

# Package: carbonpredict (via r-universe)

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**Title** Predict Carbon Emissions for UK SMEs

**Version** 2.0.1

**Description** Predict Scope 1, 2 and 3 carbon emissions for UK Small and Medium-sized Enterprises (SMEs), using Standard Industrial Classification (SIC) codes and annual turnover data, as well as Scope 1 carbon emissions for UK farms. The 'carbonpredict' package provides single and batch prediction, plotting, and workflow tools for carbon accounting and reporting. The package utilises pre-trained models, leveraging rich classified transaction data to accurately predict Scope 1, 2 and 3 carbon emissions for UK SMEs as well as identifying emissions hotspots. It also provides Scope 1 carbon emissions predictions for UK farms of types: Cereals ex. rice, Dairy, Mixed farming, Sheep and goats, Cattle & buffaloes, Poultry, Animal production and Support for crop production. The methodology used to produce the estimates in this package is fully detailed in the following peer-reviewed publications: Phillipotts, A., Owen, A., Norman, J., Trendl, A., Gathergood, J., Jobst, Norbert., Leake, D. (2025) <doi:10.1111/jiec.70106> ``Bridging the SME Reporting Gap: A New Model for Predicting Scope 1 and 2 Emissions" and Wells, J., Trendl, A., Owen, A., Barrett, J., Gridley, J., Jobst, N., Leake, D. (2025) <doi:10.1088/1748-9326/ae20ab> ``A Scalable Tool for Farm-Level Carbon Accounting: Evidence from UK Agriculture".

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**URL** <https://github.com/david-leake/carbonpredict>

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batch\_predict\_emissions  
*Batch Predict Emissions*

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## Description

Prediction entry point for batch SME and Farms emissions

## Usage

```
batch_predict_emissions(data, output_path = NULL, company_type = "sme")
```

## Arguments

data	A single entry (list or named vector), a data frame, or a path to a CSV file. The data should contain company_name, 2-digit UK sic_code, and annual turnover columns.
output_path	Optional file path to save the results as a CSV. If NULL, results are not saved to a file.
company_type	A single parameter "sme" or "farm" to determine which emission prediction functions to call (defaults to "sme").

**Value**

A data frame with input columns and predicted emissions for each scope (in tCo2e). Optionally saved to a CSV file.

**Examples**

```
sample_data <- read.csv(system.file("extdata", "sme_examples.csv", package = "carbonpredict"))
sample_data <- head(sample_data, 3)
batch_predict_emissions(data = sample_data, output_path = NULL, company_type = "sme")
```

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batch_sme_plots	<i>Batch SME Plots</i>
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**Description**

Batch plot SME Scope 1 & 2 emissions

**Usage**

```
batch_sme_plots(data, output_path = NULL)
```

**Arguments**

data	A data frame or path to a CSV file with columns "sic_code", "turnover", and optionally "company_name".
output_path	Optional directory to save plots. If NULL, plots are not saved.

**Value**

Donut chart plots showing scope 1 and 2 predicted emissions (in tCo2e) for each row in the data. Optionally saved to a directory as PNG files.

**Examples**

```
sample_data <- read.csv(system.file("extdata", "sme_examples.csv", package = "carbonpredict"))
sample_data <- head(sample_data, 3)
batch_sme_emissions <- batch_predict_emissions(
  data = sample_data,
  company_type = "sme",
  output_path = NULL)
batch_sme_plots(data = batch_sme_emissions, output_path = NULL)
```

---

`farms_scope1`*Predict Farm Scope 1 Emissions*

---

**Description**

This function loads a pre-trained emission model to predict scope 1 carbon emissions for a British farm. The function predicts emissions for the following farm types: "Cereals ex. rice", "Dairy", "Mixed farming", "Sheep and goats", "Cattle & buffaloes", "Poultry", "Animal production", "Support for crop production".

**Usage**

```
farms_scope1(  
  sic_code,  
  farm_area,  
  no_beef_cows,  
  no_dairy_cows,  
  no_pigs,  
  no_sheep,  
  annual_revenue,  
  annual_fuel_spend  
)
```

**Arguments**

<code>sic_code</code>	A 4-digit UK SIC code (numeric).
<code>farm_area</code>	Farm area in hectares.
<code>no_beef_cows</code>	Number of beef cows.
<code>no_dairy_cows</code>	Number of dairy cows.
<code>no_pigs</code>	Number of pigs.
<code>no_sheep</code>	Number of sheep.
<code>annual_revenue</code>	Annual revenue (£)
<code>annual_fuel_spend</code>	Annual fuel spend (£)

**Value**

A dataframe with predicted emissions (tCO<sub>2</sub>e)

**Examples**

```
farms_scope1(  
  sic_code = 1110,  
  farm_area = 1113,  
  no_beef_cows = 25,  
  no_dairy_cows = 8,
```

```
no_pigs = 18,  
no_sheep = 29,  
annual_revenue = 2986511,  
annual_fuel_spend = 209055)
```

---

plot\_scope3\_emissions *Plot Scope 3 Emissions Breakdown*

---

### Description

Plots a Sankey diagram showing the breakdown of Scope 3 emissions by category.

### Usage

```
plot_scope3_emissions(scope3_df, company_name = NULL)
```

### Arguments

scope3\_df      Data frame output from sme\_scope3 (must contain 'Category', 'Description', and 'Predicted Emissions (tCO2e)').

company\_name    Optional company name to include in the chart title (character string).

### Value

A Sankey plot showing a breakdown for predicted emissions of each Scope 3 category.

### Examples

```
scope3_df <- sme_scope3(85, 12000000)  
plot_scope3_emissions(scope3_df, company_name = "Carbon Predict LTD")
```

---

plot\_sme\_emissions      *Plot SME Emissions*

---

### Description

Plot a donut chart of Scope 1,2 and 3 emissions

### Usage

```
plot_sme_emissions(  
  scope1_emissions,  
  scope2_emissions,  
  scope3_emissions,  
  company_name = NULL  
)
```

**Arguments**

scope1\_emissions      Value for total Scope 1 emissions (numeric).  
 scope2\_emissions      Value for total Scope 2 emissions (numeric).  
 scope3\_emissions      Value for total Scope 3 emissions (numeric).  
 company\_name      Optional company name to include in the chart title (character string).

**Value**

A ggplot2 donut chart showing predicted emissions for each scope.

**Examples**

```
scope_1 = sme_scope1(85, 12000000)
scope_2 = sme_scope2(85, 12000000)
scope_3 = sme_scope3(85, 12000000)
plot_sme_emissions(
  scope1_emissions = scope_1$`Predicted Emissions (tCO2e)`,
  scope2_emissions = scope_2$`Predicted Emissions (tCO2e)`,
  scope3_emissions = scope_3[scope_3$Category == "Total", "Predicted Emissions (tCO2e)"][[1]],
  company_name = "Carbon Predict LTD")
```

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sme\_emissions\_profile *SME Emissions Profile*

---

**Description**

Calls the Scope 1, 2 and 3 emissions prediction functions and returns their results as a list and plots a donut chart

**Usage**

```
sme_emissions_profile(sic_code, turnover, company_name = NULL)
```

**Arguments**

sic\_code      A 2-digit UK SIC code (numeric).  
 turnover      Annual turnover value (numeric).  
 company\_name      Optional company name for labeling plots (character string).

**Value**

A list with four elements: scope1, scope2 scope3, scope3\_hotspots, each containing the predicted carbon emissions data frame (in tCo2e), the top 5 scope 3 emissions hotspots, as well as a donut chart and Sankey diagram showing the emissions breakdowns.

**Examples**

```
sme_emissions_profile(sic_code = 85, turnover = 12000000, company_name = "Carbon Predict LTD")
```

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sme_scope1	<i>Predict SME Scope 1 Emissions</i>
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**Description**

This function loads a pre-trained emission model to predict scope 1 carbon emissions for a given SIC code and turnover.

**Usage**

```
sme_scope1(sic_code, turnover)
```

**Arguments**

sic_code	A 2-digit UK SIC code (numeric).
turnover	Annual turnover value (numeric).

**Value**

A data frame with predicted emissions (in tCo2e).

**Examples**

```
sme_scope1(sic_code = 85, turnover = 12000000)
```

---

sme_scope2	<i>Predict SME Scope 2 Emissions</i>
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**Description**

This function loads a pre-trained emission model to predict scope 2 carbon emissions for a given SIC code and turnover.

**Usage**

```
sme_scope2(sic_code, turnover)
```

**Arguments**

sic_code	A 2-digit UK SIC code (numeric).
turnover	Annual turnover value (numeric).

**Value**

A data frame with predicted emissions (in tCo2e).

**Examples**

```
sme_scope2(sic_code = 85, turnover = 12000000)
```

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sme_scope3	<i>Predict SME Scope 3 Emissions</i>
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**Description**

This function loads pre-trained emissions models to predict scope 3 carbon emissions for a given SIC code and turnover.

**Usage**

```
sme_scope3(sic_code, turnover)
```

**Arguments**

sic_code	A 2-digit UK SIC code (numeric).
turnover	Annual turnover value (numeric).

**Value**

A data frame with predicted emissions (in tCo2e) for each scope 3 category.

**Examples**

```
sme_scope3(sic_code = 85, turnover = 12000000)
```

---

sme_scope3_hotspots	<i>Predict Top 5 SME Scope 3 Emissions Hotspots</i>
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**Description**

This function uses pre-computed results to predict the top 5 scope 3 carbon emissions hotspots for a given SIC code.

**Usage**

```
sme_scope3_hotspots(sic_code)
```

**Arguments**

`sic_code`            A 2-digit UK SIC code (numeric).

**Value**

A data frame with the top 5 emissions hotspots for scope 3.

**Examples**

```
sme_scope3_hotspots(sic_code = 85)
```

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