

Traceability for Sustainable Trade

A Framework to design Traceability Systems for Cross Border Trade



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A Framework to design
Traceability Systems
for Cross Border Trade



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FOREWORD

Consumers and producers are increasingly interested in knowing how products are made and whether there are any adverse environmental or social impacts. While two products may look or feel similar, consumers may still distinguish between them on the basis of certain intangible policy claims, such as whether they are “organic” or “sustainably produced”. Since these types of claims are difficult or impossible to measure merely by looking at the product, it is necessary to have mechanisms to “trace” these products and the policy claims about them.

Traceability systems are often private sector driven as producers seek to promote certain claims about their products, however, government agencies may also have a significant role. Government intervention increases the complexity of traceability systems as it introduces new elements such as data-sharing, confidentiality of information, governance and regulatory compliance. This has the potential to impact on trade, especially when governments seek to protect consumers by requiring certain documents or data from traders in order to ensure the veracity of policy claims.

The United Nations Economic Commission for Europe has developed a framework for designing traceability systems in order to ensure that traceability is efficiently dealt with in cross-border trade so that it can better contribute to the sustainable development goals. This framework should be useful for government officials and private sector actors involved in designing and implementing traceability systems.

I hope that this guide will contribute to sustainable trade by enabling cross-border traders to efficiently substantiate their policy claims and by creating trust among consumers in the credibility of sustainable products.



Christian Friis Bach

Executive Secretary
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1 Introduction

1.1 Definition of Traceability, Supply Chain and Traceable Asset

Traceability: The International Standards Organization (ISO) defines traceability as “*the ability to trace the history, application or location of an object*” in a supply chain (ISO, 2015).

GS1, Global Standards One, an international, not-for-profit, international organisation that develops and maintains standards for supply and demand chains across multiple sectors, defines traceability as “*the ability to track forward the movement through specified stage(s) of the extended supply chain and trace backward the history, application or location of that which is under consideration*”¹.

In the context of this Traceability Framework we look at traceability as a method to substantiate a claim or statement relating to a product, service or business process based on available information. In a traceability system where Government agencies are involved these claims typically relate to certain values of society, many of which are related in one way or another to one of the goals of the UN Sustainable development agenda². We will call a statement that a traceability system supports a “Policy Claim”.

Traceability in the context of this Guide is then defined as:

“The ability to substantiate a Policy Claim that requires the involvement of a Public Authority via the collection of relevant data generated along international supply chains.”

Supply Chain: A Supply Chain includes the activities necessary for goods or services to be produced and delivered to the buyer. Such activities may include sourcing of raw materials, preparing for transport, requesting an import license, preparing documentation for Customs clearance, clearance, payment, and delivery to the consumer. As a minimum, a supply chain involves two parties, the seller and the buyer. In reality, a supply chain involves many different parties. UN/CEFACT describes the main business processes of international trade in its Buy – Ship - Pay Reference Model³.

Traceable Asset: For the purposes of this guide a generic term, “Traceable Asset”, will be used to denote any item (for example an object, a product or other traded item or a service) that needs to be tracked along a supply chain.

In this Guide we do not distinguish between tracing (monitoring the history of a traceable asset) and tracking (monitoring the present and future movements of the asset) as the Framework applies to both concepts.

¹ Ryu, J. (2012). *GS1 Standards Document GS1 Global Traceability Standard*. GS1 Global Office: GS1 2010-2012.

² <https://sustainabledevelopment.un.org/?menu=1300>

³ <http://tfig.unece.org/contents/buy-ship-pay-model.htm>

1.2 The Purpose of the Traceability Framework

Current traceability systems are mainly private sector driven which greatly simplifies participation, management and data exchange.

When government agencies and private sector actors participate in traceability projects, there are numerous aspects related to trust, responsibility for data, rules for data sharing, governance and legislation which need to be taken into account. The complexity and interdependence of these issues can make the planning of a traceability project a challenge. There is currently little guidance available to help governments and project managers to plan traceability projects for cross border trade where government agencies are participating.

This Guide provides Governments and decision makers with a framework for developing a high level plan for a traceability project. The Framework starts with the identification of the key components of a traceability system such as the regulatory objectives as well as the expectations and needs of stakeholders, the goods or services that need to be traced and the rules under which information will be exchanged between parties. These components provide a functional description of the future traceability system from the point of view of its stakeholders. This functional description should be the basis of the technical implementation choices.

The Traceability Framework that we present in this Guide starts out with the user requirements which finally lead to the choice of the best technology to implement the requirements. The user driven approach is very important for traceability projects in cross-border trade where often many different stakeholders with very different expectations are participating. In these environments the Framework provides a structured and transparent planning process that allows all parties to understand, discuss and shape the components of the future system.

1.3 Who is this guide for?

This guide is designed to provide guidance for decision makers from Government agencies and the private sector involved in the planning and implementation of traceability projects. This Guide is specifically designed for the planning of traceability in international trade where government agencies are implicated. It may also be used in national or private sector traceability projects where multiple stakeholders need to agree on a common project. The Traceability framework specifically addresses the following design challenges:

- **Multiple stakeholders** are involved, often from different countries and industry sectors. Long term support for the traceability system requires consensus and a good understanding by all stakeholders.
- In particular, when the objective of the traceability project is to support **complex** social, economic and environmental **objectives** the definition of the objectives of the traceability system can become a challenge. Participants need to understand which claim or statement the traceability system will support.
- When Government agencies participate in traceability systems they need to make sure that participation in the traceability system is within their mandate and that a **suitable governance structure** for the traceability system is in place.

- Traceability with international supply chains requires substantive **international exchange of electronic information**. In particular, when Government agencies are involved this raises numerous concerns about confidentiality, liability, ownership and access rights.
- Traceability systems in international trade, especially where developing countries are involved, need to be **inclusive**, in order to integrate smallholders, small and medium-sized companies and less advanced stakeholders. The acceptance and support of the traceability system depends on its capability to integrate these stakeholders.

The traceability Framework presented in this guide addresses the issues outlined above.

2. The Components of a Traceability System

The Traceability Framework describes the components that form a traceability system. Such a description of fundamental components is often referred to as an “Architecture” as it explains how a system is built. Architectures are very useful tools when designing solutions that use Information and Communication Technologies: If we understand all components that will form the future traceability system then the solution is to develop each of these components.

Each component can be designed in a stepwise process which is much easier to plan and implement. The architecture ensures that components will assemble into a meaningful overall project. This is similar to building a house where the plan of the architect that defines the different components (fundament, walls, roof, electricity system, etc.) is assembled into a meaningful whole.

The components that we discuss for the traceability architecture are:

- the Policy Claim which provides the purpose of the traceability project,
- the Traceable Asset,
- the Entry/Exit Points on which the Traceable Asset enters and leaves the traceability system,
- the Entry/Exit Point conditions which describe the requirements on the traceable asset when it enters or leaves the system,
- the rules under which assets can move through the supply chain in conformance with the policy statement,
- the Audit Agency that will use traceability to monitor that all rules and conditions are met.

The examples that we use to explain the abstract architectural model are derived from a case study on the traceability of shark products in Costa Rica (Lehr H. , Catch documentation and traceability of shark products in Costa Rica, 2016).

The purpose of the Costa Rica project was to study the implementation of a catch documentation scheme and the traceability provisions of CITES-listed sharks.

In Costa Rica, there are artisanal, medium and large-size longline fleets catching sharks. Strict controls on species catches are in place for the medium and large sized fleets for all shark products for which a full traceability implementation was considered. The artisanal fleet required a sample based study to determine the impact of the fleet on the shark population and what type

of traceability system was needed. As a result of the workshops six recommendations were developed for the two fleets to aid the implementation of a traceability system.

In terms of process, the longline boats were expected to submit documentation about the fishing trip including details of the trip, temperature logs and locations and times of line settings. The exporting process included issuance of CITES permits, sanitary certificates, export applications, commercial invoices and FID (a catch certificate standardised within OSPESCA) details including a precise weight relationship between the exported goods and the individual species on each FID. *Costa Rica exports only frozen whole carcasses and fins as shark products; processed shark meat is consumed nationally.*

We applied the Traceability Framework to the findings of the report to develop a high level description of a future traceability system for shark products.

2.1 Policy Claim

If Governments are involved, traceability projects will typically support the implementation of the objectives of society and government mandates that generally are aimed at improving the long term viability of trade, employment, environment and safety. Policy Claims can be made for any industry and any traceable asset. A Policy Claim, by nature, will also directly or indirectly refer to a traceable asset.

“A policy claim is a high level statement, usually about an intangible feature or a process that is associated with a traceable asset that requires tracing of a supply chain and is supported by data collection.”

For this discussion, and based on the Costa Rica example mentioned above, the following will be given as examples of a Policy Claim and a related Traceable Asset.

- **Policy Claim:** *Exported shark products are obtained in accordance with national (Costa Rican) and international (CITES) rules and regulations for sustainable fishing of sharks.*
- **Traceable Asset:** *Sharks and derived products for export from Costa Rica.*

The challenge in designing a traceability project is in linking the high level Policy Claim to the events that are recorded in traceability systems which often relate to storage, loading and unloading of goods. The traceability project needs to link the Policy Claim to a set of measurable actions that happen between the Entry and the Exit Point and establish the means to determine during an audit whether a Policy Claim has been satisfied.

2.2 Entry and Exit Points

A Policy Claim will be linked to a segment of the supply chain where the traceability system records data for monitoring. A traceability solution is based on identifying the entry and exit points between which a traceable asset moves in a supply chain, with each of these events being considered an activity, for example, the landing of fish at a port.

The *Entry and Exit Points* are the supply chain activities which mark the start and the end of the supply chain that the traceability system will trace. Good choices for Entry and Exit

Points are locations where business processes are well controlled, i.e. where there is a high level of automation and business processes are well documented and enforced.



Figure 1 Traceable asset event relationship to entry/exit points

The traceable asset is assumed to have a specific and defined state at entry and exit points. An example of typical entry and exit points are landing zones in ports, Customs control points, inspection points, etc.

Continuing with the shark fin example, an entry or exit point could be defined as follows:

- **Entry Point:** *Medium or large scale longline boats must land sharks in a Costa Rica port that is authorised by the Costa Rican Ministry of Fisheries and under no circumstances without the presence of a fishery inspector.*
- **Exit Point:** *Submission of Customs declaration for the export of sharks or derived products.*

Entry/Exit Point: Activity/location where the traceable asset enters and leaves the traceability system



Figure 2 Entry and Exit Points in Costa Rica Shark example

2.3 Traceability Conditions and Rules

As mentioned above, within a traceability system it is assumed that traceable assets have a well-defined state at the entry point. The *Entry and Exit Conditions* ensure that the traceable asset meets certain features or conditions that qualify it to be included in the traceability system.

The traceable asset will enter the system at the Entry Point and then be transformed by business processes. The traceability system assumes that certain conditions are met in this

transformation process. This means that the traceable asset will meet certain conditions at the exit point of the system. If the traceability system can substantiate all conditions and rules the traceable asset meets the requirements stated in the policy claim.

Continuing with the Costa Rica shark fin example, the following examples show how these conditions and rules may look for a traceability project.

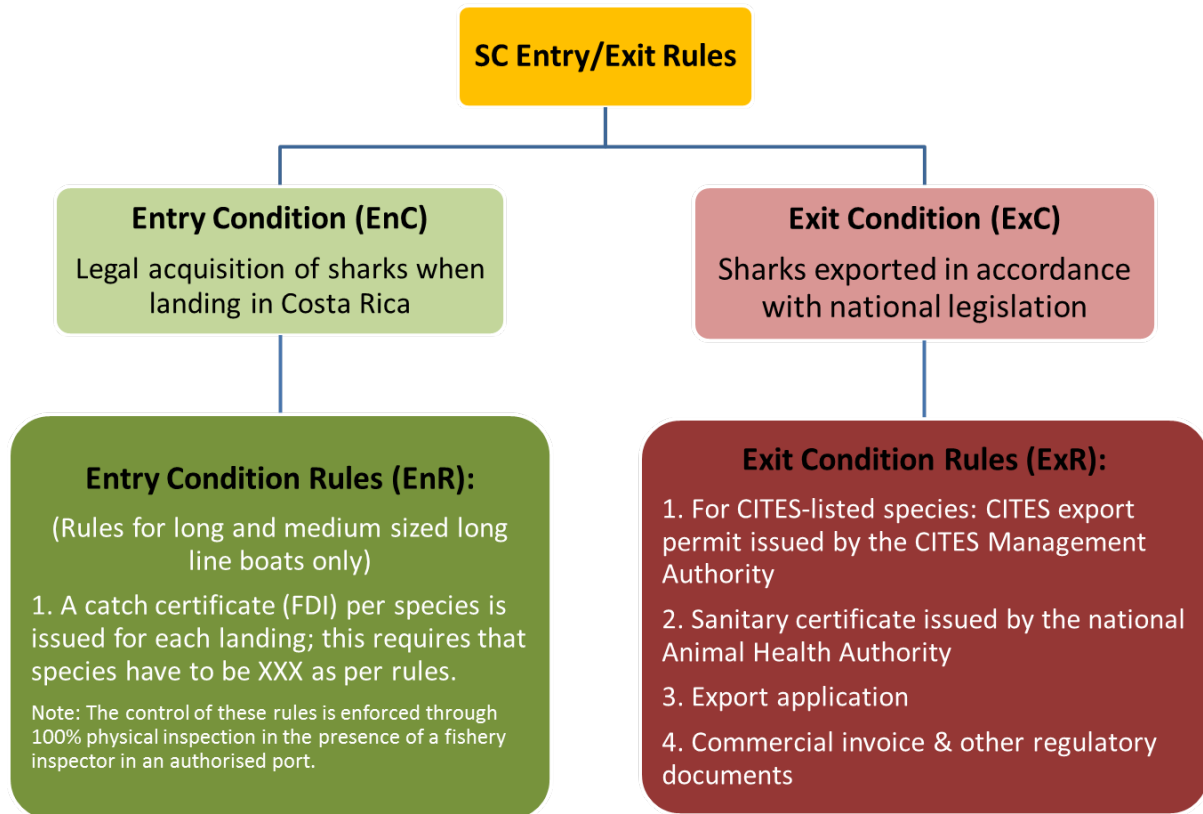


Figure 3 Rules and conditions for Entry/Exit Points

The *Transformation Rules* describe how the business processes between an Entry Point and an Exit Point need to be organised so that the Policy Claim is met. An example for a frequent transformation rule is the requirement that no traceable assets enter the supply chain between an Entry and Exit Point without being registered in the traceability system.

Below is an example of how this **Transformation Rule** looks in the case of Costa Rica shark products:

- **Transformation Rule:** *The quantity of shark and derived products (traceable assets) leaving the country through the exit point must correspond to the traceable assets entering the country at their supply chain Entry Point. This is controlled by:*
 - *Creating a relationship (in weight) between export product and landing certificate*
 - *Checking the landing certificates for each asset that passes through the Exit Point*
 - *A document declaring which amounts of each landing certificate are used for the products in each export consignment*

To be able to do this, an Auditing agency needs to be set up by the government authority.

Entry/Exit Point Conditions: A set of rules ensures that assets have certain features (quality, legal providence, ..) at entry and exit points.



Figure 4 Rules and conditions for Entry/Exit Points in Costa Rica Shark example

2.4 Audit Agency: Mandate and Governance of Entry/Exit criteria

When and if the business process conforms to the predefined rules, then it is assumed that the Policy Claim has been met. To confirm that the predefined rules have been met, an audit process needs to be implemented that creates confidence in the Policy Claim. The audit process will capture and analyse the traceability events and validate the information against the Entry, Exit and Transformation rules.

An *Audit Agency* will be set up with specifically defined criteria that will enable it to perform audit responsibilities to protect the integrity of a Policy Claim.

The agency will collaborate with other government agencies and the private sector. The Audit Agency will receive data on relevant events of the trade transaction and evaluate the information against the defined conditions and rules. The use of the data is limited for this specific purpose only.

The Audit Agency could be from the public sector, such as a Ministry, it could be from the private sector, for example an industry association or a public private sector partnership (PPP), for example a food inspection agency appointed by the Government.

The role of the Audit Agency is to:

- Collect and record data on the relevant Entry/Exit Points on the supply chain;
- Collect data on the business processes between Entry and Exit Points (i.e. traceability events);
- Ensure that the data recorded for traceability purposes is consistent with what is actually happening in the supply chain;
- Monitor and safeguard traceability by ensuring that assets meet entry/exit conditions and rules are applied correctly.

In our Shark Fin example, the primary⁴ audit agency is run by the Ministry of Fisheries in Costa Rica:

Audit Agency: The primary audit agency is the Ministry of Fisheries (INCOPECSA) which collaborates with other government agencies and the private sector.

Audit Agency: Controls that assets meet the Entry and Exit Point conditions and the transformation rules. It will request information such as traceability event data from stakeholders.

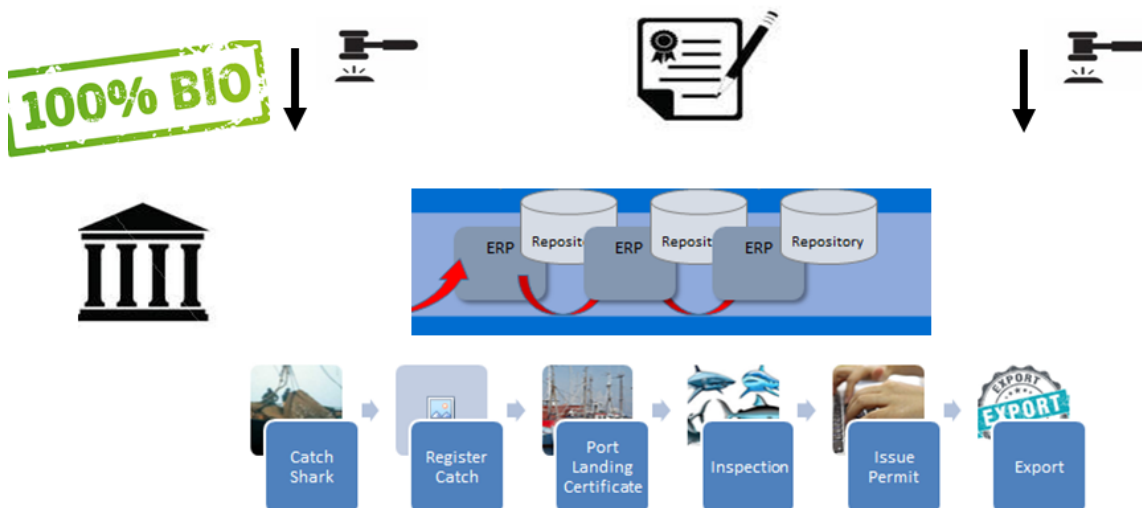


Figure 5 Role of the Audit Agency in Costa Rica Shark example

⁴ It is possible for multiple audit agencies operating independently, i.e., CITES SENASA.

2.5 Summary of Architecture components of a Traceability System

In the following table we summarize the architecture components of a traceability system

| Architecture component | What is it | Example |
|-------------------------------|---|--|
| <i>Policy Claim</i> | <i>The statement that the traceability system supports</i> | <i>All shark products exported by Costa Rica have been harvested in a sustainable manner compatible with the survival of the species and in conformance to national legislation and CITES rules.</i> |
| <i>Entry Point</i> | <i>A process that is a starting and end point of the traced supply chain</i> | <ol style="list-style-type: none"> 1) <i>In the case of the national fleet fishing in the Exclusive Economic Zone (EEZ), the landing at certified ports or by the artisanal fleet.</i> 2) <i>In the case of the national fleet fishing CITES-listed species in international waters, the introduction from the sea process⁵</i> 3) <i>For the international fleet, an import process.</i> |
| <i>Entry Point Conditions</i> | <i>Certain conditions that assets must meet when they enter the traceability system</i> | <ol style="list-style-type: none"> 1) <i>Legality of operation (vessel, license, and trip) and OSPESCA catch certificate or sales invoice if originating from the artisanal fleet.</i> 2) <i>In addition to the above, pre-approved certificate from CITES Management Authority for Introduction from the Sea</i> 3) <i>For CITES-listed species, CITES export certificate from flag state, based on Non-detriment Finding of flag state or relevant Regional Fishery Management Organization in addition to import documentation</i> |
| <i>Exit Point</i> | <i>A process that is the end point of the traced supply chain</i> | <ol style="list-style-type: none"> 1) <i>For product consumed nationally, the Policy Claim does not apply, so that entry and exit points coincide</i> 2) <i>For exports, the moment of export</i> |
| <i>Exit Point Conditions</i> | <i>Conditions that assets meet when they leave the traceability system</i> | <i>Export permission by fish marketing authority (INCOPESCA); for CITES-listed species, export certificate from CITES Management Authority</i> |
| <i>Transformation Rules</i> | <i>Rules that must be applied when processing the assets between the Entry Point and the Exit Point</i> | <i>To substantiate the policy claim Costa Rica Authorities are able to trace back shark products, in particular those related to CITES-listed species, using officially established conversion factors to either an OSPESCA catch certificate or artisanal fisherman's sales report</i> |

⁵ <https://cites.org/eng/res/14/14-06R16.php>

| | | |
|---------------------|--|--|
| | | <i>The exported weight of frozen shark carcasses should be identical to the landed weight. The weight of dried fins cannot exceed 40% of the landed wet weight.</i> |
| <i>Audit Agency</i> | <i>An agency that controls the assets that meet the Entry and Exit Point conditions and the transformation rules. It will request information such as traceability event data from stakeholders.</i> | <ol style="list-style-type: none"> 1) <i>INCOPESCA has to be present at all landings of the medium and advanced long liner fleet and issues the catch certificate</i> 2) <i>INCOPESCA also issues the export permit for shark products, based on the transformation rules cited above</i> 3) <i>SENASA⁶ is the CITES Management Agency and issues the relevant CITES permits (import, IFS or export)</i> |

In the above example the traceability system could be at a later time extended by tracing events that take place before the landing of the sharks. For example UN/CEFACT has developed FLUX⁷, a standard for electronic information exchange for sustainable management of fisheries. FLUX provides information on the fishing vessels, fishing methods, catch locations and times, etc. If the range states⁸ agree to implement FLUX then the electronic information could be directly used for the traceability system. This could be done by moving the Entry Point of the above traceability to the catch event on the fishing vessel thus tracing the shark from the moment when it is caught.

3. Designing a Traceability System for Cross Border Trade

The mandate of the Audit Agency should define what power they have and what data they are able to access. The mandate of an Audit Agency is limited to the mandate of the empowering organization which is usually a national body⁹.

This implies that the traceability system can only trace and audit the parts of the supply chain that are under national legislation and control, i.e. Entry Point, Exit Point and Transformation Rules that lie within the jurisdiction of the state.

An Audit Agency may lack power to exercise a thorough audit procedure on events that occur in a foreign state.

⁶ Servicio Nacional de Salud Animal (SENASA, www.senasa.go.cr) is the National Service of Animal Health of Costa Rica.

⁷ Fisheries Language for Universal Exchange (FLUX) <http://www.unece.org/info/media/presscurrent-press-h/trade/2016/uncefact-adopts-the-flux-standard-for-sustainable-fisheries-management/doc.html>

⁸ For a definition of range state, see https://en.wikipedia.org/wiki/Range_state

⁹ If the mandate is provided on the basis of an international agreement (convention) or through a regional organization (e.g EU, ASEAN) the mandate of the Audit agency can be at the regional or global level.

For the design of traceability systems in international supply chains there are two options:

Cross-Country Traceability: Select an entry point process in one country and an exit point process that takes place in another country. In this case the mandate of the Audit Agency needs to be enforced in both countries and, perhaps more importantly, data about traceability events in one country needs to be transmitted to the Audit Agency in another country. Such a scenario can be implemented, for example in a business to business traceability system where no government agencies are involved and where all business partners agree to participate and share data.

Cross border traceability is very difficult to implement when regulatory bodies such as Ministries or Customs are involved. The use of data in these agencies is limited to their mandates and this usually restricts exchange of data to other agencies or to the private sector, both within the country and even more so to foreign partners. For reasons of confidentiality, liability and legal mandate, the systematic sharing of information on regulatory decisions by Government agencies for traceability is unlikely to happen.

Country to Country Traceability: Instead we suggest replicating the traceability architecture in both countries. When the Traceable Assets leave the country of export at the exit point they meet the Exit Conditions which are guaranteed by the Audit Agency in the country of export.

These conditions form the Entry Conditions in the country of import, for example, the declaration of the assets at import. The country of import can then define its appropriate Policy Claim and Transformation Rules and set up an Audit Agency that will trace the asset to the Exit Point within that country. The Exit Point could be, for example, the delivery of the assets to the point of sale.



Figure 6 Country to country traceability

The *country to country traceability architecture* has several advantages:

- No need for cross border information exchange on supply chain events.
- Audit agencies are fully empowered within the segment of the supply chain they audit.
- It is possible to scale this model, i.e. to integrate alternative countries of import or export into the traceability model.

4. Integrating Developing Countries and Small Stakeholders into the Traceability System

In advanced supply chains it is possible to implement a traceability system based on product identification and segregation. The traceability system records the four W's (What, When, Where, Why) through Critical Tracking Events, typically implemented using a global standard such as EPCIS¹⁰ or UN/CEFACT Traceability Standard¹¹ and the Audit Agency can assess the traceability data using repositories¹².

This requires a high level of organization in the supply chain, i.e. assets or a group of assets (such as a lot, pallet or container) can be tagged, traced and the information can be made available in electronic format. These systems will use Product Segregation which is the preferred model for a traceability system.

Product Segregation can be implemented both for bulk commodities and for identity preservation¹³:

Bulk Commodity: Separates certified from non-certified materials but allows mixing of certified materials from different producers. All products must comply with the certification standards. This model has been used for organic produce where organic items from farms and producers are combined to achieve supply on larger scales.

Identity Preservation: Requires segregation of the certified material from the non-certified materials throughout the supply chain to provide traceability from a specific plantation or primary processor to the final consumers. This model has been used, for example for Fairtrade bananas.

In many situations, in particular when developing countries or small holders are involved, a product segregation approach is not feasible as business processes are not well defined, the assets are processed and merged with other assets or stakeholders do not have the means to electronically capture data throughout the supply chain.

However, it may be perfectly possible to implement a Mass Balance system or establish a Book and Claim system which have less stringent technical and organizational requirements. These methods are described below¹⁴.

Mass Balance: Allows for Policy Claims to be disassociated from physically traced assets and rather refers to accumulated assets. In a mass balance system, for a single physical asset, a definite state with respect to a Policy Claim cannot be ascertained; an aggregated quantity of traceable assets (e.g. production during a specific time period) will, however, have a well-defined state with respect to a Policy

¹⁰ Electronic Product Code Information Services (EPCIS) is a global GS1 Standard for creating and sharing visibility event data, both within and across enterprises.

¹¹ UN/CEFACT Animal Traceability Data Exchange Project
<http://www1.unece.org/cefact/platform/display/CNP/Animal+traceability+data+exchange>

¹² A short overview of the event based traceability concept is available in UNECE paper ECE/TRADE/C/CEFACT/2016/9

¹³ For more information see "A Guide to Traceability" (Norton, 2014) or "Voluntary Sustainability Standards" (UNFSS, 2015).

¹⁴ For a further discussion on Mass Balance and Book and Claim Systems see Voluntary Sustainability Standards: Part 1 - Issues. UNFSS.

Claim. This is a particularly useful model for traceable assets where segregation is difficult or nearly impossible to achieve e.g. for commodities such as cocoa, cotton, sugar and tea.

Book and Claim: Allows for the free flow of certified and non-certified assets without the need for segregation. This process can be used to further the adoption of desirable policies and lay the foundation of future traceability work. Traceability is not followed at each step of the supply chain. Companies wishing to make sustainability claims can purchase certificates (even though their goods may not be certified) that support sustainable sourcing. This method has been applied to systems such as green electricity, carbon emissions, soy and palm oil.

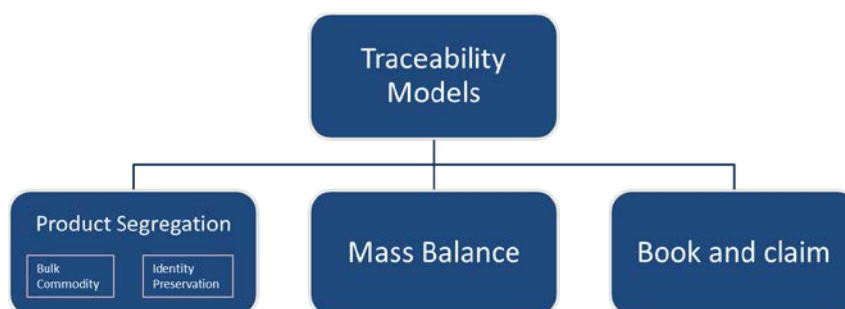


Figure 7 Supply Chain Traceability Types

The Traceability Framework allows designing a traceability system that includes two sets of Transformation Rules. One set of transformation rules would be based on product segregation and tracing the supply chains using advanced traceability and information technology. This applies to advanced stakeholders which typically have the high trade volumes thus ensuring that the majority of the assets are traced using stringent methods.

For Smallholders or Small and Medium sized Enterprises that have limited access to technology, a second set of rules can be defined, based on Mass Balance or a Book and Claim system. The Audit Agency will audit each stakeholder according to the rules that apply.

In the shark fin example that we have been referring to, product segregation would be considered the most appropriate model to be used for larger trawling vessels from the fishing fleet. However, for the smaller fishing vessels of the artisanal fleet it is difficult to enforce product segregation. Instead it was suggested to use a Mass Balance system to capture approximate input of the artisanal fleet into the supply chain.

Utilizing different transformation rules depending on the status of the stakeholders allows for a traceability system that is flexible and able to be adapted to different levels of readiness in the supply chain.

This approach has several advantages: It allows inclusion of Small and Medium sized Enterprises and developing countries into the traceability system which increases political acceptance. It ensures that traceability technology matches the capabilities of the stakeholders. It is open for “upscaling”, i.e. small stakeholders gradually increase their capacity so they can adhere to the stricter set of rules in the traceability system.

Traceability for Sustainable Trade

A Framework to design Traceability Systems for Cross Border Trade

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