THE SEA CARGO CHARTER ASSOCIATION

Sea Cargo Charter Voyage Emissions Reporting JSON Schema

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Introduction

Launched in 2020, the Sea Cargo Charter (SCC) has rapidly evolved into an industry standard for reporting emissions from bulk vessel operations. Its adoption reflects a growing commitment across the maritime sector to transparency and environmental accountability. While the Sea Cargo Charter scheme offers many advantages, it also necessitates substantial data exchange between vessel owners and charterers. Standardising this data exchange is essential to streamlining the process, improving data quality, and growing further adoption of the scheme. Although Excel-based reporting templates have served the initiative well thus far, this paper explains a more modern approach to data reporting using a JSON standard.

JSON (JavaScript Object Notation) is a lightweight, text-based format for structuring data that is both human-readable and machine-friendly. Its simplicity and widespread adoption make it an ideal choice for modernising the Sea Cargo Charter's data reporting framework. JSON enables consistent, structured data exchange across platforms and systems, reducing the risk of errors and improving interoperability.

Solution Description

The Sea Cargo Charter JSON Schema is a structured data format created jointly by charterers, ship owners, and technology vendors to standardise and digitise the reporting of voyage emissions data under the Sea Cargo Charter framework. It encapsulates all required voyage information – from vessel and cargo details to fuel consumption and calculated emissions – in a consistent format, ensuring alignment with the latest SCC Technical Guidance.[1] The SCC Technical Guidance provides detailed information on the Sea Cargo Charter reporting methodology and the SCC JSON schema, while also aiming at alignment with other accounting standards, is first and foremost a reflection of the methodology as descried in the Technical Guidance. Hence, in case of doubt, clarification should always be sought from the SCC Technical Guidance.

The schema is vendor-neutral and can be adopted across various platforms. This document outlines the schema's structure and fields, the logic for calculating voyage emissions and emission intensity, and guides Application Programming Interface (API) integration and usage. Diagrams are provided (or referenced) to illustrate the data flow from vessel operations through JSON generation to submission, including but not limited to:

- The nesting structure of the JSON data,
- Typical API workflows for data submission and status tracking, the per-voyage emissions calculation process, and
- The interactions between stakeholders (ship owner, charterer, verifier) in using the schema.

Overall, this technical document is a comprehensive reference for implementing the SCC JSON Schema. It aims to promote industry-wide standardisation in emissions data handling – a critical step towards greater

[1] The SCC Technical Guidance is being updated regularly and any updates to the Technical Guidance will be reflected in this document.

transparency and efficiency. By adopting a standard data format, shipping stakeholders can reduce manual effort, minimise errors, and improve the timeliness and quality of emissions disclosures.

1. Schema Overview

1.1 Purpose and Scope

The SCC Voyage Emissions Reporting JSON schema is organised in a logical, hierarchical structure that mirrors the components of a voyage and the data needed for emissions calculations. This design approach groups related data elements together, making the JSON both human-readable and easy for software to parse. **Figure 1** below illustrates the high-level architecture of the JSON document, with major sections and their sub-components:

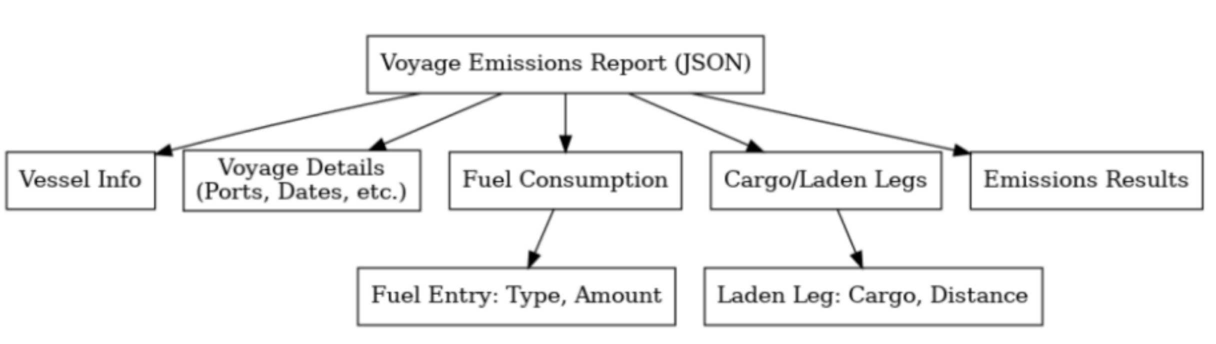

Figure 1: High-level structure of the Voyage Emissions Reporting JSON. Each voyage report is a JSON object containing grouped sections for vessel info, voyage details, fuel consumption entries, cargo/laden legs, and emissions results.

1.2 Worked Voyage Example (Simple)

The following real-world example highlights how a voyage is represented to demonstrate the application of the JSON schema for SCC voyage emissions reporting. It is based on the actual Sea Cargo Charter signatory voyage record for the vessel BOCHEM OSLO. The example includes all key elements required for a valid SCCVoyageEmissions submission.

Summary of the Voyage:

- Vessel: BOCHEM OSLO, IMO 9420710, Chemical Tanker (DWT 33,654.77)
- Ballast Leg: Sailed from MEJILLONES (CLMJS) to ULSAN (KRUSN), 10,043 NM
- Port Call: Loaded 28,050 MT of chemicals in ULSAN
- Laden Leg: Sailed from ULSAN to MEJILLONES, 10,196 NM
- Final Port: MEJILLONES – cargo retained onboard
- Fuels Used: MGO and HFO, with emission factors recorded per leg
- Voyage Type: Chemical Parceling

This JSON reflects a full voyage including pre-load ballast, loading operation, laden transport, and discharge operations. Each segment of the voyage is represented as a leg within the emissionDetails array.

The form captures both Port and Sea legs, using `legType`, and associates each with the relevant port names, UN/LOCODEs, dates, fuel types and quantities, cargo mass, and emissions measured in metric tons of CO_2e.[2]

Fuel consumption is split by leg and fuel type, and emission factors (measured in gCO_2/g_{fuel}) are applied per the selected values (e.g., 4.01 for MGO, 3.84 for HFO). Signatories can either apply certified custom emission factors or, in the absence of custom emission factors, use default emission factors from Annex 4 in the SCC Technical Guidance. The Technical Guidance also provides clarification on what to do in the case of biofuel blends. The cargo weight and charterer-specific share are tracked throughout the voyage to enable proper emissions allocation per SCC Technical Guidance.

The JSON report for this voyage would look like the following:


```json
{
   "type": "SCCVoyageEmissions",
   "comment": "Stolt SCCVoyageEmissions Feb 22, 2025",
   "targetTenantId": "123123123",
   "created": "2025-02-22T09:30:00Z",
   "lastUpdate": "2025-02-22T09:30:00Z",
   "data": {
       "chartererVoyageID": "49",
       "voyageType": "ChemicalParceling",
       "contactName": "System generated",
       "contactEmail": "GSSCOpsEmissions@stolt.com",
       "vessel": {
           "imoNo": "9420710",
           "name": "BOCHEM OSLO",
           "type": "ChemicalTanker",
           "deadweightMT": 33654.77
       },
       "emissionDetails": [
           {
               "ballastLaden": "Ballast",
               "legType": "Sea",
               "fromPortName": "MEJILLONES",
               "toPortName": "ULSAN",
               "fromDate": "2024-11-18T05:00:00.000Z",
               "toDate": "2024-12-19T13:00:00.000Z",
               "fromPortUNCode": "CLMJS",
               "toPortUNCode": "KRUSN",
               "cargoQuantityMT": 0,
               "chartererCargoQuantityMT": 0,
               "distanceNauticalMiles": 10043.164,
```


[2] CO_2-equivalent, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions.

```
            "consumption": [
                {
                    "fuelType": "MGO",
                    "quantityMT": 7.1,
                    "emissionFactor": 4.01
                },
                {
                    "fuelType": "HFO",
                    "quantityMT": 651.1,
                    "emissionFactor": 3.84
                }
            ]
        },
        {
            "ballastLaden": "Laden",
            "legType": "Port",
            "portName": "ULSAN",
            "portUNCode": "KRUSN",
            "cargoQuantityMT": 28050,
            "chartererCargoQuantityMT": 28050,
            "consumption": [
                {
                    "fuelType": "MGO",
                    "quantityMT": 38.8,
                    "emissionFactor": 4.01
                },
                {
                    "fuelType": "HFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.84
                }
            ]
        },
        {
            "ballastLaden": "Laden",
            "legType": "Sea",
            "fromPortName": "ULSAN",
            "toPortName": "MEJILLONES",
            "fromPortUNCode": "KRUSN",
            "toPortUNCode": "CLMJS",
            "fromDate": "2024-12-28T12:18:00.000Z",
            "toDate": "2025-01-31T01:06:00.000Z",
            "cargoQuantityMT": 28050,
            "chartererCargoQuantityMT": 28050,
```

```json
                "distanceNauticalMiles": 10196.46,
                "consumption": [
                    {
                        "fuelType": "MGO",
                        "quantityMT": 3.2,
                        "emissionFactor": 4.01
                    },
                    {
                        "fuelType": "HFO",
                        "quantityMT": 774.2,
                        "emissionFactor": 3.84
                    }
                ]
            },
            {
                "ballastLaden": "Laden",
                "legType": "Port",
                "portName": "MEJILLONES",
                "portUNCode": "CLMJS",
                "cargoQuantityMT": 28050,
                "chartererCargoQuantityMT": 28050,
                "consumption": [
                    {
                        "fuelType": "MGO",
                        "quantityMT": 1.5,
                        "emissionFactor": 4.01
                    },
                    {
                        "fuelType": "HFO",
                        "quantityMT": 72.7,
                        "emissionFactor": 3.84
                    }
                ]
            }
        ]
    }
}
```


This example demonstrates a straightforward one-voyage-one-cargo case in JSON. The JSON schema is robust enough to handle more complicated cases as well. In summary, the example above validates that the schema can represent a real voyage in a clear manner.

Note: A multi-port chemical-parceling case is provided in Appendix A – Extended Worked Example (STOLT BOBCAT, Voyage 14).

2. Voyage Identification and Metadata

2.1 Summary of Properties Fields

Header fields record the form lifecycle and are present at the top level of the JSON object:

- **created** *(string; ISO-8601 date-time, UTC)* – Timestamp when the form was first created/persisted. Set by the receiving system; read-only to clients.
- **lastUpdate** *(string; ISO-8601 date-time, UTC)* – Timestamp of the most recent change to the form. Updated by the receiving system on any edit, correction, or re-submission; read-only to clients.

These fields support auditability, version selection, and de-duplication when multiple versions of the same form exist.

2.2 Summary of Voyage Metadata Fields

The **data** object at the top of the JSON document contains fields that identify the voyage and provide essential context.

```
"data": {
  "chartererVoyageID": "49",
  "voyageType": "ChemicalParceling",
  "contactName": "System generated",
  "contactEmail": "GSSCOpsEmissions@stolt.com",
```

The table below defines each field along with its data type, required status and description.

Field Name	Type	Required	Description
voyageNo	Number	No	A voyage number or ID. This could be a sequential number or code used internally to identify the voyage. If the reporting company has its own voyage numbering system, that can be used here. Otherwise, it could simply be an index or a unique key for the form.
vesselCode	String	No	Internal code used by some companies to identify vessels. Can be left blank or duplicate the IMO number if not used.
chartererVoyageID	String	Yes	Charterer-assigned reference for the voyage. Allows cross-referencing with the charterer's systems. Mirrors the field shown in the example above.
voyageType	String	Yes	Contract type for the voyage. Allowed values: *TimeCharter*, *VoyageCharterSingle*, *VoyageCharterMultiple*, *Parceling*, *ChemicalParceling*.

contactName	String	Yes	Name of the person responsible for the report. If the report is system-generated, this may be a placeholder such as "System generated".
contactEmail	String	Yes	Email address for correspondence related to the report. Should be a valid email address; used for verification or follow-up.

These metadata fields ensure each report is clearly identified and that contact information is available for queries.

2.3 Voyage Types Explained

The **voyageType** field categorises the nature of the voyage. Each option has distinct implications for emissions calculation and reporting:

- *TimeCharter* – The vessel is hired by a charterer for a period of time, and the charterer directs the vessel's voyages. Fuel costs and voyage planning typically fall under the charterer's responsibility, and emissions reporting includes all legs (ballast and laden) during the charter period.
- *VoyageCharterSingle* – A single voyage charter (single trip) where the charterer contracted the vessel to carry a cargo from A to B. In a voyage charter, the charterer pays a one-time rate (usually per metric ton of cargo) and the shipowner covers the voyage costs, including fuel. "Single" indicates it involves a single load port and single discharge port (one cargo parcel, one destination).
- *VoyageCharterMultiple* – A voyage charter that involves multiple stops or multiple cargo loads/discharges under one contract. This could refer to a contract of affreightment (COA) or a voyage with multiple loading/discharge ports. A COA is effectively an agreement for several voyages or multiple shipments, possibly including multiple parcels, under the same contract. If the voyage in question had more than one load or discharge port (multiple cargo operations for the charterer), it can be categorised as *VoyageCharterMultiple*.
- *Parceling* – A voyage where the vessel carries cargoes from multiple charterers simultaneously, also known as a general parceling situation. In parceling, each charterer has only a part of the total cargo on board. For example, a bulk carrier might be loaded with cargo from Charterer A and Charterer B at the same time. Each charterer will report their share of the operational and emissions data. Under general parceling, all charterers use the overall voyage's emission intensity for their reporting, including ballast if applicable. (The SCC provides a *"Single Charterer & General Parceling"* data template for this scenario on their website, meaning the data requirements are like a normal voyage, just with partial cargo shares for each charterer.) Appendix 3 of the SCC Technical Guidance provides further details on the emission allocation methodology for general parceling.
- *ChemicalParceling* – A specialised parceling case for chemical tankers carrying multiple parcels of cargo. Chemical parceling voyages often involve many stops and longer port stays (for tank cleaning, calling multiple load/discharge berths, etc.), leading to significant in-port emissions. The SCC requires more detailed data collection for chemical parceling, specifically to allocate emissions that occur in port. In this case, the charterer should report port emissions separately for each parcel and calculate the emission intensity for *each parcel* of cargo. Essentially, climate alignment is assessed per parcel in chemical parceling, because different parcels may have different journey

segments. (The SCC provides a separate *Chemical Parceling* template for these cases, capturing the extra detail on port emissions and parcel-specific calculations.) Appendix 3 of the SCC Technical Guidance provides further details on emission allocation methodology for chemical parceling. Please note that the methodology to allocate emission from ballast legs differs between general parceling and chemical parceling and more information can be found in Appendix 3 of the Technical Guidance.

Selecting the correct voyageType is critical, as it determines how emissions are allocated among cargo parcels and charterers, and what data are required for reporting.

2.4 Vessel Information

The **data.vessel** object requires key information about the ship involved in the voyage:

```
"vessel": {
  "imoNo": "9420710",
  "name": "BOCHEM OSLO",
  "type": "ChemicalTanker",
  "deadweightMT": 33654.77
},
```

Field Name	Type	Required	Description
imoNo	String	Yes	The IMO number of the vessel. This is the unique seven-digit number assigned to the ship (IMO registration). It is a required field and is fundamental for identifying the vessel. The IMO number is used by the SCC to cross-reference vessel characteristics (like size and type) since vessel category alignment scores are reported by type/size category. Always double-check that the IMO number is correct (no typos), as it is the key identifier.
name	String	Yes	The name of the vessel. This should be the current name of the ship as of the voyage. While the IMO number is the unique key, the name is useful for human readers and verification.
type	String	Yes	Vessel category. Allowed values: *BulkCarrier, ChemicalTanker, OilTanker, LngTanker, LpgTanker, or CombinationCarrier*. The category influences benchmark alignment calculations in the SCC.
deadweightMT	Number	Yes	Deadweight tonnage (DWT) of the vessel in metric tons. Must be greater than zero. Used to assign the vessel to its size and category for emission intensity comparisons.

All vessel fields are mandatory. Accurate data ensures proper matching with the SCC registry and correct categorisation in emission disclosures.

2.5 Vessel Types Explained

The **vessel type/category**, which must be one of the allowed values in the schema: "*BulkCarrier*", "*ChemicalTanker*", "*OilTanker*", "*LngTanker*", "*LpgTanker*", or "*CombinationCarrier*". These categories correspond to the vessel categories used by the Sea Cargo Charter for reporting. The Sea Cargo Charter classifies vessels by design type, based on the IHS StatCode 5 Shiptype Coding System.[3] Choose the category that fits the vessel:

- *BulkCarrier* – dry bulk carriers, including general cargo vessels when carrying dry bulk cargo.
- *ChemicalTanker* – tankers primarily for chemicals (often multiple segregated tanks, hence the special parceling case).
- *OilTanker* – includes crude oil and product tankers (for petroleum products).
- *LngTanker* – LNG carriers (Liquefied Natural Gas tankers).
- *LpgTanker* – LPG carriers (Liquefied Petroleum Gas tankers).
- *CombinationCarrier* — combination carrier vessels such as CABU (caustic soda and bulk) carriers.

It's important to select the correct type because, in the SCC Annual Disclosure Report, climate alignment is reported by vessel category. The Technical Guidance notes that vessel categories are defined by type and size, following IMO's classification from the GHG studies and the vessel categorisation by design type as per the IHS StatCode 5 Coding System. Ensure the type here matches how the voyage is treated under SCC – for example, if it's an LPG carrier, mark *LpgTanker* so that if needed the appropriate unit (m^3 for cargo, etc.) is recognised in calculations (LPG/LNG cargoes sometimes use volume and density).

3. Emission Details: Voyage Itinerary and Fuel Consumption

The ***emissionDetails*** field is an array that represents the entire voyage itinerary including both port calls and sea passages. According to the GLEC v3.2 and ISO 14083, this granular breakdown is crucial for accurate emission calculations.

The schema defines two possible structures for these elements, distinguished by the field legType (which is either "Port" or "Sea"). Every voyage segment must be listed in chronological order, beginning at voyage start—departure from the port where all cargo was previously discharged—and ending at the final port—departure after full discharge of cargo. Departure from the final port after full discharge marks the start of the subsequent voyage. Data for each leg should be prepared as follows:

[3] https://cdn.ihs.com/www/pdf/Statcode-Shiptype-Coding-System.pdf

```
{
    "ballastLaden": "Laden",
    "legType": "Port",
    "portName": "ULSAN",
    "portUNCode": "KRUSN",
    "cargoQuantityMT": 28050,
    "chartererCargoQuantityMT": 28050,
    "consumption": [
      {
        "fuelType": "MGO",  "quantityMT": 38.8, "emissionFactor": 4.01
      },
      {
        "fuelType": "HFO", quantityMT": 0, emissionFactor": 3.84
      }
    ]
  },
```


Field Name	Type	Required	Description
legType	String	Yes	Type of leg: either "Port" or "Sea".
ballastLaden	String	No	Indicates whether the leg occurs while the vessel is in ballast ("Ballast") or carrying cargo ("Laden").
cargoQuantityMT	Number	Yes	Total cargo on board (in metric tons) during the leg. Zero for ballast legs.
chartererCargoQuantityMT	Number	Yes	Cargo attributable to the reporting charterer (in metric tons).
consumption[]	Array	Yes	List of fuel types burned on the leg. Each element includes fuel type, quantity and emission factor (defined below).

3.1 Port Legs (legType = "Port")

Port legs capture time spent at berth for loading, discharging, bunkering or other port activities. Additional fields for port legs:

```
{
  "ballastLaden": "Laden",
  "legType": "Port",
  "portName": "MEJILLONES",
  "portUNCode": "CLMJS",
  "cargoQuantityMT": 28050,
  "chartererCargoQuantityMT": 28050,
  "consumption": [
    {
      "fuelType": "MGO",  "quantityMT": 1.5, emissionFactor": 4.01
    },
    {
      "fuelType": "HFO", "quantityMT": 72.7, emissionFactor": 3.84
    }
  ]
}
```

Field Name	Type	Required	Description
portName	String	Yes	Name of the port visited. Use the official port name.
portUNCode	String	Yes	UN LOCODE of the port.

3.2 Sea Legs (legType = "Sea")

Sea legs describe the vessel's passage between two ports. Additional fields for sea legs:

```
{
  "ballastLaden": "Laden",
  "legType": "Sea",
  "fromPortName": "ULSAN",
  "toPortName": "MEJILLONES",
  "fromPortUNCode": "KRUSN",
  "toPortUNCode": "CLMJS",
  "fromDate": "2024-12-28T12:18:00.000Z",
  "toDate": "2025-01-31T01:06:00.000Z",
  "cargoQuantityMT": 28050,
  "chartererCargoQuantityMT": 28050,
  "distanceNauticalMiles": 10196.46,
  "consumption": [
    {
      "fuelType": "MGO", "quantityMT": 3.2, "emissionFactor": 4.01
    },
    {
      "fuelType": "HFO", "quantityMT": 774.2, "emissionFactor": 3.84
    }
  ]
},
```

Field Name	Type	Required	Description
fromPortName	String	Yes	Departure port name for the leg. Should match the previous port leg's portName.
toPortName	String	Yes	Destination port name.
fromPortUNCode	String	Yes	UN LOCODE of the load port.
toPortUNCode	String	Yes	UN LOCODE of the destination port.
fromDate	String	No	Departure date/time (ISO 8601). Helpful for chronological ordering but optional in the schema.
toDate	String	No	Arrival date/time (ISO 8601).
distanceNauticalMiles	Number	Yes	Distance sailed on the leg (nautical miles). Must be greater than zero. Represents actual distance steamed, not just great circle distance.

The ballast or laden status must be indicated for each sea leg. The first sea leg following a previous voyage's final discharge port is usually ballast; once cargo is loaded, subsequent sea legs are laden. Accurately distinguishing ballast vs. laden legs ensures proper allocation of emissions across cargo parcels.

3.3 Fuel Consumption (consumption[])

Each leg has a **consumption** array listing the fuel types burned on that leg. Each element is defined as follows:

```
"consumption": [
  {
    "fuelType": "MGO", "quantityMT": 3.2, "emissionFactor": 4.01
  },
  {
    "fuelType": "HFO", "quantityMT": 774.2, "emissionFactor": 3.84
  }
]
```

Field Name	Type	Required	Description
fuelType	String	Yes	Enum: HFO, MGO, MDO, LFO, LNG, BIO, LPG, etc.
quantityMT	Number	Yes	Fuel amount consumed in metric tons.
emissionFactor	Number	Yes	Emission factor (gCO_2e per gram of fuel). Follows the emission factor table in Appendix 4 of the SCC Technical Guidance. The schema also accommodates custom fuel factors if available and certified.

Fuel consumption should be itemised by fuel type for each leg. The total fuel consumed across all legs must equal the voyage's total fuel consumption for reporting accuracy.

4. Alignment with SCC Data Collection Excel Templates (Mapping)

This document provides a field-by-field crosswalk from the Sea Cargo Charter (SCC) Data Collection Excel templates to our JSON schema, aligned with the latest Technical Guidance. The schema is strictly versioned; any SCC update will trigger a version increment. The mapping confirms that the JSON schema is a strict superset of the manual templates—no information is lost—and, where useful, the JSON adds structure and disambiguation:

- *Vessel and Voyage Metadata* – The top section of the Excel template collects identifying and operational metadata about the voyage and vessel. In the JSON structure, these map into data.vessel and other data fields, forming the header block of the JSON document. Fields such as IMO number, vessel name, DWT, voyage type and charterer voyage ID appear exactly once.

Excel Template Field	**JSON Path**	**Notes**
IMO number	data.vessel.imoNo	7-digit unique identifier
Vessel name	data.vessel.name	Used as display and linkage
Vessel type	data.vessel.type	Enum: ChemicalTanker, OilTanker, etc.
Vessel size (DWT)	data.vessel.deadweightMT	Deadweight in metric tons
Voyage type	data.voyageType	Enum; for this template, set to "ChemicalParceling"
Charterer voyage ID	data.chartererVoyageID	Free-text field passed from charterer system
Contact name	data.contactName	Usually "System generated"
Contact email address	data.contactEmail	e.g., GSSCOpsEmissions@stolt.com

- *Ballast Leg Mapping (Sea Leg - Empty Return or Preloading Travel)* – Ballast leg details from the Excel section “Preceding Ballast Leg” are mapped into the first entry of the data.emissionDetails array. These entries are of legType = "Sea" and ballastLaden = "Ballast".

Excel Field	**JSON Path**	**Comments**
Previous discharge port	emissionDetails[0].fromPortName	Departure of ballast leg
UN/LOCODE (from)	emissionDetails[0].fromPortUNCode	Matches SCC registry
Load port	emissionDetails[0].toPortName	Arrival port (ballast leg ends)
UN/LOCODE (to)	emissionDetails[0].toPortUNCode	Optional but recommended
Ballast start date & time	emissionDetails[0].fromDate	UTC ISO format
Ballast end date & time	emissionDetails[0].toDate	UTC ISO format

Distance sailed (nautical miles)	emissionDetails[0].distanceNauticalMiles	Required and used for emission calculation

Fuel consumption for this leg is stored under:

```
emissionDetails[0].consumption = [{
    "fuelType": "MGO",  "quantityMT": 7.1, "emissionFactor": 4.01
 },
 {
    "fuelType": "HFO", "quantityMT": 651.1, "emissionFactor": 3.84
 }]
```

Each object under consumption aligns with the fuel-specific columns in the Excel sheet.

- *Port Stays Mapping* – Port activities (non-sailing legs such as loading or discharging) are modelled using legType = "Port" and portName.
  - ULSAN stay:
    - `data.emissionDetails[1].portName = "ULSAN"`
    - consumption includes bunker use while at berth (e.g., MGO = 38.8, HFO = 0)
  - MEJILLONES stay:
    - `data.emissionDetails[3].portName = "MEJILLONES"`
    - consumption includes: MGO = 1.5, HFO = 72.7
  - Port UN/LOCODEs are mapped to portUNCode if known.
- *Laden Leg Mapping (Sea Leg - With Cargo Onboard)* – Laden legs are legs where cargo is transported. These are entered as `legType` = "Sea" and `ballastLaden` = "Laden", typically occupying index 2 in `emissionDetails`.

Excel Field	**JSON Path**	**Comments**
First load port	emissionDetails[2].fromPortName	Should match the end of ballast leg
Final discharge port	emissionDetails[2].toPortName	Last unloading port
UN/LOCODE (from/to)	fromPortUNCode / toPortUNCode	Required for data integrity
Voyage start/end (datetime)	fromDate / toDate	Full UTC datetime with time
Total laden distance sailed	distanceNauticalMiles	Required for emissions
Cargo quantity onboard	cargoQuantityMT	Total cargo weight

Consumption is stored in the same structure as ballast:

```
"consumption": [
  { "fuelType": "MGO", "quantityMT": 3.2, "emissionFactor": 4.01 },
  { "fuelType": "HFO", "quantityMT": 774.2, "emissionFactor": 3.84 }
]
```

- *Fuel details and Fuel Emission Factor Handling* – Each fuel entry within any emissionDetails[].consumption[] object must provide:
  - fuelType – Valid enum such as "HFO", "MDO", "MGO", "LFO", "LNG", "BIO", "LPG", etc.
  - quantityMT – Fuel burned (in metric tons) during that leg
  - emissionFactor – Emission factor based on SCC's official emission factor list from Annex 4 in the SCC Techncial Guidance

These match the bottom sheet section of the Excel template and Table 8 of the SCC Technical Guidance where emission factors are provided for HFO, MGO, etc., depending on grade.

By following this mapping, information collected in the Excel templates can be converted to JSON without losing detail. The JSON representation also adds clarity by associating each value with its context (leg) and grouping related fields together.

5. Data Validation and Submission Workflow

This section describes how to use an API to submit voyage emissions data accurately and securely within a digital reporting workflow between charterers, owners or any third-party platforms that require same data.

5.1 API Integration and Error Handling

One of the major advantages of adopting a JSON schema for emissions reporting is the ability to integrate with software systems and APIs. A shared data format lets different software systems exchange emissions reports the same way. In practice, a simple text file using JavaScript Object Notation (JSON) is sent to the receiving system through an Application Programming Interface (API)—you can think of the API as a secure front desk where one system hands data to another.

Before the receiving system accepts any file, it must be configured to run checks (called "validation"). These checks are created and maintained by the receiving organisation and can be tailored to its rules; they are not automatically built into the JSON file itself. Typical checks include:

- Are all required fields present?
- Do dates and numbers use the right format?
- Do the values make sense together (for example, arrival comes after departure)?

If any check fails, the system does not save the data and sends back a clear message explaining what needs to be fixed. If all checks pass, the data are saved, and a confirmation is returned with a reference number you can use later.

5.2 Authentication and Security

Voyage-emissions data are sensitive. The receiving system must accept data only from approved systems and users. Before any file is accepted, the sender must prove who they are using a digital pass (for example, Open Authorization (OAuth 2.0) tokens or system-issued API keys). After identity is confirmed, access is limited to what that sender is allowed to do (submit, read, or both). All transfers must use an encrypted connection (HTTPS) so the data cannot be read or changed in transit. In practice: the sending system signs in first, then sends the file; if identity or permissions cannot be verified, the submission is refused.

5.3 Submission Workflow

In practice, voyage data moves from actual port operations to reporting through the following steps by the owners.

- *Data capture* – The vessel or operations team records voyage data in an operational system or form. Data capture may be automated (e.g., noon reports, electronic logging of fuel consumption, sensors, AIS data) or manual.
- *JSON generation* – Once a voyage is completed, software maps the captured data into the SCC JSON schema. The JSON is produced by assembling the header metadata, vessel information and an ordered list of legs with fuel consumption details.
- *Submission* – The JSON document is sent via the API to a central platform (e.g., an internal system). The API must be set up to automatically check the file first ('validation')—making sure required fields are present, values use the right format (for example, dates and numbers), and the information makes sense. If something is missing or incorrect, the API sends back a clear error message and does not save the data. If everything is correct, the data are saved, and a confirmation is returned.
- *Security checks* – Throughout this process, authentication tokens or API keys are required to verify the client. Data are transmitted over secure protocols.

Automating this workflow reduces manual effort and ensures timely and accurate submissions.

6. GLEC Framework and ISO 14083 Reference

This document has been constructed with the input of the Smart Freight Centre and is generally aligned with the Global Logistics Emissions Council (GLEC) Framework and ISO 14083, with a few notable exceptions in terminology. While this document consistently uses SCC terminology to stay in sync with the SCC Technical Guidance, the following terms are cross references to the applicable GLEC Framework/ISO 14083 terminology.

- The SCC scheme uses the term "leg" to designate time periods where the vessel is either in port or at sea. The GLEC Framework and ISO 14083 use the terminology "Transport Chain Element (TCE)."
- "Port" in SCC terminology could be considered a "Hub" in GLEC Framework/ISO 14083 terminology.
- The SCC scheme uses the term "emission factor" similar to the GLEC Framework that uses the term "(Fuel) Emission Factor" and the ISO14083 uses the term "GHG emission factor".
- The SCC scheme uses the more maritime friendly "nautical mile" whereas the GLEC Framework and ISO 14083 uses "kilometre,".

7. Conclusion

The SCC Voyage Emissions Reporting JSON schema provides a modern, consistent and machine-readable structure for capturing voyage emissions data. By clearly defining the structure, field logic and alignment with existing templates, the schema ensures compatibility with SCC Technical Guidance while enabling system integration and automation. The structure is flexible enough to accommodate various voyage types, fuel configurations and cargo scenarios, including complex parceling operations. With clear mapping and validation rules, this schema provides a strong foundation for digital reporting and future API-based submissions. Implementing this schema will streamline data collection, reduce manual errors and enhance the reliability of emissions reporting across voyages.

8. Data Dictionary

Section	Field	Type	Enum/Range	Notes
TopLevel	type	string	SCCVoyageEmissions	Document discriminator
TopLevel	comment	string		Free text/version note
TopLevel	targetTenantId	string		Reporting entity/system ID
TopLevel	created	string	ISO-8601 date-time (UTC)	System-generated at first persist; read-only; used for audit and de-duplication.

TopLevel	lastUpdate	string	ISO-8601 date-time (UTC)	System-managed on any modification; latest value indicates the freshest version for reconciliation.
TopLevel	data	object		Container for voyage data
VoyageMetadata	chartererVoyageID	string		Charterer reference ID
VoyageMetadata	voyageType	string	TimeCharter | VoyageCharterSingle | VoyageCharterMultiple | Parceling | ChemicalParceling	Contract category
VoyageMetadata	contactName	string		Responsible contact
VoyageMetadata	contactEmail	string		Contact email
Vessel	imoNo	string	7-digit IMO	Primary vessel ID
Vessel	name	string		Vessel name
Vessel	type	string	BulkCarrier | ChemicalTanker | OilTanker | LngTanker | LpgTanker | Combination Carrier	Vessel category
Vessel	deadweightMT	number	> 0	Summer DWT
EmissionDetails_Common	legType	string	Port | Sea	Leg kind
EmissionDetails_Common	ballastLaden	string	Ballast | Laden	Cargo condition
EmissionDetails_Common	cargoQuantityMT	number	>= 0	Total cargo on board
EmissionDetails_Common	chartererCargoQuantityMT	number	>= 0	Charterer share
EmissionDetails_Common	consumption[]	array		Per-fuel entries

<table>
<tr><td>PortLeg</td><td>portName</td><td>string</td><td></td><td>Port name</td></tr>
<tr><td>PortLeg</td><td>portUNCode</td><td>string</td><td>UN/LOCODE</td><td>Recommended</td></tr>
<tr><td>PortLeg</td><td>fromDate</td><td>string</td><td>ISO-8601</td><td>Arrival timestamp</td></tr>
<tr><td>PortLeg</td><td>toDate</td><td>string</td><td>ISO-8601</td><td>Departure timestamp</td></tr>
<tr><td>SeaLeg</td><td>fromPortName</td><td>string</td><td></td><td>Departure port</td></tr>
<tr><td>SeaLeg</td><td>toPortName</td><td>string</td><td></td><td>Arrival port</td></tr>
<tr><td>SeaLeg</td><td>fromPortUNCode</td><td>string</td><td>UN/LOCODE</td><td>Required</td></tr>
<tr><td>SeaLeg</td><td>toPortUNCode</td><td>string</td><td>UN/LOCODE</td><td>Required</td></tr>
<tr><td>SeaLeg</td><td>fromDate</td><td>string</td><td>ISO-8601</td><td>Sail-away timestamp</td></tr>
<tr><td>SeaLeg</td><td>toDate</td><td>string</td><td>ISO-8601</td><td>Arrival timestamp</td></tr>
<tr><td>SeaLeg</td><td>distanceNauticalMiles</td><td>number</td><td>> 0</td><td>Sailed distance</td></tr>
<tr><td>Consumption</td><td>fuelType</td><td>string</td><td>HFO | MDO | MGO | LFO | LNG | BIO | LPG</td><td>Fuel type</td></tr>
<tr><td>Consumption</td><td>quantityMT</td><td>number</td><td>>= 0</td><td>Fuel burned on leg</td></tr>
<tr><td>Consumption</td><td>emissionFactor</td><td>number</td><td>>= 0</td><td>Emission factor</td></tr>
</table>

Appendix A — Extended Worked Example (Chemical Parceling, STOLT BOBCAT, Voyage 14)

Purpose. Demonstrates the schema on a complex multi-port chemical-parceling voyage. **Scope.** Values are illustrative and use the same field names and units as the schema. **Units.** emissionFactor denotes grams of CO_2e per gram of fuel.


```json
{
   "chartererVoyageID": "STOLT",
   "voyageType": "ChemicalParceling",
   "created": "2024-09-22T09:30:00Z",
   "lastUpdate": "2024-10-16T03:50:00Z",
   "vessel": {
       "imoNo": "9511167",
       "name": "STOLT BOBCAT",
       "type": "ChemicalTanker",
       "deadweightMT": 23432.12
   },
   "emissionDetails": [
       {
           "ballastLaden": "Laden",
           "fromDate": "2024-05-18T11:15:00Z",
           "toDate": "2024-05-18T11:15:00Z",
           "portName": "TEXAS CITY",
           "cargoQuantityMT": 12484.041,
           "chartererCargoQuantityMT": 2093.274,
           "legType": "Port",
           "consumption": [
               {
                   "fuelType": "HFO",
                   "quantityMT": 0,
                   "emissionFactor": 3.84
               },
               {
                   "fuelType": "LFO",
                   "quantityMT": 0,
                   "emissionFactor": 3.75
               },
               {
                   "fuelType": "MDO",
                   "quantityMT": 8.43,
                   "emissionFactor": 4.01
               },
               {
```

```
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ]
    },
    {
        "ballastLaden": "Laden",
        "cargoQuantityMT": 12484.041,
        "chartererCargoQuantityMT": 2093.274,
        "distanceNauticalMiles": 332.262,
        "legType": "Sea",
        "consumption": [
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                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 0,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
                "quantityMT": 20.7,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ],
        "fromPortName": "TEXAS CITY",
        "toPortName": "NEW ORLEANS"
    },
    {
        "ballastLaden": "Laden",
        "portName": "NEW ORLEANS",
        "cargoQuantityMT": 14476.431,
        "chartererCargoQuantityMT": 2093.274,
        "legType": "Port",
        "consumption": [
```

```
                {
                    "fuelType": "HFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.84
                },
                {
                    "fuelType": "LFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.75
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                    "emissionFactor": 4.01
                },
                {
                    "fuelType": "LNG",
                    "quantityMT": 0,
                    "emissionFactor": 4.61
                }
            ]
        },
        {
            "ballastLaden": "Laden",
            "cargoQuantityMT": 14476.431,
            "chartererCargoQuantityMT": 2093.274,
            "distanceNauticalMiles": 95.415,
            "legType": "Sea",
            "consumption": [
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                    "fuelType": "HFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.84
                },
                {
                    "fuelType": "LFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.75
                },
                {
                    "fuelType": "MDO",
                    "quantityMT": 3.37,
                    "emissionFactor": 4.01
                },
```

```
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ],
        "fromPortName": "NEW ORLEANS",
        "toPortName": "BATON ROUGE"
    },
    {
        "ballastLaden": "Laden",
        "portName": "BATON ROUGE",
        "cargoQuantityMT": 16486.359,
        "chartererCargoQuantityMT": 4103.202,
        "legType": "Port",
        "consumption": [
            {
                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 0,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
                "quantityMT": 19.31,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ]
    },
    {
        "ballastLaden": "Laden",
        "cargoQuantityMT": 16486.359,
        "chartererCargoQuantityMT": 4103.202,
        "distanceNauticalMiles": 4668.881,
        "legType": "Sea",
```

```
        "consumption": [
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                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 253.111,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
                "quantityMT": 24.04,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ],
        "fromPortName": "BATON ROUGE",
        "toPortName": "ALGECIRAS"
    },
    {
        "ballastLaden": "Laden",
        "portName": "ALGECIRAS",
        "cargoQuantityMT": 16486.359,
        "chartererCargoQuantityMT": 4103.202,
        "legType": "Port",
        "consumption": [
            {
                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 15.61,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
```

```
                "quantityMT": 11.9,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ]
    },
    {
        "ballastLaden": "Laden",
        "cargoQuantityMT": 14426.721,
        "chartererCargoQuantityMT": 4103.202,
        "distanceNauticalMiles": 482.092,
        "legType": "Sea",
        "consumption": [
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                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 32.51,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
                "quantityMT": 2.27,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ],
        "fromPortName": "ALGECIRAS",
        "toPortName": "TARRAGONA"
    },
    {
        "ballastLaden": "Laden",
        "portName": "TARRAGONA",
```

```
            "cargoQuantityMT": 14426.721,
            "chartererCargoQuantityMT": 4103.202,
            "legType": "Port",
            "consumption": [
                {
                    "fuelType": "HFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.84
                },
                {
                    "fuelType": "LFO",
                    "quantityMT": 0.6,
                    "emissionFactor": 3.75
                },
                {
                    "fuelType": "MDO",
                    "quantityMT": 17.78,
                    "emissionFactor": 4.01
                },
                {
                    "fuelType": "LNG",
                    "quantityMT": 0,
                    "emissionFactor": 4.61
                }
            ]
        },
        {
            "ballastLaden": "Laden",
            "cargoQuantityMT": 9377.766,
            "chartererCargoQuantityMT": 1046.637,
            "distanceNauticalMiles": 1474.883,
            "legType": "Sea",
            "consumption": [
                {
                    "fuelType": "HFO",
                    "quantityMT": 0,
                    "emissionFactor": 3.84
                },
                {
                    "fuelType": "LFO",
                    "quantityMT": 102.1,
                    "emissionFactor": 3.75
                },
                {
```

```
                "fuelType": "MDO",
                "quantityMT": 6.57,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ],
        "fromPortName": "TARRAGONA",
        "toPortName": "GEBZE"
    },
    {
        "ballastLaden": "Laden",
        "portName": "GEBZE",
        "toDate": "2024-06-28T00:30:00Z",
        "cargoQuantityMT": 9377.766,
        "chartererCargoQuantityMT": 1046.637,
        "legType": "Port",
        "consumption": [
            {
                "fuelType": "HFO",
                "quantityMT": 0,
                "emissionFactor": 3.84
            },
            {
                "fuelType": "LFO",
                "quantityMT": 0.69,
                "emissionFactor": 3.75
            },
            {
                "fuelType": "MDO",
                "quantityMT": 3.84,
                "emissionFactor": 4.01
            },
            {
                "fuelType": "LNG",
                "quantityMT": 0,
                "emissionFactor": 4.61
            }
        ]
    }
],
```

```json
    "voyageNo": 14,
    "vesselCode": "VS4023",
    "fuelTypes": [
        {
            "fuelType": "HFO",
            "emissionFactor": 3.84,
            "displayText": "HFO"
        },
        {
            "fuelType": "LFO",
            "emissionFactor": 3.75,
            "displayText": "LFO"
        },
        {
            "fuelType": "MDO",
            "emissionFactor": 4.01,
            "displayText": "MDO"
        },
        {
            "fuelType": "LNG",
            "emissionFactor": 4.61,
            "displayText": "LNG"
        }
    ]
}
```

Sources

- Sea Cargo Charter – *Technical Guidance 5.1 (2025)* (especially Appendices on data and parceling)
- Sea Cargo Charter – *Data Collection Template v4.2 (2025)* changes summary
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- Sea Cargo Charter – *FAQ* (clarifying definitions of voyage types and data gathering responsibilities)
- International Organization for Standardization. (2023). *ISO 14083:2023 Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations*. ISO. https://www.iso.org/standard/78864.html
- Smart Freight Centre. Global Logistics Emissions Council Framework for Logistics Emissions Accounting and Reporting; v3.2 edition, revised and updated (October 2025).

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Stolt Tankers, Christopher Stickney, Business Partner Sustainability and Decarbonisation
Stolt Tankers, Inderjeet Singh, Business Application Consultant
Stolt Tankers, Mohit Kumar, Global Director Business Technology & Innovation

Advisory

Smart Freight Centre, Violetta Matzoros, Senior Technical Manager
Smart Freight Centre, Alan Lewis, Chief Technical Officer

Secretariat

Global Maritime Forum, Lena Faber, Project Manager
Global Maritime Forum, Ross Berridge, Project Coordinator