To refer to as: C.M. BILLIET & S. ROUSSEAU, "Environmental inspectors and public prosecutors: is sharing information always useful?", in S. MALJEAN-DUBOIS (ed.), *The effectiveness of environmental law*, Cambridge-Antwerp-Portland, Intersentia, 2017, 271-294

Environmental inspectors and public prosecutors: Is sharing information always useful?

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Abstract

In this contribution we focus on the communication between environmental inspectors and public prosecutors. We model the interaction between both enforcement actors using a sender-receiver model incorporating the cost factor and the objectives function. The model allows us to identify possibilities to optimize the information exchange at this crucial stage of the enforcement chain. We comment on the increasing specialization of public prosecutors in Europe and other countries, on the crucial role of effectively written notices of violation and on the issue of strategic information sharing.

Keywords: Environmental crime; Enforcement chain; Public Prosecutors, Inspectorates, Communication, Notices of Violation

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"The single biggest problem in communication is the illusion that it has taken place"
George Bernard Shaw

1. Introduction

1. Environmental law enforcement is a responsibility shared by a variety of actors. Consequently many formal and informal interactions between different enforcement actors occur. Within countries environmental administrations, police forces, specialized inspectorates, public prosecutors, criminal courts and administrative courts all play a role. Between countries collaboration is a necessity in the fight against organized crime, cross-border pollution and illegal waste transports.

In this study [1] we focus on the interaction between environmental inspectors and public prosecutors, specifically the communication of information on environmental offences by the inspectors to the prosecution. This interaction is crucial for the enforcement chain and thus for environmental policy at large. It triggers the sanctioning process within the criminal sanctioning track. Criminal sanctioning makes the hard core of law enforcement, next to administrative and civil sanctioning.

The so-called Eco-crime Directive [2], which had to be implemented by the end of 2010 [3], has secured the possibility of criminal sanctioning for the enforcement of serious environmental offences in each EU Member State, whatever its legal tradition in the sanctioning of offences at large and environmental offences more specifically [4].

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[1] We closed our source material research on 21 April 2016.
[2] Directive 2008/99/EC on the protection of the environment through criminal law (OJ 2008 L 328/28).
[3] The deadline for EU Member States to transpose the directive was 26 December 2010 (Art. 8.1 Directive).
[4] The twenty-eight Member States display quite some differences in their legal traditions regarding the sanctioning of environmental crimes. Some countries, such as the United Kingdom (UK) and Belgium, used to have sanctioning systems where the criminal sanctioning track dominated. Many other countries were equipped with sanctioning systems where the administrative track dominated. A recent comparative law overview for the actual equilibriums in between criminal and administrative sanctioning can be found on the webpage of the European Commission 's DG Justice, in the national reports of Member States on the implementation of the Eco-crime Directive under the heading "*2. National framework for transposition and implementation of Directive 2008/99/EC*" especially its subdivision "*2.2. Relation between the administrative and sanction systems*". See http://ec.europa.eu/justice/criminal/criminal-law-policy/environmental-protection/index_en.htm, last consulted 21 April 2016. Most of the national reports are published. For the time being the national reports of the following eight countries are withheld: Bulgaria, Czech Republic, France, Germany, Hungary, Romania, Spain and Sweden. Worth mentioning to appraise the relevance of the criminal sanctioning track is that, today, legal persons can be held criminally liable for environmental crimes in most Member States. The exceptions are Bulgaria, Germany,

2. We look at the information exchange that occurs when environmental inspectors communicate official records of offences detected while performing compliance monitoring duties. In most European and many other countries the environmental case load of public prosecutors is mainly built up through such official records from inspectorates and police forces with a little, a more extensive or a highly developed level of specialization in environmental compliance monitoring. A factor contributing to this in EU Member States, is the rather recent and growing amount of EU legislation on environmental inspections [5]. In this paper we use the term 'environmental inspector', shortened as 'inspector', for each public officer in charge of compliance monitoring including environmental compliance monitoring, regardless of specialization level [6]. Whenever an inspector's official record of an environmental offence – a notice of violation – reaches the public prosecutor's office, a file is opened.

Our interest in the communication process lies in the public prosecutor. While inspectors as well as prosecutors are obviously elemental in the information exchange, the prosecutor deserves our attention for his pivotal position in the sanctioning system. He has a bridging function between criminals, police forces, specialized inspectorates, criminal courts, and possibly also administrative fining authorities. Before reaching the court room and having to convince the court to convict, he decides whom to prosecute, when to settle, when to dismiss

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Greece, Latvia and Sweden. See *G. Vermeulen, W. De Bondt & C. Ryckman*, Liability of legal persons for offences in the EU, 2012, 33-35 and 79-84, as completed by the aforementioned national reports of Denmark, Estonia, Finland, Ireland, Italy, Lithuania, Malta, Poland, Portugal and Slovenia. For Spain, see additionally: http://www.gccapitalideas.com/2013/01/31/criminal-liability-of-companies-under-spanish-law-what-is-the-real-impact-on-directors-officers-coverage/. This state of affairs matters all the more in view of the fact that several EU Member States have not introduced administrative liability of legal persons for offences. In 2012 these Member States were Austria, France, Hungary, Ireland, Italy, Poland, Slovakia and Slovenia. – *Vermeulen, De Bondt & Ryckman, supra*, 35-37.

[5] This EU-legislation builds on Recommendation 2001/331/EC providing for minimum criteria for environmental inspections in the Member States (OJ 2001 L 118/41). It stimulates the development of specialization in environmental compliance monitoring. Today, legislative provisions imposing minimum standards on environmental inspections carried out by national authorities are stipulated in major pieces of EU environmental legislation such as Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (recast) (OJ 2010 L 334/17) (Article 23) and several waste management legislations including Directive 2008/98/EC on waste and repealing certain Directives (OJ 2008 L 312/3) (Articles 34-35), Directive 2006/21/EC on the management of waste from extractive industries and amending Directive 2004/35 (OJ 2006 L 102/15) (Article 17), Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) (OJ 2012 L 197/38) (Article 23) and Regulation (EC) 660/2014 amending Regulation (EC) 1013/2006 on shipments of waste (OJ 2014 L 189/135) (Article 1.3 amending Article 50 of Regulation (EC) 1013/2006). See also the following EU Directives and Regulations: Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ 2012 L 197/1) ('Seveso III'), Article 20; Regulation (EC) 1005/2009 on substances that deplete the ozone layer (OJ 2009 L 286/1), Article 28; Directive 2009/31/EC on the geological storage of carbon dioxide and amending various directives (OJ 2009 L 140/114), Article 15; Directive 2010/63/EU on the protection of animals used for scientific purposes (OJ 2010 L 276/33), Articles 34 and 35; Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations (OJ 2009 L 172/18), Articles 4 and 5, as amended by Directive 2014/87/Euratom (OJ 2014 L 219/42).

[6] Thus, for instance, public officers working at specialized environmental inspectorates whose only task consists of environmental inspections, public officers working at customs who monitor waste and wildlife trafficking but also other kinds of crime such as the smuggling of narcotics, and public officers who are part of local police forces in charge of general compliance monitoring, including the occasional waste littering and noise hindrance.

the case and, in some legal systems, when to transmit the case to administrative fining authorities [7]. It is not exaggerated to state, with Rasmusen, Raghav & Ramseyer, that his role "*is one of the most important in criminal justice*" [8].

We want to get a better understanding of the information exchange happening when a notice of violation sent by an environmental inspector reaches a public prosecutor. What exactly is happening in terms of information sharing? Is there room for optimization of this crucial communication process? If so, what could it be and why? [9]

3. There is reason to raise these questions.

At first sight it seems evident that the information sharing between those two actors in the enforcement chain leads to better environmental law enforcement. However, it is important to realize that information sharing between different enforcement actors does not automatically lead to beneficial communication. The cost of information sharing and the objectives pursued by the information senders and receivers, interfere. If information sharing is costless and every party involved shares the same goals, communication is indeed beneficial and everyone will be at least as well off with as without it. But if information sharing is costly for the sender or for the receiver, this will have a negative effect on the willingness of parties to communicate. Moreover, if parties pursue different goals, potential difficulties may arise. Each party has the

[7] The aforementioned national reports on the implementation of the Eco-crime Directive give some information on the role of the public prosecutor in the criminal procedure of the EU Member States, most often focussed on the prosecution decision. *Supra* note 4. For more extensive information, detailing the full set of decisions a prosecutor can make and the powers of criminal investigation he has, we refer to comparative legal literature. See for instance F. *Verbruggen & V. Franssen* (eds.), The International Encyclopaedia for Criminal Law, Kluwer Law International, loose-leaf, with recent monographies for a.o. Croatia, Denmark, Finland, Hungary, Italy, Portugal and Spain.

[8] *E. Rasmusen, M. Raghav & M. Ramseyer*, Convictions versus Conviction Rates: the Prosecutor's Choice, American Law and Economics Review 2009, (47) p. 48.

[9] Our research setting presupposes that the monitoring of environmental compliance, on the one hand, and the prosecution of offences detected, on the other hand, are tasks performed by distinct public officials, belonging to distinct public entities. Because of the specificity of both tasks, this situation is standard. Exceptions exist, as a rule limited to specific offences. In Norway, for instance, the National Authority for Investigation and Prosecution of Economic and Environmental Crime (ØKOKRIM), set up in 1989, can investigate as well as prosecute environmental crimes. ØKOKRIM, however, specializes in "*the bigger and more complex cases and cases that involve the public interest*", leaving more general compliance monitoring to the local police and environmental agencies - *L. Lavrysen & L. De Geyter*, Summary Report of the Questionnaire – Organization of the courts and tribunals and prosecution policy in the area of environmental crime, EUFJE Annual Conference 2007, p.10, unpublished. See also *H.C. Bugge*, Norway, in *K. Deketelaere* (ed.), The International Encyclopaedia of Environmental Law, Kluwer Law International, loose-leaf, 2004, n° 806. The utility of ØKOKRIM partly stems from the fact that legal persons can be held criminally liable in the country. *Id.*, n° 808.
The fact, however, that environmental inspectors and public prosecutors belong to one same administrative body does not as such imply that the communication issue that we study does not exist. Indeed, the internal organization of this administrative body can confine both tasks to well separated units. Thus, for instance, the Environmental Agency of England and Wales (UK). See the National Report for the U.K., mentioned *supra* note 4, p. 11. Its team of environmental prosecutors, regrouped in the Legal Services unit, does not perform environmental compliance monitoring and inspections.

incentive to only share that type of information that helps in attaining its own objective and possibly not the objectives of the other parties. [10]

In this regard it should be pointed out that the drafting and the reading of notices of violation come at a cost [11]. Depending on the case, this cost factor can be relatively light to very heavy, for the senders, the environmental inspectorates, the receivers and the public prosecutors. Think, for instance, of a case with one suspect who admitted he was the one killing that badger last Monday and compare this to a toxic waste fraud case committed bit by bit over months' time at several places and involving several perpetrators who are partly denying their involvement. The cost of information sharing definitely is a factor in the communication between environmental inspectors and public prosecutors.

Furthermore, there are theoretical insights and empirical findings on the objectives of public prosecutors that allows us to wonder if their goals and the goals of the environmental inspectors are the same, even if it cannot be doubted that some overlap in objectives exists.
A decision to prosecute a case automatically implies that resources need to be dedicated to preparing that case and bringing it to trial. Since prosecutors have limited resources, they cannot prosecute every case and need to be selective. Rational prosecutors will use these limited resources only if the benefits they expect exceed the opportunity costs of time and resources. Based on a model that maximizes justice and environmental concerns, Uhlman advises that criminal prosecution of environmental offences *"would be most appropriate when one or more aggravating factors was present: significant environmental harm or public health effects, deceptive or misleading conduct, operating outside the regulatory system, and repetitive violations"* [12]. Empirical studies investigating prosecutorial decision making, support the theoretical proposition of rational selectivity. For the U.S. such studies include those by Forst & Brosi (1977) [13], Myers & Hagan (1979) [14], Glaeser, Kessler & Morrison (2000) [15], Boylan (2005) [16], Rasmusen, Raghav & Ramseyer (2009) [17] and Uhlman (2014) [18]. Outside the U.S., empirical studies regarding prosecutorial decision making are scarce. Billiet et al. (2010) investigated criminal transaction offers by prosecutors in Flanders, Belgium [19]. Almer and Goeschl (2011) studied the environmental criminal justice system in Germany, including the

[10] On the importance of closely related goals, see for instance *V.P. Crawford & J. Sobel*, Strategic Information Transmission, Econometrica 1982, pp. 1431-1451, specifically p. 1450.
[11] This cost is not to be confounded with the cost of information generation. With regard to environmental offences, the generation of information can be very costly, for instance when repeated sampling and expensive laboratory testing are needed.
[12] *D.M. Uhlmann*, Prosecutorial Discretion and Environmental Crime, Harvard Environmental Law Review 2014, (159) p. 214.
[13] *B. Forst & K.B. Brosi*, A Theoretical and Empirical Analysis of the Prosecutor, The Journal of Legal Studies 1977, pp. 177-191.
[14] *M.A. Myers & J. Hagan*, Private and Public Trouble: Prosecutors and the Allocation of Court Resources, Social Problems 1979, pp. 439-451.
[15] *E.L. Glaeser, D.P. Kessler & A. Morrison*, What Do Prosecutors Maximize? An Analysis of the Federalization of Drug Crimes, American Law and Economics Review 2000, 259-290.
[16] *R.T. Boylan*, What Do Prosecutors Maximize? Evidence from the Careers of U.S. Attorneys, American Law and Economics Review 2005, pp. 379-402.
[17] *Rasmusen, Raghav & Ramseyer*, *supra* note 8, pp. 47-78.
[18] *Uhlmann*, *supra* note 12, 159-216.
[19] *C.M. Billiet et al.*, Minnelijke schikkingen voor milieumisdrijven in Vlaanderen, Panopticon 2010, pp. 78-84.

enforcement decisions made by prosecutors [20]. The different empirical studies confirm the concept of the prosecutor as a rational decision maker, typically balancing expected benefits in the form of successful prosecutions – in terms of convictions and sentences – against opportunity costs of time and resources. However, they also indicate that the benefits this rational decision maker expects and incorporates in his decisions, depend on the objectives he pursues. Besides justice and social concerns, other goals can enter a prosecutor's objective function, for instance personal career related goals. Especially in systems with elected prosecutors, such as in the U.S., public prosecutors are thought to also pursue such objectives [21].

4. In the next section, we use a communication model to analyse the potential of information sharing between environmental inspectors and public prosecutors. We model the communication between those two enforcement actors by using a basic sender-receiver communication model. The modelling incorporates the cost factor and the objective function, allowing us to distinguish four hypotheses where costs and objectives [22] combine in different ways. For each of these, we discuss the decision process of the information sender (the environmental inspector), as well as the decision process of the information receiver (the public prosecutor), looking at outcomes regarding information sharing happening, or not, and regarding the benefits of the information shared. (2. Modelling communication between environmental inspectors and public prosecutors) In the third section, we confront the actual environmental enforcement process with the conceptual framework. This allows us to comment on the increasing specialization of public prosecutors in several countries, on the crucial role of effectively written notices of violation and on proof-driven selectivity while recording offences in notices of violation. (3. Relevance for policy development and practice) Finally, we conclude with possibilities to optimize information sharing between environmental inspectors and public prosecutors and with suggestions for a wider use of our findings (4. Conclusions)

5. Our focus on the communication issue underpinning the public prosecutor's decision making adds, to our knowledge, to existing literature. In general, previous theoretical and empirical studies have studied the prosecution decision on its own or as a game between prosecutor and judge. The latter type of studies mostly center around the process of plea bargaining. Moreover, Almer & Goeschl have adopted a system approach and included interactions between police, prosecutor and judge in an empirical political economy model [23].

[20] *C. Almer & T. Goeschl*, The Political Economy of the Environmental Criminal Justice System: a Production Function Approach, Public Choice 2011, pp. 611-630.
[21] *Glaeser, Kessler & Morrison, supra* note 15; *Boylan, supra* note 16. See also *A. van Aaken, L.P. Feld & S. Voigt*, Do Independent Prosecutors Deter Political Corruption? An Empirical Evaluation across Seventy-eight Countries, American Law and Economics Review 2010, pp. 204-244.
[22] In this paper, we use the words 'objectives' and 'utility' as synonyms.
[23] *Almer & Goeschl, supra* note 20.

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2. Modelling communication between environmental inspectors and public prosecutors

2.1. Model setup and scenario's

6. Whenever environmental inspectors are sending information on offences to a public prosecutor's office, we have a one-directional information exchange with the inspector on the sender side and the prosecutor on the receiver's side. This communication set-up is reflected in the model we choose to analyse the communication process: the sender-receiver model.

7. The sender-receiver model, developed shortly after World War II, is the most basic communication model (see Figure 1) [24]. As such it has inspired most other communication models. Its general set-up contains a sender who has an idea or a concept that he wants the receiver to appreciate and thus sends a message to communicate it. The message can be distorted by 'noise'. 'Noise' is defined as anything in the communication process that interferes with the intended receiver getting and understanding the message [25]. Once the receiver gets the – possibly distorted – message, he reads it, assesses the (distorted) idea or concept and then takes – or does not take – action.

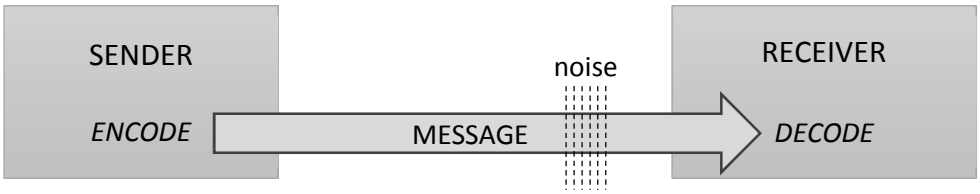

Figure 1: Sender-receiver model

Within this general set-up, we distinguish four different model scenarios according to two dimensions (see Table 1): the first dimension deals with the costs of sharing information and the second with the differences between the objectives pursued by both parties. Firstly, depending on the cost of encoding, sending and decoding messages, communication can be costless or costly. When communication is costless, the model assumes 'cheap talk'. The classic cheap talk set-up with an informed sender and an uninformed receiver was developed by

[24] *C.E. Shannon*, A Mathematical Theory of Communication, The Bell System Technical Journal 1948, pp. 379-423 and 623-656; *W. Weaver & C.E. Shannon*, The Mathematical Theory of Communication, University of Illinois Press, 1949.
Speakers or writers are often referred to as 'encoders', and listeners or readers as 'decoders'. When putting ideas or information into words and other signs, you encode them. When you translate the sound waves that hit your ears, or the signs on the screen or paper you are looking at, in ideas and information, you are decoding. *J.A. DeVito*, The Essentials of Human Communication, Pearson Publishing, 8th ed., 2013, p. 5.
[25] *Id.*, p. 8. The four main categories of noise are physical noise (e.g. difficult-to-read format types of background noises), physiological noise (e.g. hearing loss or poor eyesight), psychological noise (e.g. feelings of irritation, prejudices or distraction) and semantic noise (e.g. an insurance salesperson using the jargon of the insurance industry to talk to someone not trained in such topics). *Id.*

Crawford & Sobel [26]. Secondly, we distinguish a setting in which sender and receiver have identical objectives and one in which they have different objectives. The model presented by Crawford & Sobel, for instance, showed that communication can be more informative when sender's and receiver's preferences are more similar.

Table 1: Model scenario's

Model scenario's	**Information sharing is costless for sender and receiver ('cheap talk')**	**Information sharing is costly for both sender and receiver**
Identical objectives	MODEL 1	MODEL 3
Different objectives	MODEL 2	MODEL 4

2.2. Modelling the information sharing from environmental inspector to public prosecutor

8. The actual modelling of the information sharing from an environmental inspector, the information sender (S), to a public prosecutor, the information receiver (R), starts here. The modelling will allow us to analyse what happens in the communication process from inspector to prosecutor in a structured, complete and transparent way. The model findings will establish the conceptual touchstone for our further policy analysis. We are especially interested in the combined effects of cost levels and objective functions, even if, at the outset, we intuitively can guess that information sharing will be more beneficial in a setting with costless information and identical goals. Besides testing our intuition for these rather simple settings, the modelling gives us a solid theoretical understanding of, and a complete and clear insight in, the process of information sharing, including the mutual influences of costs and goals.

We work in five steps. First, we formulate the assumptions underlying our model. This gives transparency regarding questions such as 'Can the environmental inspector be dishonest and send false information?' and 'How to understand the cost of a unit of information? Is each unit as costly as the others, or does the price go up or down the more information shared?' (2.2.1). Next we model the decision of the environmental inspector, the sender (S), to encode/send information (2.2.2). Thereafter we model the decision of the public prosecutor, the receiver (R), to decode/receive the information (2.2.3). We continue with an analysis of the information sharing that results from both decisions (2.2.4). We wrap up with a summary of our findings (2.2.5).

To help readers who are not familiar with the maths, we explain all formulas and graphs with words. This significantly adds to the length of this part, but we think that sharing this relevant

[26] *Crawford & Sobel, supra* note 10.

information with our reader is worth that downside. Our recommendation to readers who feel that the modelling remains too hard to approach and digest, is to have a quick glance at the assumptions and jump over what follows in straight line to the summary of the findings.

Here we go.

2.2.1. Model assumptions

9. Our model assumptions on the information sharing from environmental inspectors, the information senders (S), to public prosecutors, the information receivers (R), are the following ones.

1/ There is no 'noise'; the message sent thus equals the message received.
2/ The information that can be shared is based on objective facts and lying is not possible. So we basically assume honesty: the message contains information that is true.
3/ Yet, this true information might only be part of the available information (partial information) or it might be hidden in other irrelevant information (redundant information). Thus the message contains a certain amount of information y_S. The information content varies from extremely minimal and not so useful, over just right and directly useful, to very elaborate and costly to use.
4/ Increasing the information content of the message comes at a unit cost of c_S. Thus a message with an information content y_S costs $c_S y_S$ to send. Next the receiver can decode the message at a unit cost c_R per unit of information content y_S. The receiver decides on an enforcement action a based on the received information:

$$a(y_S) = \delta y_S. \tag{1}$$

5/ Both actors maximize their expected utility, the objectives they pursue. However, their utility functions are not necessarily equal. The utility of the sender depends on the expected benefit B_S from the action a taken by the receiver and on the cost of sending a message:

$$U_S(c_S, a) = B_S\big(a(y_S)\big) - c_S y_S \tag{2}$$

The utility function of the receiver differs from the utility function from the sender: b represents the bias relative to the sender. The bias b can be smaller or larger than one ($b<1$ respectively $b>1$) and measures the degree to which the sender's and receiver's objectives are aligned. A bias equal to one *(b=1)* implies identical utility functions. A bias smaller than one ($b<1$) implies that the benefits from the information sharing are smaller for the sender than for the receiver, while a bias larger than one ($b>1$) implies the reverse. Further, the receiver's utility also depends on the expected net benefit B_R from the enforcement action taken and the cost of decoding the message:

$$U_R(c_R, a, b) = B_R\big(b, a(y_S)\big) - c_R y_S. \tag{3}$$

2.2.2. Decision making process of the sender (environmental inspector)

10. The sender decides to share information or not to share it, and if he shares information, he has to decide how much to share. On the one hand, this decision depends on the costs of sharing information: e.g. sending an email, picking up the phone, writing a short report or writing a long analysis with technical annexes. On the other hand, the decision depends on the expected benefits of sharing information: i.e. how will the information change the behaviour of the receiver? From equation (2) we can derive the optimal amount of information y_S^* to send, i.e. the amount of information that maximizes the utility function of the sender:

$$\frac{\partial B_S}{\partial a}\frac{\partial a}{\partial y_S} - c_S = 0$$

Assuming the marginal benefit of information sent (MB_S) [27] is a linear function equal to $MB_S = \frac{\partial B_S}{\partial a} = \beta_{S0} - \beta_1 a(y_S)$ and using equation (1), we have:

$$y_S^* = 0, \qquad if\ c_S > \beta_{S0}$$
$$y_S^* = \frac{\beta_{S0} - c_S}{\delta\beta_1}, \quad if\ c_S \leq \beta_{S0} \qquad (4)$$

So the sender prefers not to communicate when the costs of sending information are too high ($c_S > \beta_{S0}$). However, when those costs are sufficiently low ($c_S < \beta_{S0}$), the sender will send information. The amount of information shared increases if the cost decreases and if the usefulness of the information increases. This equilibrium is illustrated in Figure 2 for the hypothesis where the costs are sufficiently low ($c_S < \beta_{S0}$). Both the marginal benefit of information sent (MB_S) and the marginal cost of information sent (c_S) are expressed in euros. We can distinguish two scenarios: firstly, when sending information is costless (c_S=0), we find the solution for Model 1 and Model 2, and secondly, when sending information is costly (c_S>0), we find the solution for Model 3 and Model 4.

[27] Marginal benefit of information sent: benefit per additional unit of information sent.

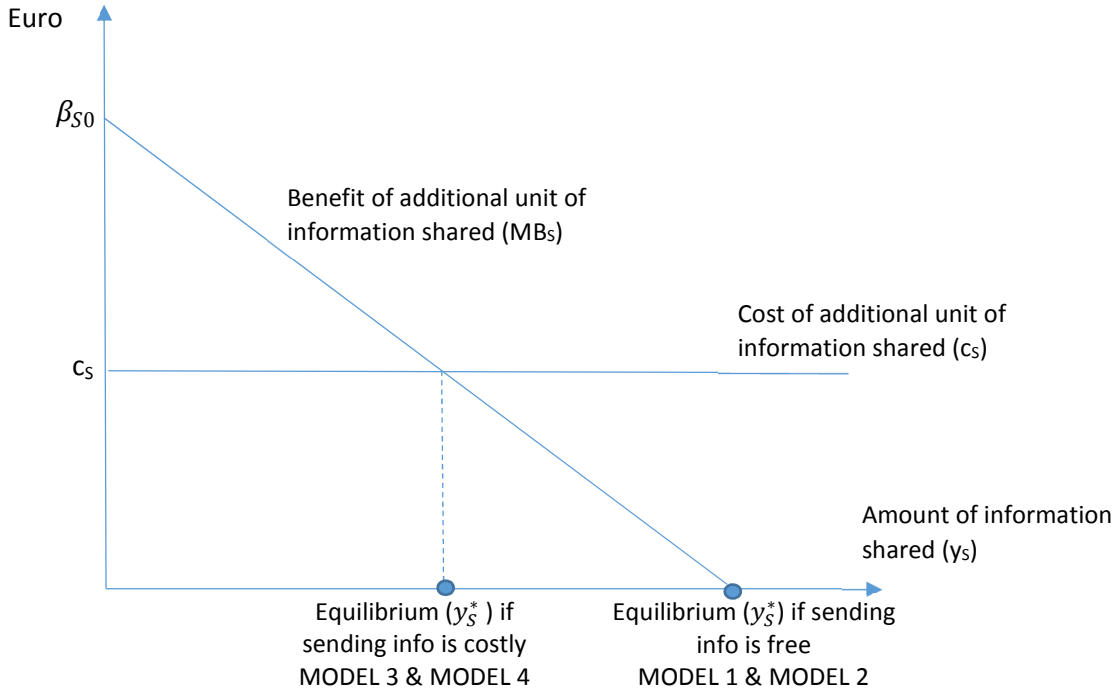

Figure 2: Decision process of sender

2.2.3. Decision making process of the receiver (the public prosecutor)

11. The receiver decides to actively process the information he receives or not to do so. This decision depends on the costs of processing information: e.g. reading emails, updating files or verifying and studying information. Moreover, the decision to decode the message and assess its information content also depends on the possible benefits that the receiver associates with the information: i.e. how could the information change his behaviour, and would this change be beneficial for him? These benefits depend on the objectives the receiver pursues.
Given the information y_S^* received from the sender, the utility derived by the receiver from decoding the message equals:

$$U_R(c_R, a, b) = B_R\big(b, a(y_S^*)\big) - c_R y_S^*.$$

The receiver will decide to decode the message as long as:

$$B_R\big(b, a(y_S^*)\big) - c_R y_S^* > B_R\big(b, a(0)\big).$$

Otherwise, the message will be ignored.

However, the information received from the sender may not be optimal for the receiver. Therefore, we now derive the amount of information that would be optimal for the receiver and that would maximize his utility. From equation (3) we can derive the optimal amount of information y_R^* from the point of view of the receiver:

$$\frac{\partial B_R}{\partial a}\frac{\partial a}{\partial y_R} - c_R = 0$$

Assuming the marginal benefit of information received (MB_R) [28] is a linear function equal to $MB_R = \frac{\partial B_R}{\partial a} = \beta_{R0} - \beta_1 a(y_R)$ and using equation (1), we have:

$$y_R^* = 0, \qquad if\ c_R > \beta_{R0}$$
$$y_R^* = \frac{\beta_{R0} - c_R}{\delta\beta_1}, if\ c_R \leq \beta_{R0} \qquad (5)$$

So the receiver prefers not to communicate when decoding information is too costly ($c_R > \beta_{R0}$). However, when costs are sufficiently low ($c_R < \beta_{R0}$), the receiver would like to receive information. Again, the preferred amount of information increases if the cost decreases and if the usefulness of the information increases. This derived equilibrium is illustrated in Figure 3 for $c_R \leq \beta_{R0}$. We can distinguish two scenarios. Firstly, when sending information is costly (c_R>0), we find the solution for Model 3 and Model 4. Secondly, when sending information is costless (c_R=0), Figure 3 illustrates the solution for Model 1 and Model 2.

Using the parameter *b* to represent the extent to which objectives differ between sender and receiver, we assume that the marginal benefit function of the receiver is a linear shift of the marginal benefit function of the sender. This is:

$$MB_R = \beta_{R0} - \beta_1 a(y_R) = b\beta_{S0} - \beta_1 a(y_R)$$

Thus, if b=1, meaning that sender and receiver have identical utility functions, the two curves coincide and both parties derive the same marginal benefit from an additional unit of enforcement effort made by the receiver. If b<1 (b>1), the marginal benefit from an additional unit of enforcement effort for the receiver is lower (higher) than the marginal benefit for the sender. For simplicity's sake, Figure 3 only models two situations: the situation where b =1 and the situation where b>1. Both the marginal benefit of information received (MB_R) and the marginal cost of information received (c_R) are expressed in euros.

If $c_R \leq \beta_{R0}$, we can rewrite equation (5) as follows:

$$y_R^* = \frac{\beta_{R0} - c_R}{\delta\beta_1} = \frac{b\beta_{S0} - c_S}{\delta\beta_1} + \frac{c_S - c_R}{\delta\beta_1} \qquad (6)$$

[28] Marginal benefit of information received: benefit per additional unit of information received.

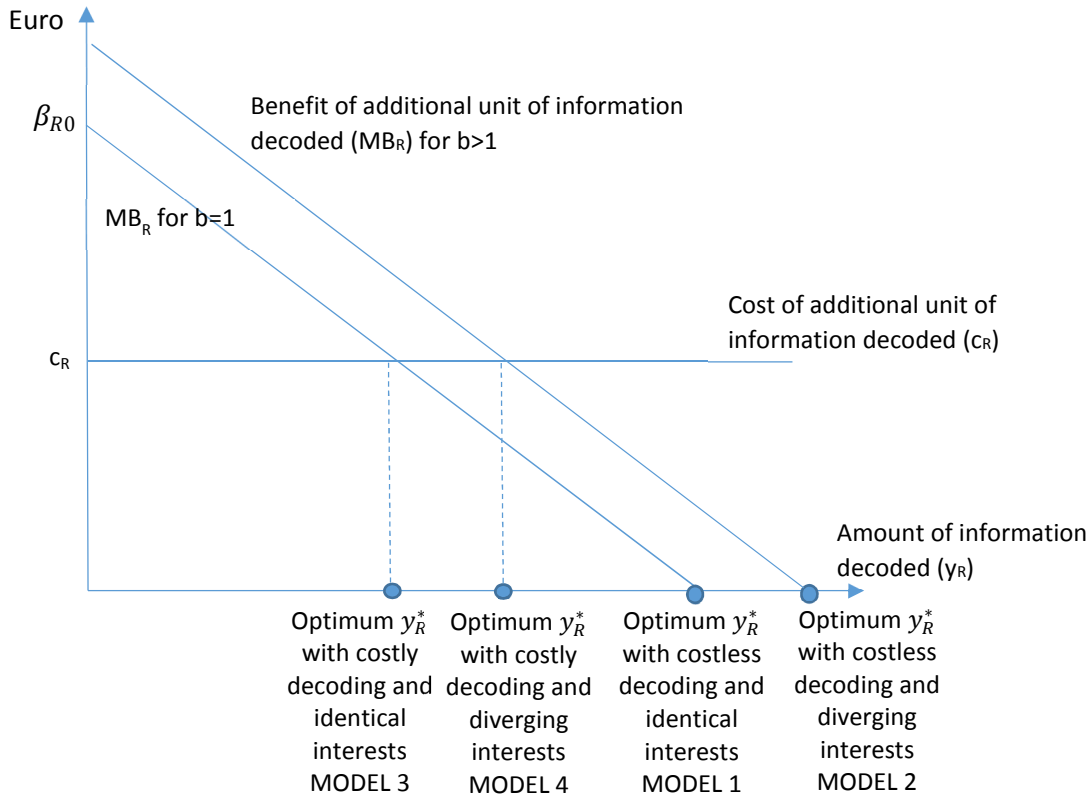

Figure 3: Decision process of receiver

2.2.4. Model results

12. We now discuss the implications of equation (6) for the four different conceptual models presented in Table 1.

Model 1: costless information sharing and identical objectives

13. In this setting we assume that senders can send information without cost (c_S=0) and receivers can decode messages without cost (c_R=0). Moreover, objectives between the two parties are perfectly aligned and the benefits from information sharing are identical for both sender and receiver (b=1). Looking at equation (6), the expression now simplifies to

$$y_R^* = y_S^*$$

Thus the amount of information sent by the sender is optimal for both parties and maximizes both the sender's utility and the receiver's utility. To conclude, sharing information will always happen since it is costless in this model. Moreover, if we define welfare in a utilitarian way (i.e. as a sum of both utility functions), information exchange in this model leads to a welfare optimum.

Model 2: costless information sharing and diverging objectives

14. In this setting we still assume that senders can send information without cost (c_S=0) and receivers can decode messages without cost (c_R=0). However, objectives between the two parties are no longer assumed to be aligned (b≠1) and thus the benefits from information sharing differ between sender and receiver. Looking at equation (6), the expression now simplifies to

$$y_R^* = by_S^*$$

The amount of information sent by the sender is a factor 1/b different from the optimal amount of information desired by the receiver. Thus, if b>1, the sender sends a message that will optimize his own objectives, but this message will not optimize the objectives of the receiver since it contains too little information content ($y_R^* > y_S^*$). If b<1, the message will only be partly decoded since the receiver does not need all the information in the message. Then the action taken by the receiver will optimize his own objectives, but will not lead to an optimum for the sender ($y_R^* < y_S^*$).

Model 3: costly information sharing and identical objectives

15. In this setting we assume that both sending information and decoding messages is costly (c_S>0 and c_R>0). However, objectives between the two parties are aligned (b=1) and the benefits from enforcement actions are identical for both sender and receiver. Looking at equation (6), the expression simplifies to

$$y_R^* = y_S^* + \frac{c_S - c_R}{\delta\beta_1}$$

We distinguish three cases depending on the relative size of the cost of sending and receiving information:

i) sending and receiving information is equally costly (c_S=c_R),
ii) sending information is more costly than receiving it (c_S>c_R), and
iii) sending information is less costly than receiving it (c_S<c_R).

First we look at the first case in which sending and receiving information is equally costly (c_S=c_R). In this case, if information is shared, the amount of information in the message is optimal for both parties and it maximizes both sender's and receiver's utility. However, information will not always be shared since it is costly to do so. From equations (4) and (5) we know that a sender will only send a message if $c_S \leq \beta_{S0}$ and that a receiver will only decode the message if $c_R \leq \beta_{R0} = \beta_{S0}$. Two possible solutions can be distinguished. If the costs of sharing information are too high ($c_S = c_R > \beta_{S0}$), no message is sent. If the cost of sending is sufficiently low, a message will be sent and it will be decoded. So, in this first case, sharing information will not always happen, but, if it happens, it will be beneficial for both sender and receiver.

In the second case sending information is more costly than receiving it ($c_S > c_R$). No message is sent if the costs of sending information are too high ($c_S > \beta_{S0}$). If the cost of sending is sufficiently low, a message will be sent and it will be decoded since $c_R < c_S$. In this case, sharing information will again not always happen, but if it happens, it will be beneficial for both sender and receiver.

In the third case sending information is less costly than receiving it ($c_S < c_R$). We observe again that no message is sent if the costs of sharing information are too high ($c_S > \beta_{S0}$). If the cost of sending is sufficiently low, a message will be sent. However, it will not necessarily be decoded since $c_R > c_S$. Only if $c_R \leq \beta_{S0}$, the message will be decoded and used by the receiver. In this case, useful information will not always be shared and, if a message is sent, it will not always be decoded and used by the receiver.

Model 4: costly information sharing and diverging objectives

16. In this setting we assume that both sending information and decoding messages are costly actions ($c_S > 0$ and $c_R > 0$). Moreover, the objectives between the two parties are not aligned and the benefits from enforcement actions differ between sender and receiver ($b \neq 1$). Looking at equation (6), we have:

$$y_R^* = \frac{b\beta_{S0} - c_S}{\delta\beta_1} + \frac{c_S - c_R}{\delta\beta_1}$$

In this case, information will not always be shared and, even if a message is sent, it will not always be decoded, since it is costly for the receiver to do so. From equations (4) and (5) we know that a sender will only send a message if $c_S \leq \beta_{S0}$ and that a receiver will only decode the message if $c_R \leq \beta_{R0} = b\beta_{S0}$. Four possible solutions can now be distinguished (see Table 2). If the costs of sharing information are too high $c_S > max\{\beta_{S0}, b\beta_{S0}\}$, no message is sent. If the cost of sending is sufficiently low, a message will be sent. Next, depending on the relative size of the decoding costs and the bias in her utility function, this message will be decoded ($c_R \leq b\beta_{S0}$) or not ($c_R > b\beta_{S0}$) by the receiver.

If a message is sent, then we observe two scenarios. Firstly, if $b > 1$, the sender sends a message that will optimize his own objectives, but this message will not optimize the objectives of the receiver since it contains too little information content. Secondly, if $b < 1$, the message will only be partly decoded since the receiver does not need all the information in the message. Then the action taken by the receiver will optimize his own objectives, but will not lead to an optimum for the sender.

Table 2: Possible solutions

	$\boldsymbol{c_R \leq \beta_{R0}}$	$\boldsymbol{c_R > \beta_{R0}}$
$\boldsymbol{c_S \leq \beta_{S0}}$	Message is sent and decoded	Message is sent but not decoded
$\boldsymbol{c_S > \beta_{S0}}$	No message is sent	No message is sent

2.2.5. Summary of the model results

17. Using the four different conceptual settings we are able to derive conditions that make sharing information more likely and conditions that make sharing information more useful (see Table 3). Obviously sending information is more likely, the lower the costs of sending messages are and the more benefits the resulting information sharing bring about. Further, a message is more likely to be decoded, the lower the decoding costs and the higher the benefits associated with the information sharing are for the receiver compared to those for the sender. Finally, the message will include the optimal amount of information when the objectives of both parties are closely aligned (b=1). If the benefits of the information sharing are more beneficial for the sender than for the receiver (b<1), then the receiver can reach his optimum, while the sender cannot. On the other hand, if the benefits of the information sharing are less beneficial for the sender than for the receiver (b>1), the sender can reach his optimum and the receiver cannot.

Table 3: Summary of model results

	Information sharing is costless for sender and receiver **('cheap talk')**	**Information sharing is costly both for sender and receiver**
Identical objectives	MODEL 1 Sharing information will always happen and will always be beneficial (nobody will be worse off)	MODEL 3 Sharing information will happen if total benefits exceed total costs (nobody will be worse off; but sometimes useful information might not be shared because sharing is too costly overall)
Different objectives	MODEL 2 Sharing information will happen if it is beneficial for the sender (sender will never be worse off; impact on receiver is ambiguous; sometimes useful information might not be shared because it does not benefit the sender)	MODEL 4 Sharing information will happen if benefits for sender exceed costs for sender (sender will never be worse off; impact on receiver is ambiguous; sometimes useful information might not be shared because sharing is too costly for the sender)

3. Relevance for policy development and practice

18. We now explore the relevance of the insights provided by the conceptual model for the communication between environmental inspectors and public prosecutors in practice. To this end, we discuss three different topics: first, the impact of increasing specialization of public

prosecutors; second, the informative quality of notices of violations; and thirdly, the prioritization of environmental offences in prosecution.

3.1. Specialization of public prosecutors: 'environmental prosecutors'

19. In Europe exists a trend towards increasing specialization of public prosecutors in the field of environmental crime.

We have observed this development in Belgium since 2008. At country level, an evolution towards a structurally formalized specialization of public prosecutors in several highly technical crime areas, including environmental offenses, started in January 2008 on a local scale [29]. It involved the judicial resorts of two courts of first instance, thus two prosecutors' offices. The initiative spread to the whole of the Province of West-Flanders (November 2010, four judicial resorts), part of the Province of Antwerp (January 2011, two out of the three judicial resorts) and the Province of East-Flanders (December 2011, all three judicial resorts) [30]. The essential part of this cooperation effort was that the same prosecutor, or prosecutors of the same prosecutors' office, would deal with all environmental files throughout all the cooperating judicial resorts. This same prosecutor was also responsible for actually prosecuting the defendant in court and for requesting the appropriate sanctions from the court judge [31]. This move towards specialization was consolidated throughout the country on April 1st 2014 when the judicial reform that reduced the existing twenty seven Belgian judicial resorts to twelve entered into force. One of the main objectives of the greater scale of the resorts is precisely to allow for specialization in crime areas that need it, such as environmental crime. [32]

The tendency towards specialization, giving rise to the emergence of 'environmental prosecutors' appears to develop throughout Europe. This is illustrated by the creation, in 2012, of the European Network of Prosecutors for the Environment (ENPE) [33] and by ENPE's recent successful bid on a EU LIFE program (2015-2020) supporting its statutory goals [34].

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[29] *D. Leestmans*, Gedaan met het exclusief locale denken? Juristenkrant 27 January 2010, 8-9; *W. Haelewyn*, Criminal offence policy with respect to combating environmental offences in Belgium, in: Instituut voor Gerechtelijke Opleiding – Institut de Formation Judiciaire (ed.), Investigation, prosecution and judgment of environmental offences. European seminar for members of the judiciary specialized in combating environmental offences (conference proceedings), Durbuy (Belgium) 24-27 May 2011, 63-67; *J. De Clercq*, Parketsamenwerkingsverbanden inzake milieu en stedenbouw, presented at Vlaamse Vereniging voor Omgevingsrecht, Debating Evening 6 June 2013.

[30] *De Clercq, id.*

[31] *Leestmans, id.*; *Haelewyn, id.*; *De Clercq, id.*

[32] Act from December 1st 2013 "tot hervorming van de gerechtelijke arrondissementen en tot wijziging van het Gerechtelijk Wetboek met het oog op een grotere mobiliteit van de leden van de rechterlijke orde" [to reform the judicial resorts and to modify the Judicial Code so as to allow an increased mobility to members of the judicial order] (Belgian Official Journal, 10 December 2013).

[33] See http://www.environmentalprosecutors.eu/ .

[34] Project reference: LIFE14 GIE/UK/0043. The project, stretching from July 2015 to July 2020, did obtain a funding of 1.072.400 euro (EU-contribution: 643.439 euro). It's objectives are to: (1) develop ENPE to a sustainable network of European environmental prosecutors, (2) improve the collection and dissemination of data

20. When comparing the situation with structurally formalized specialization to the situation without structurally formalized specialization, it is clear that specialization gives a systematic chance to develop useful expertise as well as to refine prosecution policy objectives. Both evolutions can lead to less costly communication and more closely aligned objectives between environmental inspectors and public prosecution offices. Nobody needs to be convinced about the complexity of environmental legislation. Specialization obviously helps to overcome the cost of complexity and thus helps to bring down the costs of decoding the information contained in the notice of violation. Moreover, the narrowing of the goals of the public prosecutors policy from a prosecution policy including a wide range of crimes to a prosecution policy encompassing only environmental crime, is another important aspect. Insofar specialization exists (positive perspective) [35], it implies that communication and the associated enforcement actions are more likely to fulfill the objectives of the environmental inspectors as well as the prosecutors, rather than the objectives of only one of these parties. Communication will then be more efficient. More efficient communication will logically lead to a more efficient prosecution policy. Insofar as specialization does not exist yet (normative perspective), it is a situation to pursue, a goal to support in view of achieving a more efficient and effective sanctioning of environmental offenses.

3.2. Informative quality of notices of violation

21. Our communication model highlights the importance of the informative quality of notices of violation in the interface between environmental inspectors and public prosecutors.

Irrespective of the type of environmental inspector – from a highly specialized environmental inspector to a police officer in charge of general compliance monitoring – notices of violation are the main tool to open a case at the public prosecutor's office. In Belgium, for instance, empirical data show that 95% to 99% of all environmental cases at prosecutors' offices are opened following the receipt of a notice of violation. Cases provided by other sources, such as through complaints of private parties directly addressed to the prosecutor's office, form an utterly small fraction of the case intake. [36] Environmental compliance monitoring by public

on environmental crime and its prosecution, and (3) to bring together environmental prosecutors to share knowledge and expertise, cooperate and share intelligence, and improve capacity in prosecuting environmental crime. Its partners include the European Union Forum of Judges for the Environment (EUFE) (www.eufje.org), the National Environmental Crimes Unit at the Swedish Prosecution Authority and the Office for Serious Fraud and Environmental Crime of the Dutch National Public Prosecutor's Office. See http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5353&docType=pdf.

[35] See, for instance, the specialized prosecutors working at the Environmental Agency of England and Wales (UK), mentioned *supra* note 9.

[36] *T. Van der Beken & A. Balcaen*, Strafrechtelijke sanctionering van milieurecht: stroomschema van PV tot vonnis (working paper), UGent – IRCP, www.environmental-lawforce.be – Lawforce Working paper 2007/2; *Vlaamse*

officers dominates compliance monitoring because of factors such as the necessity of manpower and other costly means to develop and uphold the monitoring, the technicality of many environmental compliance issues and the legal authority required to visit industrial and other premises. We may reasonably assume that, for same reasons, the situation is roughly similar throughout Europe and in many other countries. In EU Member States, the rather recent and expanding EU legislation on environmental inspections [37] is an additional factor supporting it.

Drafting a notice of violation concerning one or more environmental offenses is always costly [38], even if some notices are more costly than others. The cost stems from the effort the environmental inspector invests in 'encoding' the facts of the offence: administrative data, such as data detailing the identity of suspects and the environmental permits of the factory involved; the facts providing the evidence; information relating to eventual antecedents; background data helping to understand and size up the evidence (cartographic material, business records, …); data useful to assess the illegal benefits generated by the offence; … An additional part of the effort can consist in the encoding of a first analysis of all data considered as a whole. The more complex the case in terms of facts and perpetrators, the more costly the encoding. At the receiver's end, the costs of decoding the information will more or less follow this same rule of thumb. The cost of notices of violation brings the communication from environmental inspectors to prosecutors' offices in the realm of our conceptual analysis, more specifically in the realm of the models which assume that information sharing is costly for both sender and receiver (Model 3 and Model 4).

Considering the crucial role of notices of violation in the enforcement chain and the encoding and decoding costs they bring along, the technical dismissal rate by prosecutor's offices bears attention. A technical dismissal happens when the notice of violation lacks usefulness in view of the evidence needed, which is evidence regarding the offense as well as the offender. In Belgium, the rate of technical dismissals for environmental offenses was 25% in the years 1993-2002 [39]. The hope would be that this rate was due to the then recent acquaintance [40] with environmental law enforcement. This idea does not find support in recent data. The dismissal rate decreased only slightly in the years 2009-2013, to some 20%-22% of all cases [41]. An important waste of law enforcement efforts is involved in this communication failure. Each technical dismissal stands for encoding/sending costs coming to nothing. It also stands for some decoding/reception costs coming to nothing.
It matters to know more about this fraction of failed communication. Thus, for instance, we know for Belgium that an important fraction of technical dismissals is explained by the lack of

Hoge Raad voor de Milieuhandhaving, Milieuhandhavingsrapport 2013. 5 jaar Milieuhandhavingsdecreet (2009-2013), 2014, 143-145.
[37] *Supra*, nr. 2, note 5.
[38] In terms of our model: $c_S > 0$. See *supra*, nrs. 10 and 15-17.
[39] Information given in the answer to a parliamentary question raised in the Belgian Senate: Vr. en Antw. Senaat, 2003-04, Vr. nr. 3-243, 5 september 2003(H. VANDENBERGHE).
[40] E.g. *M. Faure*, Preadvies Milieustrafrecht, 1990, 163 pp.
[41] Flanders: *Vlaamse Hoge Raad voor de Milieuhandhaving, supra* note 36, pp. 156-159.
Belgium (statistics for 2009-2011): *Federale Overheidsdienst Volksgezondheid, Veiligheid van de voedselketen en Leefmilieu*, Tweede federaal milieurapport. Deel 2: de andere aspecten van het federale milieubeleid, 2015, p. 145.

proper evidence on the identity of the perpetrator of the offences [42]. But it is unclear to what extent this lack of evidence is due to factors that can be solved, such as a shift in information generation efforts from inspectors to prosecutors, whether signals flaws in encoding skills such as an improper understanding of the level of evidence required, or is due to wholly different difficulties such as ill-drafted laws, which give near to no chance to find a culprit. An example of this kind of legal provision could be a provision forbidding to place poison-baits to control predator populations in the countryside. What is the chance to identify the person placing such a bait somewhere in Flanders fields, the Irish grasslands, a Spanish Sierra, a German forest?

22. Our model highlights the importance of costs in communication. Lessening the costs stimulates efficient communication. Considering all the above, a well-thought investment in lessening the costs involved with notices of violation will stimulate efficient environmental prosecution. In policy terms, this stresses the importance of an ongoing investment in the conceptualization of well-made and usable notices of violation ('*Notices of violation for Dummies'*) and in the training of environmental inspectors in drafting such well-made and usable notices of violation. We also find that a better knowledge and understanding of technical dismissals would matter.

3.3. Prioritization of environmental offences in prosecution

23. The last point we would like to make, draws from an empirical observation. This observation is the following one.

In Flanders (Belgium), we build a dataset gathering all verdicts of environmental case law at seven courts of first instance and the Court of Appeal of Gent, from 2003 to 2007, as well as precursory decisions by the public prosecutors of three of the seven prosecutors' offices involved, covering the year 2005 [43]. The observed criminal sanctioning policy regarding environmental offences was dominated by three articles of law. Over 62% of the transaction settlements concluded by public prosecutors [44] and 55% of the accusations in the cases brought to court [45] deal with infringements of (1) the prohibition to discard waste (article 12 Waste Decree), (2) the environmental permit obligation (article 4, §1, Environmental Permit Decree) (EPD) and (3) the obligation to comply with the environmental permit exploitation conditions

[42] Belgium (statistics for 2009-2011): *Federale Overheidsdienst Volksgezondheid, Veiligheid van de voedselketen en Leefmilieu*, Tweede federaal milieurapport. Deel 2: de andere aspecten van het federale milieubeleid, 2015, p. 145.
[43] *C.M. Billiet et al.*, Milieurechtshandhaving: een databestand voor onderzoek naar de penale en bestuurlijke sanctioneringspraktijk, Tijdschrift voor Milieurecht 2009, pp. 128-150; *Billiet et al., supra* note 19, p. 80.
[44] *Billiet et al., supra* note 19, p. 83.
[45] *Billiet et al., supra* note 42 p. 140. See also *C.M. Billiet, T. Blondiau & S. Rousseau*, Punishing Environmental Crimes: an Empirical Study from Lower Courts to the Court of Appeal, Regulation & Governance 2014, (472) 478.

(article 22, §1, EPD). Considering the vast amount of environmental legislation, filling literally thousands of pages in the European [46] and Belgian official journals, this finding is puzzling.
The focus of the enforcement efforts on the environmental permitting legislation, however, can be explained. In Belgium, as in the rest of the EU, this legislation is a centerpiece of environmental legislation. Intriguing, however, is the relative importance of offences against the environmental permit obligation (article 4, §1 EPD) compared to offences against the obligation to respect permit conditions (article 22, §1, EPD) in the case-load the public prosecutor concluded by a transaction settlement and in the case-load he brought to court. It is observed that infringements of article 22, §1, EPD, offences which as a rule imply actual pollution and/or hindrance and thus are really harming the environment and/or public health, are dealt with by a transaction settlement twice more often (18,3%) than infringements of article 4, §1 EPD (7,5%), an offense that does not necessarily imply actual pollution and/or hindrance. In the case load brought to court, this proportion is reversed, with a less outspoken yet neat preponderance of article 4, §1 EPD accusations: 16,3% as opposed to 13,2%. A possible reason for this observed prosecution policy is that communication on offenses against emission standards is less straightforward and thus more costly to decode than information on the other type of offenses [47]. This would induce prosecutors to opt more easily for a transaction offer as a means of closing a case, since this is a choice where the issue of proof only appears in a limited way and does not require detailed debate and discussion in court.

24. Starting with this observation, and the questions it raises, it could be argued that the communication through notices of violation should not only take care of lowering the cost at the sender's side but also at the prosecutor's end. More specifically, the environmental inspectors could systematically, and strategically, pay attention to the reporting of offenses that not only matter in terms of protection of the environment and/or public health, but are also, on the more, documented by information that is relatively easy to decode. Such offenses are, in our understanding, mainly of two categories. The first category includes authorization obligations of all kinds, as they are often pivotal in the operation of, limited or extended, sets of conditions that protect humans and the environment from harm. Having or not having the authorization required by law, makes a rather simple case to prove, decode, also in the relationship prosecutor-judge. A second category includes paperwork obligations, specifically in environmental domains where the control of activities essentially happens through paperwork, such as waste, hazardous substances, manure, … Remember Al Capone, who was brought to court and put in jail for tax offenses [48]: paperwork offenses. Here again, the communication issue, including proof, is quite straightforward.

[46] EU official journal: think of the extensive body of EU regulations in the field of waste management, toxic substances and wildlife traffic, which directly apply in the EU member states.
[47] This explanation finds support in *Forst & Brosi, supra* note 13, who find that prosecutors are "*more sensitive to strength of evidence than to crime seriousness*" – *id.*, p.190.
[48] https://en.wikipedia.org/wiki/Al_Capone

4. Conclusions

25. The simple communication model developed in this paper highlights two characteristics of communication. Next to the cost of communication, which is a commonly noticed issue, the model also stresses a rather less detected characteristic, namely the issue of the similarity or difference in objectives of communication partners. We clearly show that the communication between environmental inspectors and public prosecutor is distorted by the fact that communication is costly and also because of differences in the actual objective functions. While at first sight both parties aim to maximize deterrence and minimize environmental harm, upon closer examination some differences can be identified. More specifically, the opportunity costs of prosecution are not directly relevant to the decision made by the inspectors, while they are clearly relevant to the prosecutor. Thus improvements in the communication strategy are possible from a joint perspective.

We identified three possibilities to improve communication in this crucial stage of the enforcement chain.
1/ The specialization of public prosecutors is beneficial to communication. Considering a case with a given complexity, specialization lowers decoding costs. It also aligns the prosecutor's objectives more closely with the environmental inspector's objectives.
2/ The effective encoding of information on environmental offences in notices of violation needs ongoing attention, at a conceptual level ('*Notices of violation for dummies*') and at the implementation level (training of inspectors drafting notices of violation)
3/ Inspectors should be attuned to the constraints the prosecutor faces while allocating scarce offices resources. Strategic encoding of offences detected, combining environmental concerns with attention to offences that are cheap to decode at the prosecutor's side, ultimately at the judge's side, will pay off in terms of intake into the prosecution and successful convictions in court.

The phenomenon of technical dismissals needs to be better known and understood. What is going wrong and why? It might be that technical dismissals for some types of environmental crime signal a necessity to adapt legislation, for instance by introducing provisions that, while being effective in terms of policy goals, raise the chance to identity an offender from a near to inexistent chance to a reasonable one. This is a topic worth further research.

26. The interface environmental inspectors – public prosecutors is a crucial one in the enforcement chain. It is decisive for the intake of a case into the criminal judicial system. Yet all other interfaces in the enforcement chain matter too. The insights drawn from the communication model we developed can be applied to other links in the enforcement chain such as, for instance, the interface prosecutors – judges.

27. Last, but not least, an extension of our analysis to environmental networks seems possible. Environmental networks exist in many shapes: formal, informal, with homogenous membership

and with heterogeneous membership, local and supranational, regional and international. Enforcement networks with supranational homogenous membership are, for instance, IMPEL (European Network for the Implementation and Enforcement of Environmental Law) [49] and the aforementioned ENPE and EUFJE [50]. INECE (International Network for Environmental Compliance and Enforcement) [51] offers an example of a worldwide formal network with heterogeneous membership. Informal local networks exist everywhere, for instance between environmental inspectors and public prosecutors having niches for meeting when coping with their duties. Whatever its size and shape, a network thrives through information sharing. Information sharing belongs to the core business of all networks.

The communication model helps to get insight into the vulnerabilities that networks, formal and informal, face when coping with an information sharing process that is costly for both sender and receiver. For networks with heterogeneous members, such as INECE, the analysis emphasizes the importance of cheap or even costless communication in order to get communication going.

[49] http://www.impel.eu/
[50] *Supra*, nr. 19.
[51] http://inece.org/