March 2019

Update on Holzindustrie Schweighofer's pilot project for individual log tracking

Holzindustrie Schweighofer started a pilot project in order to facilitate physical tracking of single logs. This could be a future means to track and trace timber even in complex (i.e. broken) supply chains.

In order to track and trace individual logs through a supply chain, the single pieces have to be identifiable at each stage. Holzindustrie Schweighofer investigated a number of possible marking technologies – but came back to a well-established method: plastic tags. They have unique numbers and can be safely hammered onto the top-ends of the logs. The polymer itself is unproblematic for further processing, even in case of pulp and paper utilization of the by-products.

The pilot project was discontinued ahead of schedule, because of ongoing problems with the mobile application. Due to an unresolved error in the database structure, the phone's processing time increased potentially with the number of logs for a given set of origin after entering the dimensional data of one log. Until discontinuation, a volume of 1,500 m^3 of logs were tagged and registered in the system (corresponds to more than 10,000 tags).

The attached progress report provides further details.

A second pilot is under preparation. An update will follow.

Internal Progress Report

Holzindustrie Schweighofer Pilot Project

Log tagging & log tracking

Project status: 1st Pilot Project discontinued, 2nd Pilot Project in preparation

Project Period: Summer 2018

Report: March 2019

1. Introduction

Timber Processors have a legal and moral responsibility for their sourcing. The forest can be a resource for a large variety of high-quality, eco-friendly products. But this requires sustainable forest management, as well as respect for high-conservation areas and non-intervention areas.

Consequently, processors are required to execute due diligence when sourcing timber. This means, that the risk of timber from so called “controversial sources” is assessed and mitigated to a negligible level.

1.1 Timflow

Holzindustrie Schweighofer pioneered in Romania, by developing and implementing a tracing system for all trucks delivering saw logs to one of its three saw mills. Only trucks that are equipped with a Timflow-GPS tracker (hard-wired into the truck’s circuitry) are allowed to enter the mills. Additionally, the truck drivers have to register each load in a mobile application. The Timflow dataset includes details about the transport and pictures taken before departure. Upon arrival, Holzindustrie Schweighofer can verify if: (a) the photos at departure resemble the arrived truck load, (b) the documents of origin match the departure coordinates, and (c) if the route between loading site and mill shows implausible detours. Holzindustrie Schweighofer publishes the full dataset of each Timflow-transport at timflow.com.

1.2 Complex supply chains

The Timflow system is very robust in supply chains, where the logs are loaded in the forest. But a significant part of Romania’s saw logs are traded over so-called log yards. Log yards are part of Romania’s timber industry. Due to the underdeveloped forest road infrastructure, log yards are used as platforms where harvested wood is sorted, split by assortments and afterwards delivered to various customers. Operators are typically small or medium enterprises that specialize in cutting and sorting timber into unified assortments that can be sold to specific customers. While traditional saw mills are interested in large diameter timber and furniture suppliers are looking for hardwoods (e.g. beech), Holzindustrie Schweighofer needs small diameter logs, and panel producers need lower quality logs.

Inherently, log yard operators mix timber of many origins. By doing so, information about the harvesting site is lost physically for the specific log. For one particular log, only a *range* of several possible harvesting sites can be assigned. In case of supply chains where timber passes through more than one log yard, one quickly arrives at hundreds of possible harvesting sites. The conventional approach to fulfil due diligence requirements in such supply chains is to minimize the risk for *all* possible origins and check each of them on site.

This approach has three weaknesses:

- It is inefficient, because many harvesting sites might be audited, assessed and their risk mitigated – even though little or no timber was sourced there.
- It is possibly vulnerable towards controversial sources, because at each link of the supply chain it is possible to mix a certain percentage of controversial sources into an otherwise legit supply chain. Currently this risk is mitigated by a check of the balances of the register books of the log yards.
- It is not possible to track and/or trace the flow of particular logs. This might be valuable information, both, upstream (e.g. assessing where the highest quality logs were harvested),

or downstream (e.g. identifying and sequestrating logs from sources where an audit uncovered contraventions on the purchasing policy)

1.3 Description of the HS DDS for Log yards – Legal traceability back to the harvesting site

Holzindustrie Schweighofer is aware of these issues, and is addressing them with an extended verification programme and a comparably large and well-equipped "Supply Chain Control"-Department. This 8-person team conducted 447 audits in Romania alone in 2018.

- Each harvest plot is approved by the competent authority and measured before harvest (APV).
- Every truck delivery is registered in the SUMAL system and the database/information is available to the general public via he internet. This prevents the possibility of illegal transport of harvested material.
- Each log yard in Romania needs to be authorized by several authorities before getting operational. Romanian forest governance especially regarding log yards is much stronger than it was a decade ago. Under Romanian law, wood that enters the log yard has to show proof of origin from harvesting activity (be it by companies or individuals) and is only allowed to leave the log yard with correct papers. All inbound and outbound deliveries are recorded in a regulated registry ("registrul") and in the national wood tracking platform (SUMAL). They are reported every month to the Forest Guards (mandatory) via an online-server. This registry book is subject to continuous state inspections and provides information also for second party audits to verify incoming supplies, their origin and legality.
- More than 50% of Holzindustrie Schweighofer's wood purchases from Romania are made directly from forests where no traceability issues are emerging. These supplies are covered by the unique Timflow GPS tracking system including pictures and a clear documentation of the delivery route.
- As it was described before, there are cases when direct delivery from the forest to the mill – due to technological reasons are not possible. Holzindustrie Schweighofer conducts more than 400 on-site audits (just in Romania) annually in order to verify the documentation and the business practice of its suppliers to cover log yard deliveries. In addition to requesting clear and proper documentation from the state-run security mechanisms, Holzindustrie Schweighofer has also a verification mechanism of the log yards it purchases from. Holzindustrie Schweighofer requires the APV document (as document of origin) to be presented for each supply – even for timber deliveries that have been re-sorted on a log yard. This provides a sound basis to verify that wood has been sourced from legal harvesting operations.
- For the individual log, currently physical traceability is not maintained in practice. However, as long as there are no concerns about legality for the entire volume of logs entering a log yard, Holzindustrie Schweighofer therefore requests its suppliers to present all possible APVs and harvesting permits when sourcing from a log yard.
- Additionally, Holzindustrie Schweighofer monitors if the delivered saw log volume exceeds the permitted harvesting volume in the APV, taking into consideration species and dimensions. Holzindustrie Schweighofer's security architecture, along with the legal requirements and provisions, provide a strong mechanism to prevent the inflow of controversial material.
- Illegal depots cannotdeliver to Holzindustrie Schweighofer since our DDS including Timflow provides effective controls (legal check mostly. by on-site audits, by providing GPS

information and pictures of the loading places etc.). Every log yard is controlled on site at least once per year, where documents for traceability (which are available only if the depot is authorized) are checked and confirmed by Holzindustrie Schweighofer experts.

- All the deliveries of logs from a log yard to Holzindustrie Schweighofer's sawmill are also tracked using Timflow. This ensures that the load is coming from a legally authorised log yard subject to strict legal requirements.

A video shows how Holzindustrie Schweighofer operates due diligence on log yards.
https://youtu.be/iYDrj_Pygk4

2. Log yard traceability project

2.1 History of the project

Holzindustrie Schweighofer started a pilot project in order to facilitate physical tracking of single logs. This could be a future means to track and trace timber even in complex (i.e. broken) supply chains.

- 2017: The investigation for possible technologies and partners started
- End of 2017: an Austrian company was contracted with the development of a tailor-made application. It aimed at an electronically assisted registration of logs, including dimensions
- April-May 2018: The pilot project was carried out.
- June 2018: The pilot project was suspended due to technical problems
- February 2019: After reviewing the specification requirements (no longer registration of dimensions, but instead pictures and GPS coordinates), a Romanian company was contracted to develop a mobile application with extended functionality.

Outlook:

- *Spring 2019: an adapted Pilot Project will be carried out at one of Holzindustrie Schweighofer's suppliers*
- *May/June 2019: On-site visit of pilot project site with stakeholders in order to exchange views on the project.*

2.2 Aim of technology selection

In order to track and trace individual logs through a supply chain, the single pieces have to be identifiable at each stage. Holzindustrie Schweighofer investigated a number of possible marking technologies – but came back to a well-established method: plastic tags. They have unique numbers and can be safely hammered onto the top-ends of the logs. The polymer itself is unproblematic for further processing, even in case of pulp and paper utilization of the by-products.

2.3 1st Pilot Project

In 2018, Holzindustrie Schweighofer operated a log yard in Leordina, Romania. Logs are delivered by truck to this location. At the site they are cut to the desired length (mostly 3 m or 4 m) and sorted for industrial use. The majority of the logs are delivered to one of Holzindustrie Schweighofer's saw mills by train. The wagons are loaded directly at the log yard sites.

After the mobile application was finalized, the local project leader travelled to Leordina in April 2018 in order to train the staff on site. In the following chapters, the marking procedure is outlined.

2.4 Process of timber marking

At the moment of arrival, once all Timflow and legal steps for document verification are completed, the logs are unloaded on the ground in piles, defined for each supplier (if it's the case per truck/trailer). The fork lift operator spreads out the logs on the ground one by one so that the sorter can measure each single piece (Picture_ 01)

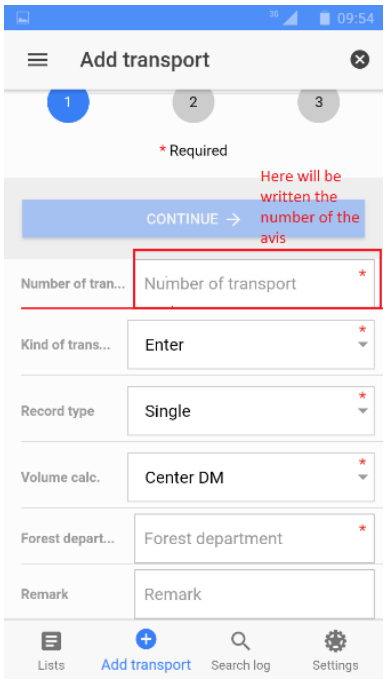
Picture_ 01

After the logs are unloaded and spread out, the sorter prepares to cut them to lengths of 3 and 4 meters. After the lengths are prepared the sorter inserts the plastic tags that contain a serial number with the [brand name] hammer (Picture_02). Hammer, tags, and mobile application were provided by the Austrian company [XXX]. The tags are made of a special polymer, with high impact resistance.

Picture_02

Once the plastic tags are inserted, the measuring process can start. The sorter accesses the Global Logs Management (GLM) application on his smartphone and goes through the first two steps where he has to enter information about the transport and the supplier. In the last step of the application, information about each log has to be inserted one by one. The information regarding the species, diameter, length and quality are sent to the application with the special electronic forest caliper which is connected to the application via Bluetooth. (Picture_03)

Picture_03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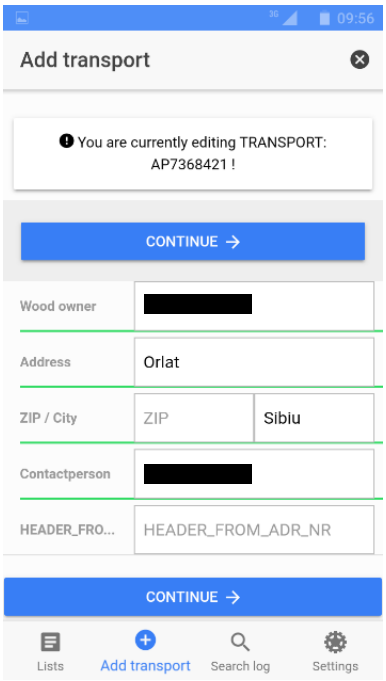
Add transport
1
2
3
* Required
Here will be written the number of the avis
CONTINUE
Number of tran...
Number of transport
Kind of trans...
Enter
Record type
Single
Volume calc.
Center DM
Forest depart...
Forest department
Remark
Remark
Lists
Add transport
Search log
Settings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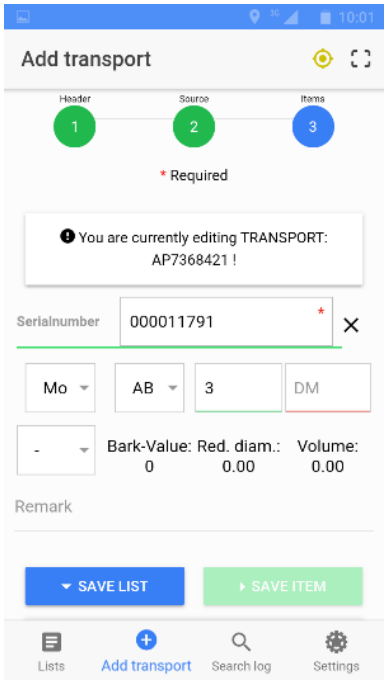
[redacted]
Address
Orlat
ZIP / City
ZIP
Sibiu
Contactperson
[redacted]
HEADER_FRO...
HEADER_FROM_ADR_NR
CONTINUE
Lists
Add transport
Search log
Settings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Header
Source
Items
1
2
3
* Required
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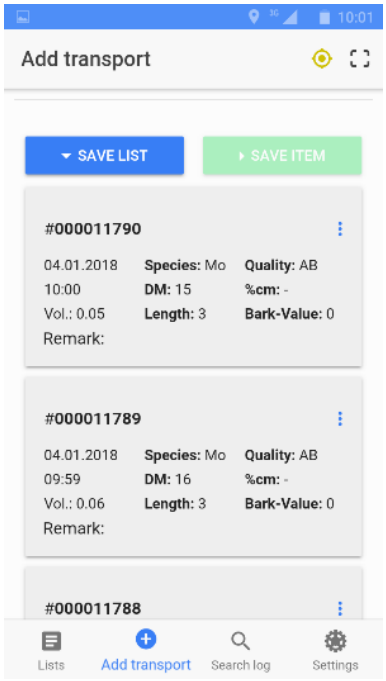
AB
3
DM
Bark-Value:
0
Red. diam.:
0.00
Volume:
0.00
Remark
SAVE LIST
SAVE ITEM
Lists
Add transport
Search log
Settings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Vol.: 0.05
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Length: 3
Bark-Value: 0
Remark:
#000011789
04.01.2018 09:59
Species: Mo
Quality: AB
Vol.: 0.06
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Lists
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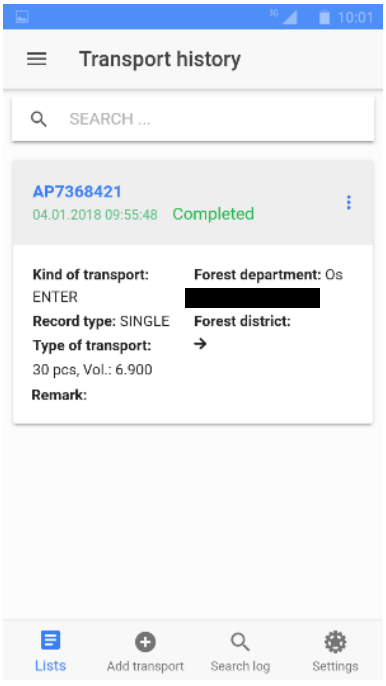
Search log
Settings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Completed
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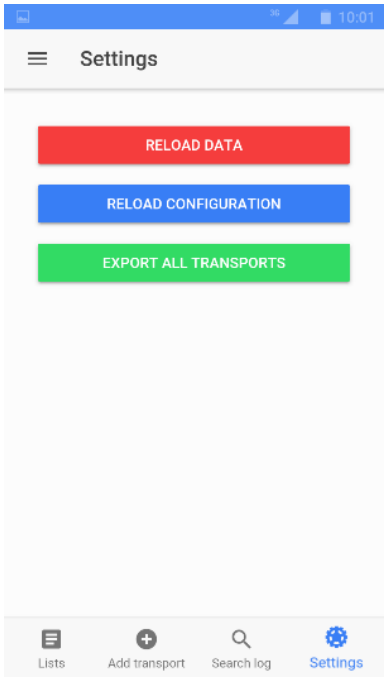
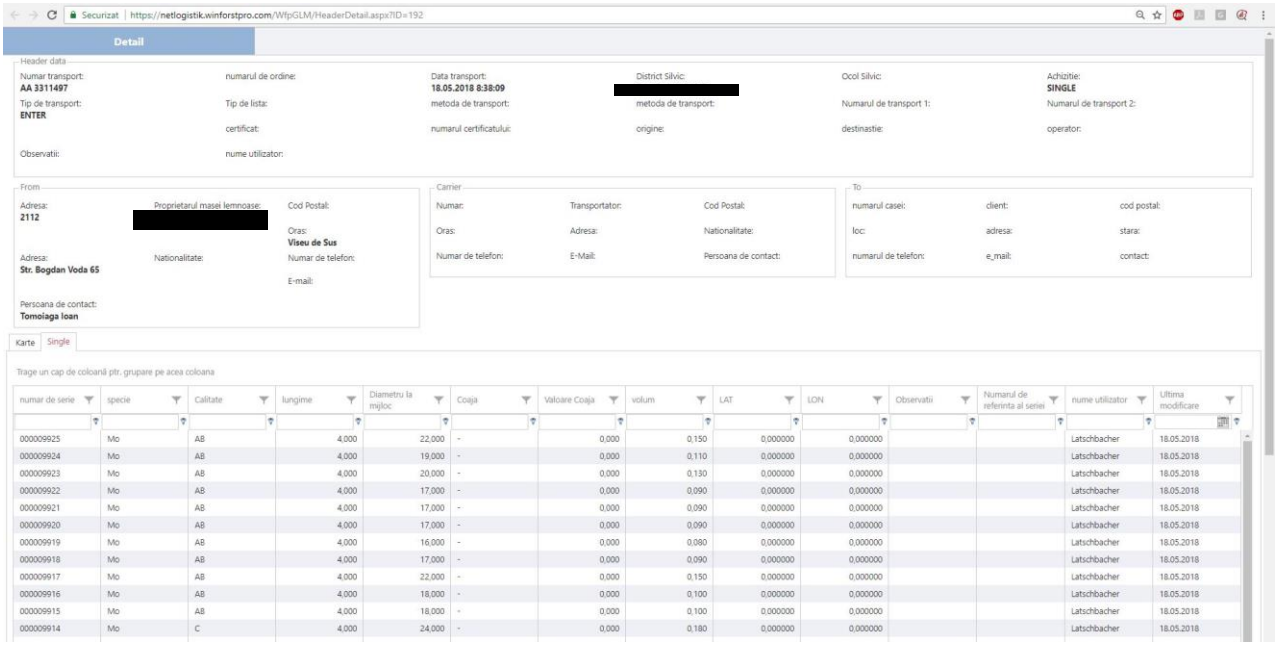
ENTER
Record type: SINGLE
Type of transport:
30 pcs, Vol.: 6.900
Remark:
Forest department: Os
[redacted]
Forest district:
Lists
Add transport
Search log
Settings


10:01
Settings
RELOAD DATA
RELOAD CONFIGURATION
EXPORT ALL TRANSPORTS
Lists
Add transport
Search log
Settings

2.5 Administration of the data

Once the measurement is finished, the reception file is exported from the application to the internal portal. All the information contained here can be exported as PDF, CSV or Excel format (Picture_04)



Picture_04

2.6 Loading of logs

After the reception is made the logs are stored in piles until the wagons are prepared to be loaded. For loading, the sorter uses a Nautix X2 phone which is equipped with a scanner to scan the plastic tags of the logs which have to be loaded on the wagon (Picture_05). The Nautiz X2 phone uses the same application Global Log Management to scan the plastic tags. When the wagon is full, the sorter finishes the transport in the application and sends the information of the load to the internal portal. Now the responsible employee on the log yard prepares the transport document based on the information from the list. When the train is completed, the entire loading is sent to its final destination.

Picture_05

2.7 Reception in the mill

On arrival at the destination (HSR mill) the logs are unloaded from the train after all the legal steps are completed. The logs are then sorted again in order to make the reception in the mill. The reception is made with an automatic system with electronic measurement. After the logs from one wagon are sorted, a reception note is created in order to register the stock *[due to the premature discontinuation, the reception was not included in the pilot projects].*

3. Results and learnings of first pilot project

3.1 Technical results and learnings

The pilot project was discontinued ahead of schedule, because of ongoing problems with the mobile application. Due to an unresolved error in the database structure, the processing time of the phone after entering dimensional data of one log increased potentially with the number of logs for a given set of origin. Until discontinuation, a volume of 1,500 m³ of logs were tagged and registered in the system (corresponds to more than 10,000 tags).

3.2 Tactical analysis

Due to the premature discontinuation of the pilot project, the tactical analysis only covers the findings at the log yard (application and registration of logs, dispatching of loaded wagons). The pilot project did not result in findings about the applicability of the system in the primary processing site (i.e. sawmill).

3.3 Weaknesses

Time requirement and economic burden: The effort for tagging and registration of the logs is considerable. The operator managed to tag and register roughly 40 m³ of logs per hour. This corresponds to 42 minutes for one truck load of logs with a volume of 28 m³. Holzindustrie Schweighofer concluded that the registration of dimensional data for each log is too much of an

effort. In following pilot projects, it will be necessary to look for alternative solutions (e.g. batch-registration).

Number of tags: Holzindustrie Schweighofer typically buys small diameter logs in 3 m or 4 m lengths. An analysis of the dimensions processed over the company's own log yards in Romania showed that the number of logs per solid cubic meter is 6.60 logs per cubic meter (log yard 1), and 7.73 logs per cubic meter (log yard 2). The average number of logs and therefore *the number of tags per solid cubic meter is 7.2*. This results in: (i) a considerable extra cost for the tags, (ii) the introduction of a large number of non-renewable items into the supply chain[1], and (iii) possible negative effects in further processing steps (e.g. when pressing pellets).

Dependency on compliant operators: The system is designed to be used by the log yard operators themselves. Although the registered data would be transparently available to all parties in the supply chain, the quality of the data input is crucial. It is possible that—by accident or deliberately—the origin of logs is wrongly registered[2]. The vulnerability towards such a mis-registration depends on the stage of registration.

- *Registration in the forest: least concern.*
  Best would be the registration of already cut-to-lengths logs[3] in the forest. By integrating GPS coordinates and/or pictures taken in the forest, the system could provide hard evidence for the origin of the logs. *[remark: this stage was not in the scope of the 1st pilot project]*
- *Registration at the entrance of the log yard: medium concern.*
  The registration happens right after unloading the logs. Quality of data can be well audited by comparing arrival dates of trucks, and registration dates of logs.
- *Registration of cut-to-length logs: highest concern.*
  Many log yards receive long-length logs (e.g. 10 m long), which are subsequently cut into smaller pieces. When this happens, the resulting logs also need to be tagged and they have to be connected to the original log, in a parent-child data structure. This cut-to-length process leaves room for the introduction of timber of different physical origin (remark: legal origin is maintained by requesting all APV information). E.g. if from a 10 m log, the top 4 m are only of fire wood quality (e.g. due to rot) the operator could simply take another 4 m log of different origin and declare it an offspring of the original 10m log in order to optimize high quality output.

3.4 Strengths

Possibility of tracing: Physical tracing is suitable to enable the tracking of origin-data of timber in broken and complex supply chains. Primary processors (such as saw mills) are able to check for each log whether it comes from an accepted harvesting site. Such a possibility does not yet exist. Now, any primary processor who receives logs that have been manipulated at a log hard cannot provide secure information about the precise timber origin.

Improved auditing and plausibility analysis: Physical tracing is a step towards more robust supply chains. It provides information about the origin for each log. The correctness of this information can be verified by the following plausibility analysis:

[1] Plastic tags based on renewable raw materials (e.g. PLA) are currently in the development phase, but not yet available in a sufficient quality, especially concerning impact resistance;
[2] This concerns just physical traceability; legal origin is maintained by requesting all APV information;
[3] In the case of Holzindustrie Schweighofer this would mean 3m or 4m long logs;

- Time-based: During log yard audits, it is possible to compare the date of registration, and the stated origin with the arrivals of trucks as noted in the registrul.
- Volume based: In Romania, the harvesting estimation document gives the precise number of trees (per species) that have been authorized for cutting. It would be possible to make automated plausibility analysis, e.g. the number of registered spruce saw logs for a certain plot cannot exceed the number of spruce trees authorized for cutting multiplied with a factor[4].
- GPS based: In case of inclusion of GPS information of the registration dataset, it would be possible to automatically compare the measured coordinates with the coordinates where the registration *should* have happened.

Tailor-made supply chains: Sometimes stakeholders and customers demand restraints in timber supplies that go (well) beyond the legal obligations. Examples are: (i) no timber from a certain country or (ii) no timber from national parks[5]. Such claims are made voluntarily. And in complex supply chains they are hard to control. Holzindustrie Schweighofer, e.g. commits to a „zero timber from national park"-policy. This means, as long as a supplying log yard receives logs from a national park and is not able to physically separate those volumes from the rest of the timber, they are excluded from Holzindustrie Schweighofer's supply chain. If the logs were individually tagged, it would be possible to separate them later, and the suppliers would not need to be temporarily suspended.

[4] Factor would represent a reasonable number of saw logs that can be be cut out of one tree.
[5] Contrary to popular belief harvesting of timber is legal in most countries. Many national parks have buffer zones that allow for cautious forest management. Despite being legal, such cuttings in national parks are often criticized by stakeholders.