



C40 CITIES  
FINANCE  
FACILITY

# Estimating Climate Impacts: Overview of the Impacts Tool



# 1. Introduction

This document describes the general structure, workflows and sections' overview of the Integrated Impacts Assessment Tool (IIAT or 'Impacts Tool') developed by C40 Cities to assist member cities and other stakeholders with the assessment of project-level impacts.

## 1.1. Tool Overview

The Impacts Tool allows users to estimate the benefits of several types of climate actions, projects or policies. The tool can be used to estimate greenhouse gas (GHG) and air pollution emissions as well as air quality related and active mobility health benefits. Upcoming expansions will also allow evaluation of job generation and other local economic impacts.

The tool is intended to be used by both expert and non-expert users. The basic mode allows users to obtain quick estimates using default values and minimal project information. The advanced mode provides users highly detailed estimates and allows all parameters to be modified. For the advanced mode to provide maximum accuracy, the user will need to collect extensive information on the project context.



Figure 1 - Impacts Tool Homepage

The Impacts Tool is designed to perform a wide variety of climate project impact analyses. It is capable of evaluating multiple impact types at the same time and gives a clear understanding of the multiple benefits of a climate action. The tool also allows comparisons of different projects or project alternatives. It also allows the user to aggregate multiple projects and demonstrate the cumulative impact of a package of climate actions.

## 2. Impacts Tool General Structure

The basic workflow for the Impacts Tool consists of a six-step project definition procedure, illustrated in Figure 2.



Figure 2 - Impacts Tool project workflow

The Impacts Tool user's data input starts from defining the climate actions to be evaluated according to its sector, typology and timeframe in the **Project selection** step.

Subsequently data related to the activities affected by or involved in the action are inputted in the **Activity data definition** and the data related to the impact selected are inputted in **Impacts Data Definition**.

Then, the parameters of the scenarios' definitions and their evolution in time are loaded in the **Baseline Scenario Definition** and **Project Scenario Definition**. And finally, the project's emission reductions are shown in the **Results** page.

A deeper look at each section of the tool is presented in the following chapters.

## 2.1. Project Selection

In the first section of the tool the user defines in the project name and description, sector, action category and timeframe.

The Impacts Tool currently allows for the analysis of 8 project types:

### Buildings and energy:

- Solar Water Heaters, and
- Solar PV panels

### Transportation:

- Cycling Infrastructure,
- Cycle Hire Schemes,
- Bus Rapid Transit, and
- Electric or CNG buses

### Waste:

- Anaerobic Digestion,
- Composting, and
- Landfill gas capture.

**Create a new project**  
This page is used to create a new project. Please define the project sector (transport, buildings & energy or waste) and briefly describe the project, before defining the time frame of the project's impacts that you want to evaluate. Then choose which impacts you want to evaluate (greenhouse gas emissions, air pollutant emissions, health impacts from air quality and job creation). Estimation methods and causal chains detailing impacts and methodologies used in the calculations can be accessed through this page.

**Project details**  
Please add project name and description.

Project name: Solar Water Heater

Project description: SHW 001

Project sector:  TRANSPORTATION  BUILDINGS & ENERGY  WASTE

Action category: Solar Water Heaters

**Project timeframe**  
Specify the project's horizon years, i.e. the years for which project results will be calculated. The higher the number selected (up to a max 30), the more precise the results will be, but be aware you will need to supply additional data for each of the horizon years to make use of this feature.

Base year: 2020

Number of horizon years to use: 10

Set horizon years:  Automatically horizon years to be set one year apart  User-defined horizon years

Horizon years:

Base year	Horizon 1	Horizon 2	Horizon 3	Horizon 4	Horizon 5	Horizon 6	Horizon 7	Horizon 8	Horizon 9	Horizon 10
2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

Figure 2 - Project Selection page

From the project selection page, users can also review the modelling framework. This framework is presented through the methodology used for the calculations and a causal chain outlining the impacts of the project.

## Methodology Overview

$$Em_{BL,y} = \sum_{vtype,ftype} EFveh_{btype,ftype,y} \times DT_{btype,y} \times Nveh_{BL,btype,ftype,y}$$

$$Em_{PJ,y} = \sum_{vtype,ftype} EFveh_{btype,ftype,y} \times DT_{btype,y} \times Nveh_{PJ,btype,ftype,y}$$

TERM	DEFINITION	Unit	TYPE
BL	Baseline scenario		Subscript
PJ	Project scenario		Subscript
y	Year of calculations		Subscript
ftype	Fuel type		Subscript
btype	Bus type		Subscript
Em <sub>BL</sub>	Total emissions in year y for baseline scenario	tCO2e	Variable
Em <sub>PJ</sub>	Total emissions in year y for project scenario	tCO2e	Variable
EFveh <sub>btype,ftype,y</sub>	Emission factor for vehicle category vtype, fuel ftype in year y, per passenger.km	tCO2e/pkm	Default Variable
Nveh <sub>BL,btype,ftype,y</sub>	Number of operation project vehicles btype in year y		Variable
Nveh <sub>PJ,btype,ftype,y</sub>	Number of operation project vehicles btype in year y		Variable
DTveh <sub>btype,y</sub>	Annual average distance travelled by vehicle type vtype in year y	km	User input

Figure 3 - Methodology page

The methodology section presents the equations and parameters used for calculations in the tool. This page displays primary equations, showing how emissions are calculated in the baseline, and policy scenarios as well as secondary equations, showing the intermediate calculation resulting from the data provided by the users.

While this level of technical detail may not be easily accessible to all audiences, it provides more expert users a way to check every aspect of the calculations being performed in the tool. Users can also ensure that they are adequate for the project assessed and follow international standards (the UNFCCC's CDMs in this case).

For more detail, please refer to the document '*Estimating Climate Impacts - A Methodology for Estimating GHG Emission Mitigation Potentials of Infrastructure Projects*'.

## Causal Chain Overview

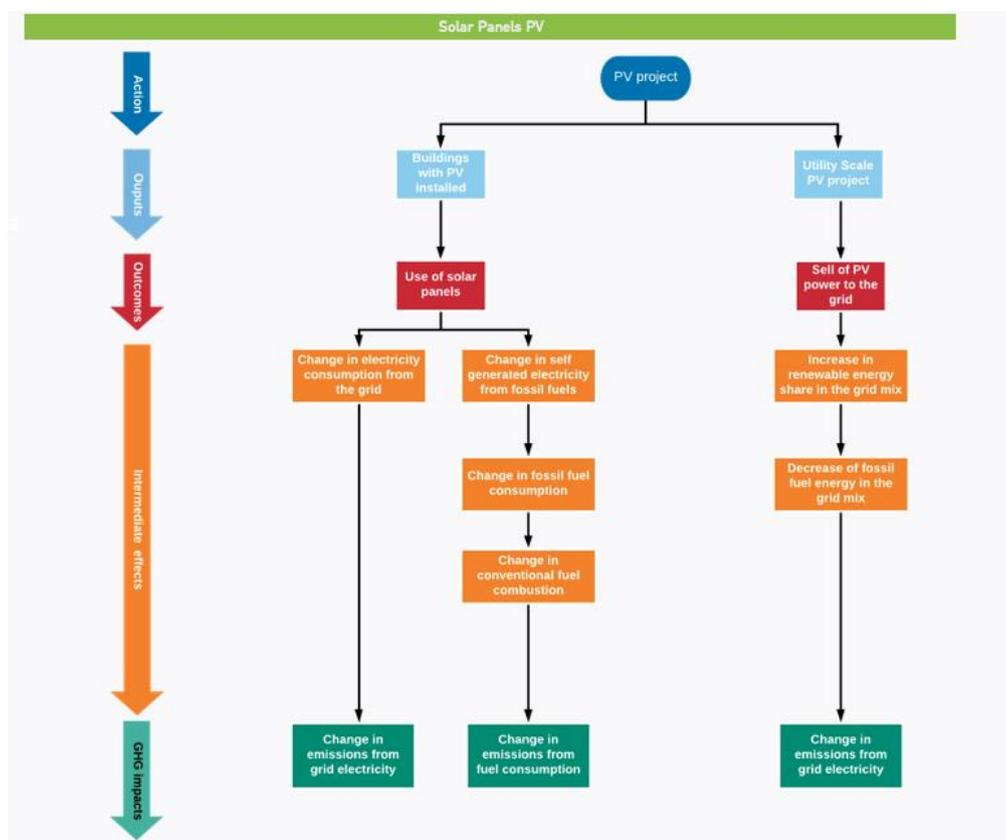


Figure 4 - Causal chain page

Causal chains give users a more practical and accessible way of understanding the methods used in the tool. They outline the changes effected by the projects and how those can lead to a decrease or increase in GHG emissions.

They breakdown the different effects created by the projects between:

- Outputs: the products of the action such as the service provided, infrastructure built etc.;
- Outcomes: the changes generated by the outputs, which can be changes in behaviour for project users or changes in technology used;
- Intermediary effect: breaking down the intermediary steps leading to the Impacts;
- Impacts: the final effect in terms of GHG emission reductions or reductions for the project, intended or not.

A project can produce several outputs and impacts.

## 2.2. Project Setup

In this section we will have to input data related to the activities affected by or involved in the action. This section is divided in two parts, one dedicated to project information and the other one to baseline scenario information.

Here the user defines the parameters that describe the activity of the actions and the relative outcomes.

The activity data includes technology parameters (e.g. type of buses used) as well as some behavioural parameters (e.g. mode share). This data is the core model that describes changes of behaviour within the assessment boundary and is used to drive calculation for all impacts.

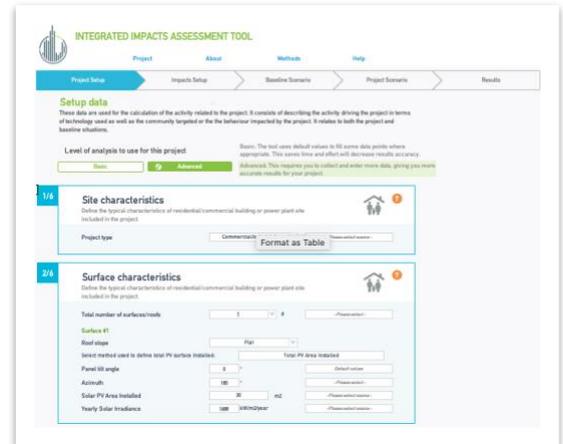


Figure 5 – Project Setup input page

## 2.3. Impacts Setup (Emission Factors)

This section allows the user to fill data regarding the impacts selected and to define impact related parameters such as GHG emission factors.

The data input in this page is used, together with the activity data previously defined, to calculate impacts effects.

The type of data requested varies by impact type; to evaluate a project's GHG impact, users will be asked for emission factors describing the intensity of the energy, or fuel, used in the project.

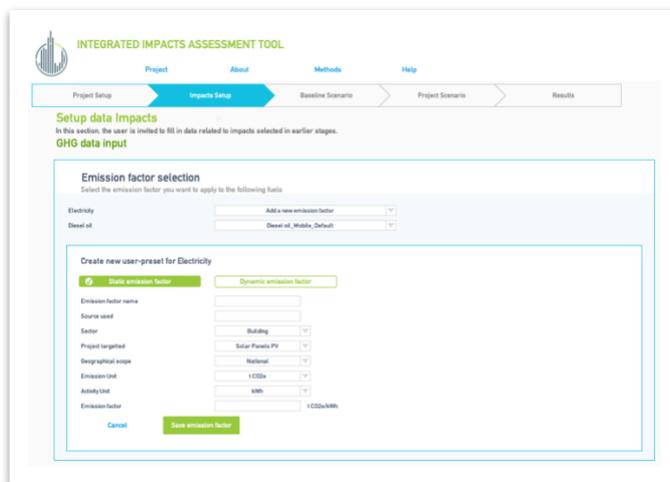


Figure 6 - Impacts data/Emission factor selection

## 2.4. Baseline Scenario

In this section, users select and fill all the parameters that define the baseline scenario. The baseline scenario refers to the situation in the absence of the project, and the changes that might have occurred had the project not existed.

The baseline scenario is described through parameters changing across the horizons of the project lifespan.

Once the base year values have been determined, the next step is to project how the parameters are likely to change in the absence of the action being analysed, considering

drivers that are expected to have a significant impact on emissions, such as:

- **Other policies or actions:** Other policies, actions and projects taking place independently of the project can have an impact on how emissions would evolve in the baseline scenario.
- **External factors:** Other conditions, such as projections of socio-economic factors and market forces expected to affect the baseline scenario (e.g. population growth, economic activity, changes in switching practices)

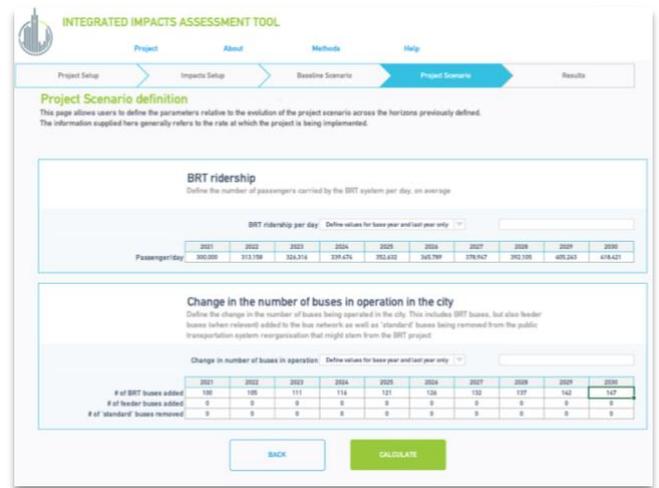


Figure 8 - Baseline Scenario Definition page

## 2.5. Project Scenario

This section of the tool is where the data driving project implementation gets collected. The user is invited to select and fill all the parameters that define how the project scenario evolves across the horizons.

Because the purpose of the GHG assessment is to estimate or monitor the efficacy of the policy or action there is the need for monitoring indicators data such as changes in behaviour, technology, processes or practices that result from the implementation of a policy instrument itself.

This section is where users can input data related to how a project gets implemented over time (e.g. BRT scheme ridership).

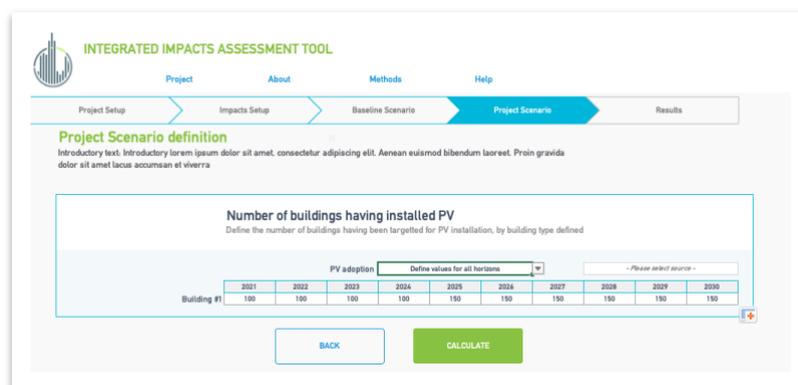


Figure 9 - Project Scenario Definition page

## 2.6. Results

In this section of the tool, results are displayed through different charts, helping the user identify changes in emissions from the baseline and project scenarios as well as emission savings. A toggle allows users to switch the display of results between the impacts analysed, such as energy and GHG emissions.

The users can also display advanced results for the project being calculated, including details on the drivers of the impacts estimated, and allows the user to compare/aggregate projects having been calculated, including project alternatives.

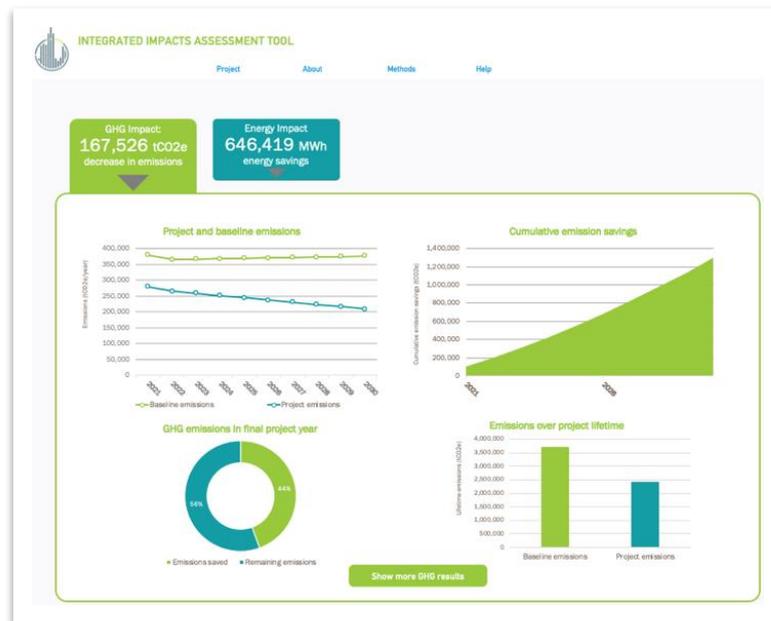


Figure 10 - Main Results page

### 3. Additional resource

This document is intended for giving an overview of the Impacts tool and the content provided is sufficient for a quick understanding of the workflow and sections of the tool. Further guidance will be needed for a complete understanding of the data requirement, use of the tool and understanding of the methodology.

Additional exhaustive resources focused on some of the projects available on the tool are:

- *Estimating Climate Impacts - A Methodology for Estimating GHG Emission Mitigation Potentials of Infrastructure Projects*
- *Estimating Climate Impacts – A step-by-step guide to the Impacts Tool*
- *Estimating Climate Impacts - Supplemental Guidance on Project Specific Parameters*

The methodology document, as already mentioned, dives deep into the methods, equations and parameters used in each project type. The video guides lead the user through the process of filling the tool and describe all data inputs as well as the results per each project type. The supplemental guidance describes the main drivers for the various projects and shows the sort of data expected providing guidance related to the data collection phase.

With these documents the user will understand and be able to use the Impacts Tool and perform preliminary GHG emission mitigation impact estimates.

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