Menu

CARBON DATA FOR SHARING LIBRARIES

A CARBON CALCULATOR FOR TOOL LIBRARIES

In 2020 we started a project to create a carbon calculator that shows how much carbon was prevented from entering the atmosphere because tools were shared instead of bought. “Borrowing not buying” and reuse are imporant parts of or environmental aims, so figuring out how much impact we (and every other sharing library) are having is really important. There are other ways we save carbon (such as waste reduction, recycling, shared workshop space, material reuse) but these aren’t included at this stage.

Emission Factors:

A central part of the tool library carbon calculation is the emission factor. To calculate the amount of carbon saved, we need to know how much carbon was released in the making of a new version of a tool – the one someone would have bought if

lidn't borrow one instead. We need to know how much carbon was used to make the constituent parts – the **embedded** or embodied carbon. There are 3 databases of **embedded carbon** that we have used. Embedded carbon is the amount of carbon released in cradle to gate processes like extraction, transport, refinement and shaping. These aren't perfect, for example there isn't an embedded carbon value for a cordless drill, but there are factors for steel, plastic, batteries etc. We have combined these to approximate as best we can to create 12 different emission factors, to cover the make-up of most tools in a tool library inventory. These are shown in the table below. The 12 different factors are a combination of embedded carbon values according to the approximate amounts of that material in that tool type. It's important to note that we are calculating the carbon produced in the manufacture of a new tool (which is not purchased because of the existence of the tool library), so we are not concerned with the material composition of older tools.

We used 3 different embedded carbon material databases to decide on each emission factors. These are:

- The ICE (Inventory of Carbon and Energy) by Circular Ecology and the University of Bath. https://circularecology.com/embodied-carbon-footprint-database.html
- The Climate Impact Forecast – LCA for startups and impact entrepreneurs. https://climate.impactforecast.org/about/

eenhouse Gas Reporting: Conversion Factors 2020, UK overnment.
https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

When there were differences between these databases, we selected the data that most accurately represented our use case for tools, or in some cases combined data for more accuracy. This is noted in the second table below.

EMISSION FACTOR TYPES

We have selected 12 different emission types, categorised by the materials (one or more) in common tools.

Type	Example
solid metal	Crowbar, wrench
solid plastic/rubber	Paint tray
mixed plastic/rubber and metal	Paint roller, screwdriver
mixed wood and metal	Chisel, Axe
mixed wood and plastic	Garden rake
wood	Mallet
aluminium	Spanner, bike tool
fabric	Bag

less power tool	Cordless drill
Corded power tool (no battery)	Corded angle grinder
Petrol based (metal mostly)	Lawn mower
WEE (flashlights, meters)	Sensors

EMISSION FACTOR VALUES

Type	Value	notes	source
solid metal	3.2485	Assume an average by weight of 95% steel and 5% aluminium	ICE database values
solid plastic/rubber	3.218	Assume an average by weight of 80% plastic, 20% rubber	ICE database values
mixed plastic/rubber and metal	3.23325	Assume an average by weight of 50% plastic/rubber, and 50% solid metal factor	ICE database values
mixed wood and metal	1.87075	Assume an average by weight of 50%	ICE database

Menu		wood, and 50% metal factor	values
mixed wood and plastic	1.8555	Assume an average by weight of 50% plastic/rubber, and 50% of solid metal factor	ICE database values
wood	0.493	An average value, provided by ICE database	ICE database values
aluminium	7.63	Database value assumes and Aluminium trade mix (66% prim 33% sec)	Climate Impact Forecast value
fabric	7.96	Assume an average by weight 50% cotton fabric and 50% nylon	ICE database value
Cordless power tool	6.165	ICE database does not include battery values, so using UK government value for battery (12.119).Climate Impact database	Motor value from Climate Impact Forecast, battery from UK

Menu		has a factor for motors under 500W, so using this value to improve accuracy for material content of motor.Assume an average by weight of 30% battery, 15% motor, 15% solid metal factor, and 40% plastic/rubber factor	Government database, others from ICE database
Corded power tool (no battery)	3.771	Assume an average by weight of 30% motor, 30% solid metal factor, 40% plastic/rubber factor	Motor value from Climate Impact Forecast, others from ICE database
Petrol based (metal mostly)	4.132	Assume an average by weight of 50% motor, 25% solid metal factor, 25% plastic/rubber factor	Motor value from Climate Impact Forecast, others from

Menu			ICE database
WEE (flashlights, meters)	1.760	“Small “ WEEE value	Government Factors database value

With these 12 values and the borrowing history of our tool library, we can calculate our carbon savings for any time period, tool type or member.

The calculation for each tool is:

NUMBER OF TIMES TOOL WAS BORROWED INSTEAD OF BOUGHT X WEIGHT OF TOOL X EMISSION FACTOR = CARBON SAVED FOR THAT TOOL

We are working with myturn.com to integrate this calculation on their website so that every sharing library that uses myturn will be able to see their carbon saving.