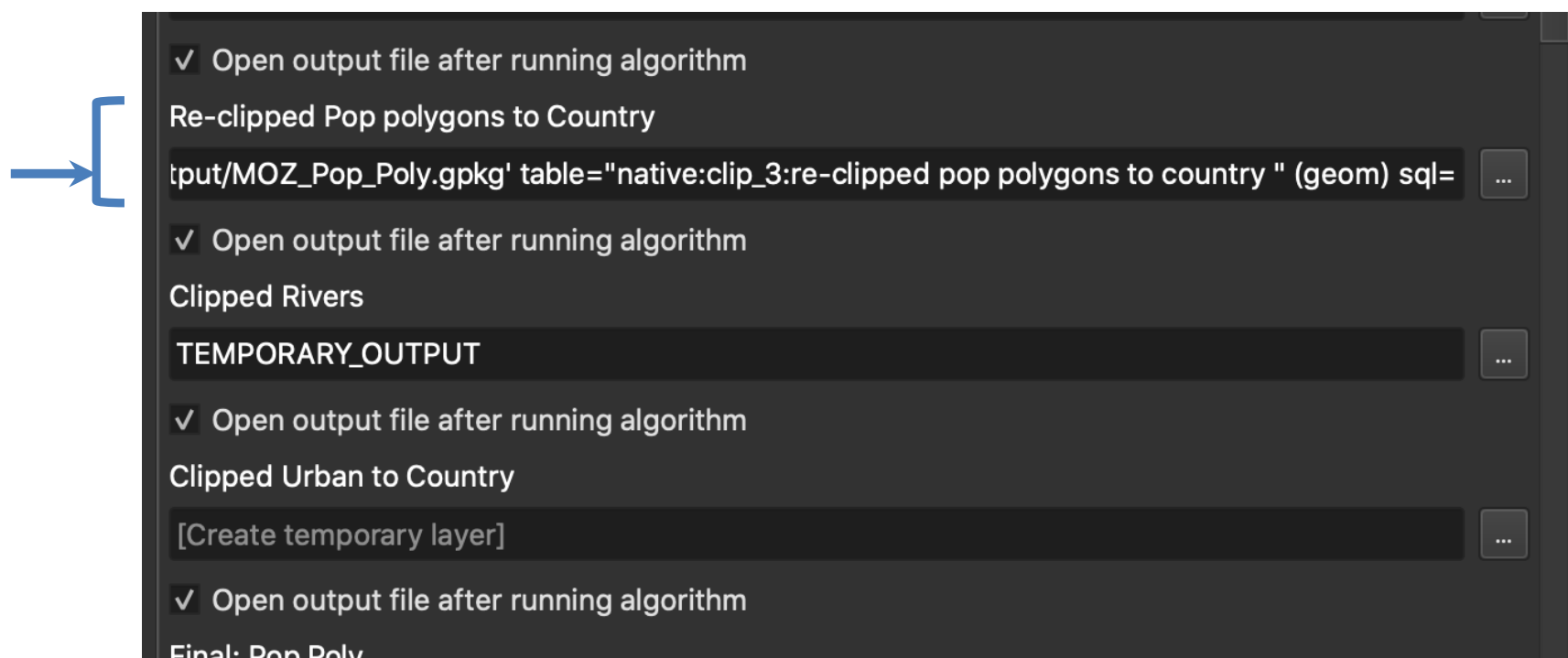
e. A drop down menu opens. Associate every parameters with the correct layer, downloaded at step a.





HOW TO USE THIS TOOL ?

f. Scroll down the drop-down menu to find the entry “Re-clipped Pop polygons to Country”. This file needs to be saved in geo-package extension. This is an important step because it creates a unique number associated to each km² of area covered by the study so that when the geographical, hydrological and demographic information will be exported in a csv file and then edited by tool T5.3 it will be possible to re-import them in QGIS.



g. Go to the bottom of the drop-down menu and run the model



HOW TO USE THIS TOOL ?

h Several layers are generated by the model. Save the file named “Final: fid Dist Runoff adm123 U” as a .shp but also as a .csv file. This is the file containing all the information on geographical, hydrological and demographic data by km², which is needed by tool T5.3 in order to compute the leakage. Some of the data included are: population density, surface water runoff, distance to nearest waterway.

	Identifier for the km ²	Population density	Administrative regions			Distance to closest waterways	Surface water Runoff	
	fid	VALUE	NAME_1	NAME_2	NAME_3	HubDist	Runoff	Urban
0	6275	249.242126	Hà Giang	Hà Giang	Minh Khai	0.724497	1.349736	U
1	5784	249.211609	Hà Giang	Hà Giang	Quang Trung	0.314610	1.349736	U
2	6025	249.226898	Hà Giang	Hà Giang	Trần Phú	0.314619	1.349736	U
3	6026	249.226852	Hà Giang	Hà Giang	Trần Phú	1.094035	1.349736	U
4	5785	249.211639	Hà Giang	Hà Giang	Trần Phú	0.681844	1.349736	U
...	...	...	...	...	...	...	...	...
400596	171029	480.875183	Nghệ An	Quỳnh Lưu	An Hòa	2.875018	2.174542	0
400597	170845	480.850861	Nghệ An	Quỳnh Lưu	An Hòa	3.644328	2.174542	0
400598	171208	480.899323	Nghệ An	Quỳnh Lưu	Quỳnh Thuận	2.150133	2.174542	0
400599	171377	602.551514	Nghệ An	Quỳnh Lưu	Quỳnh Thọ	2.186453	2.174542	0
400600	171204	480.899384	Nghệ An	Quỳnh Lưu	Quỳnh Thọ	2.198677	2.174542	0

“Final: fid Dist Runoff adm123 U” once loaded in Python



TOOL

T5.3

Leakage calculation



HOW TO USE THIS TOOL ?

a. Open the Python script (preferably with Jupyter Notebook). In the first part of the script assign the correct file name and path names to the variables. See comments in script for explanation.

```
import pandas as pd
import numpy as np
pd.options.mode.chained_assignment = None

#Give direction on where to find your waste managemnet informations by archetype
#This table should contain well predefined column such as Archetype, Population, Generated kt/year etc

#waste_folder =
#waste_file =
#waste_sheet =

#Give direction on where to find the file with demographic,
# geographical and hydrological data per km2 information

#DR_folder =
#DR_file =

#Pop_file =

#Decide on which Admin level is your archetype (normally NAME_1 or NAME_2)
#arc_level =

#Decide your 2 output file names
#fid_out =
#dis_out =

#Import waste data by archetype
df_waste = pd.read_excel(waste_folder+waste_file,sheet_name = waste_sheet)

#Import runoff and distance by fid
df_DR = pd.read_csv(DR_folder + DR_file)
```



HOW TO USE THIS TOOL ?

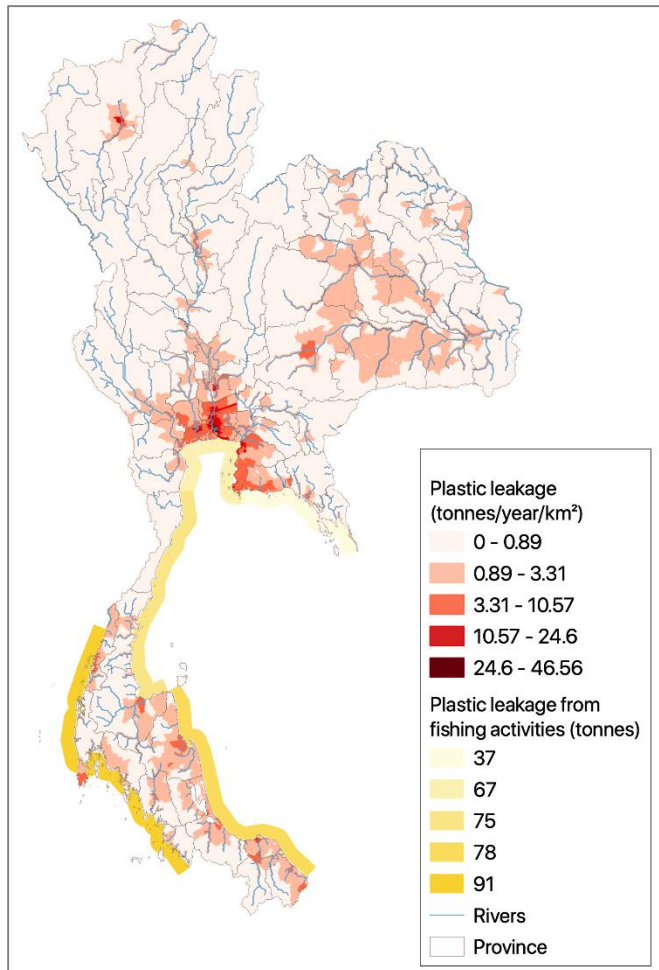
b. Run the code. The code will generate two main output tables, one contained in “fid_out” and the other in “dis_out” (as assigned at step a). “fid_out” contains information on waste management and leakage quantity by km², while “dis_out” contains waste management and leakage quantity by archetype.

Example of “dis_out” table containing waste management and leakage by archetype

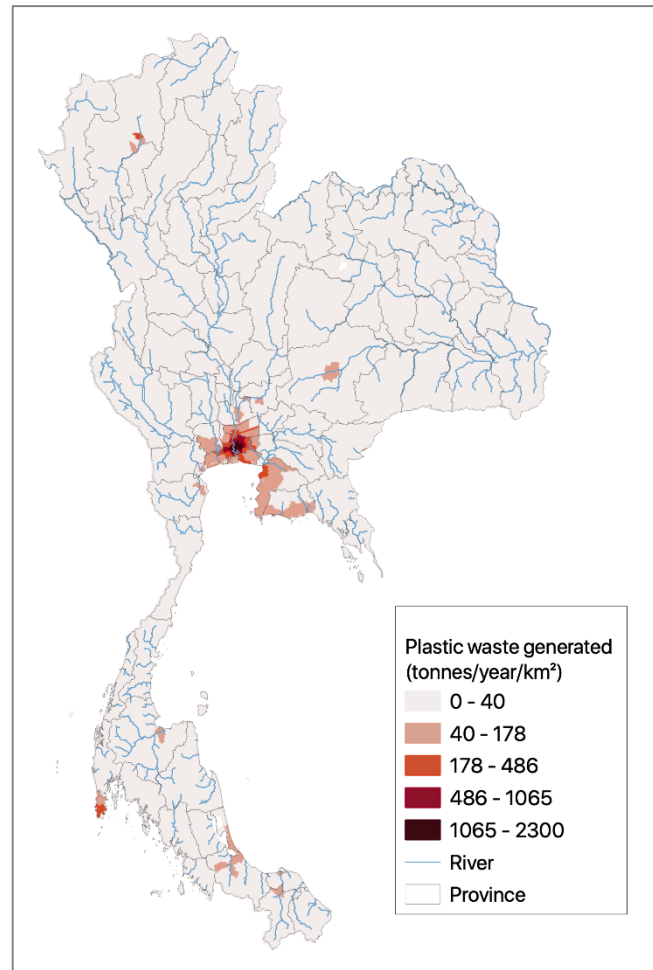
NAME_1	Population	Generated	Collected	Mismanaged	Leaked	Share of Collected	Share of Mismanaged
An Giang	2.225334e+06	145789.842742	33568.992724	137610.540708	16719.441787	0.230256	0.943897
Bà Rịa - Vũng Tàu	1.016454e+06	88788.915008	60894.866874	42249.291695	4335.007271	0.685839	0.475840
Bình Dương	3.260681e+06	284825.691331	150541.103961	134284.587370	14960.501028	0.528538	0.471462
Bình Phước	1.194238e+06	78238.974282	5607.566170	76437.654909	8435.695459	0.071672	0.976977
Bình Thuận	1.296882e+06	84963.570743	44846.267227	68216.036134	6691.274170	0.527829	0.802886
...	...	...	...	...	...	...	...
Đà Nẵng	1.059935e+06	92587.019460	79187.139555	13399.879905	1379.843727	0.855273	0.144727
Đắk Nông	7.495874e+05	36012.714120	6974.781396	34462.762698	3746.958205	0.193676	0.956961
Đắk Lắk	2.109870e+06	101365.284605	39195.450406	96139.224550	10247.169689	0.386675	0.948443
Đồng Nai	3.175144e+06	208015.432493	58055.297086	149960.135407	16393.479961	0.279091	0.720909
Đồng Tháp	1.753691e+06	114890.771964	24053.346669	106511.044135	10528.975943	0.209358	0.927064

HOW TO USE THIS TOOL ?

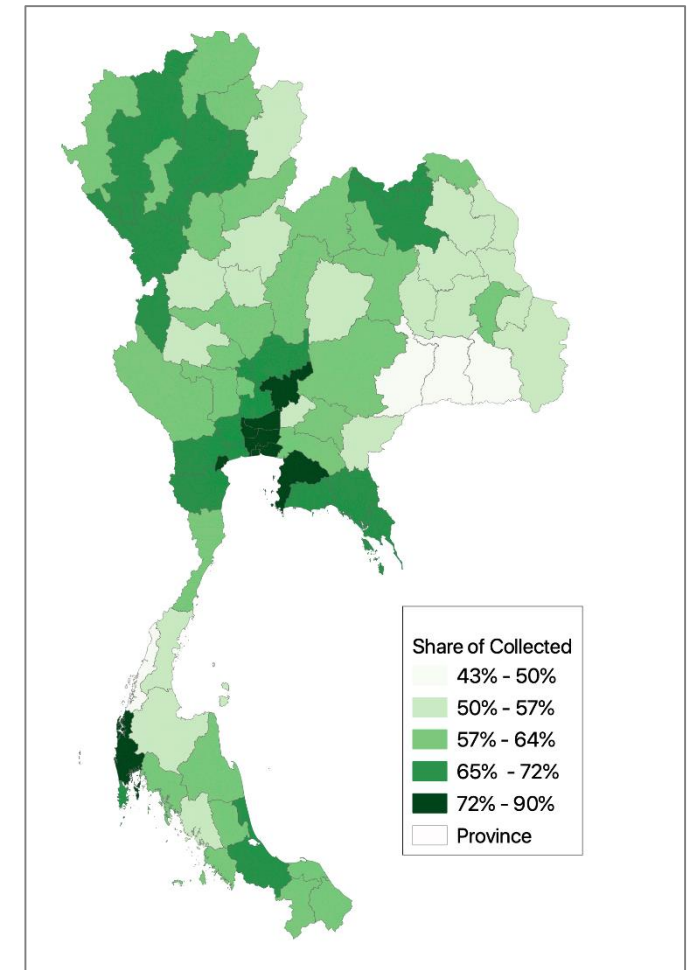
c. Import the csv table in the QGIS project (generated in T5.2) and produce leakage map of the country. The user can also create maps of waste collection patterns and waste generation by km² or by archetype.



Leakage



Waste generated



Waste collected



TOOL

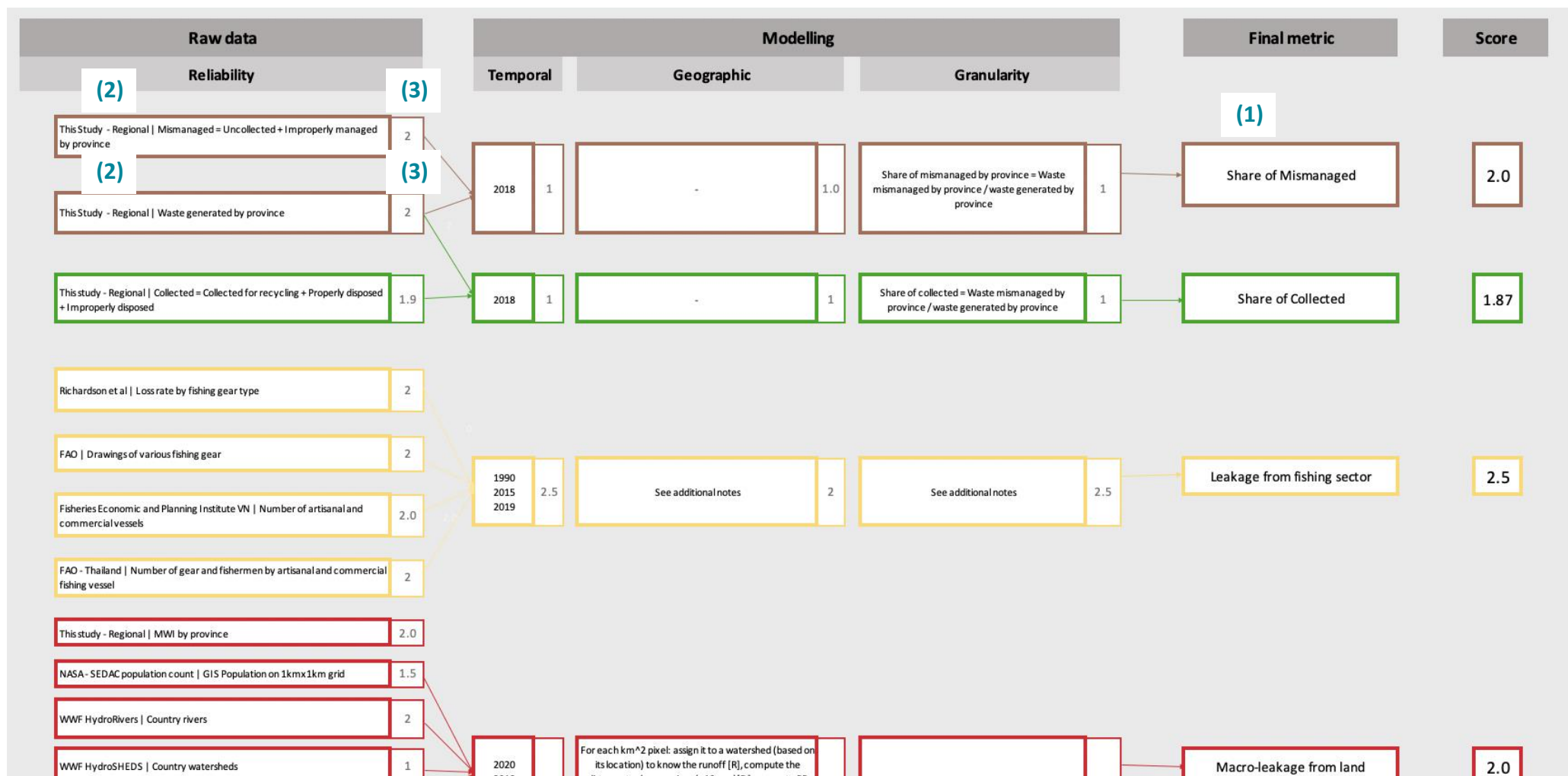
T5.4

GIS modelling quality assessment



HOW TO USE THIS TOOL ?

In the Raw data section, for each final metric **(1)**, mention the main sources of raw data **(2)** and attribute a reliability score to it **(3)** based on the pedigree matrix prepared for the project (see slide at the end of this section).





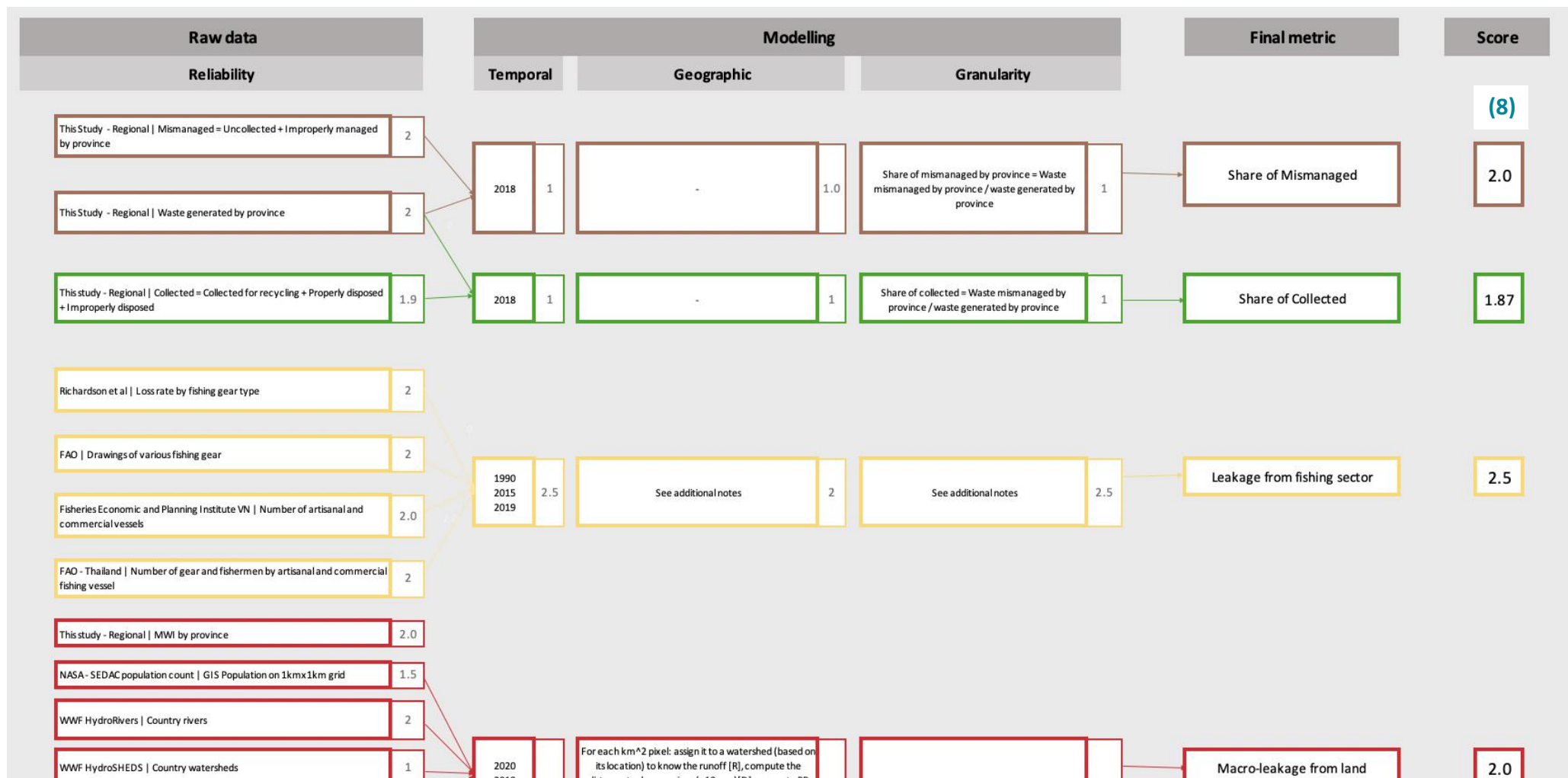
In the modelling section, note the main temporal (4), geographic (5) and granularity (6) modelling assumptions and attribute their respective scores (7) based on the pedigree matrix prepared for the project (see slide at the end of this section).





HOW TO USE THIS TOOL ?

In the score column, compute the score **(8)** for each final metric as the maximum score between the Raw data, Temporal modelling, Geographical modelling and Granularity modelling scores. If there is more than one Raw data, take the average of all the Raw data scores as a overall Raw data score for each metric.





HOW TO USE THIS TOOL ?

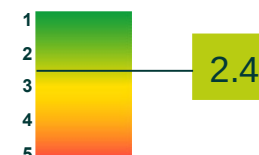
Inputs

Raw data		Modelling				Final metric	Score		
Reliability		Temporal	Geographic	Granularity					
This Study - Sector Total plastic waste generated	2	2018	1	Per capita waste generated = the total plastic waste generated/population. Waste generated by province = population by province * per capita waste generated. Waste generated by km2 = population per km2 * per capita waste generated	2	-	1	Waste generated	2
NASA - SEDAC population count GIS Population on 1km2 grid	1.5								
GA Circular Plastic collected for recycling by the informal sector	2	2018	1	We assume plastic is collected for recycling only in Mega and Medium provinces. The total plastic collected for recycling is distributed between the provinces based on the provinces waste generation	2	-	1	Collected for recycling	2
GA Circular Grouping of provinces by archetype Mega, Medium, Rural, Remote	1								
WB General waste treated in landfills (by province) + share of landfills that is sanitary	1	2018	1	See additional notes	2	See additional notes	2	Properly disposed	2
GA Circular Per capita generation of general waste	2								
This Study - Sector Per capita generation of plastic waste	2								
WB Share of waste collected that is incinerated, recycled and composted at country level	2							Improperly disposed	2
This study - Regional Waste - Collected for recycling - Properly disposed - Improperly disposed (by province)	2.0	2018	1	-	1	Uncollected = Waste - Collected for recycling - Properly disposed - Improperly disposed	1	Uncollected	2

Compute the final quality score for the regional analysis as the average of all the final metrics scores.

Quality Score

Average



Maps

Raw data		Modelling				Final metric	Score		
Reliability		Temporal	Geographic		Granularity				
This Study - Regional Mismanaged + Uncollected + Improperly managed by province	2	2018	1	-	1.0	Share of mismanaged by province = Waste mismanaged by province / waste generated by province	1	Share of Mismanaged	2.0
This Study - Regional Waste generated by province	2								
This Study - Regional Collected - Collected for recycling + Properly disposed + Improperly disposed	1.8	2018	1	-	1	Share of collected = Waste managed by province / waste generated by province	1	Share of Collected	1.87
Rehder et al Leavies by fishing gear type	2	1990 2015 2020	2.5	See additional notes	2	See additional notes	2.5	Leakage from fishing sector	2.5
FAO Drawings of various fishing gear	2								
Fisheries Economic and Planning Institute (FI) Number of artisanal and commercial fish vessels	2.0								
FAO - Thailand Number of gear and fishermen by artisanal and commercial fishing vessel	2								
This Study - Regional MMR by province	2.0	2015 2018 2020	2	For each km ² plot, assign it to a watershed (based on its location to know the runoff). We compute the distance to shore or river (in km) and compute the leakage of plastic = population of plot * MMR of province * 700	-	1	Macro-leakage from land	2.0	
NASA - SEDAC population count GIS Population on 1km2 grid	1.5								
WWF HydroWatch Country rivers	2								
WWF HydroWatch Country watersheds	1								
Laboraton et al., 2017 Catchment run-off of watersheds	2								
ICCN Marine Plastic Footprint Release Rate matrix based on distance to waterbody and surface runoff	1								
Sanbeck et al., 2015 Central estimate for maximum release rate	2								



SUPPORTING INFORMATION FOR TOOL T3.3

Detailed pedigree
matrix used for
scoring

	1 BEST	2 GOOD	3 AVERAGE	4 BAD	5 WORST
RELIABILITY	Verified (e.g. peer-reviewed or highly trustable source) data based on measurements, multiple sources showing coherent values	Verified data based on calculation, multiple sources showing coherent values	Unverified data from measurement or calculation and/or from single source	Documented estimate	Undocumented estimate
TEMPORAL CORRELATION	Less than 3 years of difference with date of study	Adapted to the year of reference based on clear population or GDP correlation	Adapted to the year of reference based on unclear population or GDP correlation	Not adapted to the year of reference (< 10 years old data)	Not adapted to the year of reference (> 10 years old data)
GEOGRAPHICAL CORRELATION	Data is complete and representative of the area of study	Data extrapolated to the area of study based on weighted average (multiple archetypes)	Data extrapolated to the area of study assuming homogeneous conditions	Data extrapolated to the area of study in spite of un-homogeneous conditions	Data from unknown area or with very different conditions
GRANULARITY	Data is complete and representative of the polymer/application/sector of interest	Modelling based on allocation rules (comprehensive and specific)	Modelling based on allocation rules (non comprehensive or unspecific)	Modelling based on global average	Modelling based on estimates



B

Project data repository

HOW TO USE THIS TOOL ?

b. Copy table in tool T5.1 “WasteMngmt_Data_for_toolB” sheet on waste management by archetype in tool B.

WASTE MANAGEMENT by archetype (tool T5.1)

Example: Extract of waste management by archetype from Vietnam case study.

Province	Population 2020	Generated t	Collected t	Collected for recycling t	Properly disposed t	Improperly disposed t	Uncollected t	Generated kg/hab	Collected for recycling kg/hab	Mismanaged kg/hab	Share of collected	Share of mismanaged
Khánh Hòa	1227104	81158	81158	15935	12872	52351	0	66	13	43	100%	65%
Kiên Giang	1743951	115341	19103	3510	2599	12995	96237	66	2	63	17%	95%
Kon Tum	603759	39931	5235	0	748	4487	34696	66	0	65	13%	98%
Lai Châu	688030	45505	16715	0	16715	0	28790	66	0	42	37%	63%
Lâm Đồng	1438995	95172	12725	0	2936	9788	82447	66	0	64	13%	97%
Lạng Sơn	736054	48681	23205	0	23205	0	25476	66	0	35	48%	52%
Lào Cai	631133	41742	13289	0	13289	0	28452	66	0	45	32%	68%
Long An	1557826	103031	22044	578	17820	3645	80987	66	0	54	21%	82%
Nam Định	1705356	112788	31304	1951	27084	2270	81484	66	1	49	28%	74%
Nghệ An	2937567	194284	32798	0	17492	15306	161486	66	0	60	17%	91%
Ninh Bình	873062	57742	9803	1801	4001	4001	47939	66	2	59	17%	90%
Ninh Thuận	632195	41812	9531	0	1003	8527	32281	66	0	65	23%	98%
Phù Thọ	632687	41844	24118	4431	14765	4922	17727	66	7	36	58%	54%
Phú Yên	933402	61733	18729	0	2081	16648	43004	66	0	64	30%	97%
Quảng Bình	884456	58496	13614	0	10589	3025	44882	66	0	54	23%	82%
Quảng Nam	1439191	95185	20610	0	7361	13250	74574	66	0	61	22%	92%
Quảng Ngãi	1209357	79984	23484	0	13699	9785	56500	66	0	55	29%	83%
Quảng Ninh	1048043	69315	69315	14498	24774	30042	0	66	14	29	100%	43%
Quảng Trị	621134	41080	9199	0	4181	5018	31881	66	0	59	22%	90%
Sóc Trăng	1385370	91625	26161	4807	0	21355	65464	66	3	63	29%	95%
Sơn La	1333745	88211	22940	0	0	22940	65270	66	0	66	26%	100%
Tây Ninh	1178873	77968	15885	2919	6483	6483	62083	66	2	58	20%	88%
Thái Bình	1721923	113884	25578	862	24716	0	88306	66	1	51	22%	78%
Thái Nguyên	1214475	80322	30030	5517	8171	16342	50292	66	5	55	37%	83%
Thanh Hóa	3276720	216714	20646	3793	1532	15320	196069	66	1	65	10%	98%



Life Cycle Initiative

Implemented with



Contacts:

support@shaping-ea.com

Feng.Wang@un.org

Lynn.Sorrentino@iucn.org