EUROPEAN COMMISSION

SEVENTH FRAMEWORK PROGRAMME
THEME Monitoring and tracking of shipping containers
SECURITY
FP7-SEC-2010-3.2-1
GA No. 261795

CASSANDRA

Common assessment and analysis of risk in global supply chains

Deliverable No.	D6.4 – CASSANDRA	
Deliverable Title	CASSANDRA – D6.4 - Final – Privacy, human rights and human factors	
Dissemination level	Public	
Written By	Erika Ustailieva, Linda Drupsteen, Mat Jongen (TNO Safe and Healthy Business)	16-8-2013
Checked by	Michiel Nijdam, Erasmus University, Rotterdam	16-8-2013
Approved by	Heather Griffioen-Young / TNO	16-8-2013
Issue date	19 August 2013	

Executive summary

This issue paper describes the risks related to human factors like safety and health in container handling supply chains. It aims to raise awareness about these risks and about the relation between prevention and management of these risks and the proposed information transfer in the CASSANDRA project.

The supply chain can have a positive effect on safe and healthy working conditions by promoting occupational safety and health (OSH) improvements within the supply chain members. All partners have a function in a (part of) the supplier chain, aimed at physically handling a container and/or exchange of information between partners.
Two main kinds of occupational safety and health risks can be distinguished in the container supply chain:

- Risks related to the content of a container, for example dangerous products or conditions inside a container like toxic gases introduced by active gassing of containers, or containers containing fumes originating from products.
- Risks related to cargo-handling operations (physical risks) resulting, for example, from moving heavy and highly stacked containers and the use of heavy equipment.

The main issue in relation to information management and with potential significant implications for CASSANDRA are the OSH risks related to the content of the containers. This is the case when the container contains:

- dangerous goods such as chemicals, or products containing hazardous substances;
- hazardous wastes;
- non-hazardous waste for recovery or disposal;
- toxic gases introduced by active gassing of containers;
- fumes originating from products.

In order to prevent the risks caused by these hazardous substances, it is of great importance that information regarding the hazard of the content is provided on time to all parties that have to work with the containers. It must be taken into account that information regarding hazardous working conditions is included in the pipeline and should be made available to all actors in the supply chain. It might be useful to include recommendations for the actors in the supplier chain to provide their contactors with this information before scheduling and execution of contracted tasks.

Two specific risks are illustrated with a case. The first case illustration handles the risk of toxic gases in shipping containers. The second case illustrates the effect that container content has on OSH risk, the corresponding regulatory framework, actors, and authorities involved.

Factors that influence the availability of OSH information (which is here the container content hazards) are trust, pride, loyalty, feelings of reciprocity and also extrinsic motivators such as the promise of competitiveness and power. These factors facilitate or limit the willingness of companies to share information with other partners. Enhancing the synergy between enterprises improves the ability to cluster innovation, the motivation to share information and the ability to promote the overall competitiveness of the supply chain. CASSANDRA is aimed at sharing information, so awareness of the facilitators and the distinction between types of communication is relevant.

Next to the main OSH issues, regulations related to OSH in the container handling chain are also listed in this report. The rules and regulations related to occupational safety and health in the container-handling supply chain are diverse and depend on the location and the type of the cargo. At all locations in the world national legislation on occupational health and

safety applies. In the European Union these legislations are becoming more and more harmonised according to the EU-regulations. A summary of global and European legislation and conventions is given, as well as the most important regulations with respect to the handling of dangerous substances and containers containing dangerous substances.

The insights in this issue paper lead to the following recommendations:

1. The data pipeline should take into account communication on the most important OSH risk in the supply chain - the presence of hazardous substances in shipping containers.
2. Define for which types of content the data pipeline will contain information
3. Consider the necessity of OSH risk communication through the data pipeline to the secondary contractors' chain.
4. Define the so-called focal companies or actors in the container handling chain and use these actors in the strategy for designing the data pipeline with respect to communication on OSH risks.
5. The design of the data pipeline should incorporate the notion of the two types of knowledge sharing mentioned in this report. An analysis should be made of what type of knowledge sharing (codified or person-to-person) - or what mix of these types - is the best strategy for reaching the goals of CASSANDRA. And address the important issue of trust that is essential for the willingness to share knowledge.
6. The data integrated into the pipeline should cover the information related to human and environmental risks as discussed in the report.
   In order to (1) define the data sources and build an effective communication structure covering all parties concerned, and (2) to share knowledge ensuring that risks are identified and eliminated or controlled, a supply chain simulation workshop can be organised with the representatives of the main stakeholders. One of the Living Labs might be a place for such a supply chain simulation workshop.

Index

1 Introduction

The main strategic goal of CASSANDRA is to enhance supply chain visibility in order to simultaneously improve business operations and the efficiency and effectiveness of the inspection processes of authorities. This will be facilitated by data-sharing and a new approach towards risk assessment. Data sharing and communication are known factors to influence cooperation within the supply chain. Disturbances in communication and information sharing can lead to misunderstandings, errors and therefore affect security, efficiency, competitiveness and safety for people working in the supply chain. On the other hand, the data pipeline may be able to improve management of occupational safety and health (OSH) risks by providing information on the hazardous substances in the shipping containers. CASSANDRA aims at better sharing of information and therefore also contributes to safety for workers within the supply chain.

Work package 630 of CASSANDRA is meant to address human factors of importance for the implementation of CASSANDRA. Focus is on the risks for the people working in the container handling supply chain. These risks comprise occupational health and safety, and environmental issues (HSE). These are separate areas, however they are often linked. One of the strongest links between these disciplines is that a single risk event may have impacts in all three areas, albeit over different timescales. For example, the uncontrolled release of radiation or a toxic chemical may have immediate short term safety consequences, more protracted health impacts and much longer term environmental impacts.

This issue paper describes specifically the risks related to human factors like safety and health in container handling supply chains. It aims to raise awareness about these risks and about the relation between prevention and management of these risks and the proposed information transfer in the CASSANDRA project.

When considering occupational safety and health risks in the supply chain it is important to distinguish two types of company networks that may be involved. The container handling supply chain can be defined as the network of companies, which are directly involved in the transportation of goods and the accompanying information flow: the primary network. This is defined in this report as the ‘suppliers’ chain’. When considering OSH risks one has to include also the contractors and sub-contractors working for the companies in the suppliers’ chain who are not directly involved in this supply chain. This network is defined as the ‘contractors’ chain’, For example, companies offering local services as a (sub)contractor, such as cleaning activities. This report focusses on the suppliers’ chain.

Another concept that is important when considering OSH-risks is the role of a so-called ‘focal’ company. A focal company is considered to be an influential company that is able to set standards for a whole chain of companies, including standards for safe and healthy work practices.

This paper is the result of a document study, a literature scan, and interviews. It consists of eight chapters and will address the following issues:
Chapter 2 outlines the general aspects of OSH in supply chains such as the types of supply chains and the role of the focal company, the OSH risks in the supply chains and the importance of knowledge sharing. Chapters 3, 4 and 5 are focused particularly on the container-handling chain. Chapter 3 describes the work process and stakeholders involved in this chain, Chapter 4 presents the health and safety risks, and Chapter 5 the regulatory aspects of OSH in the container-handling chain. In Chapter 6, the implications of the issues presented in the previous chapters on the CASSANDRA project are discussed. Including the influence of the information management processes on health and safety risks and possible effects of the CASSANDRA concept on managing these risks. In order to illustrate the main

issues two case descriptions on specific health and safety risks in the container handling chains are presented in Chapter 7. Recommendations are given in Chapter 8.

2 Occupational safety and health in supply chains

In this chapter some general aspects of OSH in supply chains such as the types of supply chains and the role of the focal company, the OSH risks in the supply chains and the importance of knowledge sharing will be explained. These general notions are used as background in order to understand OSH risks in the shipping containers handling supply chain.

2.1 Supply chains and networks

Various relationships can be distinguished within the supply chain. The EU-OSHA report (EU-OSHA, 2013) presents a simplified, general model for supply chains where the main actors and the relationships between them are summarised (figure 1).

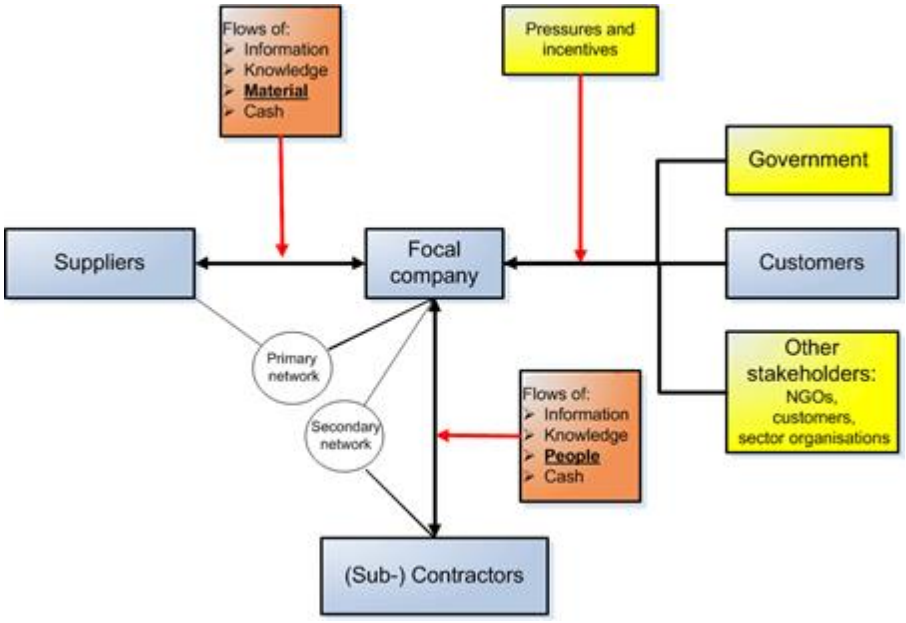

Figure 1: Relationships between a company and its surroundings

Source: adapted from Seuring and Muller (Seuring and Muller, 2008; EU-OSHA, 2013)

In terms of OSH two main supply chain networks or relationships between companies and the members of their supply chain must be considered: the primary network (or 'suppliers' chain') - a company and its suppliers of certain goods and materials and the secondary network (or 'contractors' chain') - a company and its contractors and sub-contractors providing specific services such as maintenance, construction, cleaning or catering activities. Both networks are affected by stakeholders such as government, non-governmental organisations (NGOs), and customers. The differences between those two networks and their relation to OSH-risks are discussed in the next sections. The nature of the above-mentioned networks is different as well as the relationships among their actors. This is also of relevance in the CASSANDRA project.

2.1.1 Suppliers' chain and the focal company

According to the EU-OSHA report (EU-OSHA, 2013) a suppliers' chain encompasses primarily the flow of goods and materials. Companies are linked together through information, knowledge, materials and capital flows. Powerful members of this supply chain ('focal companies') can influence the other actors to apply sustainable OSH practices, for example economic pressure or incentives, policy against suppliers, retailers and purchasers. Seuring and Müller (2008) define the focal companies as those companies that usually (1)

rule or govern the supply chain, (2) provide the direct contact to the customer, and (3) design the product or service offered. A supplier is a party that supplies goods or services. A supplier may be distinguished from a contractor or subcontractor, who commonly adds specialized input to deliverables (EU-OSHA, 2013). “The supply chain encompasses all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows. Involving material and information flow both up and down the supply chain. Supply chain management (SCM) is the integration of these activities through improved supply chain relationships to achieve a sustainable competitive advantage” (Handfield, 1999). The supply chains (especially the global supply chains) can be quite complex and there might be multiple tiers.

2.1.2 Contractors’ chain

While in the suppliers’ chain there is primarily a flow of goods and materials, the secondary network comprises a flow of people and their services (i.e. contracting and sub-contracting). In this contracting chain companies are linked together through information, knowledge, people and capital flows. Nowadays companies tend to carry out only core functions, outsourcing subsidiary or specialised functions like cleaning, maintenance, construction, waste disposal or catering to other companies: the 'contractors'. Usually the definition of this kind of relationship is designated as ‘outsourcing’. This is very common in several industries, such as construction, chemistry, transport, or energy. Most often this work is of a sporadic nature which implies that employees are only temporarily needed. Specialised companies and their employees are hired to perform the work better, faster and usually cheaper. Not only do employers hire contractors, these contractors can hire sub-contractors and a chain of companies emerges. The executed work takes place mostly at the premises of the focal company/organization (Zwanikken, 2008; EU-OSHA, 2013).

2.2 General aspects of OSH risks in supply chains

The type of supply chain operations and the outsourcing trend have their implications for the working conditions and safety and health of workers of supplier and contracting companies. The OSH risks within the suppliers’ chain are mainly caused by a lack of knowledge on the safe use of products/materials and on exposure to certain hazards. Also, safety and healthy working conditions under which the respective goods or materials are produced, packed and transported are most often not considered in the purchasing criteria. The suppliers’ chain can have a positive effect on safe and healthy working conditions by promoting OSH improvements within the supply chain members. Walters and James (2009) have reviewed a number of studies where the economic relations involved in the supply chain support improvements in health and safety arrangements. This results from the ability of focal companies to make their suppliers adopt specified policies and practices (Walters, 2009; Walters and James, 2009).

The OSH problems regarding the safety performance of contractors may be aggravated by a lack of skilled and experienced labour, by the low profile of the small enterprises involved and by the low frequency with which they are inspected. This can lead to less secure employment, which is also more likely to be illegal, where workers have limited access to trade unions and other forms of collective representation (Walters and James, 2009). As contractors perform their job in the client’s facilities, they can be exposed to unknown hazards, like biological agents, chemical products, asbestos or noise. Conversely, workers of the client company can also be exposed to hazardous situations derived from the work performed by contractors. These situations mainly originate from activities not familiar to the company workers or by activities that are performed unexpectedly. Prevention requires that such hazardous working conditions are identified and controlled before the scheduling and execution of the contracted tasks (EU-OSHA, 2013). Although not the primary target group for the CASSANDRA project, this contractor chain may be affected by some of the OSH risks

that occur in the primary container handling chain such as contractors operating in the vicinity of containers containing dangerous substances.

2.3 OSH and knowledge sharing in the supply chain

To address OSH risks the availability of risk information is very important. For example when containers arrive at their endpoint and before they are opened it is necessary to know what is in them and whether the container contains dangerous gasses. Risks can only be addressed if they are identified and recognized by relevant actors. If knowledge is lacking, or people are misinformed, this might lead to a misinterpretation of risks and result in disturbances or other unwanted situations such as accidents.

In a supply chain, information is diffused amongst the different organisations which makes it more difficult to get all relevant information. Although CASSANDRA is not specifically aimed at OSH information, it is aimed at sharing and storing knowledge within the supply chain so that all relevant actors get sufficient and accurate information. The data pipeline is aimed at storing and sharing information, mainly on the contents of the container and to reduce security risks. This sub-chapter briefly describes theories from knowledge management studies that are relevant when sharing information, for instance about OSH risks, because, in order to address the risks, the risks need to be known.

2.3.1 Knowledge sharing

Knowledge sharing is an activity through which knowledge (i.e. information, skills, or expertise) is exchanged and it is generally supported by a knowledge management system. The sharing of knowledge constitutes a major challenge, because sometimes employees tend to resist sharing their knowledge with the rest of the organization (Ciborra, 1998). The same applies for inter-organisational knowledge sharing, as in supply chains (Panteli, 2005; Zaheer, 1998, Panayides, 2009) where some organisations are reluctant to share their knowledge with supply chain partners.

In knowledge sharing theories two types of knowledge are distinguished: implicit knowledge and explicit knowledge. Different knowledge sharing strategies apply to these types of knowledge. Implicit or tacit knowledge exists as a combination of experiences, competences and attitudes (Weggeman, 2000). It can best be transferred by a personalization strategy (Ghosh, 2004) or a so-called 'person-to-person' approach. Explicit knowledge is information that can be stored into a system through text, graphs or formulas. The strategy to share this knowledge is called codification (Ghosh, 2004). There is generally a distinct preference for IT-based knowledge management systems over personalized systems (Gammelgaard, 2007). This strategy is also used in the data-pipeline for CASSANDRA and therefore CASSANDRA gets most use out of codified knowledge. However, technology constitutes only one of the many factors that affect the sharing of knowledge in organizations (Panayides, 2009; Stewart, 2009; Ghosh, 2004). The content data elements or so-called datums, should be specifically targeted at the people who should receive and use the knowledge (Stewart, 2009). Words used to communicate a message are unlikely to mean exactly the same things for all parties involved (Stewart, 2009). In codification a message is simply delivered and open for interpretation by the recipient, whereas personal communication allows for dialogue, a check whether the information is received and understood, etc. Therefore both personalisation and codification of knowledge are relevant for optimal risk assessment and risk communication.

2.3.2 Facilitators and barriers for knowledge sharing

The previous section already mentioned that some organisations are reluctant to share information. This section lists some factors that positively influence knowledge sharing and factors that are seen as hindrances for sharing.

- Trust

Trust is a matter of belief in the honesty, fairness or benevolence of another party. Trust is a necessary condition for knowledge sharing. To put it in another way: a lack of trust hinders knowledge sharing (Ghosh, 2004; Gammelgaard, 2005; Panteli, 2005; Panayides, 2009). A well-known suggestion for inter-organisational work is to use a best sellers list, or a list with preferred suppliers (Ghosh, 2004), meaning that you only work with organisations that you consider trustworthy.

Research also shows that the relationship between trust and knowledge sharing in virtual communities is complex and part of its impact is manifested through the perceived level of psychological safety. If an individual's level of perceived safety is low owing to other reasons, they may still be less willing to share their knowledge even when trust exists (Zhang, 2010).

- Intrinsic motivators

An organization or individual representative can be intrinsically motivated to share knowledge. Pride and loyalty are strong influential factors. It addresses the willingness to help others by giving them useful knowledge. Reciprocity is also an intrinsic motivator. It refers to the expectation that when sharing your knowledge, you will also get knowledge, trust and loyalty in return. Reciprocity could be used as payment for knowledge sharing, but it doesn't work in a codification system due to significant asymmetry between sellers and consumers of knowledge (Ghosh, 2004).

- Extrinsic motivators

Extrinsic motivators are powerful motivators for organizations within a supply chain. Knowledge is shared because a positive outcome is expected. Examples are for instance rewards, recognition, competitiveness and power. It is closely related to reciprocity, since motivation is determined by the probability you will get something in return, the value of what you expect in return, and the probability that others will use the knowledge as you did yourself.

According to Fang (Fang, 2011), knowledge sharing among enterprises has very important practical significance for reducing the cost of knowledge acquisition. Enhancing the synergy between enterprises improves the ability to cluster innovation, and to promote the overall competitiveness of the supply chain.

On the other hand, knowledge sharing can also be hindered because the expected outcome is negative. Often knowledge is for example not used, due to the 'not invented here syndrome' (Gammelgaard) whereas sharing is a costly and time consuming process (Ghosh, 2004). Shi (Shi, 2009) lists several risks of knowledge sharing, including loss of core knowledge (Gammelgaard, 2005) and an over-protection of knowledge. Also, opportunism causes high tension and mistrust which in turn will lead to renewed reluctance to share relevant knowledge.

Although these notions about knowledge sharing may seem to be too abstract for direct use in CASSANDRA, awareness about some basic principles like the distinction between person-to-person communication and the use of codification may be an important issue within CASSANDRA. Also, awareness and knowledge on facilitators and barriers for knowledge sharing could be of help when defining the strategy for building the data pipeline.

3 Actors relevant to OSH in the shipping container handling chain

Descriptions of the container handling supply chain have been elaborated in other work packages of the CASSANDRA project already (Figure 2).

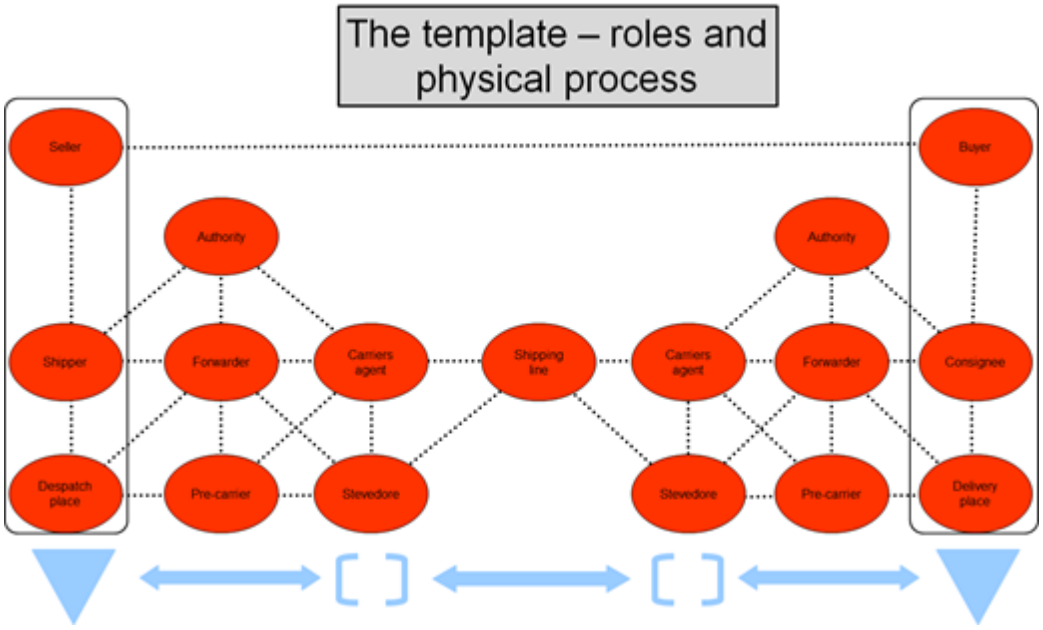

Figure 2: General model of the container handling supply chain

Source: CASSANDRA WP

The shipper, as the owner of the cargo, has the most important position in the chain. Other stakeholders focus on the organisation or performance of the transport of the cargo in the container. The governmental stakeholders focus on the safety, security and efficiency of traffic and the inspection of goods in the harbour. The seaport is an important link in connecting import and sea transport and a focal point for inspection. The stevedore and the shipping line have an important task in the relation with other organizing and executive partners.

All partners have a function in a (part of) the supplier chain, aimed at physically handling a container and/or exchange of information between partners. The involvement of many parties in the chain results in a local focus: each partner focusses on its own services and not on the total service for the final recipient of the container.

The parties that have a more or less decisive role in the process may be regarded as the focal companies that have the power to influence working conditions in the supply chain. Such actors have been defined in the stakeholder analysis elaborated in other CASSANDRA work packages (Nijdam, 2012) of (Table 1).

The roles in Figure 2 are carried out by actors as mentioned below. The naming of the actors makes clear what kind of organisations are responsible for that node of the chain. And thus responsible for any OSH risks at that position in the chain.

Table 1: Actors and focal companies that have influence on working conditions in the container supply chain

Influential parties	Definition and relation to CASSANDRA	Focal company? *
Shippers	Shippers are, together with the consignees, the main stakeholders in the supply chain. They form the organizations that benefit the most from a smoother running supply chain. The shipper has a choice to organise the transport himself or to subcontract it to a provider of logistics services. The possible benefits (from CASSANDRA) for them are cost savings and better insight in their supply chain. A drawback of the system and risk based approach for the shippers might be the obligation to provide more shipment data than they would like.	Yes
Shipping agents	The shipping agent can arrange the transport or parts of the transport for the shipper	Yes
Shipping lines	Shipping lines fulfil the largest part of international transport and are in many cases also involved in the logistics and hinterland transport. They also form an important link in the data flow, in many cases they are the ones collecting the data from the shipper and delivering it to other parties in the supply chain. This central role in the data pipeline makes them an important stakeholder for CASSANDRA.	No
Forwarders and third party logistics	Forwarders and third party logistics providers are in many cases at the start of a transport chain and sometimes even control the whole international flow. These companies act on behalf of the shippers and have an important role in creating the correct data and making it available to other parties in the supply chain. Possible benefits for these companies are that they can use the data pipeline to provide a smoother supply chain to their customers. For some forwarders it might be a limitation of their work related to custom clearance.	Yes
Consignees	Consignees are at the receiving end of the supply chain. They often are responsible for delivering the right information about the shipments they receive to the customs organization. The potential benefit for these organizations from improved data quality and availability is substantial. The system based approach of the customs organizations can be attractive for them, but could also create extra work for the smaller consignees.	Yes
Buyers	The buyer opposes quality requirements on the products to be transported and can influence working conditions.	Yes
Port companies (Stevedore)	Port companies are all companies in the port that have activities related to the cargo that is transferred there. These are mainly container terminals, but also some warehousing activities might be included. These companies form an important link in the transport and information flows. Stevedoring companies might also profit from better information about the cargo, this can help them plan their processes better.	No
Transporters	Transporters are the companies that provide hinterland transport. These companies bring containers to or from the port. They are a stakeholder in the CASSANDRA project because their work might be influenced by better data availability. Their role in the data pipeline is probably limited because they do not create extra data other than trip information.	No

Legislative government	The legislative government is a stakeholder because they make rules and regulations that make it possible or impossible to implement a date pipeline and risk based approach. Also they might be influential for international standardization of the protocols used.	Yes
Government agencies	The inspection authorities are responsible for inspection of adherence to regulations among which working conditions, safety and security and environmental violations. The governmental agencies are one of the main beneficiaries of the CASSANDRA project. The idea of a data pipeline that can be used for a system and risk based approach is mainly geared towards the customs organizations. Also other inspections as the environmental and labour inspections can benefit from extra information availability. Possible drawbacks for these organizations can be that not all information they need is included in the data-pipeline, which might make it more complex to fulfil all their tasks.	Yes
Port Authorities	Port authorities are relevant stakeholders because ports are the locations where cargo is exchanged and where most inspections take place. Also some port authorities are active in the development of port community systems for the processing of data. These systems can be very useful for the CASSANDRA project. Ports are also beneficiaries of a more efficient inspection system, this adds to the competitiveness of the port.	No
Branch organizations	Branch organizations often play an important role in creating support for a certain activity or plan. They have knowledge about the opinion of their members and can influence that opinion.	No
IT and date companies	IT and data companies are those companies that provide the infrastructure or data storage and interpretation that is needed to implement the CASSANDRA project. The IT companies are suppliers to the system and in that sense will benefit from the implementation. The data companies are often the port community systems that collect data about shipments and can thus be important partners for businesses in the supply chain and government inspections. A possible issue is the ownership of the data.	No
Insurers and banks	Insurers and banks could contribute to the CASSANDRA project because they have in certain cases information about shipments that is not available elsewhere. Furthermore, financing and insuring of transport might be easier when the data pipeline can provide more and better information about the shipments.	No

*: Focal companies are those companies that usually (1) rule or govern the supply chain, (2) provide the direct contact to the customer, and (3) design the product or service offered (Seuring and Müller, 2008).

In order to combine this chain with a description of OSH-risks it is meaningful to indicate the (kind of) locations where the physical process of container handling takes place. Figure 3 indicates the actors and locations for a specific trade lane as taken from the CASSANDRA project.

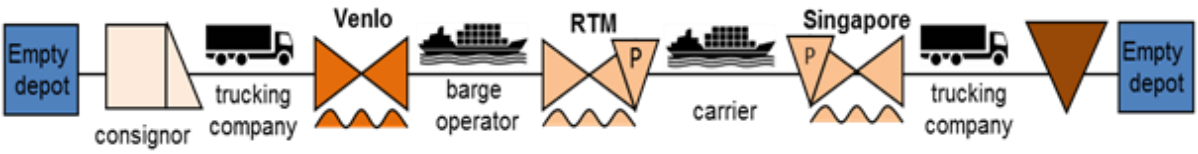

Figure 3: Actors and locations of a CASSANDRA trade lane

Source: CASSANDRA WP

At each node of the above supply chain contractors and sub-contractors will be working on a sporadic/temporary basis for performing local services as cleaning, maintenance, construction, waste disposal or catering (see contractors' chain, Chapter 2). These contractors are not part of the information flow and therefore are not aware of the risks related to the containers' handling and content. It is the responsibility of the client (in this case the supply chain member) to provide his contractors with information regarding the potential safety and health risks and required measures at the location they operate. The next chapter will go into the kind of OSH risks in the shipping container handling chain.

4 OSH risks in the shipping container handling supply chain

Two main kinds of occupational safety and health risks can be distinguished in the container supply chain:

- Risks related to the content of a container, for example dangerous products or conditions inside a container like toxic gases introduced by active gassing of containers, or containers containing fumes originating from products.
- Risks related to the cargo handling operations (physical risks) resulting, for example, from moving heavy and highly stacked containers and the use of heavy equipment.

4.1 Risks related to the content of a container

These risks are connected to the content of the container and "travel along" during the transport of the container. These risks derive from the content, such as:

- chemicals or products containing hazardous substances;
- hazardous wastes;
- toxic gases introduced by active gassing of containers or;
- containers containing toxic gases originating from products or the packaging.

Operations with containers with such content pose potential threats to the health and safety of port and ship workers, inspectors and nearby inhabitants. Risks may be caused by accidental spills or vessel or vehicle collisions, leading to fire or explosions, air emissions, spreading of diseases, etc.

Most relevant for safety are the toxic gases released either from products in the container or the presence of toxic compounds added intentionally for the conservation of products ("active gassing"). A third category is the presence of dangerous compounds as part of the cargo (chemicals or products containing hazardous substances or hazardous wastes). A description of the risks caused by the first two categories is given by highlighting the situation in the Netherlands, based on a series of reports on gassed containers (see the case description in chapter 7).

4.2 Risks related to container handling (physical risks)

These type of risks are mainly physical risks for port/ship workers resulting from moving containers and working with heavy equipment, like forklift trucks. These risks are related to the provision of safe gear and equipment, safe means of access and safe working places for all container-handling workers at each location, to the regular inspection and maintenance of equipment and gears. Further related issues are provision of necessary information, training, instruction and supervision of safe working practices. Including provision of adequate personal protective clothing and gears, such as safety helmets and safety shoes. Although incidents with the handling of containers may cause disruption of the transport chain, CASSANDRA focuses on the information and safety issues related to the content of the containers. This report will, therefore, not further elaborate on the physical risks of container handling.

5 Rules and regulations related to occupational safety and health in the containers handling supply chain

The rules and regulations related to the occupational safety and health in the containers handling supply chain are diverse and depend on the location and the type of the cargo. At all locations on the world national legislation on occupational health and safety applies. In the European Union these legislations are becoming more and more harmonised according to the EU-regulations. This chapter will not go into all national OSH legislation but give a summary of global and European legislation and conventions. As well as the most important regulations with respect to the handling of dangerous substances and containers containing dangerous substances.

5.1 Global regulations and conventions

There are a number of international conventions, regulations and programmes that are related to occupational safety and health in the containers handling supply chain. They can be found on the websites of the international and national organisations such as the European Sea Ports Organisation (ESPO), the International Maritime Organization (IMO), the International Labour organisation (ILO), the World Health Organisation (WHO), the European Maritime Safety Agency (EMSA), the American Association of Port Authorities (AAPA), and the Australian Maritime Safety Authority (AMSA). The most important international rules and legislation are:

- IMO Conventions (International Convention for Safe Containers - CSC, 1972).
- ILO (ILO's Maritime Labour Convention - MLC, 2006) provides comprehensive rights and protection at work for seafarers, and standards and recommendations for seafarers, dockworkers, and labour inspectors.
- WHO (international health regulations).

5.2 EU OSH legislation

The most relevant EU OSH legislation related to workplace safety and health:

- Directive 89/391/EC - Framework Directive on the safety and health of workers in general, which is supplemented by several individual directives.
- Directive 89/654/EEC - Workplace requirements concerning the minimum safety and health requirements for the workplace (first individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC).
- Directive 98/24/EC - Risks related to chemical agents at work. On the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).
- Regulation 336/2006/EC of the European Parliament and of the council on the implementation of the International Safety Management Code (ISM) within the Community Directive 2009/13/EC implementing the Agreement concluded by the European Community Ship owners' Associations (ECSA) and the European Transport Workers' Federation (ETF) on the Maritime Labour Convention (Flag State and Port State aspects).

5.3 Content specific regulations

A lot of legislation relevant to container transport is connected to the risks caused by the content of the container (see paragraph 4.1):

- Chemicals or products containing hazardous substances.
- Toxic gases introduced by active gassing of containers or containers containing fumes originating from products.

- Hazardous wastes.
- Radioactive materials and waste.

The most important EU regulations related to the marketing and use of dangerous substances to chemicals are:

- European Commission (2006), Council Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, OJ, L 396.
- European Commission (2008), Council Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, OJ, L 353.

The presence of toxic gases and fumes originating from products is not covered by specific regulation. Active gassing of wooden packaging materials is covered by ISPM 15 regulation from the Food and Agriculture Organization (FAO) of the United Nations (FAO, 2009).

The shipping of waste is an important issue in the EU. EU legislation related to the shipment of waste is as follows:

- Regulation (EC) No 1013/2006 of European Parliament and of the Council of 14 June 2006 on shipments of waste. It is in force from 12 July 2007 (OJ L 190, 12.07.2006, p. 1-98) and its amendments (Waste Shipment Regulation – WSR).
- Commission Regulation (EC) No 1418/2007 of 29 November 2007 concerning the export for recovery of certain waste listed in Annex III or IIIA to Regulation (EC) No 1013/2006 of the European Parliament and of the Council to certain countries to which the OECD Decision on the control of trans boundary movements of wastes does not apply.
- Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste (Waste Framework Directive).
- Council Directive 91/689/EEC of 12 December 1991 on hazardous waste.
- Decision of the Commission on the European Waste Catalogue 2001/118/EC (OJ L 47, 2001) and its amendments.
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal, in force from May 1992.
- Council Regulation (EEC) No 2913/92 of 12 October 1992 establishing the Community Customs Code (OJ L 302, 19.10.1992, p. 1-50) and its amendments.
- Commission Regulation (EEC) No 2454/93 of 2 July 1993 laying down provisions for the implementation of Council Regulation (EEC) No 2913/92 establishing the Community Customs Code (OJ L 253, 11.10.1993, p. 1) and its amendments.

The Basel Convention and OECD Council Decision can be seen as worldwide regulation regarding waste shipments. On European scale Waste Shipment Regulation (WSR) 1013/2006 is the regulation in force.

The extensive regulations on the transport of radioactive materials or waste is outside the scope of CASSANDRA and will not be treated here.

6 Main information management and OSH issues with potential implications for CASSANDRA

In the first five chapters of this paper general OSH issues related to supply chains and in particular to the containers handling chain were presented. In this chapter the relation of these issues with information management and the potential implications for CASSANDRA will be discussed. The main issues with potential implications for CASSANDRA and vice versa are:

6.1 Type of network

Will the CASSANDRA solution cover both the suppliers' chain and the contractors' chain? It is to be expected that only the suppliers' chain will be covered by the information pipeline of the CASSANDRA project? However, it must be taken into account that information regarding hazardous working conditions is included in the pipeline and should be made available to all actors in the supply chain. It might be useful to include recommendations for the actors in the supplier chain to provide their contactors with this information before scheduling and execution of contracted tasks.

6.2 The role of powerful actors of the supply chain (focal companies)

As explained in Chapter 2, the focal company is considered to be an influential company that is able to set standards for a whole chain of companies, including standards for safe and healthy work practices. Such actors could use the CASSANDRA information pipeline to disseminate and collect information from and to their suppliers. On the other hand, the CASSANDRA project has to take into account the standards and supply chain strategy of the focal companies within the container handling supply chain in order to be successful.

6.3 OSH risks in the supply chain

Risks can be classified as being related to the content of the container or to the handling of the container (physical risks). The risks related to the cargo handling operations are not expected to have considerable implications on the CASSANDRA project and vice versa. The main issue in relation to information management and with potentially significant implications for CASSANDRA are the OSH risks related to the content of the containers. This is the case when the container contains:

- dangerous goods such as chemicals, or products containing hazardous substances;
- hazardous wastes;
- non-hazardous waste for recovery or disposal;
- toxic gases introduced by active gassing of containers;
- fumes originating from products.

In these cases, the operations with containers pose potential threats to the health and safety of port and ship workers, inspectors and nearby inhabitants. The risks include:

- spills;
- vessel or vehicle collisions;
- fire or explosions;
- air emissions;
- exposure to harmful gases;
- spreading of diseases, etc.

In order to prevent such risks, it is of great importance that information regarding the hazard of the content is provided on time to all parties that have to operate with the containers. This may be a relevant issue for the CASSANDRA information pipeline. Lack of knowledge and

good communication regarding the content, the safe handling of the cargo, and the potential exposure to hazardous substances, most often causes these risks. Missing information, incorrect information or illegal shipments (where harmless goods/waste instead of the actual dangerous materials/waste are declared) can pose a risk to the labour and/or environmental inspectors, police and customs representatives involved in inspections and the port/ship workers. Regular shipment of dangerous goods or waste where the port/ship workers are not well informed regarding the necessary personal protection measures also poses a threat to their health and safety. This applies also in cases where gassing is used or where the hazardous gas originates from the products, and where adequate information is not available for the inspectors or workers. The latter has been illustrated by a case of recent political upheaval on gassed containers in the Netherlands. This case is presented in Chapter 7 of this report.

There are different actors involved in the information management depending on the type of the content and different rules and regulations that apply next to the general customs regulations. In addition, it should be taken into account that the information flow regarding the transported cargo could encompass other actors than the actors involved in the physical transport of a container. All these actors must be identified and included in the CASSANDRA information pipeline. This is illustrated by an example of waste shipment in Section 7.1.

7 Case illustrations of the main issues

This chapter contains two cases. One on the OSH risks of gassed shipping containers and the consequences for health and safety and transportation processes. And a second one on the relevance of the container content for OSH risks, the corresponding regulatory frame work, and the actors and authorities involved.

7.1 Political upheaval regarding toxic gases in shipping containers in the Netherlands

Several severe incidents with opening of containers have led to considerable political upheaval in the Netherlands, resulting in questions and discussions in the Dutch parliament and the start of a platform on "Gases in Containers" by several sector organisations and the unions[1]. This has led to an increase in both awareness among the inspection agencies as well as the relevant industrial sectors, and also to increased inspection activities in the Dutch harbours. The Dutch Labour Inspection started an inspection campaign among companies handling containers in 2010 (Dutch Labour Inspection, 2010). This campaign showed that 40% of the inspected companies adhered to the regulations on handling containers, as opposed to 2% in 2003. Although compliance appeared to be increasing, still two out of three companies did not meet the requirements of the Dutch Labour Law regarding the handling of shipping containers.

Basic information on the presence of fumigants in containers is given by a 2007 trend report by the Dutch National Institute for Public Health and the Environment (De Groot, 2007). Dutch inspection authorities took air samples from a selection of 300 containers imported into the Netherlands. Concentrations of five main fumigants appeared to increase during this period, as well as the number of containers containing dangerous gases above the maximum allowable concentration. One of the conclusions: In 2006 30% of the inspected containers contained one or more hazardous gases. The trend was that these numbers were increasing. In addition, to the five main fumigants roughly 40 other components could be detected in the selection of containers.

In another 2011 report (De Groot, 2011) the same institute investigated the percentage of containers containing fumigants or other toxic gases with a concentration above the maximum allowable concentration in the period 2002 - 2009. The results indicate that 7 - 11 % of all containers contained concentrations above the maximum allowable concentration of at least one of the compounds detected (Table 2).

Table 2: Percentage containers with concentrations of hazardous gases above maximum allowable concentrations, 2002-2009

Active gassing with fumigants (methyl bromide, phosphine, chloropicrin)		± 1,5 – 5 %
Either fumigant or originating from products	1,2-dichloroethane	± 2 %
	formaldehyde	not known
Originating from products (benzene, toluene)		± 3-6 %
Total without formaldehyde		**± 7 – 11 %**

A noteworthy comment in this report was that high concentrations of hazardous gases can be found in containers with all kinds of cargo, but more often in containers with food products, textile, and shoes.

[1] Platform Gassen in Containers (Platform on gases in shipping containers), started in 2010 by the unions (FNV Bondgenoten) and several branch organisations (http://www.pgic.nl/; in Dutch).

Important information on the governmental policy on the handling and inspection of shipping containers is summarised in the letter of State Secretary Joop Atsma of March 16, 2011 to the Dutch Parliament. Below are some of the conclusions, concerning OSH risks as well as information exchange between inspection agencies, that are relevant to CASSANDRA:

- The percentage of containers that have been actively treated with fumigants is relatively low.
- Many containers contain gases originating from the products in the container.
- "Gas free" statements are not reliable when gases originate from products. The government will therefore not issue these kind of declarations after inspection by government agencies.
- The government will continue the regular inspections of shipping containers.
- Information exchange on shipping containers between the government agencies in the harbour will be continued.
- The Dutch Labour Inspectorate will continue inspecting companies handling shipping containers.

As a result of all the attention for these issues, the Dutch standardisation institute (NEN) started developing Dutch technical agreements (Nederlandse Technische Afspraken - NTA) for the safe handling of shipping containers (website of the Platform on gases in shipping containers, 2012).

Another action is a survey by the Dutch Poisons Information Centre (DPIC; Nationaal Vergiftigingen Informatie Centrum - NVIC), amongst employees who think they have inhaled toxic gases from shipping containers. DPIC provides a 24/7 information service to medical professionals about symptoms and treatment in case of possible poisoning of humans or animals. Considerable attention is currently being paid to working conditions of employees involved in unloading fumigated freight containers. Since February 2011 DPIC has started an investigation to gain more insight into: (1) the severity of acute symptoms after inhalation exposure to container gasses, (2) the frequency of these incidents, and (3) the circumstances of exposure. In 2011, DPIC received 10 information requests/ notifications about incidents where in total 22 persons were exposed to toxic gases after opening and/or unloading of gassed shipping containers). These 22 persons had health complaints which arose after exposure. In terms of seriousness they ranged from mild complaints to complaints lasting a few days. Three incidents led to short term (mostly one night) admission in a hospital for observation, but no serious intoxication was recorded. The intention was to continue the research throughout 2012.

At the European level, the Dutch Labour Inspection organised a conference for the European Labour Inspectorates (Senior Labour Inspectors Committee, SLIC) on the dangers of fumigated containers with representatives of the Labour Inspectorates of 12 EU member states, the European Commission and the European Agency in Bilbao in October 2009. The goal of the seminar was to reach a common approach to the handling of risks of hazardous gases in shipping containers (Dutch labour Inspectorate, 2009).

7.2 Transfrontier shipment of waste

This case is used as an illustration of the different parties involved in information management in container transport, depending on the content of a shipping container. Although this case may be less applicable to the CASSANDRA pipeline, it shows the dependence on container content and the complexity that can be the result of all regulations and actors involved.

Waste is being shipped by marine (but also road, railway or air) transport all over the world to strive for making profit, saving costs or looking for available treatment facilities. Within the

European Union, 15% of all transport movements already involve waste (IMPEL, 2006). In developing industrial countries in Asia and Africa, like China and India, waste is considered a valuable source for raw material. Although a great deal of waste transport is legitimate, there is growing evidence of illegal transfrontier movements of waste, which needs to be urgently tackled (IMPEL, 2006). A control on transfrontier shipments of waste is essential to ensure a high level of protection for the environment and human health. It also aims to prevent the unauthorised disposal of waste and the unregulated recovery of hazardous waste from international waste shipments, without impeding the legitimate trade of waste. For this purpose international and national waste shipment legislation is developed all over the world. In the European Union the conditions for transfrontier shipment of waste are determined by the Regulation (EC) 1013/2006 of European Parliament and of the Council of 14 June 2006 on shipments of waste (OJ L 190, 12.07.2006, p. 1-98) (See also chapter 5).

There are many actors involved in the information and actual cargo flow of the waste shipment. The involved non-governmental actors in Regulation 1013/2006 (WSR) can be defined basically as producer, notifier and consignee. These stakeholders are involved in the procedures for waste shipment according to the Waste Shipment Regulation (WSR) (Ustailieva, 2007). Next to non-governmental actors there are governmental actors involved in the implementation and enforcement of WSR. Their competences and roles are presented in Table 3.

Table 3: Authorities involved in the implementation and enforcement of WSR and their competencies

Governmental authority	Environmental authority	Customs	Police
Competences	• Specific competence in environmental legislation	• General competence in customs matters: transfrontier (EU) shipment of waste and goods; taxes • Limited competence in environmental legislation	• General competence in police matters • Competence in the enforcement of environmental legislation • Approachable 24/24 • Recognizable for the public
Expertise in:	Environmental issues	Custom matters	• Police matters • Privileged contacts with Public Prosecutors

Source: Ustailieva, 2007

Considering the trans-boundary character of the WSR the international cooperation and information sharing at different levels is essential for its effective implementation and enforcement of the regulation and preventing illegal waste shipment and subsequent harm to human health and the environment. Considering the different competencies of the above presented governmental authorities, the cooperation and information sharing between them within one member state, but also between the relevant authorities from the countries involved in the waste shipment chain, is of significant importance. Figure 4 presents the information flow and cooperation links on the global, European and national level for the implementation and enforcement of waste shipment legislation.

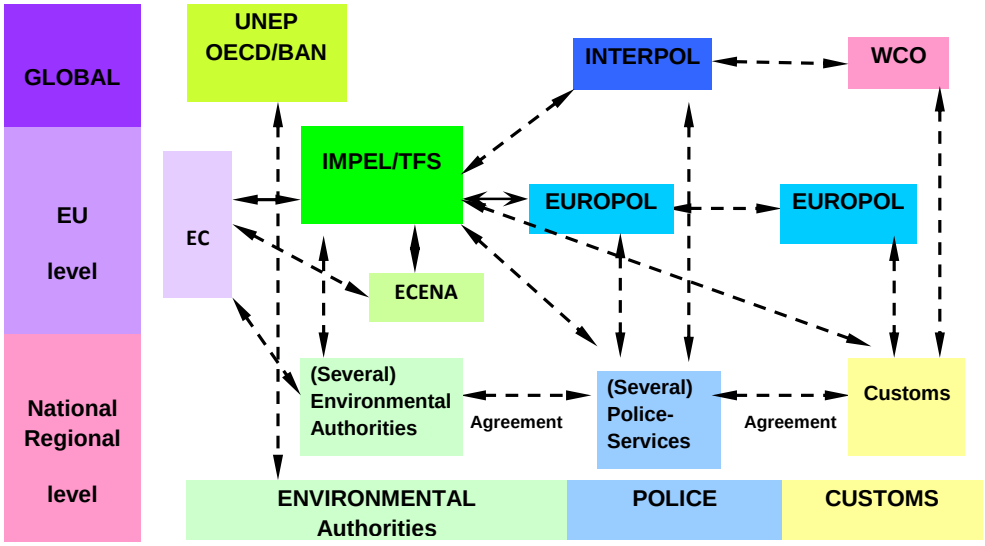

Figure 4: Co-operation and information network of the governmental institutions related to transfrontier waste shipment

Source: Presentation at TAIEX Workshop on Shipment of Waste, 2007, Bulgaria, adapted by Erika Ustailieva

The above presented cooperation and information flows encompassing both non-governmental and governmental actors should be considered when building the CASSANDRA information pipeline. This example presents the case of waste shipment, however in case of different container content different actors might be involved and different regulations will apply.

8 Recommendations

Work package 630 is supposed to raise awareness about human factors relevant to the CASSANDRA project. This report focuses on occupational health and safety issues and on the information management issues that are a linking pin between the health and safety issues and the data pipeline to be developed in CASSANDRA.
The OSH risks that are expected to have significant implications for the data pipeline in CASSANDRA are the risks related to the content of the containers. In order to prevent spills, explosions, air emissions and other OSH risks, it is of great importance that information regarding the hazard of the content is provided on time to all parties that have to operate with the containers.

The CASSANDRA data pipeline can facilitate the accessibility of information about container content so that OSH risks can be identified and managed better. However, if information sharing is limited to the data pipeline and there is little person to person communication, problems with incorrect information and misinterpretation of information remain.

These insights lead us to the following recommendations:

1. The data pipeline should take into account the communication on the most important OSH risks in the suppliers' chain: the presence of hazardous substances in shipping containers.
2. Define for which types of content the data pipeline will contain information (e.g. not for radioactive materials; not for waste shipments). The complexity of the regulations and the involved actors requires CASSANDRA to define its scope clearly in this respect.
3. Consider the necessity of OSH risk communication through the data pipeline to the secondary contractors' chain. The attention from the government in the Netherlands, including the Labour Inspection will be influential for CASSANDRA because of the extra inspections.
4. Define the so-called focal companies or actors in the container handling chain and use these actors in the strategy for designing the data pipeline with respect to communication on OSH risks. A first attempt has been made in this report, based on the stakeholder analysis that has been carried out in Work Package 630. This may be extended to the non OSH related information in the data pipeline.
5. The design of the data pipeline should incorporate the notion of the two types of knowledge sharing mentioned in this report. An analysis should be made of what type of knowledge sharing (codified or person-to-person) - or what mix of these types - is the best strategy for reaching the goals of CASSANDRA and address the important issue of trust that is essential for the willingness to share knowledge.
6. The data integrated into the pipeline should cover the information related to human and environmental risks as discussed in the report. In order to (1) define the data sources and build an effective communication structure covering all parties concerned, and (2) to share knowledge ensuring that risks are identified and eliminated or controlled, a supply chain simulation workshop can be organised with the representatives of the main stakeholders. One of the Living Labs might be a place for such a supply chain simulation workshop.

References

Ciborra, C.U. (1998) Crisis and foundations: an inquiry into the nature and limits of models and methods in the information systems discipline. The Journal of Strategic Information Systems, 7(1), 5-16.

Dutch Labour Inspectorate (2010) Inspection campaign on shipping containers. Retrieved 18 June 2013. www.arboonline.nl/nieuws/rapport-ai-over-dacontainers-geen-reden-tot.30653.lynkx.

Dutch Labour Inspectorate (2009). Meeting European Port Inspectors Rotterdam Retrieved August 2012. http://www.inspectieszw.nl/zoekresultaten.aspx?access=p&oe=utf8&sort=date:D:L:d1&site=S_Inspectie_SZW&num=10&client=default_frontend&output=xml&filter=0&q=container&ie=UTF-8&ip=10.137.2.71&entqr=0&start=20.

Ustailieva, E., Starren, A., Eeckelaert, L., Nunes, I. L., Elsler (2013). *Promoting occupational safety and health through the supply chain.* European Agency for Safety and Health and Work- EU-OSHA. Retrieved from: http://osha.europa.eu/en/publications/reports

Food and Agriculture Organization of the United Nations –FAO (2009). *International standards for phytosanitary measures revision of ISPM no. 15. Regulation of wood packaging material in international trade*.

Fang, Y., Liang, Q., Jia, Z. (2011). Knowledge Sharing Risk Warning of Industry Cluster: an Engineering Perspective. *Systems Engineering Procedia, 2, 412-421.*

Gammelgaard J., Ritter T. (2005) The knowledge retrieval matrix: codification and personification as separate strategies, *Journal of Knowledge Management, 9(4), 133 – 143.*

Ghosh T. (2004) Creating Incentives for Knowledge Sharing. *MIT Sloan School of Management.* Available at: http://scholar.google.nl/scholar?cluster=14009845673516615877&hl=nl&as_sdt=0&as_vis=1

Groot De, G.M. (2007) *Trendanalyse schadelijke gassen in containers (Trend analysis harmful gases in shipping containers)*. RIVM rapport 609321001/2007 (In Dutch with an English abstract).

Groot De, G.M., Schols E. (2011) *Vergelijking van meetcampagnes naar schadelijke gassen in containers (Comparison of measuring campaigns of hazardous gases in shipping containers)*. RIVM Report 609021103/2011 (in Dutch)

Handfield, Robert B. and Ernest L. Nichols, Jr. (1999) *Introduction to Supply Chain Management*, Prentice Hall Inc., Upper Saddle River, New Jersey.

IMPEL (2006) IMPEL-TFS seaport project: *European Enforcement Initiative to Detect Illegal Waste Shipments* (Isarin N.).

Panayides, P.M. (2007) The impact of organizational learning on relationship orientation, logistics service effectiveness and performance. *Industrial Marketing Management, 36(1), 68-80.*

Panayides, P.M., Lun, Y.H.V. (2009) The impact of trust on innovativeness and supply chain performance. *International Journal of Production Economics, 122 (1), 35-46.*

Panteli, N., Sockalingam, S. (2005) Trust and conflict within virtual inter-organizational alliances: a framework for facilitating knowledge sharing. *Decision Support Systems. 39 (4), 599-617.*

Panteli, N., Sockalingam S. (2005) Trust and conflict within virtual inter-organizational alliances: a framework for facilitating knowledge sharing. *Decision Support Systems, 39 (4), 599-617.*

Panayides, P.M. (2007) The impact of organizational learning on relationship orientation, logistics service effectiveness and performance. *Industrial Marketing Management, 36 (1), 68-80.*

Panayides, P.M. , Lun V.Y.H. (2009) The impact of trust on innovativeness and supply chain performance. *International Journal of Production Economics, 122 (1), 35-46.*

Nijdam M.H., Romochkina I.V., Van Oosterhout M. (2012) *CASSANDRA deliverable D6.1 - Stakeholder Analysis*. (CASSANDRA internal report).

Seuring, S. and Müller, M. (2008) From a Literature Review to a Conceptual Framework for Sustainable Supply Chain Management. *Journal of Cleaner Production, 16 (15), 1699 -1710.*

Shih, S.C., Hsu, S.H.Y., Zhu, Z., Balasubramanian, S.K. (2012) Knowledge sharing - A key role in the downstream supply chain. *Information & Management, 49 (2), 70-80.*

Stewart G. (2009) A safety approach to information security communications. *Information Security Technical Report, 14 (4),197-201.*

Ustailieva (2007) *Cooperation of stakeholders at national and international level for the implementation and enforcement of EU waste shipment regulation in Bulgaria*. Wageningen University and Research Centre Environmental Science Environmental Policy Group.

Walters, D. (2009) Supply chains and best practices in the management of health and safety at sea. *Seafarers International Research Centre Symposium Proceedings, 47-74.*

Walters, D. and James, P. (2009) *Understanding the role of supply chains in influencing health and safety at work.* Leicester: Institution of Occupational Safety and Health (IOSH).

Weggeman, M. (2000) *Kennismanagement: de praktijk (Knowledge management in practice)*, Scriptum, Schiedam (in Dutch).

Yongheng Fang, Qian Liang, Zhouping Jia (2011) Knowledge Sharing Risk Warning of Industry Cluster: an Engineering Perspective. *Systems Engineering Procedia, 2, 412-421.*

Zaheer, A., McEvily, B., Peerone, V. (1998) The Strategic Value of Buyer-Supplier Relationships. *Journal of Supply Chain Management, 34 (3),20–26.*

Zhang, Y. Fang, Y. Wei, K.K., Chen, H. (2010) Exploring the role of psychological safety in promoting the intention to continue sharing knowledge in virtual communities. *International Journal of Information Management, 30 (5), 425-436.*

Zwanikken, A.L.J., Drupsteen, L., Zwetsloot, G.I.J.M. (2008) Improving chain management of contractor safety. *Working on safety Conference, Greece.*

Websites

- Dutch website on gasses in shipping containers: available at http://www.pgic.nl/ (June, 2012; in Dutch).
- American Association of Port Authorities website, available at: http://www.aapa-ports.org/
- European Sea Ports Organisation website, available at: http://www.espo.be/
- European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) website, cluster Transfrontier Shipment of Waste, available at http://impel.eu/cluster-2, available at: http://impel.eu/cluster-2
- European Maritime Safety Agency (EMSA) website, available at http://www.emsa.europa.eu/implementation-tasks/ship-safety-standards.html
- European Commission website, available at: http://ec.europa.eu/environment/waste/shipments/legis.htm
- International Maritime Organization (IMO) website, available at http://www.imo.org/About/Pages/Default.aspx
- International Labour organisation (ILO) website, available at http://www.ilo.org/dyn/normlex/en/f?p=1000:12030:636902815197052::NO:::
- Maritime Safety Authority (AMSA) website, available at: http://www.amsa.gov.au/

Disclaimer and acknowledgement

Disclaimer

Confidentiality

PU = Public

PP = Restricted to other programme participants (including the Commission Services).

RE = Restricted to a group specified by the consortium (including the Commission Services).

CO = Confidential, only for members of the consortium (including the Commission Services).

Confidential:

The document is for use of the GA No. 261795 Contractors within the CASSANDRA Consortium, and shall not be used or disclosed to third parties without the unanimous agreement within the CASSANDRA PMC and subsequent EC approval since document classification is part of the EC Grant Agreement.

Any executive summary specifically intended for publication may however be made known to the public by the author and/or the Coordinator.

Acknowledgement

This deliverable results from the CASSANDRA project, which is supported by funding 7th Framework Programme of the European Commission (FP7; SEC-2010.3.2-1) under grant agreement no. 261795. The CASSANDRA project addresses the visibility needs of business and government in the international flow of containerised cargo. It does so by developing a data-sharing concept that allows an extended assessment of risks by both business and government, thereby enabling enhanced supply chain visibility and cost-efficient and effective security enhancement. Ideas and opinions expressed by the [author(s) / reviewer(s) do not necessarily represent those of all partners.