



Wasting opportunities - prevention of illicit cross-border waste trafficking

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Abstract

This study aims to construct a consolidated crime script of cross-border illicit waste trafficking by analysing similarities in modus operandi. In addition, factors enabling illicit waste trafficking were studied. Research questions were analysed from a situational crime prevention point of view by applying crime script analysis to 13 judiciary case studies of illicit cross-border waste trafficking obtained from the Netherlands, Italy and Finland. The findings suggest that the potential offender usually has advanced knowledge of the waste market and of the legislation and regulation. The case studies also suggest that the lack and misuse of appropriate licenses and falsified documentation, as well as taking advantage of illicit and licit networks in facilitating activities, are prevailing characteristics in the illicit cross-border trafficking of waste. Despite the small number of cases, the findings imply the need to focus crime prevention efforts on the early stages of the crime commission process, such as planning the crime.

Key words: waste crime, crime script, illicit waste trafficking, environmental crime, situational crime prevention

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1 Introduction

Waste management is a continuously growing business sector in Europe. The revenues of the sector in the European Union are estimated to be over 100 billion euros (Commission of European Communities, 2005, p. 3). As a result, the social and economic impact of the sector has increased (European Environment Agency, 2012, p. 24). The recycling regulation, the increase in raw material prices and the attraction of the Asian market have encouraged transfrontier waste shipment (European Environment Agency, 2012, pp. 20-23; European Environment Agency 2009, 15). Most of the hazardous waste (97% in 2009) is transported from EU Member States to other Member States for further processing. For example, suitable waste treatment plants may be located abroad or waste treatment may be cheaper in other countries (European Environment Agency, 2012, pp. 12-20). On the downside, trafficking of non-hazardous and hazardous waste has also increased since 1999 (European Environment Agency, 2012, pp. 20-21; Fischer, 2008).

Transnational environmental crime in general not only undermines efforts to promote sustainable development and denies income to governments but also fosters corruption (Elliott, 2012, p. 90). The importance of waste management has also heightened the need for advanced knowledge of illicit waste trafficking (e.g. Environmental Investigation Agency, 2008; European Environment Agency, 2009; Interpol, 2006; Europol, 2013). To illustrate, Europol (2013) named illicit waste activities as one of the key types of environmental crime. Interpol and Europol have identified involvement of organised crime in the waste sector as well as linkages between licit and illicit activities as future threats (Interpol, 2006; 2009; Europol, 2013, pp. 6-11).

Previous research on environmental crime has highlighted waste trafficking as an attractive illicit activity (Huisman & van Erp 2013; Dorn, Van Daele & Vander Beken, 2007; Gibbs, McGarrell & Axelrod, 2010; van Erp & Huisman, 2010; Baird, Curry & Cruz, 2014; Massari & Monzini, 2004; Van Daele, Vander Beken & Dorn, 2007). For example, mixing hazardous with non-hazardous waste is fairly easy. Market conditions also create trafficking opportunities. For instance, waste treatment and disposal are often cheaper, less regulated and less enforced in developing countries outside Europe.

The purpose of this study is to provide advanced knowledge on how illicit waste trafficking activities may be prevented and to identify factors enabling it. Tompson & Chainey (2011) applied crime script analysis to illicit waste trafficking (IWT) and proposed the use of this approach to identify the procedural aspects of a crime, casting light on the actors and their interactions, the *modus operandi*, the crime facilitators and the spatial-temporal dynamics. This methodological approach would probably help a better understanding of this relatively new offence, because this analysis allows identification of the offenders' "points of decision" and the linked vulnerabilities.

The significance of this study is to apply the crime script approach to a set of specific cases in real life and therefore get concrete information for crime prevention. Even though a completely new approach was not formed here, by including the element of economic benefit into analysis of real juridical cases, additional, essential information was gained. Stages where illegal action was chosen instead of the legal one were detected, that is, identifying points where waste crime had an opportunity to occur. A consolidated crime script of cross-border illicit waste trafficking was constructed by analysing similarities in *modus operandi*. Crime script analysis was applied to 13 case examples of judiciary waste trafficking cases collected from Finland, Italy and the Netherlands. After recognising different steps in crime commission, it is possible to detect points of intervention and tailor preventive efforts accordingly.

The study is organised as follows. First, we briefly discuss the theory of situational crime prevention and crime script analysis. Second, we describe the case study data. Then, the findings of the crime script analysis are presented. Finally, the findings and their policy implications are discussed and conclusions drawn.

2 Situational crime prevention (SCP)

Situational crime prevention introduces discrete managerial and environmental change to reduce the opportunities for crimes to happen, focusing on the settings for crime. Central to this analysis are public and private organisations and agencies, such as e.g. schools, shops, local parks, transit systems and manufacturing businesses, whose products and services may create opportunities for crimes. The criminal actions are not tried to be eliminated, rather it is analysed how they could be made less attractive to offenders. (Clarke, 1997; Beebe & Rao, 2005)

Adjusting situational factors will influence the potential criminal's perception of the crime's net benefits and thus affect his/her rational decision-making process and subsequent behaviour. A potential offender is hypothesised to choose rationally whether or not to become involved in criminal events (Clarke 2005; 1997; Beebe & Rao, 2005; Bullock, Clarke & Tilley, 2010; Becker, 1968). Upon entering an illegal activity, rationally behaving offenders evaluate the conceivable costs and benefits associated with offending. They will commit a crime if the expected revenues appear to be higher than the costs of using time and resources in a different way. SCP assumes that situational factors influence the criminal's impression about net benefits, therefore having an impact on criminal's rational choice and subsequent behaviour. However, criminals may mainly focus on positive consequences and may underestimate the possible costs of crime, such as the risk of getting caught (Akers & Sellers, 2009).

Situational prevention includes opportunity-reducing measures tailored to highly specific forms of crime and involves the management, design or manipulation of the immediate environment in as systematic and permanent way as possible. It is recognised that for different types of crime, the decision-making process of whether to commit a crime or not, may be different. (Beebe & Rao, 2005; Clarke, 1997; Willison & Backhouse, 2006) Therefore, prevention methods must be tailored to the characteristics of the crime. In addition, after conducting tailoring measures, many offenders should be of the opinion that committing crimes are more difficult and risky, or less rewarding and excusable. (Clarke, 1997)

According to Cornish and Clarke (2003), situational crime prevention techniques can be classified into five broad categories. First, effort to commit a crime should be increased. SCP theory assumes that modifying the potential crime scene in such a way that committing a crime will be more difficult ('target hardening'), will have a preventative effect. Second, the risks associated with offending should be increased. Risks could be increased by extending guardianship, for instance by strengthening formal and informal surveillance. The third category relates to aspects for reducing the possible rewards; by concealing targets it may be possible to reduce the rewards. Thus, potential costs for offender increase if committing the crime requires more effort or if the probability of being caught increases. In addition, net benefits will decrease if the anticipated benefits are lower. Therefore, limiting opportunities is assumed to decrease the likelihood of criminal activities. (Beebe & Rao, 2005; Clarke 1997; Emery & Watson, 2004; Faure & Visser, 2004, pp. 59-60; Simpson, Gibbs, Rorie, Slocum, Cohen & Vandenberg 2013, p. 236) Also provocations should be reduced, by e.g. neutralizing peer pressure or repairing vandalism rapidly. Finally, the theory suggests that excuses may be removed for instance by setting rules and raising awareness (Clarke, 1997, p. 18; Cornish & Clarke, 2003).

A number of studies in different topics have applied situational crime prevention theory to studying, for example: cybercrime victimisation (Ngo & Paternoster, 2011), online piracy groups (Basamanowicz & Bouchard, 2011), information systems security (Beebe & Rao, 2005) organisational data breaches in the healthcare and education sectors (Collins, Sainato & Khey, 2011), auto burglary (Michael, Hull & Zahm (2001), adult child-sex offenders (Leclerc, Wortley & Smallbone (2011) and terrorism (Freilich & Newman, 2009).

SCP was also applied to studies of environmental crimes. Huisman & van Erp (2013) explored the fruitfulness of SPCT in analysis of the opportunities of serious environmental offences and the development of prevention strategies. SCP was found to provide a useful framework. Strategies to reduce illegal waste dumping were highlighted by Crofts, Morris, Wells & Powell, 2010. Situational crime prevention was seen to address illegal dumping concerns well because it is aimed at specific crimes in specific circumstances. They concluded that environmental design and situational crime prevention would be utilised to increase risks and efforts, as well as reduce the rewards of illegal dumping.

3 Methods

Crime script analysis, a method developed by Cornish (1994a; 1994b), highlights the procedural aspects of crimes. By presenting the *modus operandi* in a compact and systematic manner it illustrates the offender's sequence of actions during the criminal act. This is also being referred to as deconstructing the 'criminal business process' (Sieber & Bögel, 1993; Spapens, 2011). As such, the necessary steps in the process are analysed and possibly predicted. Crime scripts illustrate the sequence of instrumental decisions and actions before, during and after criminal acts, and increase our understanding of how crimes are committed (Tompson & Chainey, 2011, p. 186; Cornish & Clarke, 2002, p. 47; Chiu, Leclerc & Townsley, 2011; Spapens & Fijnaut, 2005; Spapens, 2006; 2008). To be more precise, scripts are "*a way of organizing our knowledge about procedural aspects and procedural requirements of crime-commission*" and offer "*a helpful way of approaching the problem of developing better accounts of crime-commission*" as described by Cornish (1994a, p. 34)

Scripts emphasise both the form and content of crimes. Crimes are seen as dynamic, sequential, contingent and improvised activities which require specific actions, casts, props and spatio-temporal locations. Therefore, crimes are comprehended as a process rather than as a single event. (Cornish, 1994b) When steps of actions are identified, it is possible to detect points of intervention. As such, script analysis can be utilised as a basis for crime prevention policies (Chiu, Leclerc & Townsley, 2011; Cornish, 1994a; 1994b; Hutchings & Holt 2015).

The technique originates from cognitive science and has previously been applied to different types of crimes, such as the hunting process of serial sex offenders (Beauregard, Proulx, Leclerc & Allaire, 2007), stolen vehicle exportation (Sieber & Bögel, 1993; Morselli & Roy, 2008) drug production (Spapens, 2006) and illicit waste activity (Tompson & Chainey, 2011). In this study, script analysis was used to analyse enabling factors of illicit waste trafficking in Finland, Italy and the Netherlands.

Using the concepts developed by Cornish (1994b, p. 162), the following crime-specific levels of analysis may be identified. Trafficking of specific waste, e.g. e-waste, may be described as a specific *track* of a larger illicit waste trafficking *script*. Illicit waste trafficking script is again part of a wider waste crime *protoscript*. The protoscript is then part of the environmental crime *metascript* (Table 1). In this study, the analysis concentrates on the script level. As such, the analysis includes various types of waste.

Table 1. Levels of analysis

Level of analysis	
Metascript	<i>Environmental crime</i>
Protoscript	<i>Waste crime</i>
Script	<i>Illicit waste trafficking</i>
Track	<i>Trafficking of specific waste, e.g. e-waste</i>

This study was approached qualitatively. When constructing the crime scripts based on cases of illicit waste trafficking, content analysis was utilised: replicable and valid inferences from data to their context were made (see e.g. Krippendorf, 1989). Phases of crime commission were named in a similar way as in Tompson and Chainey's study (2011).

The following steps were implemented. First, three acts (referred as scenes in Cornish's study 1994b), such as collection/transportation, treatment and disposal, were identified. Second, the acts were further split into four scenes: preparation, pre-activity, activity and post-activity. At the preparation phase, opportunities for crime are identified. Pre-activities are phases needed to be conducted before the illicit activity itself. Finally, post-activity actions are performed when exiting from the illicit activity. Actors, activities, offending and enforcement conditions were all included in scenes. The offending conditions include prerequisites, which refer to preconditions that support the illicit activities, and facilitators such as factors that make it profitable to engage in illicit activities. The enforcement conditions refer to responsibilities, legislation and regulation such as agencies that are responsible for preventing or supervising illicit activities. (Tompson & Chainey, 2011, pp. 189-191) Third, all cases were compared and similarities pinpointed, and an overall script of illicit cross-border waste trafficking was drawn.

4 Data collection

The data consists of 13 investigation cases of waste trafficking: 5 cases were selected from the Netherlands, 5 from Italy and 3 from Finland. Therefore, the data covers geographically Western, Southern and Northern Europe. What was crucial to the selection process was that all the cases had a cross-border element such as corporations located in different countries or the fact that the illicit activities and transports took place in more than one country. To be able to analyse as many extensive cases as possible, cases that included corporate actors were preferred to cases involving only a single actor.

As the purpose of this study was to compare waste trafficking cases at a general level, we did not limit case selection to specific types of waste (e.g. scrap metal, e-waste or hazardous waste). In addition, given the differences in the legislation in the Netherlands, Italy and Finland, the cases may not have ended in a conviction in a court of law but instead settled before the trial or still be in the pre-trial investigation phase. The cases are presented in Table 1 and data collection procedures are explained in more detail below.

Table 2. Selected judiciary cases

Type of waste	Cross-border element	Case number	Country
Processing napfta to blend-stock with caustic soda	Import to the Netherlands and export to Ivory Coast.	NED Case I	The Netherlands
Metal scrap	Export to China	NED Case II	The Netherlands
Plastic waste	Import from Belgium and Luxembourg and export to Asia.	NED Case III	The Netherlands
Metal scrap	Export to China	NED Case IV	The Netherlands
Plastic waste	Import from European countries to Asian countries	NED Case V	The Netherlands
E-waste	Export to Nigeria and Ivory Coast	IT Case I	Italy
Textile waste	Import from Germany and export to several countries	IT Case II	Italy
Plastic and paper waste	Export to China and Syria	IT Case III	Italy
Plastic materials, contaminated with other components	Export to China	IT Case IV	Italy
Several types of waste	Export to various countries in Southeast Asia	IT Case V	Italy
Used car batteries	Export of waste to Baltic states	FIN Case I	Finland
End-of-life vehicles	Export of waste to United Arab Emirates	FIN Case II	Finland
E-waste	Export of waste to Ghana	FIN Case III	Finland

4.1 Dutch cases

The Dutch cases were selected from a dataset of 24 cases of waste trafficking that have occurred in the Netherlands during the period 2002–2012. The dataset is part of an ongoing PhD study on waste crime in the Netherlands. An extensive topic list was used as an analysis tool when collecting the data from the case files and open source information. Five cases were selected for this article, representing the variety of the waste trafficking cases in the dataset, including import and export cases. The data includes a case of importing waste materials from processing naphtha to blend-stock with caustic soda, which are later exported. Two cases in the dataset present the export of metal scrap to China; the waste was collected by small collectors at households and small companies and then sold to a metal recycling company. The final two cases present the import of plastic materials from European countries and subsequent export to Asian countries.

The cases were all investigated by the Dutch police or the special criminal investigation department of the Human Environment and Transport Inspectorate and were prosecuted by the Public Prosecution Service. All cases include two or more offenders to exclude the smaller cases of waste crime. For the analysis, permission was required from the Dutch Ministry of Safety and Justice, who are the legal owner of the information, to gain access to the criminal case files. Based on information of the Dutch Police, the Human Environment and Transport Inspectorate and the Public Prosecution Service, an overview of waste cases was composed.

The analysis of the cases took place at different investigation and prosecutor team locations in the Netherlands where the files were kept. Most of the cases were extensively investigated and contained multiple boxes of data, such as interrogation reports, witness statements, forensic analysis, etc. An analysis tool was used to extract all relevant information from the cases, including case characteristics, offender's characteristics, modus operandi, administrative and judicial sanctions, background characteristics of the offense and corporate characteristics. If necessary, officers involved were interviewed to fill in the blanks and to provide open source information. The latter includes media coverage, reports from NGOs and court verdicts. All the information was structured per topic and anonymised to avoid recognisability of offenders.

4.2 Italian cases

The selection of the Italian cases followed a two-step method. First of all, open source information (newspaper articles, reports from NGO's and institutions) were collected to identify the most relevant cross-border cases related to illicit waste trafficking in Italy between 2005 and 2015. This first preliminary step identified 20 cases, which were cut down to 17 after further and in-depth research. The second step consisted of contacting different Prosecutors who worked on the 17 cases to request the material regarding the investigation and the prosecution phases. The documents were collected for 10 cases out of 17. Among the 10 cases, the final sample of 5 was selected:

- assessing the completeness of the material received;
- giving priority to cases more advanced in the prosecution phase, because they contain more information;
- selecting different types of waste trafficked;
- including both import and export cases of waste trafficking;
- covering different geographic destination areas (East, Middle East, Africa).

The final sample included mainly export cases of different types of waste (e-waste, textile waste, plastic materials also contaminated with other components and paper) headed to Nigeria, Ivory Coast, China, Syria, and Southeast Asia. One of the cases also presents an import dimension (textile waste imported from Germany and exported to several countries outside Europe). In processing the analysis, all the information was anonymised to avoid recognisability of offenders.

4.3 Finnish cases

Finnish cases consist of transporting e-waste to Ghana, end-of-life vehicles to the United Arab Emirates and used car batteries and metal scrap to Lithuania. All the cases include transporting the waste without required permissions and/or against the regulations.

Cases were collected by contacting the Finnish Customs investigation unit, the National Bureau of Investigation and environmental crime prosecutors. In order to find relevant cases, we did not limit selection to a specific time frame. However, only two cases were found that led to a conviction, and one that was limited to a pre-trial investigation. This may indicate that illicit cross-border waste shipments are rarely exposed by or reported to the Finnish authorities. The same observation followed from a previous study of environmental crime conducted in Finland (Sahramäki & Kankaanranta, 2016a; Sahramäki & Kankaanranta, 2016b). On the other hand, the low number of cases may also be explained by the fact that different departments and authorities around Finland are responsible, which makes collection of the data for research purposes challenging.

One of the three cases had been taken to the district court and court proceedings had ended. However, in the two other cases the pre-trial investigations had just finished when the analysis was conducted, and they had not yet gone through court proceedings. In these cases, it should be noted that pre-trial investigation material is sensitive and is not publicly available. The material may not be directly referred to in the analysis. However, the figures and analysis are derived from the crime script analysis on the basis of the pre-trial investigation material and an interview with the officer in charge of the investigation, who also gave permission to use the material in this study.

5 The consolidated crime script of illicit waste trafficking

Stages of the criminal act

The consolidated script of the illicit cross-border waste trafficking was based on 13 judiciary case studies. It brings forward situations where illicit activities may have been prevented or uncovered (Figure 1). The three characteristics, lack and misuse of appropriate licences, falsified documentation and taking advantage of illicit and licit networks in facilitating activities were present in all the acts and scenes of the crime commission.

First, environmental licences were typically either lacking or they were misused. This was either intentional in order to avoid enforcement or due to indifference to the legislation. An example of the former is provided by one of the Italian cases where the offenders used an authorized recovery facility as a shell company for waste import, as they didn't have the appropriate licences themselves (IT Case II). An example of the latter is the Finnish case where the suspected offender argued the plan to transport waste was put together so fast that he didn't have time to apply for the permit and apparently had no interest in doing so either (FIN Case I). The appropriate licences were lacking for storage and transport, the hazardous waste was stored on the premises without a licence, the permit to export waste cross-borders was lacking, and the truck driver didn't have a licence to transport hazardous waste.

The lack, misuse and avoidance of licences were present in different phases of the crime process from preparation, pre-activity and activity to post-activity of the crime commission. In addition, it appeared in collection, transportation, storage and treatment as well as in disposal of waste. In the preparation phase, it was typical to create networks with actors who had licences for storing, treating or exporting waste and misusing these licences for illicit purposes. In the pre-activity phase the waste was, for instance, accepted and stored without appropriate licences, such as in the Dutch case where the company had no licence for accepting used electro waste and other used equipment or a licence to process refrigerators, washing machines, car wrecks or other metal waste (NED Case IV).

In another case the leading actor used the permit of another leading actor to export metal to China. (NED Case II). The waste was collected without a permit and transportation documents were falsified. Also the recycling company accepted the waste without a permit. In order to transport the waste to China, the leading actors obtained permission under false pretenses and misused another one. The process ended with the illicit treatment of waste in China.

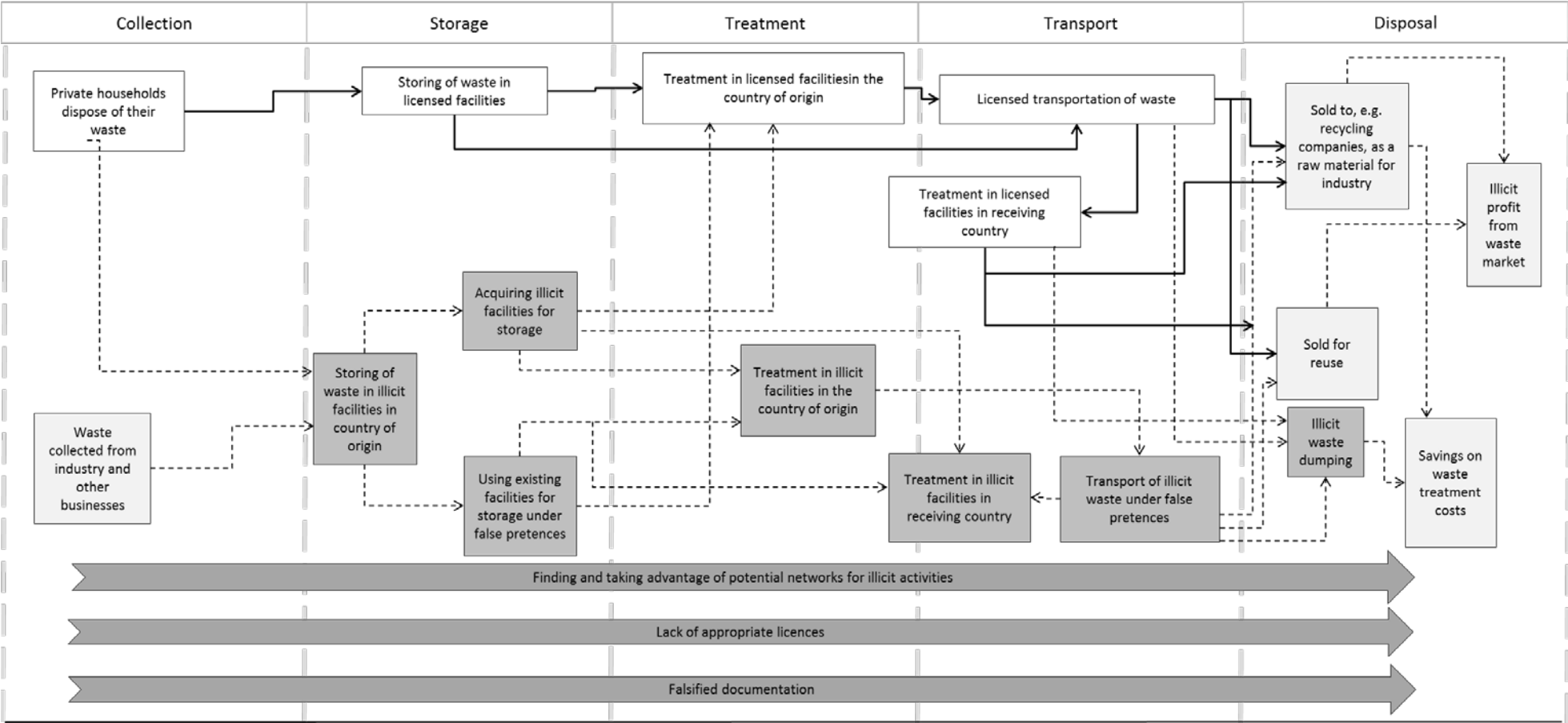
Second, related to the first point made above, was the falsification of information and documentation related to waste management. In one of the Italian cases dealing with illicit trafficking of contaminated plastic waste, the leading actors first received the waste that was already falsely classified and pretended to perform an appropriate waste treatment. As a result of the performed treatment, they produced a small amount of secondary raw material and a large amount of waste, classified as "mixtures of materials from mechanical treatment of wastes" namely the real and original nature of the waste received in the recovery facility. (IT Case IV) In another case, the leading actors booked the shipping of the containers and produced fraudulent paperwork. They declared to the Naples Custom Officers that the containers were filled with secondary raw material; in reality they contained untreated textile waste. (IT Case II).

A third characteristic of all cases was the networking and taking advantage of previous connections. This characteristic also appeared in all the acts and scenes of almost all the cases. Despite the differences in the leading actors in the case studies, the networks between the actors were the prerequisite for the illicit activities conducted. The leading actors knew each other and they shared

the interest to conduct illicit activities (e.g. IT Case IV; IT Case II). In addition, the leading actors had networks for collecting the waste from supporting actors and connections, which enabled storing and transporting the collected waste as well as a network at the receiving end of the waste trafficking. For example, offenders had a network of disposers and buyers at their disposal (NED Case V). Also family members were utilised as contact persons in the receiving countries (e.g. FIN Case III). As such, the networking of actors was a penetrating element of the crime commission process in all the case studies.

The simplified script of illicit waste trafficking presented in Figure 1 includes collection of waste from households and commercial actors, who may or may not be aware of the illicit aspects of the operations. The waste is stored in premises that are acquired for the illicit activities or premises with licences that are used under false pretenses. The waste treatment may be conducted in the country of origin or waste may be transported illicitly into the receiving country for further treatment or disposal. In the disposal phase, the waste is either dumped, sold, for recycling for example, or in the case of e-waste to various consumers for reuse.

Figure 1. Consolidated crime script of illicit cross-border waste trafficking.⁷



⁷ Darker grey boxes refer to illicit activities, and the lighter grey ones to activities which may be licit or illicit depending on, for example, what happens next. Dashed lines describe the illicit process. White boxes and solid lines refer to what would have been the licit activity.

Actors

All the cases analysed involved a web of actors in all the acts and scenes of the process of crime commission. A division of actors into leading and supporting actors could be made. The leading actors were the main offenders or suspected offenders in the cases. Supporting actors were part of the crime commission either willingly or unwillingly. The leading actors were mainly the owners of the companies, such as recycling, export and import companies. In these case studies, the leading actors varied from small one-man companies to family businesses and larger groups of commercial actors. For example, in one case the illicit export of used car parts and half cuts was organised by the owner of the small business alone (FIN Case I) and in another one the offences were carried out by the director and employee of an import and export company of industrial materials (NED Case V). In the Italian case studies, the leading actors included mainly groups of commercial business owners who had a shared interest in earning or saving costs with illicit waste trafficking.

The supporting actors were in an important role in enabling illicit activities. However, in the analysed cases, the supporting actors were not necessarily aware of the illegality of the activities. For example, in one of the Italian cases the supporting actor was under the impression of giving away the e-waste to charity, while the main actors were willing to eliminate the firms' waste management costs with illicit waste trafficking (IT Case I). In one of the Dutch cases, the supporting actors were dealers in used metal who hand over metal scrap to the leading actor, a recycling company, which afterwards transported illicitly to China (NED Case IV). There were also cases where the shipping lines and forwarding agents enabled shipping of the containers loaded with illicit waste without being informed about the true content of the containers (e.g. FIN Case I, IT Case III).

In addition, private households become somewhat unwilling supporting actors of the illicit waste management activities in most parts of the cases. Private households left their waste for disposal, recycling or reuse. However, as illicit waste management occurs side by side with the licit one, it is difficult for the consumer to foresee whether their waste is being handled appropriately. In some cases, the other end of the process consisted of consumers or commercial actors who purchased or otherwise used the illicitly trafficked waste in the receiving countries. As such, they created a market and demand for illicit waste trafficking. In some cases, it was also evident that not all the commercial actors handing over their waste for recycling and otherwise further processing were aware of the illicit activities even though it would have been in their interest to save in waste treatment and disposal costs.

On the other hand, supporting actors also included actors who were aware of the illicit activities and intentionally and actively enabled them. For instance in one case, members of various manufacturing industries were aware of the illicit waste trafficking and were willing to participate. They sold the waste as secondary raw material to leading actors, even though the waste was untreated. In this way, the manufacturing industries could avoid the payment of taxes and costs related to waste disposal, and profit from the illicit waste management. (IT Case III) In one of the cases of illicit export to China, there was an intermediate who arranged the permits from Chinese authorities and buyers for the waste in China on behalf of the recycling and metal export company based in the Netherlands (NED Case II).

Offending conditions

The case studies had several similarities regarding the prerequisites and facilitators of illicit waste trafficking. First, in almost all the cases, the leading actors had previous knowledge of the waste

markets and possible profits to be made with illicit waste activities. For example in one case, the market for plastic bags was calculated to bring the offender a profit of 2 million euros. At the same time, there is lot of competition in the waste market which created enticement to make a profit outside the licit market. (NED Case V)

Secondly, in the cases that we studied, the waste had no value or had a negative value to the disposers, making it easier for the leading actors to turn the waste to their profit either by earning with the waste or by saving on waste treatment costs. Waste with a negative value may lead to criminal activities, with the aim of saving in treatment costs. Waste can also be transformed in a valuable commodity (metal, plastic) and money is earned with it. For example in one Finnish case, the suspected offenders collected used car batteries, which had negative value to their owners in Finland and attempted to transport them illicitly to a country where they presumably could be turned into profit (FIN Case I).

Thirdly, the leading actors often had knowledge of the existing legislation and regulation, which they intentionally violated. For example, the leading actors had knowledge of European legislation (NED Case II), of environmental regulation (e.g. NED Case IV, FIN Case II) and the legislation in the receiving country (IT Case V). To illustrate, the leading actor in one Italian case tried to make a profit by avoiding the waste treatment. The actor decided to fake the waste treatment and to forge documents that stated otherwise. As such, the actor had knowledge of the ways to elude regulation. (IT Case IV)

Finally, what was also evident in the cases was that usually the actors had a presumably low or medium risk perception of getting caught. In addition, it may be assumed that should they be caught, the punishment, such as a financial loss, would not be significant enough to make the illicit activities unprofitable. As such, the benefits from the illicit activities were assumed to be worth taking the risk.

Enforcement conditions

The case studies showed challenges in both enforcement responsibilities and legislation and regulation of waste trafficking. To illustrate, in the Netherlands the collectors and transporters of the waste have to be registered on a list of the Dutch government for collectors, transporters, traders and mediators of waste. Several Dutch authorities are responsible for enforcement of this legislation: police, provinces, Inspection of Environment and Transport. This fragmentation of supervision and lack of enforcement offered opportunities for non-registered actors, since there is a small chance of getting caught (e.g. NED Case II). Another example comes from Finland, where the supervision of export and import is the responsibility of Finnish Environmental Institute. However, the inspection at the Finnish border is conducted by Customs or the Finnish Border Guard.⁸ As such, identifying the containers and loads to be inspected requires cooperation between several authorities, which may result in gaps in supervision (e.g. FIN Case III).

In the 13 cases analysed in this study, several laws at the European and national level were violated, which indicates the complexity of the cases under the title of waste crime and also highlights the web of legislation and regulation addressing illicit cross-border waste trafficking. This was illustrated in one of the Dutch cases where it was concluded, during the criminal investigation, that the knowledge of the administrative authorities was insufficient and this was boosted by complex legislation (NED Case I).

The amount and variety of national laws violated in the cases also show this complexity. In the Italian case where e-waste was illicitly transported from Italy to Nigeria and Ivory Coast (IT Case I), four

⁸ Finnish Border Guard is allowed to conduct the inspections at the Finnish border if asked by Customs or if the inspection is not organised by Customs.

paragraphs of national laws, the Italian Criminal Code and the Consolidated Environmental Code⁹ were violated. In another case where textile waste was illicitly imported and exported to different continents (IT Case II), seven national laws were violated including paragraphs from the Italian Criminal Code, the Consolidated Environmental Code, regional legislation and Ministerial Decree¹⁰. Also for example, in the Dutch case (NED Case V) where metal waste was illicitly transported to China, altogether seven national laws were violated. These included legislation on forgery, economic offences and criminal law¹¹. In the Finnish case where the actors tried to export used car batteries to Baltic countries, four national laws such as the Finnish Criminal Code and regulation on road transportation were violated according to the pre-trial investigation¹². The European and international legislation and regulation added to this variety and complexity of national legislation.

6 Discussion and conclusions

The present study produced advanced knowledge of waste trafficking events. A consolidated crime script of illicit cross-border waste trafficking was drawn and the similarities in *modus operandi* detected. In addition, the key factors enabling illicit cross-border waste trafficking were identified. The analysis was based on the 13 judiciary case studies conducted in the Netherlands, Italy and Finland.

The offender's sequence of actions during the crime commission was illustrated in Figure 1. The following acts were recognised: collection, storage, treatment, transport and disposal. These acts were further divided into scenes: preparation, pre-activity, activity and post-activity. In the preparation scene opportunities for crime were identified, and pre-activity refers to steps that needed to be carried out before the activity. The illicit activity itself is also called activity in the script analysis. Finally, the post-activity are the steps needed when exiting from the illicit activity (Tompson and Chainey 2011, 188-189). Actors and activities as well as offending and enforcement conditions were involved in all of the scenes.

The findings revealed that when the crime was prepared, the potential offender usually had knowledge of the waste market and also of the legislation and regulation combined with an incentive not to obey them. However, usually the risks and costs of getting caught were presumably considered to be fairly low in the cases analysed. This finding is in agreement with previous studies,

⁹ Article 110 of the Italian Criminal Code "Involvement of persons in the crime"; Article 81 of the Italian Criminal Code "Persistent Crime"; Article 256 (paragraphs 1 and 2) of the Legislative Decree 152/06 (D.Lgs 152/06), also called TUA (Consolidated Environmental Code - Testo Unico Ambientale) "Unauthorised waste management activities"; and Article 260 of the Legislative Decree 152/06 (D.Lgs 152/06), also called TUA (Consolidated Environmental Code - Testo Unico Ambientale) "Organized activities for illicit waste trafficking".

¹⁰ Article 110 of the Italian Criminal Code: "Involvement of persons in the crime"; Article 81 of the Italian Criminal Code: "Persistent Crime"; Article 256 (paragraphs 1 and 2) of the Legislative Decree 152/06 (D.Lgs 152/06), also called TUA (Consolidated Environmental Code- Testo Unico Ambientale): "Unauthorised waste management activities"; Article 260 of the Legislative Decree 152/06 (D.Lgs 152/06), also called TUA (Consolidated Environmental Code - Testo Unico Ambientale): "Organized activities for illicit waste trafficking"; Article 6 (paragraphs 1d and 1f) of The Law 2010/2008 (L. 210/08), also called "Extraordinary measures to tackle the waste disposal emergency in the Campania Region and additional civil protection measures": "Penalties"; Points 8.4 and 8.9 of Ministerial Decree 5.2.1998 (D.M. 5.2.1998), also called "identification of non-hazardous waste subject to simplified recovery procedures"; and the provisions contained in the license to perform waste treatment granted by the Province of Benevento (Campania Region).

¹¹ Shipment of waste without notifying all competent authorities (art. 10.60 Law of Environmental control); Acceptance and processing of metal waste contrary to the license regulation (art. 18.18 Law of Environmental control); Accepting and collecting waste without the required registration; Incorrect editing of transport documentation (art. 10.38 Law of Environmental control); Activities are punishable under art. 6 of the Law of Economic Offences; Intentional providing of wrong information (art 227a, code of criminal law); and Forgery (art 225, code of criminal law).

¹² Act on Transport of Dangerous Goods (719/1994); Order of the State Council on Road Transportation on Dangerous Goods (194/2002); Degree of the State Council on the license to Transport Dangerous Goods (401/2011); and Law on Road Transport (345/1979).

which suggest that environmental crime carries little risk for the trafficker (Comte, 2006, p. 196) and that traffickers have basically nothing to fear (Wright, 2011, p. 335). Also, situational crime prevention theory assumes that a low risk of detection increases criminal activities. The incentive to commit illicit waste trafficking may be prevented when, e.g. the risk of getting caught is increased. One of the options is to intensify surveillance on borders. However, this may be described as extinguishing fire ad-hoc instead of acting pre-emptively. As Liddick (2010, p. 143) has suggested, technical methods to reduce the costs for responsible disposal need to be developed to decrease the incentive to resort to illicit activities. Also regulating the recycling market, instead of focusing on criminalization, is seen as one of the solutions, particularly with regard to e-waste (van Erp & Huisman, 2010, p. 588).

Secondly, another interesting finding was that the supporting actors may have had an important role in enabling illicit activities. As the consolidated crime script of illicit cross-border waste trafficking suggests, they seemed to not only assist in the waste collection and treatment but also seemed to enable the pre-activities, such as supporting logistical steps in carrying out the illicit activities. However, when interpreting this result, it must be borne in mind that the judiciary cases usually described the main offenders in detail but were less focused on the supporting cast. As such, the preventative efforts should not only be directed at potential offenders but also at supporting actors by increasing the knowledge on illicit activities associated with waste management. These would decrease situational conditions that may encourage committing a crime. In addition, the case studies indicate that preventative efforts should also be directed at commercial actors, such as shipping agencies and forwarding agents, who enable the illicit activities by providing, for example, containers and licit paper work based on false information. This notion is supported by a previous study on situational crime prevention, which has suggested targeting secondary preventative efforts to educate communities on the harms associated with illicit waste management (Crofts et al., 2010, 35).

Thirdly, findings indicate that the complexity of legislation combined with a variety of authorities addressing the illicit activities at different levels created a complicated web of regulation and legislation, which is bound to make prevention and investigation of illicit waste trafficking challenging. Given the differences between the analysed cases falling under the title of illicit waste trafficking, one could hypothesise that there are significant challenges in creating uniform authority response nationally and inside the European Union. This enables illicit waste trafficking by creating loopholes and gaps in the enforcement of the environmental legislation. In order to boost the enforcement, this study is in agreement with prior studies that "in relation to legislation the waste management business is beset by vulnerabilities arising from loopholes in regulation, national differences and a lack of integration" as Dorn et al. (2007, p. 34) has aptly remarked. Institutional changes at a national and transnational level are necessary for European waste management as concluded in a previous study (Vail, 2008, p. 833).

Fourthly, the findings suggest that the lack and misuse of appropriate licenses and falsified documentation is a prevailing characteristic in illicit waste trafficking. The consolidated crime script of illicit cross-border waste trafficking indicates that by uncovering the falsified documentation, illicit activities themselves could have been prevented during the storage, transportation and disposal phases of the crime commission process. These findings also confirm the notion of a previous study (Huisman & van Erp, 2013) that environmental crimes are often crimes of omission instead of commission. Also, it has been concluded that mislabelling containers and mixing waste with other commodities is the usual method of illicit export in the United Kingdom (Interpol, 2009, p. 373) From the point of view of situational crime prevention, this suggest that enforcement should be focused on site inspections at storage and treatment facilities. During site inspections, the true nature of activities may be uncovered instead of trusting the documentation.

Policy recommendations suggested by this study can be drawn. Incentives to commit crimes related to IWT should be reduced by increasing the risk of being caught. As taking advantage of illicit and licit networks is typical to illicit cross-border waste trafficking, our findings indicate the need to target prevention efforts at uncovering criminal networks. This finding is consistent with other studies (Elliot, 2012, p. 97) and suggests that enforcement should focus more on disrupting criminal networks than concentrating on individuals.

Citizens' knowledge about illicit waste trafficking and its consequences should be increased. Therefore, preventative efforts should not only concentrate on potential offenders. One of the key issues that emerged from this study is the need to also focus preventative efforts particularly at the early stages of the crime commission process, such as preparation and pre-activities preceding the illicit activity itself, instead of trying to uncover trafficking at national or European Union borders. Proactivity efforts should be targeted also to point where the crime is prepared and planned.

Methods to improve the control of documents to avoid falsification should be implemented. In addition, sufficient resources for authorities should be assured. Authorities should have a common understanding of legislation and regulations at both national and transnational level. As the number of authorities involved in prevention, supervision and investigation of IWT cases is high, well-functioning cooperation between authorities is essential.

With a small number of case studies, caution must be applied when interpreting the results, as the findings may not be transferable to all illicit waste trafficking cases. The cases selected for the analysis were also varied and complex. In addition, the characteristics of the analysed offences in this study may be atypical and as such may not represent all illicit waste trafficking cases. Therefore generalizing these findings has limitations. Given the above, the findings have more of an implicit link than a direct relevance to policing.

It should also be noted that applying situational crime prevention theory to environmental crime has its downfalls, such as not being able to provide distinctive prevention measures to environmental crime cases. (Huisman & van Erp, 2013, p 1195) While this argument does apply to some extent to the findings of this study, the application of crime script analysis as a specific form of situational crime prevention helps to take the edge off the criticism. This study has shown that if crime script analysis was applied in a specific field of waste trafficking, such as trafficking of plastic waste or textile waste, it would most likely provide suggestions for precise preventative efforts.

Questions remain that were not addressed in this study. Further research should be done to analyse the criminal networks in the field of waste management, which appears to be a prerequisite for successful illicit waste trafficking. In addition, while this study has focused more on the wider script of illicit waste trafficking and similarities between the cases, applying the crime script method to specific types of waste and to differences between trafficking of different types of waste are interesting topics for future research. To gain a better understanding of the offenders (actors) involved, the use of social network analysis, and mapping it on to the script could be utilised. These may shed light on specific prevention efforts needed to tackle illicit waste trafficking.

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Table 2. Selected cases.

Country and type of waste		Cross-border element	Case number	Summary of the modus operandi
The Netherlands	Processing naphtha to blend-stock with caustic soda	Import to the Netherlands and export to Ivory Coast.	NED Case I	This case concerns a ship which tried to dispose of 'waste water gasoline' in the port of Amsterdam. However, the actual waste material in the ship was produced during the processing of cooker naphtha to blend stock for gasoline with caustic soda. After trying to dispose of the waste and being declined in the ports of Malta, Italy and Gibraltar, the ship sailed to Amsterdam, where it falsified the composition of the waste to the harbour authorities in order to dispose of the waste. Based on the falsified composition, the waste was accepted by the harbour waste receiver company. The waste receiving company found out that the composition was different than noted before and asked a higher price for disposal. The disposer refuses. The ship then leaves and after being rejected in Nigeria, they dispose of the waste at a facility in Ivory Coast that dumped the waste, resulting to environmental harm.
	Metal scrap	export to China	NED Case II	The waste was collected by various small collectors at households and small companies and then sold to a metal recycling company. To obtain export permission from the Dutch authorities, the offenders used falsified shipment documentation and photos of the waste, presenting the Chinese authorities a clean batch of metal waste. They also failed to obtain Dutch permission to export the waste and falsified the information on the Bill of Lading
	Plastic waste	Import of Belgium and Luxembourg and export to Asia.	NED Case III	The waste was bought by the director of a company that trades in used plastic via an advertisement on the internet. The investigation showed that the offender accepted waste from 20 large companies. The director of the waste company exported the waste with falsified Bills of Lading, stating a shipment agency as the disposer. The shipment agency was located at the port of Antwerp from where the containers left to Asia.
	Metal scrap	Export to China	NED Case IV	The metal waste was collected from households and small companies and then sold to a metal recycling company. The metal was transported to this company without the correct transport documentation and the recycling company didn't have a permit for the electro waste. From the recycle company the metal waste was exported to buyers in China. For the export the recycle company misused the AQSIQ-permit by letting an intermediate handle the permits. This intermediate also fraudulently obtained permission from the Chinese authorities (CCIC permission).

	Plastic waste	Import from European countries to Asian countries	NED Case V	In this case plastic waste was bought from European countries, such as Belgium, Spain, Germany and Eastern European countries of different qualities (for instance, in the batches hospital waste, wood, animal remains were found). The batches were pressed and sold to China, Hong Kong, India and Indonesia. To obtain permission from China cleaner batches were loaded last and pictures of this load was send to the administrative authorities, masking the real cargo. The wastes were also exported without a permit from the country where the transport originated (Belgium, Spain, etc.) and with falsified Bills of Lading.
Italy	E-waste	Export to Nigeria and Ivory Coast	IT Case I	A conspiracy of Italian and African offenders (mainly Nigerian) organised the export of tons of e-waste (and, to a lesser extent, end-of-life vehicles) from Turin to Nigeria and Ivory Coast. A group of commercial business owners transferred the e-waste for free to a group of collectors. A group of African people ("land tenants") rented a piece of land in the suburbs of Turin from a businessman, who was unaware of the intended use of this area as the main storage site. The land tenants, and other partners in crime who did not rent the land in the first place, stored and then arranged the transport of the waste from Turin to Genoa harbour, and then to Nigeria and Ivory Coast (final destinations). Shipping lines and vectors involved in the transportation of the waste were unaware of the IWT. The judicial documents do not give additional information on the disposal of the e-waste, which was sold to unknown persons once it arrived in Nigeria and Ivory Coast.
	Textile waste	Import from Germany and export to several countries	IT Case II	The old rags and second-hand clothing were both legally imported from Germany and legally collected in different cities of the Campania Region from municipal trash bins specifically used to gather old garments. Then the waste was illegally exported from Naples Harbour to the United Arab Emirates, India and, allegedly, North Africa and South America. Six firms were actively involved in the illicit waste trafficking: a group of commercial businesses active in the second-hand clothes trading and selling sector, a recovery facility, a commercial business managed by the same individuals who conduct business in the recovery facility, and a transport company. The untreated waste was falsely classified as secondary raw material.
	Plastic and paper waste	Export to China and Syria	IT Case III	A waste storage and pre-treatment facility was actively involved in illicit waste trafficking, from the collection stage to the final export. Other companies colluded with the facility in different stages. The waste was collected from different channels. Several actors decided together to use the legal storage site to store the waste collected and the illegal warehouse to fake the waste treatment. The members of the waste storage and pre-treatment facility faked the waste treatment and forged documents that stated the untreated waste was secondary raw material. The members of the waste storage and pre-treatment facility arranged the transport of the waste to harbours in Slovenia, and then to China and Syria (final destinations). They forged documents to disguise the real content of the containers, and in one case the real destination.

	Plastic materials, contaminated with other components	Export to China	IT Case IV	A family from Hong Kong, who live and work in Italy, managed both a wholesale plastic materials supplier in the Lombardy region and a trade and intermediation company in Hong Kong, none of them authorized to manage the waste. To start and fulfil a profitable illicit waste trafficking venture they decided to use authorised recovery facilities as shell companies to manage all the stages of the IWT, from the collection to the transport and selling abroad; and to organise illicit exportation of waste derived from a legal landfill.
	Several types of waste	Export to various countries in Southeast Asia	IT Case V	The waste – plastic material from industrial and agricultural activities, scraps of rubber and end-of-life tires – was collected all over the Italian territory by three groups of private businesses operating in the waste sector. Groups of Italian businesses operating in the waste sector collected the plastic material / scraps of rubber and end-of-life tires – not always legally – from a group of various Italian businesses that generate waste as a result of the industrial and agricultural activities they conducted. The waste was exported to China, Vietnam, Pakistan, and South Korea. According to judiciary files, the total estimated business volume of the illicit waste trafficking was approximately 5,600,000 euros.
Finland	Used car batteries	Export of waste to Baltic states	FIN Case I	Two companies collected used car batteries around Finland from companies and private persons. One of the companies stored the batteries without an environmental licence and the other one used facilities of a third company with appropriate licences in Finland. Transportation of the batteries from Finland to Estonia and further to Lithuania was ordered from a truck driver who didn't have a licence to transport hazardous substances. Also, the bill of lading didn't include the necessary information on the content of the truck's load. Neither of the two companies had a licence to export waste.
	End-of-life vehicles	Export of waste to United Arab Emirates	FIN Case II	Used cars and spare parts were collected around Finland by a small company. The company didn't have appropriate environmental licence for the activities. The collected end-of-life vehicles were cut in half and loaded into a container. The hazardous liquids were not removed from the half cuts. The business owner had a buyer of the parts in the United Arab Emirates where the container was meant to be sent. The purpose was to send the container to United Arab Emirates via Rotterdam. However, the container was scanned in the Rotterdam port and sent back to Finnish environmental authorities for further inspection. The company didn't have a licence to export waste from Finland. Also, exporting hazardous waste outside OECD countries is forbidden.
	E-waste	Export of waste to Ghana	FIN Case III	A small company collected e-waste, such as used refrigerators and computers around Finland. The company filled containers with the e-waste and exported the containers to Ghana where the brother of the owner of the company was waiting for the container. The machines exported didn't have proof that they were functioning instead of e-waste. In addition, the company tried to transport used car batteries, which are hazardous waste. The company also had neglected accounting in their accounting operations. The District Court found that the lack of the proof of functionality didn't give reasonable doubt to suspect that the in fact transportation of e-waste instead of reuse of electrical equipment was in question. As such, most of the charges were dismissed.