

# Features of the Pre-trial Investigation of Air Pollution

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**Abstract** Concern for the regulation of relations between man and nature cannot be only an internal affair of an individual country, especially in matters of atmospheric air and the commission of crimes in this area. Most current environmental problems have a global aspect, which means they can be solved only through international cooperation. In today's reality, the European Union is taking decisive legal and organizational steps towards combating air pollution as a crime against the environment. At the same time, the legal regulation in this area needs to be updated, and the methods of conducting investigative actions need to be generalized, coordinated and involve more experts. The aim of the article was to conduct a comparative analysis of the procedural actions of competent authorities during the pre-trial investigation of air pollution in the territory of EU Member States and identify their typical features. The leading practical methodological tools were methods of observation and comparison. The study revealed the imperfection of the procedural actions of law enforcement agencies in the EU and the low level of crime detection in this area. At the same time, the involvement of experts by law enforcement agencies at the stage of the initial inspection of the scene can help to qualitatively increase the effectiveness of the investigation. As part of the research, it was proposed for the Member States to establish independent institutions in the environmental field at the national level. The reasonability of developing a unified EU Coordination Program for pre-trial investigation of air pollution in the national and transboundary context at the interstate level is substantiated. The gradual implementation of the changes proposed by the author in the territory of the EU member

states will be a vector of further research in the long run.

**Keywords** Harmful Emissions, Investigative Actions, Site Inspection, Environmental Crimes, Climate Change, Atmospheric Air

## 1. Introduction

Climate change and air pollution are two of the biggest problems that have a negative impact on people's lives. In 2017, human-induced warming reached approximately  $1.0 \pm 0.2$  °C above pre-industrial levels and increased by  $0.2 \pm 0.1$  °C over each decade [1]. In particular, there is a number of ways in which air pollution can affect the biosphere and, in particular, human health. Atmospheric pollution is associated with damage to food and water supplies, while reducing crop yields, damaging wildlife habitats, accelerating warming in the Arctic, causing irreversible climate change, increasing energy consumption, increasing the burden of morbidity and producing millions of premature deaths [2]. Research programmes that link air pollution to human health typically face two main challenges: general impact assessment and health impact assessment.

The COVID-19 global pandemic foregrounded the effects of air pollution. Poor air quality is still a widespread reality despite the corresponding production decline in this period. As a result, 9 nine out of 10 people breathe air with contaminated compounds that penetrate deep into the lung tissue, and even deeper — into the cardiovascular system

[3]. Inadequate air quality is one of the biggest and most pressing global health threats. Atmospheric air pollution causes about 4.2 million premature deaths annually [4]. More importantly, air pollution decreases immunity, while increasing human vulnerability to infectious diseases, including COVID-19 [5].

The methods currently used to assess the impact have several inherent problems that affect how clinical trials assess the impact on the environment. According to the State of Global Air Report [6], air pollution has been identified as the leading risk factor responsible for 7.5% of deaths worldwide. In November, the European Environment Agency [7] confirmed that air pollution remains the greatest risk to environmental cleanliness in Europe, causing around 400,000 premature deaths per year in the EU. In the context of the Covid-19 pandemic and the transformation of approaches to human health, air quality is gaining new importance [8]. At the same time, the trend of its deterioration is associated by researchers primarily with criminal acts in the field of air pollution.

The updated WHO Global Air Quality Guidelines [9] present the results of the assessed impact of air pollution on public health and set recommended limit values for the concentration of hazardous pollutants. The study showed a direct causal link between air pollution and crime. At the same time, in 2015, in order to create the world's long-term acceptability and suitability of the environment for human life, more than 200 countries signed the Paris Climate Agreement, which aims to keep global warming below 2.0 °C and limit it to 1.5 °C until 2100 [10]. Among other things, the countries have declared the reasonability of achieving ambitious climate goals and taking active action to mitigate the consequences of crimes against air pollution in each country. At the same time, scholars continue to argue that this international document remains purely declarative [11].

There are many complex factors that correlate with crime, such as: opportunities of committing a crime, crime scene, offender behaviour, and time of committing a crime [12]. At the same time, crimes aimed at air pollution are characterised by special latency and difficulties in identifying the perpetrators. According to the Report on Eurojust's Casework on Environmental Crime [13], published in January 2021, air pollution is classified as one of the four leading types of environmental crimes. The world community recognizes that environmental crime is spreading rapidly, threatening not only habitats and wildlife populations, but entire ecosystems. These crimes lead to a significant enrichment of the perpetrators, carry a relatively low risk of detection and are mostly committed by organized criminal groups operating at the cross-border level. At the same time, the real state of development of crime in the world in this area is currently impossible to establish due to the lack of proper evidence of all the facts of pollution [14].

Environmental criminal offenses account for less than 1% of the total number of reported crimes worldwide.

There are also significant differences between the number of recorded (possible) offenses and the number of confirmed crimes. Besides, in modern realities, air pollution is mostly the result of criminal acts in various fields. Low risk of prosecution, high incomes and lack of tools for the judiciary and law enforcement motivated organized and unorganized crime to spread to the atmospheric air. The current rise in environmental crime, both globally and in Europe, requires prompt actions. However, despite the EU's many years of experience, Member States and the European Union as a whole are left without effective tools to combat and effectively investigate air crimes, and there is no common position on the list and content of offenses in this area [15].

The rise of environmental crime, together with its complex transnational nature, requires a comprehensive and coordinated approach of the administrative, law enforcement and judicial cooperation at the national level, as well as cross-border and expert cooperation at the international level. A UN study on the environment has identified several major shortcomings in responding to environmental crimes, including air pollution. They include lack of data, knowledge and awareness, lack and limited use of legislation, lack of institutional will and governance, lack of capacity in the law enforcement chain, lack of national and international cooperation, lack of exchange of information between authorities, and lack of interaction with private entities [16]. To close these gaps, the international community must reintroduce programmes to combat environmental crime, initiate concerted action and information exchange in the pre-trial investigation process, recognize environmental crimes and view them as a serious threat to peace and sustainable development, as well as strengthen the rule of law at all levels. In turn, an effective guarantee of prevention of crimes in the field of atmospheric air is a quality pre-trial investigation, which urges the selected research topic.

The aim of the article was a research of the leading properties of pre-trial investigation of criminally punishable acts related to air pollution. The aim involved the following research objectives: 1) carry out the comparative analysis of features of pre-trial investigation of crimes in the field of air pollution in the territory of the EU Member States; 2) generalize adaptive innovations in the direction of pre-trial investigation of the category of crimes under research.

## 2. Literature Review

The criminal lawyer Karnavas reveals the mechanisms for detecting crimes and properly collecting evidence of criminal activity in the field of air pollution in his work *Ecocide: Environmental Crime of Crimes or Ill-Conceived Concept?* [17]. This work deals with, among other things, to the ecocide through the prism of air pollution and the impact of low activity of investigative bodies on the global air quality. Besides, approaches to responding to crimes

aimed at air pollution are also fragmentarily covered in this work, which allowed forming primary author's idea of scientific positions in this area.

The paper also took into account the results of historical analysis of air quality conducted by Fowler et al. [18] in their work *Chronology of Global Air Quality*. The authors expressed a position on the impact of air quality on the investigation of crimes and bringing perpetrators to justice.

The work of Professor Mackie [19] in the field of systemic analysis of the provisions of EU directives in the field of environmental protection in general and atmospheric air in particular was of fundamental importance for scientific research. The conclusions made by the scientist allowed to further substantiate the position expressed in this article. The critical analytical results of Lennan's [20] research allowed to question the effectiveness of the existing EU legal regulation in the area under research and created a background for the author's suggestions of the reform of legal regulation. Thus, Lennan [20] noted a low level of transposition of directives into the national legislation of the EU Member States, which was further confirmed by statistics provided in the article.

The interdisciplinary approach of scientific experts to the impact of air pollution on crime in the EU as a whole, the generalizations of statistical studies by Cruz et al. [21] were also taken into account when drawing the authors' conclusions. The paper also takes into account the author's idea of Fisher [22] on the regime of the European Union on climate change and measures to protect the air from pollution. In particular, the analysis of variable approaches to initiatives that the EU should implement in connection with the reduced effectiveness of the detection of environmental crimes has become especially important in the context of the study.

The authors Kulovesi and Oberthür [23] present the diametrically opposite position on the inexpediency of creating new state bodies to investigate crimes against the

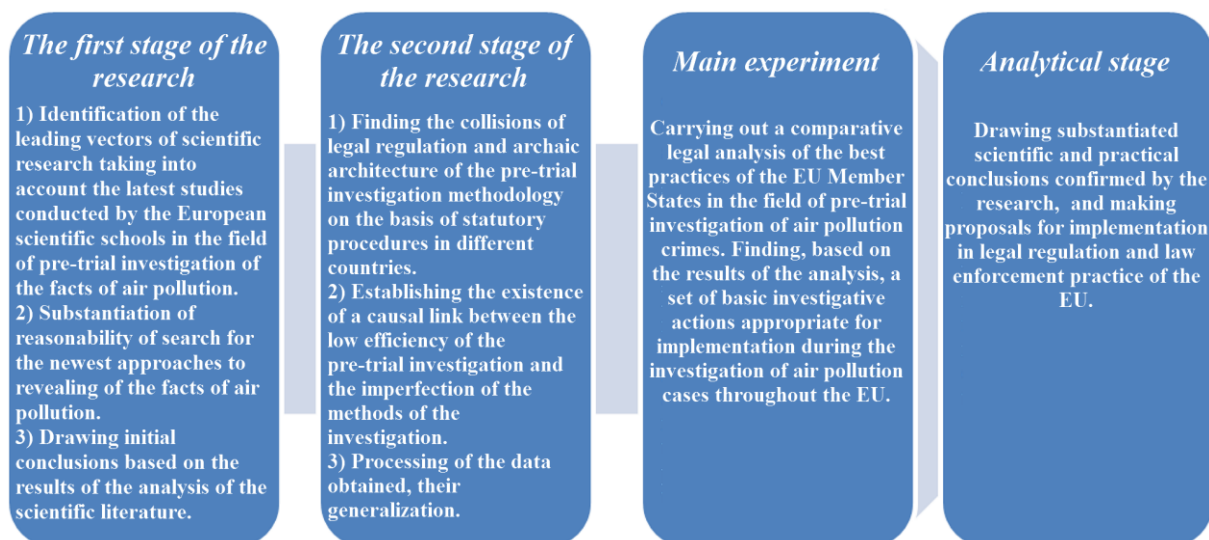
environment in general, and air pollution crimes in particular. The conclusions of the scholars served as an impetus for a more thorough author's substantiation of the conclusions drawn and proving the fragmentary nature of the identified contradictions. The study provides a theoretical justification for approaches to the pre-trial investigation of air pollution crimes, their comparison and practical application in accordance with EU law. The paper also provides the scientific recommendations of Mazur-Kumric and Zeko-Pivac [24] on improving the existing EU criminal law, which should primarily focus on the application of liability for environmental crimes in the field atmospheric air and its inevitability [25].

These authors have made a significant contribution to the theory of forensic science and the practice of detecting and investigating crimes of the studied category. At the same time, emphasizing the significant successful developments and conceptual positions presented in the works of these scientists, it should be noted that their research does not cover the whole set of issues related to the detection and investigation of air pollution crimes. The need to improve the current EU legislation and investigation algorithms led to the intensification of the latest scientific research.

It is stated that despite the multivariate nature of scientific and legal concepts outlined by representatives of doctrine and practice in works and publications, the study of the investigation of air pollution in the EU needs to be updated in the context of current realities and new EU environmental values.

### 3. Methods and Materials

Scientific and methodological tools were widely used in the course of scientific research, and the results of their testing were presented in the article. The stages of empirical study are shown in Figure 1.



**Figure 1.** The procedure of author's research on the subject of the article

The method of observation was the leading practical method of research, which allowed considering the leading features of investigative actions in the EU in crimes aimed at harming the air. The author made a list of leading investigative actions through this method, which are of basic importance for bringing the perpetrators to justice and reducing the latency of the committed crimes.

Another practical method is comparison, which was used in the analysis of the legal regulation of air protection against pollution in the European Union. This method was also used to know the general and distinctive properties of the constituent elements of the studied legal norms. The method of comparison was also useful in comparing the qualitative characteristics of atmospheric air and forming a comprehensive view of the effectiveness of EU law enforcement practice. This method has shown that the lack of integrated approaches of EU Member States to the use of crime investigation methodology and levelling of emissions reporting can potentially lead to artificial trends and distortion of the real state of air pollution. This method allowed stating that the existing negative trends in the detection of air pollution in the EU will hinder obtaining a balanced set of emission data for European countries.

The formal-legal method allowed finding out and interpreting the content of regulatory acts and documents in the researched area. At the same time, solving the problem of criminal law protection and the effectiveness of investigative actions in the field of atmospheric air also required an analysis of the development of criminal law, conditions and patterns of its formation. The application of the method of historical analysis has contributed to a more effective prediction of ways to further improve the pre-trial investigation in environmental crimes. This method allowed us to consider the trends in the effectiveness of investigative actions through a historical perspective.

The functional method was used to determine the role of methods and algorithms for investigating air pollution crimes in the optimization of investigative and expert activities in the EU. Along with the above methods, classification and typology methods were used to summarize the results of the pre-trial investigation in order to identify typical problematic investigative situations in criminal activity related to air pollution crimes. The logical method was used as a universal means of argumentation of scientific conclusions in the research area in the context of this issue.

The used methodology is determined by the aim of the article and the outlined objectives, which, in turn, allowed revealing the issues mentioned in the article as much as possible, and offering author's solution to the problems that arise during law enforcement in modern realities.

The objectives of the article were fulfilled and the author's scientifically substantiated conclusions were drawn through a balanced analysis of a set of primary documents, in particular — the texts of regulations, works of scientists and practitioners, statistics and reports of law enforcement agencies. The results of the study showed that

it is possible to find the most effective ways to reform the law enforcement system and improve the competence components of investigative actions through the comparison of legal norms and discussion positions of representatives of environmental law doctrine. The author studied 36 sources in the course of the research, which are the basis of the article.

## 4. Results

According to the analysis of global statistical reports on environmental crimes, air pollution around the world by the following ways can be identified: 1) open incineration of hazardous waste (combustion products such as small suspended particles can worsen the condition of people with heart and lung disease); 2) hazardous waste can be illegally disposed of or incinerated in large quantities, for example, a warehouse fire, or in small quantities — by dumping sewage, incineration in 200-liter metal barrels or supply to household waste incinerators; 3) medical waste can be illegally stored, disposed of or incinerated in very large quantities, for example, in a warehouse, or in small quantities — by dumping in landfills, recycling or burial in rural areas [26].

This context requires an analysis of the legal background and approaches of states to the detection of criminal offenses, which further determines the direction of pre-trial investigation in different jurisdictions. In particular, it is first of all reasonable to refer to the legal regulation of the peculiarities of liability for air pollution in the territory of the European Union. Directive 2010/75/EU [27] on industrial emissions (IED) aims to minimize pollution from various industrial sources. Operators of industrial installations covered by the IED must obtain a comprehensive permit from the local competent authorities. This integrated approach means that the permit must take into account all the environmental characteristics of the plant, including different types of emissions. The IED had to be adapted to national law by January 7, 2013 and was integrated into the existing regional permit system. Criminal liability for violating the provisions of this act has not been enshrined in the national legislation of the member states, and the directive itself has been implemented in fragments despite the expiration of the expected implementation deadlines. Despite the progressive norms in the field of protection and prevention of air pollution, large entrepreneurs still do not perceive it at the proper level. The guarantee of its observance should be the criminalization of acts in the field of permitting relations in the territory of the EU Member States.

At the same time, the provisions of Directive 2008/99/EU focus on crimes related to the release of hazardous substances into the atmosphere. This document has an impact on the criminal law of the Member States, contributing to the wider criminalization of environmentally harmful behaviour and more severe

sanctions. However, the specification and categorization of concepts and responsibilities for criminally punishable acts are unclear. This is due to the fact that air pollution becomes mostly an “unplanned” consequence of another crime and the actions of the perpetrator not aimed directly against this object of the crime. The Directive recognized the need for more restraining penalties for environmentally harmful activities that cause or may cause significant damage to the air (including the stratosphere). So, Directive 2008/99/EU provides that almost all Member States need to reduce emissions to meet their commitments by 2030, and nine Member States need to reduce emissions by more than 10%. For many countries, the reduction required is significant: 10 countries need to reduce their emissions by more than 30%, and Malta by more than 50%. Significant actions to reduce SO<sub>2</sub> will also be required in several Member States [28].

In December 2021, the COM (2021)851 Proposal was submitted for the Directive of the European Parliament and of the Council on the protection of the environment through criminal law and replacing Directive 2008/99/EU [29]. The Commission evaluated the Directive in 2019/20 and published its opinion in October 2020 [30]. An analysis of the effectiveness of implementation of the Directive and statistical indicators of the pre-trial investigation revealed that the Directive did not have a significant impact in practice. Over the past 10 years, the number of successfully investigated environmental crimes and imposed sentences has remained very low. Besides, the level of sanctions imposed was too low to produce a deterrent effect, while cross-border cooperation was not consistent.

The evaluation identified significant gaps in law enforcement in all Member States at all levels of the law enforcement chain (police, prosecutors and criminal courts). It also identified shortcomings in Member States in terms of resources, expertise, awareness, prioritization, cooperation and information exchange, as well as the lack of comprehensive national strategies to combat environmental crime covering all levels of the law enforcement chain. Moreover, the lack of coordination between administrative and criminal law enforcement and sanctions often reduces the declared effectiveness of pre-trial investigations.

It is particularly important to emphasize that the lack of reliable, accurate and complete statistics on pre-trial investigations and trials on environmental crimes in the Member States not only complicates the evaluation, but also hinders from monitoring the effectiveness of their national policies and practices. This fact is recognized in the international arena, as evidenced by the Communication [30], which explains the objectives of the updated pollution prevention policy. So, it is advisable to propose the international classification of information on the state of pre-trial investigation of air pollution by the following criteria: 1) country of emissions; 2) the area of distribution of emissions; 3) pollution level; 4)

identification of perpetrators; 5) calculation of damage to atmospheric air; 6) expediency of carrying out environmental regenerative activities; 7) transfer of the case to court.

In order to solve the identified problems, the following six objectives of the proposed reforms can be provisionally confirmed: 1) making investigations and prosecutions more efficient by updating the scope of the Directive; 2) clarification or elimination of vague terms used in the definition of environmental crimes, pre-trial investigation stages; 3) ensuring effective, convincing and proportionate types and levels of sanctions for environmental crimes; 4) facilitating cross-border investigations and prosecutions; 5) improving informed decision-making on environmental crimes by introducing a consolidated collection and dissemination of statistics; 6) increasing the operational efficiency of national law enforcement chains to stimulate investigation, prosecution and imposing sanctions.

The new Directive includes new categories of environmental offenses to the extent required by basic environmental legislation. Both offenses and sanctions are reduced to serious violations of environmental law and thus adhere to proportionality. There is a need for criminal sanctions to ensure the effective implementation of EU environmental policy on such categories of offenses as air pollution, which are not currently covered by the Directive: placing products on the market that violate mandatory requirements, cause significant damage to the environment through the use of the product on a large scale; serious violations of EU legislation on chemicals that cause significant damage to the environment or human health; serious circumvention of the requirements for environmental impact assessment; illegal production, placing on the market, import, export, use, emission or release of fluorine-containing greenhouse gases. These proposals are fully supported at the international level. For example, the world community recognizes that serious violations of bans on the use of damaged devices in cars that interfere with or disable emission control in real driving conditions, even if the vehicle is undergoing official emissions tests since 2015, show that even large companies cannot refrain from infringements if they believe that a single enforcement will be administrative in nature [30].

On December 14, 2021, the European Commission published a report assessing progress in the implementation of the EU law on industrial emissions [31]. This document provides extensive information on the installation of more than 52,000 industrial plants across Europe between 2013 and 2018. The sectors covered by the IED account for a significant share of air and water emissions, as well as the generation of non-household waste in Europe. It is estimated that they contribute about 23% of total EU emissions to air and about 40% of total EU greenhouse gas emissions. The IED revision package is scheduled for Q1 2022. According to Article 15(3) of the IED, the emission limit values (ELVs) set under the permit

must ensure that, under normal operating conditions, the emissions do not exceed the BAT-associated emission levels (BAT-AELs) as specified in relevant Executive Decisions of the Commission. France, Germany, Italy and Sweden reported a total of 22 cases where ELVs under permit were more stringent than the BAT range. Stricter permitting conditions are most often imposed on installations operating in the glass industry. However, this can only reflect the fact that the BAT opinions for this sector were among the first to be adopted under the IED, and technological advances in emission reduction techniques have taken place since then.

The Member States face long-term plans to combat air pollution, which, in turn, requires appropriate transformations in approaches to identifying the cases of pollution and bringing perpetrators to justice. On the other hand, the cross-border nature and impact of environmental offenses, the growing trend of profit-driven crime fueled by a low risk of disclosure, and large discrepancies in sanctions between Member States have been (and remain) direct shortcomings in law enforcement against air pollution. At the same time, the transposition of the Directive did not introduce a comprehensive reform of national environmental and criminal legislation that would meet the general objectives of the document. It was reduced to simple adjustments and partial additions at the national level. However, the Directive has established a new legal framework and standards in the areas of environmental protection, diversification and enforcement of penalties, as well as a clear provision on environmental criminal liability.

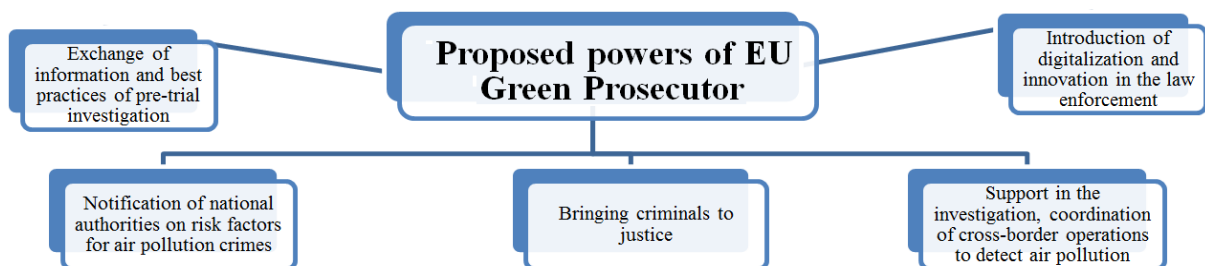
The Member States have added more specifics in the definition of crimes and sanctions for their commission. For example, Belgian law has long enshrined [32] a prison sentence of eight days to 6 months and/or a fine. At the same time, the Law of 28 December 1964 on Combating Air Pollution [33] remains an effective mechanism of pre-trial investigation in this jurisdiction. According to the 2020 World Air Quality Report [34], Belgium ranked 90<sup>th</sup> out of 106 countries, which was attributed to countries with a responsible attitude to air protection.

According to the latest data, the cities of Poland and Italy are among the worst in terms of air quality in Europe. The European Environment Agency (EEA) has published the latest urban air quality rating, reiterating that air pollution continues to pose a health risk in some cities [35]. At the same time, Umeå in Sweden has been recognized as

the European city with the best air quality for the past two years. According to the Report on the implementation of the 2030 Agenda for Sustainable Development 2021, Sweden currently has high air quality globally and emissions of fine particles into the atmosphere have decreased significantly. The country owes such positive transformations to effective legal regulation and law enforcement reform. The National Environmental Protection Agency is the main body responsible for the environment in Sweden and is responsible for detecting and preventing air pollution crime [36]. Police currently plays a minor role in Sweden when it comes to detecting environmental crimes. It is a specialized body that is the most important link in the detection and registration of criminally punishable acts. According to The Swedish National Council for Crime Prevention [37], the police may know or suspect that wrongdoing is taking place, but they do not have enough evidence to initiate a case. In turn, the specialized body has a greater set of expertise and experience in the field of pre-trial investigation, and productive cooperation between the two bodies creates positive trends in the fight against crime.

Analysis of reporting in the study area in the EU showed a lack of clear crime rates and relatively low efficiency of law enforcement and criminal justice authorities in air pollution crimes in most EU Member States. The reasons include inadequate control over the environment and a slight deterrent effect of the imposed sanctions. In many EU countries, a small number of prosecutions are accompanied by even fewer successful sentences. There is also a lack of experts in the field of calculating environmental damage caused by toxic substances and emissions into the atmosphere. In Member States where environmental offenses already existed before Directive 2008/99/EU, it encouraged a more integrated approach. Since then, several Member States have adopted special programmes to train law enforcement officials to address the many challenges of gathering evidence, optimal investigative and prosecution strategies.

In June 2021, the European Union law enforcement agency — Europol — announced that environmental crimes are now one of the main security threats in the EU, and it is advisable to create a special body to combat environmental crimes with the position named EU Green Prosecutor [38]. It is currently proposed to include the following powers in the competence of the EU Green Prosecutor (Figure 2).

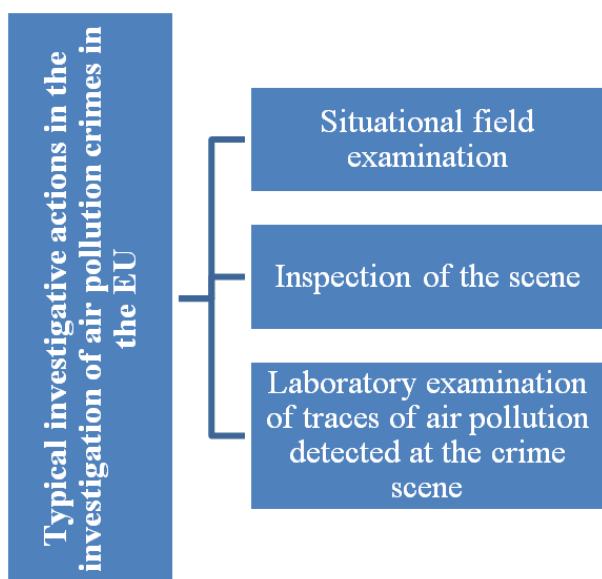


**Figure 2.** Proposed discretion of the powers of EU Green Prosecutor according to Europol (summarized by the author)

In this context, the previous adoption of a new roadmap of the European Green Deal [39] by the European Commission to make the EU economy sustainable in all spheres is also quite positive. Today, states have the collective capacity to maximize the investigative efforts of national authorities to ensure the effectiveness of the investigation and prosecution for air pollution crimes across borders.

Given the variability of criminally punishable acts and methods of their commission — the relevant investigative actions are also subject to transformation. In particular, the methodology of investigation of environmental crimes related to air pollution involves a significant number of operational and tactical actions and investigative measures that can ensure the collection of evidence in a criminal investigation. A significant range of criminal offenses that entail criminal liability does not allow considering the peculiarities of the initial investigative actions against each of them because of the heterogeneity of the object of encroachment.

At the same time, an effective pre-trial investigation is directly related to the strategic planning of law enforcement actions in the direction of finding evidence of illegal actions, analysis of the consequences and prevention of global damage to the air. Initial investigative actions during the investigation of air pollution crimes are connected with the initiation of a criminal case. The ground for such actions is the receipt by law enforcement agencies of data indicating violations of certain regulations (environmental standards in the field of ambient air), which produce harmful effects on human health and life, the environment as a whole.



**Figure 3.** Generalized list of basic investigative actions appropriate for implementation during the investigation of air pollution crimes in the EU (according to the results of the author's research)

environmental standards and the consequences of such actions, becomes important. Forensic analysis is of particular importance for the investigation of environmental crimes, where the application of this analysis can provide the courts with appropriate and admissible physical evidence. The study revealed a stable background for typical investigative actions in the process of pre-trial investigation of air pollution crimes in the European Union (Figure 3).

Besides, the analysis of surveys of law enforcement agencies in different countries allows forming a universal algorithmic set of actions at the stage of the pre-trial investigation of air pollution crimes.

- 1) The reasonability of using protective equipment at the crime scene — disposable overalls, dust mask, gloves, boots suitable for protection against dust.
- 2) Development of a sampling plan that assesses risks for humans and the environment.
- 3) Making photographs the burning of waste/dust at regular intervals (every 10-15 minutes) to document the intensity and direction of the smoke plume.
- 4) Control and record of wind direction, notation and schematic representation of the potential emission zone. Photographs and notes may be sufficient evidence of air pollution, depending on local laws.
- 5) Panoramic photography of the crime scene and contaminated area, indicating the source whenever possible, from a height whenever possible.
- 6) Air sampling.
- 7) Questioning of the responsible persons of the facilities and all witnesses.
- 8) Compilation of data on samples, drawings of grids or graphs of concentrations depending on the distance to the contamination source.
- 9) Active cooperation with local health authorities in case of impact on human health to obtain a sound expert opinion.
- 10) Preparation of the case for proceedings.

According to the questionnaires, special attention should be paid at the pre-trial stage to hazardous waste that is illegally incinerated or disposed of. Such waste can be illegally disposed of or incinerated in very large quantities, such as a fire in a warehouse, or in small quantities by dumping it in a sewer, burning it in 200-liter metal barrels or feeding it to household incinerators. Waste may contain organic (carbon-based chemicals), chlorine-contaminated (polychlorinated biphenyls (PCBs), dioxins and furans) substances or toxic heavy metals such as arsenic, cadmium, chromium, copper, lead, mercury and zinc. Low-temperature combustion can cause organic chemicals to form toxic and environmentally resistant compounds, such as dioxins and furans, or to spread toxic heavy metals into smoke that accidentally spreads with the wind. Fire foams and sprayed water also pose a serious danger to human life or health and to the environment. It can contaminate homes, land, water and food crops, as well as

The so-called trace picture, which reveals violations of

poison people, plants, animals and aquatic flora and fauna. In this context, the above algorithm can be supplemented, in particular, by making a sampling plan that collects at least one source sample (contaminant) and one sample of the host environment. These actions at the pre-trial investigation stage will allow us to gather all the available evidence that can determine the type of waste and liability. Depending on the scale/size/type of hazardous waste fire, safety measures will need to be adjusted accordingly. The following basic elements of the pre-trial investigation should be worked out by an environmental officer in consultation with the HAZMAT Response Team. The following should be reasonably implemented: 1) limiting the territory with barriers and/or warning tape; 2) establishing a safe area of entry and exit on the basis of known or suspected pollution, risk of smoke and discharges.

So, the leading investigative action in the process of detecting air pollution crimes is the inspection of the scene.

German law enforcement agencies in their reporting data on the effectiveness of crime detection stated that an immediate inspection of the scene in this category of crimes is the key to an effective investigation [40]. In particular, law enforcement officers point out that in practice there are difficulties in maintaining the actual state of the scene (especially in the conditions of production activities of enterprises and variable weather conditions). Moreover, the Polish training guidelines for the course of investigative actions contain the remark that in the studied category of crimes the source of air pollution is increasingly remote from the actual place of detection of the consequences of such pollution [41]. It can be stated that the rapid change of consequences of the event is natural (active movement of air masses, change of atmospheric conditions) or artificial, used to eliminate the consequences or hide them, determines the urgency of the scene or several places, if the event occurred in such a way that its traces were found in different places.

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scene or several places, if the event occurred in such a way that its traces were found in different places.

At the same time, law enforcement agencies mostly cooperate with specialists in the field of atmospheric air, in particular, in the field of the analysis of its quality, during initial investigative actions. In the territory of some EU Member States (Sweden, Bulgaria, Italy, etc.), specially created bodies in the field of environmental protection are involved in the inspection of the scene by law enforcement agencies. Instead, in countries where this practice is not common, individual experts are involved to properly collect air samples and other evidence of pollutants. Specialists who are invited to participate in the inspection of the scene also provide advice and the necessary expert assistance to the investigator in identifying and recording certain traces. At the same time, the selected samples of air and substances are sent for analysis, which aim to determine the type of pollution, the presence of chemicals or their complex in the air, the calculation of possible harmful effects on the environment. The study showed that the evidence obtained as a result of this investigative action is a stable ground for the formation of a criminal case, the establishment of the subject of the crime aimed at air pollution, and effective proof of guilt in the pre-trial investigation. Among the problems identified during this investigative action in different jurisdictions, the most common are: 1) the plurality of objects; 2) variability of types of pollutants; 3) the spread of polluted air to large areas; 4) the variety of negative consequences of the crime.

Investigative actions such as the identification of witnesses and their interrogation are typical of other types of crimes, so they do not attract the close attention of law enforcement agencies. At the same time, it is reasonable to emphasize the need to interrogate experts/engineers/persons responsible for environmental safety at enterprises that are potential places of crime. It is the testimony of these subjects that will allow experts to establish a complete picture of the criminal act, its preconditions, the perpetrators, the possible consequences and the actual damage. Proper interrogation of persons involved in the crime allows determining the grounds and circumstances of the pollution, as well as identifying those responsible for compliance with environmental regulations, determining the degree of guilt of each, the possibility of preventing air pollution.

The appointment of various types of forensic examinations remains a well-founded practice in the process of investigating this type of crime. A relatively small list of typical issues that are addressed through forensic examination is worth noting. These primarily include the establishment of the content, composition of harmful substances in the air, which has been adversely affected by a particular facility according to available data, the concentration of these substances, their compliance with the maximum allowable level of concentration. If the negative consequences of such influence are obvious, the examination allows establishing the circumstances of the

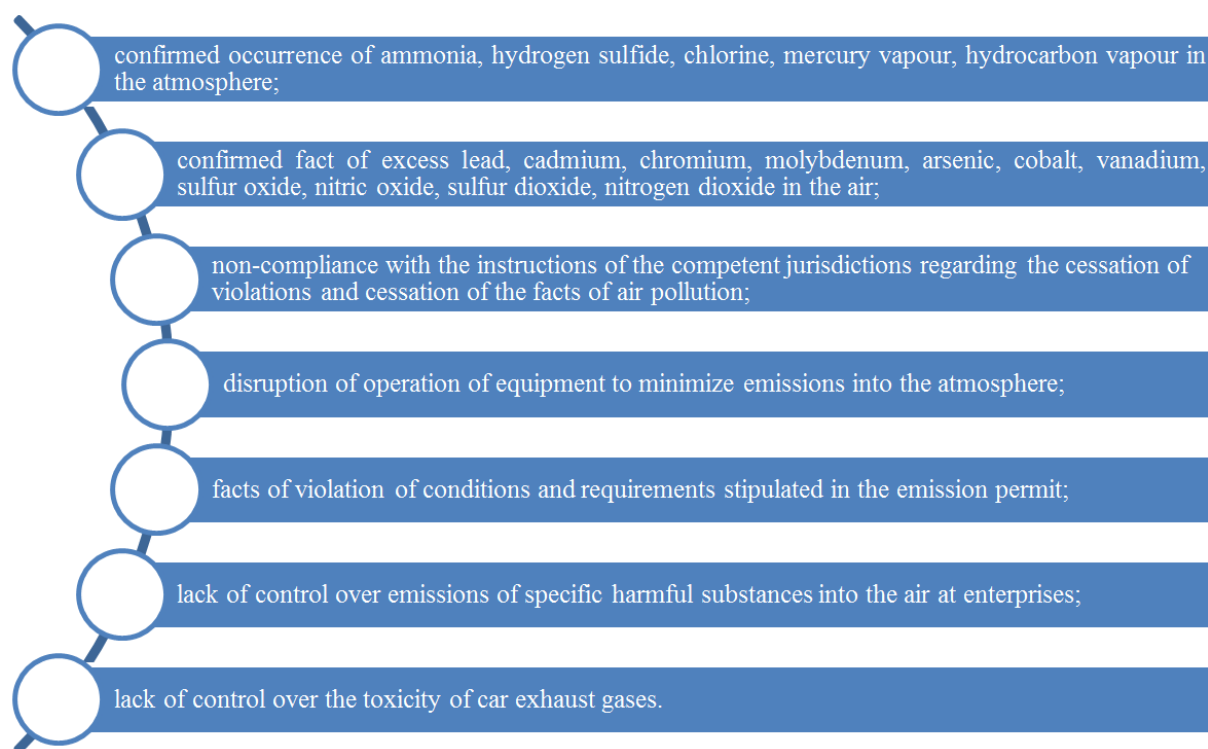


event, including the causal link with the damage. Environmental forensics in the field of atmospheric air combines knowledge from various classical scientific fields, including chemistry, biology and environmental science, with a more modern subject of forensic science. This means that a forensic ecologist needs extensive basic knowledge in the general sciences. At the same time, the current facts of pollution and their analysis require the joint efforts of people with different sets of skills and knowledge, such as environmental chemists, aerial scientists, hydrologists, botanists, organic chemists. All scientific evidence must be obtained, recorded, stored and analysed within a rigorous forensic system designed to ensure the integrity of the evidence. Besides, the pollutants found in the environment can vary greatly in each case, as pollution can come from a number of sources, including industrial ones. These factors can make expert study difficult and complex, as the contaminant is unknown and may never have been encountered and, consequently, not analysed by experts. This once again emphasizes the requirement for the joint efforts of people with different skill sets.

A comprehensive study of the practice of pre-trial investigation of air pollution crimes in the EU allowed summarizing the features of these crimes, which are committed in most jurisdictions and are indicated in most expert opinions and reports of law enforcement agencies (Figure 4).

It is important to emphasize that air pollution is a material component of the crime, which involves the mandatory occurrence of socially dangerous consequences — air pollution or other changes in its natural properties. Therefore, the signs of environmental crimes shown in Figure 4 (violation of the rules of emission of pollutants or the rules of the operation of equipment, facilities) will not constitute a crime if these actions did not cause air pollution or other changes in its natural properties.

The quantities of harmful (polluting) substances allowed to be released into the air in the EU are legally established, as well as air quality standards and policies for controlling emissions of harmful substances into the atmosphere, regulating the concentration of air pollutants by setting limits and targets for health protection of people in the EU. The existence of sustainable legal regulation remains a positive and stable background for identifying the facts of air pollution. At the same time, the proper establishment of all the facts of the crime remains impossible in all EU member states without special knowledge and the involvement of atmospheric experts, criminological research is fundamental in the search for the perpetrators. The study substantiates that the coordination of all procedural actions in the process of pre-trial investigation of the facts of air pollution by experts is a guarantee of bringing the perpetrators to justice.



**Figure 4.** Signs of environmental crimes committed in the field of air protection in the European Union (based on the results of the author's observation and generalization of data)

## 5. Discussion

The scientific research resulted in the conclusion that proves the fact of air pollution or other changes in its natural properties in the EU are possible only with the use of specialized knowledge. It is substantiated that expert coordination of the scene inspection, correct choice of type of examination, completeness of questions posed to experts, as well as the appropriateness and timeliness of evidence collection are of great procedural importance and determine the effectiveness of pre-trial investigation in the criminal proceedings. In this context, it is proposed to set up special and independent state bodies in the EU Member States, which will be responsible for the pre-trial investigation of environmental crimes, including air pollution crimes. It seems appropriate to adopt coordination documents on cooperation between the newly established bodies and the existing bodies which carry out pre-trial investigation at the national level. This author's position is consistent with the conclusions of scientists.

Karnavas [17] points to the fact that the competence component of law enforcement agencies should be divided into areas and the combination of a wide range of powers in one body has a corruption component. Scientists emphasize that environmental crimes, given their specifics, should be administered by separate and independent entities.

Samad et al. [42] in their collective work point out that law enforcement activities in the EU are erroneously focused exclusively on the control of industrial enterprises in the field of air pollution. Fowler et al. [18] also emphasize that the levelling of air quality and proper analysis of its content leads to distortion of objective data and evasion of responsibility by the perpetrators. Lennan [20] gives a general critical assessment of the EU directives on environmental responsibility and environmental crimes, and emphasizes the urgency of comprehensive reform of legal regulation and minimization of declarative norms. Cruz et al. [21] support the scientist's thesis and emphasize that air pollution in the EU is becoming a factor in the growth of crime as such, and require active interstate action to prevent such pollution and overcoming global consequences. In 2020, Fisher [22] expressed the position of establishing a pan-European body to investigate environmental crimes with special discretion to establish the facts of air pollution in the context of global climate change.

Instead, Kulovesi and Oberthür [23] have a position that is contrary to the author's conclusions on the establishment of a separate environmental investigative body. The scientist claims that such actions of the EU Member States at the national level will lead to a multitude of bodies, competition in powers and unjustified competition to find evidence of air pollution crimes. According to the lawyer, such a strategy will only minimize the effectiveness of the pre-trial investigation. In this context, the author proposes the introduction of additional training and expert

qualification measures to improve the skills of existing bodies. The maximum possible measure is the formation of internal accountable units with central coordination of functions. According to the author of the article, this position of the representative of the scientific community deserves attention, while the outlined actions cannot be tested in practice in countries with declared reforms of decentralization of power and overcoming the corruption component. Therefore, the author's conclusions provided in the article seem more balanced at this stage of scientific research.

Given the transformation of approaches to investigative actions and the introduction of innovative technologies in this area, the need for cross-border investigation of air pollution crimes, it is necessary and urgent to develop a Coordination Programme for pre-trial investigation of air pollution crimes in national and transboundary contexts. Such a document should be developed and adopted taking into account the good practice of Member States, the experience and recommendations of experts, the practice of intergovernmental cooperation in this field, and the analytical data of the European Environment Agency [28].

The author's proposal is fragmentarily supported by Professor Mackie [19]. The scientist pointed out that in the context of economic globalization and the recognition of the priority of environmental issues, the requirements for air quality and the investigation of related crimes should be unified in different countries, which necessitates investigative actions and their coordination at the international and supranational levels. Skirienė and Stasiškienė [43] also propose to approve a comprehensive and universal method of calculating the damage caused to the air as a result of illegal emissions of harmful (polluting) substances at the EU level. Mazur-Kumric and Zeko-Pivac [24] emphasize that there is an urgent need in the EU for effective implementation of the principle of inevitable criminal liability for environmental crime in the field of ambient air.

## 6. Conclusions

Atmospheric air pollution is a problem for the whole world with significant transboundary impacts and negative potential. Variable sources of air emissions and their direct content are constantly changing, creating obstacles to detection and proving the fact of air pollution. In current conditions, it is especially important to prosecute the perpetrators of air pollution, and the investigative bodies take all appropriate and permissible measures for this purpose.

The analysis of legal regulation in the study area showed that despite the existence of EU directives and the legislatively enshrined criminalization of acts of air pollution at the level of national legislation of Member States — the existing prosecution processes remain declarative and imperfect. The process of transposition of

Directive 2008/99/EU by states is still ongoing.

The generalization of law enforcement practices in the EU Member States allowed distinguishing Sweden and Belgium as the countries with the highest level of air pollution crime prevention in the EU. It was stated that the practice of these states is the result of an effective pre-trial investigation of crimes by independent expert bodies in the environmental field provided mandatory cooperation with law enforcement agencies. The generalization of law enforcement surveys in different countries allowed structuring algorithms for primary investigative actions and properly recording the fact of air pollution for further referral to court.

Taking into account the discretion of the powers of national investigative bodies on the territory of EU Member States, a set of leading investigative actions in the studied area was established: 1) inspection of the scene (places of pollution and places of air distribution); 2) interrogation of witnesses; 3) conducting ecological and forensic examinations of various levels. Emphasis is placed on the features and types of examinations in the field of atmospheric air.

Based on the results of the study, it is proposed to adopt a Coordination Programme for pre-trial investigation of air pollution crimes in the national and transboundary context. Further development of the content of such a document will be the object of author's scientific research in the long run. Besides, the results of the gradual implementation of the declared updated practices in the conduct of investigations into environmental and air pollution crimes by the EU member states will be the subject of the author's further research. It is also proposed to establish a cross-border statistical register of the state of pre-trial investigation in the field of air pollution. This innovation will allow tracking negative trends in pollution and working out more effective preventive measures.

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