

Article

Laggard by Design: The Case of the Implementation of the EU Directive on the Agricultural Use of Sewage Sludge in Italy

Emanuela Bozzini 

Department of Sociology and Social Research, University of Trento, 38122 Trento, Italy;
emanuela.bozzini@unitn.it; Tel.: +39-0461281168

Abstract: The literature on EU environmental policy implementation shows that Italy's low administrative capacity prevents it from fully complying with EU provisions. This paper builds on this literature and, through a comprehensive documentary analysis, utilises a process tracing methodology to analyse the implementation process of the sewage sludge directive. This policy has implications for public health and the environment, causing widespread concern. Empirical findings show that the poor performance in this sector results from specific, customised policy decisions made by national and regional authorities at different points in time. The conclusions suggest that, rather than being incompetent, Italy can be defined as a laggard by design.

Keywords: policy implementation; Italy; EU environmental policy

1. Introduction

It has often been remarked that the implementation of the European Union (EU) environmental policy is problematic [1–3]. Results seldom match ambitions, and as the European Commission itself noted, ‘in addition to agreeing on ambitious goals at EU level, it is critically important to ensure that EU environmental policies and legislation are applied’ [4]. The literature has also documented that the implementation gap is highly differentiated across EU member states. Scholars have identified leaders and laggards [2,5,6] in an attempt to categorise EU countries according to performance. In this context, Italy has often been placed among the laggards because of its low administrative capacity, limited resources, weak accountability mechanisms, and neglect of environmental protection, preventing it from fully complying with EU rules in a timely manner [7,8]. However, despite the academic interest in EU environmental policy, this stream of literature provides a partial account of the outputs, outcomes, and impacts in this sector [9,10]. Only recently have scholars recognised the need to go beyond the notion of legal compliance and the transposition stage of EU directives to analyse how policy works in practice across the multilevel structure of EU governance [10,11]. Furthermore, studies have so far provided evidence on a fairly limited set of issues, such as the Water Framework Directive and the climate package, which represent landmark legislations with high public and political visibility [12]. These are also closely monitored and sanctioned by EU institutions. Overall, the extant literature overlooks the bulk of the EU environmental policy, consisting of nearly 400 legislative acts [3], often dealing with apparently minor issues of low public salience. Most of these acts do not give rise to any legal action on the part of the Commission [2,13]. Consequently, we know very little about what happens in ‘small’, marginal sectors, where no infringements have been opened.

This paper makes the argument that it would be important to bridge such knowledge gaps and is a first step in that direction. It goes beyond transposition and compliance on paper to analyse the multilevel implementation of a marginal legislative act for which no infringements have been opened. Specifically, this paper presents a detailed case study of the implementation of the sewage sludge directive (SSD) in Italy. Although this issue is



Citation: Bozzini, E. Laggard by Design: The Case of the Implementation of the EU Directive on the Agricultural Use of Sewage Sludge in Italy. *Sustainability* **2023**, *15*, 16561. <https://doi.org/10.3390/su152416561>

Academic Editor: Rajesh Kumar Jyothi

Received: 13 September 2023

Revised: 4 November 2023

Accepted: 8 November 2023

Published: 5 December 2023



Copyright: © 2023 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

clearly minor and generally ignored, it holds highly relevant implications for public health and the environment. Sewage sludge is the unavoidable residue of wastewater treatment. EU legislation introduced the obligation to treat wastewater, instead of discharging it untreated into the sea, producing millions of tonnes of sludge that need to be disposed of. Since sewage sludge contains nutrients, it can be utilised in farming to fertilise soil. However, since it also contains contaminants, its utilisation is conditional upon certain requirements to guarantee soil and water protection, as well as food safety. The 1986 directive set such criteria for the safe reuse of sewage sludge in agriculture. In this sense, the SSD was a precursor to the circular economy, and despite being old and largely outdated, it is still considered to hold value in the context of the EU Green Deal. It is also considered a 'success story', as the Commission's last evaluation report states, 'the transposition and implementation of this directive continues to be unproblematic, and no major changes took place since the last reporting period' [14].

This paper provides a comprehensive analysis of policy development across all stages of implementation, therefore tracing policy processes over three decades at different territorial levels. By extending the scope of research beyond the limits of the extant literature, this paper yielded significant results. The research revealed that, while Italy appears compliant on paper, it is non-compliant in practice, since potentially unsafe sludges have been utilised in agriculture for decades. This paper further argues that such poor performance in the regulation of sewage sludge has been caused by specific, customised policy decisions made by national and regional authorities at different points in time. In other words, national and regional authorities designed the transposition and implementation of the SSD in a way that made it legally possible to utilise potentially contaminated sewage sludge in farming. By tracing cause-and-effect relationships over the stages of policy implementation, this paper identified an alternative path to non-compliance that is not based on incompetence, low administrative capacity, neglect, and lack of political will, but rather on intentionality. This alternative path is termed 'laggard by design'.

As they are based on a case study, the findings of this paper cannot be generalised. Nevertheless, beginning to consider the implementation of minor and unproblematic directives is important. First, this study makes the argument that marginal issues are of great significance due to their impact on public health and the environment. This paper suggests a line of research worth exploring further and invites greater scrutiny of minor yet crucial EU legislation. Second, this study provides additional evidence on Italy's performance in implementing the EU environmental legislation and suggests a clarification of its status among the 'laggards'. From a theoretical point of view, this paper contributes to the extant literature by adding an alternative hypothesis, beyond incompetence, to explain environmental performance.

This paper is structured as follows. Section 2 reviews advanced theories to explain (non)compliance with EU law and presents the current state of research on the issue. Section 3 provides basic information on the contents of the SSD. Section 4 illustrates the methods and data employed, while Section 5 presents empirical results on the implementation of the SSD in Italy. Section 6 discusses these findings and provides concluding remarks.

2. Literature Review: Leaders and Laggards in Compliance with EU Environmental Policy

The literature on the compliance of national norms of the EU *acquis* is a rich and diverse field that has, over time, addressed a wide range of issues. With no pretence of exhaustiveness, this section presents a summary of the main research questions and approaches to situate the original contribution of this paper.

The majority of studies have dealt with the issue of transposing EU legislation into national law [9,15]. The focus has therefore been on policy outputs, i.e., decisions resulting from the policymaking processes. In other words, most analyses have dealt with policies 'on paper,' with an assessment of the substantive conformity between the EU and national laws,

or the legal compliance. More recently, interest has been extended to the customisation of directives, a term that refers to changes to the EU rules during their transposition into national law [16]. The analysis has shown how member states use their discretion to adapt EU provisions to national circumstances or to meet their preferences. The evidence shows that member states can decide to alter the density of a policy by adding regulations to EU requirements and/or by modifying the restrictiveness of EU directives, either by making them more stringent or more lenient.

On the whole, the literature has shed light on factors that make it possible for states to comply or not with EU rules. However, it does have some limits. First, research that focuses on policy ‘on paper’ does not consider what happens beyond transposition, i.e., on policy ‘in practice’. As Treib put it, ‘we have as yet comparatively little evidence on the extent to which there is non-compliance beyond transposition and on the factors that are conducive to effective implementation and enforcement’ [9].

Second, the most important empirical basis for studies on legal compliance consists of instances of non-compliance, like timing and delays of transposition and infringement procedures. As Börzel [2] noted, this choice is mainly due to the availability of data. Yet, as this study confirmed, a lack of an infringement procedure does not mean that a member state fully complies with EU provisions. Assuming that the Commission identifies violations, it ‘is neither capable nor willing to legally pursue all violations it detects and therefore consistently focus on cases of systemic and persistent noncompliance’ [13]. Consequently, Hartlapp and Falkner [17] noted that this literature covers the ‘tip of the iceberg’—the observable cases of non-compliance—leaving the size of the iceberg itself largely unknown.

Third, it leaves open questions in terms of the consistency of empirical findings. Explanations for non-compliance are based on three main factors, either taken separately or combined [2]. The first is power and denotes the capacity of a member state to ‘upload’ their policy preferences at the EU level or, in other words, to intervene during the policy formulation and decision-making stages to shape policy outputs. The idea is that the less a country is able to upload its preferences at the EU level, the less EU decisions will fit national preferences, and the less likely it is that full compliance will be achieved. Second, capacity is used to broadly indicate the resources (staff and funds) and the expertise of national actors. A third factor is politicisation, which ‘captures the extent to which compliance costs give rise to political conflict at the domestic level’ [2].

According to this framework, Italy shares, with other southern European countries, the so-called ‘Mediterranean syndrome’: the country is a laggard because it is unable to intervene in policy formulation at the EU level, its administration has limited resources and expertise, and the country is without a strong civil society able to hold authorities to account [18,19]. As Börzel noted, ‘whether it is their sovereign debt, the treatment of refugees, or the protection of wild birds, Greece and Italy outdo the other member states in their defiance of EU rules and regulations’ [2]. Yet, other studies have provided a different picture, placing Italy with Belgium and France in a ‘middle’ or ‘in between’ category [20]. Additionally, the status of Italy in the ‘worlds of compliance’ [7] is ambiguous. It is classified either in the ‘world of transposition neglect’ or in the ‘world of dead letters’, where directives are transposed correctly but ignored. Finally, other studies have gone as far as placing Italy among the leaders: ‘while starting off at a lower performance level, the country occupied the top rank in 1980 and remained in the leader ranks in 1990 (4) and 2000 (6)’ [21].

This paper builds on these insights. The focus on a specific case study was needed to address some of the shortcomings of the extant literature. The detailed analysis implied in the study of a single policy sector allowed for the tracing of developments along the three distinct (albeit interrelated) stages of the implementation process, transposition, application, and enforcement [9], over a period of three decades. In doing so, this paper goes beyond transposition and contributes to the emergent literature on policy in practice, shedding light on substantial compliance with EU provisions. Second, the choice of a case study that did not officially present implementation problems or infringement procedures provided

evidence below the ‘tip of the iceberg’; in this case, we analysed the performance of Italy in a case that successfully passed EU scrutiny.

In addition, this paper considers the EU, national, and regional levels to address the multilevel architecture of EU governance [11]. The implementation of decisions by administrators is generally ignored in the literature, but it can be highly consequential on the ground. Accordingly, the analysis included the choices made by subnational actors and their feedback effects at the national level. Finally, the study went beyond the framework based on deficiencies and neglect to explain poor compliance. It accounted for agency and demonstrated that policy outcomes and impacts can be considered the result of specific policy decisions taken at critical moments.

3. The Context: The Regulation of Sewage Sludge in the EU

Wastewater treatment is a complex combination of physical, chemical, and biological processes that removes or reduces pollutants to safe levels. As a result, the depurated water can be safely reutilised or discharged into the environment. The mud-like residue of wastewater treatments is sewage sludge. As a waste product, sewage sludge has the potential for reuse and therefore contributes to landmark EU strategies like the Green Deal, the strategy on a circular economy, and the strategy on soil [22,23]. Indeed, it contains organic matter and nutrients and is therefore used in agriculture as ‘human manure’ to fertilise soil or to improve its agronomic quality. Furthermore, sludges can be used to extract phosphorus, an essential substance for which EU countries are almost entirely dependent on imports [24], and to produce biogas, a renewable energy source [25].

While appealing from the point of view of a circular economy, the use of sewage sludge in farming is not free from risks to human health and the environment, since wastewater can contain various hazardous substances [26]. At the time of the approval of the directive in 1986, EU authorities established limits for a restricted range of heavy metals that could be expected to be found in domestic wastewater. Specifically, the SSD prescribed maximum concentrations for cadmium, copper, lead, mercury, nickel, and chromium. In addition, the SSD prescribed requirements that agricultural soils must meet to be treated with sewage sludges so that their use did ‘not impair the quality of the soil and of agricultural products’ [27].

Today, such safety standards, and in particular, the original list of contaminants, are outdated and considered inadequate [22]. This is because, over time, analyses have revealed that urban wastewaters are polluted by a very wide range of contaminants in addition to heavy metals, including organic compounds, microplastics, nanomaterials, and pathogens [28,29]. Recently, the COVID-19 coronavirus has been found in sewage and raised alarm related to the potential contamination of fields (for example, during the pandemic, the French government introduced limitations on the use of sewage sludges for precautionary reasons. See <https://www.consultations-publiques.developpement-durable.gouv.fr/projet-d-arrete-abrogeant-l-arrete-du-30-avril-a2790.html>, accessed on 3 November 2023).

The trade-offs between risks and benefits of the use of sewage sludges in farming have been addressed by EU member states according to different criteria. According to Eurostat data, on average, around 40% of total sewage sludges are reprocessed and utilised in agriculture [22,30], but there are huge variations among countries because of the national customisation of the SSD and the availability of facilities capable of reprocessing sludges to recover raw materials or to prepare them for utilisation in agriculture (some of the most common treatments include stabilisation, dehydration, anaerobic digestion, and composting). Indeed, while all water treatment plants produce sludges as a result of their operations, not all treatment plants can process these sludges. If additional facilities are not present, then it is not possible to close the circle, and sludge has to be either sent for incineration or disposed of in landfills.

Available Eurostat data [30] show that Ireland, Bulgaria, and Spain utilise around 90% of their sludge production in agriculture; France and Denmark utilise around 70%;

while the other countries utilise around 30–40%. In Slovenia, Croatia, and Portugal, the percentage is below 10%. Finally, not all MSs permit the use of sewage sludge in farming. For example, the Netherlands, Slovakia, and some Austrian and Belgian regions forbid the practice and send sludges for incineration. Germany allows the practice (the use is at around 15%), but it has recently adopted a regulation that prioritises the recovery of phosphorus over the spreading of sewage sludge on agricultural soils (see <https://www.bmuv.de/en/law/sewage-sludge-ordinance>, accessed on 3 November 2023). The majority of MSs have modified the SSD to include an extended list of contaminants to be monitored, like polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), as well as pathogens like *E. coli* and salmonella.

In Italy, the capacity for the recovery of sewage sludge is in line with the European average at about 40% of total production, while 60% is sent for incineration or to landfills [31].

It is important to note that the production of sewage sludge has increased over recent years, in correlation with the progressive installation of wastewater treatment plants as required by the urban wastewater directive (DIR 91/271/EEC) [32], which ‘forced EU-15 countries (old member states) to improve their wastewater collecting and treatment systems’ [33]. The EU report covering the period 1998–2000 revealed that, at that time, Italian wastewater treatment plants produced around 700,000 tonnes of dry matter a year [34] and around 850,000 tonnes in 2010 [14,35]. The ISPRA reported that, in 2018, Italian wastewater treatment plants produced 3.1 million tonnes of untreated sewage sludge [31,36]. A report published by Utilitalia, the federation of Italian utilities providing public services in the sectors of environment, water, and energy, estimated that the completion of the installation of wastewater treatment plants across the entire country would result in a total production of 4.1 million tonnes per year [37]. The implementation of the urban wastewater directive in Italy has proven to be highly problematic. Istat reported that around 18,000 plants are active but that 1.6 million Italians live in urban centres without a wastewater treatment plant, meaning their wastewater is discharged untreated into the environment. ([38] ISTAT. Censimento delle acque per uso civile. 2022. Italy was condemned by the ECJ in 2014 and was referred to the Court again in 2023 for failing to comply with the 2014 judgement. See: https://ec.europa.eu/commission/presscorner/detail/%2520en/ip_23_2626, accessed on 3 November 2023).

There are regional variations in the production of sewage sludges, which are only weakly correlated with demographic density. Additionally, the capacity for reprocessing depends on the investment in recovery facilities. From a technical point of view, the quantity of residual sludge also significantly depends on the technique utilised for the depuration of water. Obsolete water treatment plants produce larger quantities of residues. As Table 1 below shows, production and reprocessing are concentrated in northern regions (particularly Lombardia, Emilia Romagna, and Veneto), which together account for half of the total sewage sludges produced in the country and over 70% of the recovery [31]. The questionnaire published by ISTAT on urban waters and wastewater includes a battery of questions on sludge and sludge plants. At present, however, no data have been published, and the available reports on water use skip this topic. (See ISTAT).

In Lombardy, large quantities of sludge come from other regions that—because of a lack of infrastructure—are unable to deal with the issue locally. For example, Puglia exports 90% of its total sludge production. The agricultural use of sewage sludge is also concentrated in Lombardia and Emilia Romagna (150,000 and 40,000 tonnes, respectively, in 2015), while there is no use in Trentino Alto Adige, Liguria, Valle d’Aosta, Campania, and Calabria [39].

Table 1. Disposal and recovery of sewage sludges by region (tonnes and %).

Region	Disposal (Tonnes)	Disposal (%)	Recovery (Tonnes)	Recovery (%)	Total (Tonnes)
Piemonte	109.138	64.5	60.002	35.5	169.140
Valle d'Aosta	657	97.3	18	2.7	675
Lombardia	189.920	22.9	639.600	77.1	829.520
Trentino Alto Adige	61.034	74.3	21.081	25.7	82.115
Veneto	137.316	48.1	148.170	51.9	285.486
Friuli Venezia Giulia	43.571	81.8	9.726	18.2	53.297
Liguria	10.390	99.8	18	0.2	10.408
Emilia Romagna	218.538	59.1	151.263	40.9	369.801
Toscana	216.369	98.6	3.118	1.4	219.487
Umbria	24.869	94.7	1.394	5.3	26.263
Marche	79.957	80.2	19.733	19.8	99.690
Lazio	280.266	94.3	17.062	5.7	297.328
Abruzzo	12.715	51.3	12.070	48.7	24.785
Molise	12.415	97.2	355	2.8	12.770
Campania	21.137	90.5	2.207	9.5	23.344
Puglia	173.766	87.4	25.039	12.6	198.805
Basilicata	0	0.0	81	100	81
Calabria	10.579	61.4	6.641	38.6	17.220
Sicilia	22.342	21.2	83.169	78.8	105.511
Sardegna	17.616	19.6	72.122	80.4	89.738
Total 2018	1642.595	56.3	1272.869	43.7	2915.464
Total 2017	1505.654	50.6	1468.249	49.4	2973.903
Total 2016	1553.411	53.1	1370.678	46.9	2924.089

Source: own elaboration from Ispra.

The official EU evaluations of the SSD are currently positive for all EU countries [14,35,40,41]. The 2009 report affirmed that ‘the measures put in place in Member States and the described implementation practice point to no implementation problems’ [41], a judgement confirmed in later reports. In terms of impact, the Commission noted that there were no reports of environmental harm resulting from the use of sewage sludge (the European Economic and Social Committee objected that legal requirements for monitoring are too limited to rule out adverse effects on human health and the environment [42] European Economic and Social Committee. Opinion of the Economic and Social Committee on ‘The revision of Council Directive 86/278/EEC on the use of sewage sludge in agriculture’. 2001, 2001/C 14/26). Yet, as this case study shows, the Italian substantive compliance with the SSD provisions and goals is low. First, the percentage of sewage sludge that is landfilled—and therefore not recovered either in agriculture or in the production of energy—is very high at around 40% [30]. Second, there are legitimate doubts about the absence of polluting effects on soil, an outcome that emerged in the enforcement phase when evidence of contamination on farmland became available. Before turning to the detailed analysis of the implementation processes that have produced such outcomes, the next section explains the methodology and the empirical basis of the research.

4. Materials and Methods

This paper applied the analytical tool of process tracing, a method of within-case analysis that aims to explain how the configuration of factors operates to produce a specific outcome of interest [43,44]. As the term ‘process’ suggests, process tracing involves the identification of a sequence of factors and traces their development over time. More specifically, this paper was based on a variant of PT that Blatter and Haverland [45] called ‘comprehensive storyline’. In this context, ‘a major goal of these comprehensive

storylines is to differentiate the major sequences of the overall process and identify the critical moments that further shape the process' [45]. This version of process tracing is close to the original proposed by authors like Bennet and Checkel [44]. Over time, process tracing has evolved into different variants. In particular, Checkel noted that Bayesian applications are currently predominant in the literature. This involves a formalization of the data analysis to assess alternative explanations for the outcome of interest. While interesting, the inductive and to some extent exploratory intention of this study prevented the use of Bayesian process tracing, whose 'logic cannot work with inductive forms of process tracing, as one has no (deductively derived) theoretical priors to which values can be assigned' ([46] Checkel, J.T. *Process Tracing—Towards a New Research Agenda*. In *Proceedings of the Annual Convention of the American Political Science Association*, Seattle, WA, USA, 15–18 September 2021). Accordingly, the specific focus of the analysis performed for this article was to identify the sequence of policy choices made by Italian institutions during the transposition, implementation, and enforcement stages that have led the country to be non-compliant with SSD in substantive terms. The detailed reconstruction of chains of events aimed to shed light on cause-effect relationships that can explain the policy outcomes.

In terms of data collection, the long-term perspective adopted in this study required a detailed and extended documentary analysis that spanned from the late 1980s to the present. Further, since the analysis covered the entire policy cycle, including transposition, application, and enforcement, it included data on a multiplicity of actors at different territorial levels. Documents included:

- Parliamentary acts. The analysis included the transcripts of the Commission for Environment of both the Camera dei Deputati and the Senate at the time of the transposition of SSD (November, December 1991 and January 1992). A search was performed on transcripts from 1992 to date. Substantive parliamentary discussions on the issue were detected only in auditions held by the bicameral committee on waste management in 2018.
- Legal controversies around the criteria for the use of sewage sludge, sentences, and, if available, commentaries on them.
- Policy documents drafted by European, national, and regional governments. Specifically, annual reports published by the European Commission on the implementation of SSD from the first in 2001 onwards and draft regulations for the (never adopted) reform of the SSD. Among the national documents, the analysis included all decrees issued from 1992 onwards. At the regional level, specific attention was paid to policy developments in Lombardia and Emilia Romagna because of their prominence in sewage sludge management.
- Reports from European, national, and regional environmental protection agencies in charge of monitoring and reporting. Specifically, the analysis included reports on waste management annually published by ISPRA from 2000 onwards.
- Reports, position papers, and videoconferences published by water management operators and stakeholders.

On the whole, the empirical material extensively covered policy developments over the last 30 years and allowed for the reconstruction of the storyline of the implementation of the SSD in a comprehensive way. As in most studies that have adopted PT, the analysis started with a detailed description of the case. Consequently, the following sections illustrate the events that characterized the transposition, implementation, and enforcement of SSD in chronological order, highlighting the critical decisions made by national governments and regional authorities over time, and their impact on the safe utilization of sewage sludges in farming.

5. Results Transposition, Application, and Enforcement of the SSD in Italy

5.1. Transposition

The transposition of Directive 86/278/EEC into Italian national legislation was completed in 1992, with the approval of Decreto Legislativo 99/1992 [47]. The choice of ‘decreto legislativo’ meant that the government could adopt the provision based on a delegated act of the parliament. Specifically, Law 428/1990 delegated the government to adopt around 90 directives, including 86/278/EEC, whose transposition was long overdue. Law 428/1990 required the national government to submit draft legislation to the relevant parliamentary committees, who could discuss it and deliver an opinion within 60 days. Should the parliamentary committees fail for whatever reason to provide comments, the government was authorised to proceed with the formal approval of the decree. This is what happened for the transposition of the SSD. The seventh Andreotti government submitted the proposal for text in mid-November 1991 and formally adopted it at the end of January 1992, without a parliamentary debate to scrutinise it. The decree then entered into force on 1 March 1992. The transposition was therefore late, to the point that Italy missed the first reporting deadline in 1991 (only a few states submitted implementation reports, and the Commission did not publish any results. Italy also failed to submit a report for the second and third reporting periods).

The Italian law introduced some changes to the EU version of the directive. It increased the legislative density, since it required additional implementation acts to be adopted at the regional level. Specifically, as is explained in more detail in the next section, regions were required to adopt a regulation, and they were allowed to define their own specific criteria for the determination of safety (art. 6 d.lgs 99/1992).

In terms of the customisation of restrictiveness, Italian choices were mixed. Some provisions were more restrictive. In particular, while the EU directives allowed the use of untreated sludge under certain conditions, the Italian provision explicitly prohibited the practice, thus making the treatment of sludge mandatory (France, Sweden, and Ireland also have specified criteria for the use of untreated sewage sludge). Furthermore, some of the limits for the presence of heavy metals were stricter, and requirements for analysis were more frequent.

However, a crucial and highly consequential customisation made the Italian law overall more lenient. The original directive admitted the use in agriculture of sludges resulting from domestic and urban wastewaters and ‘from other sewage plants treating waste waters of a composition similar to domestic and urban waste waters’ (article 2). It did not mention a third category, namely industrial wastewaters. The Italian law referred to a different classification of wastewaters and permitted the use of sludges from both ‘civil’ and ‘productive’ sites (the definition of a ‘productive site’ was provided by Law 319/1976 on water pollution, which states that they are sites where the production of goods takes place permanently or temporarily), provided that the quality of the latter was comparable. Consequently, the criteria for the evaluation of comparability became crucial because the type of contaminants that could be expected in domestic wastewaters and productive wastewaters were very different. Yet, the specification of the criteria for the analysis and for the comparison of civil and industrial sludges was left open, no additional provision was added to consider a very relevant difference in the sources of wastewaters, and the matter was delegated to the regions to decide. In short, the transposition of the SSD into Italian legislation authorised the use of industrial sewage sludge in agriculture according to criteria that the EU proposed for domestic and urban wastewaters, with consequences that would become apparent only 25 years later.

5.2. Subsequent Developments at the National Level: Water, Waste, and Fertiliser Legislations

The SSD is very old and—as previously noted—outdated. Yet, a reform of the directive has not been delivered, either at the EU or at national level. Both Directive 278/1986 and D.lgs 99/1992 are still enforced and remain substantially unchanged. However, the policy debate on the safe utilisation of sewage sludge has continued at the EU level, providing

inputs of potentially direct relevance for the regulation of the sector. Moreover, it is important to note the indirect impacts from developments in legislation on water protection, waste management, and fertilisers. This means that, at different points in time, Italian decision-makers had relevant policy choices to make. In the 30-year process, four crucial moments are worth nothing.

- (1) In the late 1990s, the EU Commission was already planning to reform the SSD and set up an expert group to inform policy developments. In 2000, the Commission circulated a working document, known in policy circles as the '3rd draft', which proposed a series of important changes [48]. The most relevant ones were an update of limits for heavy metals, the addition of new parameters related to organic compounds and dioxins, and the possibility of utilising sewage sludge from a specific list of food industries, namely meat, fish, fruit, vegetable, and sugar processing, alcoholic and non-alcoholic beverages, paper, and leather. Later, the Commission commissioned additional studies, and the findings were along the same lines [23,49,50]. While an official proposal for reform of the SSD has not been advanced (it goes beyond the scope of this paper to trace policy debates on the reform of the SSD at the EU level. The lack of an official proposal was in part due to the highly differentiated paths taken by member states since the adoption of the SSD (see above) and the difficulties in delivering a comprehensive soil protection policy (Author, forthcoming)), the debate promoted by the Commission clearly signalled the inadequacy of the 1986 criteria. It also recognised that most MSs had already independently adopted stricter criteria (see above), and consequently, there was a necessity to intervene to revise common standards.
- (2) Second, an intervention at the national level acknowledged EU inputs on sewage sludges in the context of policy processes on water pollution. In 1998, Italy was condemned by the European Court of Justice for failing to comply with some provisions on dangerous chemicals in waters (Judgement of 1 October 1998 in Case C-285/96 for failing to adopt pollution reduction programmes with quality objectives for the 99 dangerous substances as required by Council Directive 76/464/EEC of 4 May 1976). To fulfil its obligations, the Ministry of the Environment (second Berlusconi government) issued a ministerial decree to establish a list of substances that should be prioritised in monitoring and detection to deliver on water quality requirements. The relevance of the present study lies in the fact that the ministerial decree n. 367/2003, under the heading 'industrial wastewater', forbid the use of sewage sludge in agriculture [51]. It seems, therefore, that the Ministry tried to remedy the situation created by D.lgs 99/1992, albeit in a secondary legislation whose legal force was immediately questioned [52]. Local authorities also questioned the feasibility of new dispositions, leading the government to issue a clarification note in 2004, which gave regions discretion in implementation. As is explained below, only Emilia Romagna reacted by introducing limitations in use. Indeed, the available data show that, in the period of 2003–2004, the share of sewage sludges reutilised in agriculture decreased by 17%, mostly because of policy changes in Emilia Romagna [53]. Later, decree 367/2003 was substituted by decree 219/2010 (adopted by the fourth Berlusconi government), which removed any reference to sewage sludge [54].
- (3) A third crucial moment refers to the definitions of wastewater sources and took place on the occasion of the transposition into national legislation of Directive 91/271/EEC on urban wastewater. The (delayed) transposition was finalised only in 1999, with the adoption of D.lgs 152/1999 [55]. Notably, decree 152/1999 established the alignment of the Italian categorisation of wastewaters with that in use in EU legislation, thus making reference to domestic, urban, and industrial wastewaters. The move created a mismatch between the new terminology and the terminology of decree 99/1992, which, as noted above, referred to wastewaters from civil and productive sites as in Law 319/1976, now no longer in force. As a result, it was still legally possible to mix domestic and industrial wastewaters. The opportunity to correct such ambiguity was

missed at the time of the publication of the so-called 'Testo Unico Ambientale' (TUA, Legislative decree 152/2006, Single Environmental Text) in 2006 [56]. The government (second Prodi government) systematised the entire acquis and published a consolidated version of the environmental legislation in force. Neither the decree 152/1999 nor the TUA amended D.lgs 99/1992 because it was considered complementary legislation referring to a special category of waste.

- (4) A fourth and highly consequential initiative was linked to the legislation on fertilisers adopted in 2010. Of interest here, it should be noted that decree 75/2010 established that sewage sludges could be utilised for the production of soil improvers, providing that they met some safety criteria. Sludges were employed to produce soil improvers and received 'end of waste' status. In short, they were no longer considered waste but products. The main consequence was that the full obligations foreseen for waste management—for example, in terms of traceability—were no longer valid, thus reducing costs and procedures. At what stage of the treatment sewage sludge ceases to be waste and can be considered a product has been at the centre of a complicated and prolonged juridical case, which has seen different levels of jurisdictions disagree. The matter was eventually clarified by the government (Meloni) in April 2023. The option of transforming sewage sludge into soil improvers was taken by multiple operators and has since become the main route for the recovery of sludges. ISPRA [31] reported that over 447,000 tonnes of soil improvers were produced in 2021. However, as is explained below, the lack of obligations and controls had adverse side effects and was exploited by fraudulent producers. The judiciary found that over 150,000 tonnes of soil improvers produced from highly contaminated sewage sludge have been spread in Tuscany, Lombardy, and Emilia Romagna (see <https://economiecircolare.com/fanghi-e-gessi-di-depurazione-senza-tracciabilita-il-rischio-e-grosso/>, accessed on 3 November 2023).

On the whole, these legislative developments have been designed to make the Italian law more permissive; they did not forbid the use of sewage sludges from industrial wastewaters, left decisions on safety criteria to the regional authorities, and allowed the use of sludge in the production of soil improvers, thus relaxing obligations in terms of controls as well as costs. These developments made it possible to recover a higher proportion of sewage sludge, avoiding the need to dispose of them into landfills or abroad. However, they also raised concerns among the population and regulators. In 2016, a group of representatives in the national parliament presented a decree to ask the government to reform D.lgs 99/1992, without success. The government (Gentiloni government) started an initiative and published a draft regulation in 2018 [57,58]. This proposal addressed most of the critical issues and was generally praised by stakeholders who asked for clarity and certainty. However, the resignation of Gentiloni in June 2018 prevented further action; the legislative text was never put to vote and never adopted, and to date, D.lgs 99/1992, with all its ambiguities, remains in force.

5.3. Multilevel Applications

As noted above, regions were in charge of the adoption of crucial implementation regulations to establish criteria for the safe utilisation in agriculture of sewage sludges from domestic and productive sites. A first important aspect was that regions proved very slow in responding to this. Second, regional provisions were highly divergent and overall made for a deeply fragmented regulatory framework.

Emilia Romagna issued guidelines for the use of sewage sludge in agriculture in 2004 [59]. Emilia Romagna decided to follow EU indications as presented in the 3rd draft (see above) and introduced some additional requirements to D.lgs 99/1992. The guidelines significantly departed from national provisions since they made explicit the prohibition of the use of industrial sewage sludges, with the exception suggested by the EU 3rd draft of those produced by agro-food industries. Second, the region expanded the list of contaminants to be analysed and outlined detailed methods of analysis to be employed

in monitoring. The guidelines were reformed in 2019 to integrate further requirements for contaminants and analysis [60].

Lombardia took a very different and ‘pragmatic’ approach. Wastewater treatment is improving but still problematic in Lombardy. The Commissario per la depurazione reported that around 10% of Italian non-compliant plants fined by the EU in various infringement procedures are located there. Plants are often too small and outdated, resulting in insufficient depuration. The region is highly industrialised, thus making it technically difficult to manage civil and industrial wastewaters separately. Consequently, wastewater treatment plants deal with ‘inputs’ that present a variety of contaminants. The total sludge production is around 800,000 tonnes per year and comes from civil (50%), agro-industrial (20%), and industrial (30%) sources. The first comprehensive guidelines were adopted in 2014 [61] and, contrary to those in Emilia Romagna, did not exclude wastewaters from industrial sites. Notably, the list of industrial sectors whose sludges were admissible in agriculture included food production but also chemical and pharmaceutical industries, which were therefore considered ‘comparable’ to domestic sources. Furthermore, the 2014 guidelines did not extend the list of parameters to be checked for the authorisation of use in farming, limiting legal requirements to the original list of heavy metals. In short, the Lombardy guidelines took full advantage of the lenient regulatory provisions adopted in 1992. Later, as is explained in the next section, the region was forced by judicial action to change such provisions and introduced limitations on the sources of sludges, as well as on contaminant concentrations.

Table 2 below summarises the main differences among EU, national, and regional provisions to highlight crucial discrepancies in sources of sewage sludge authorized for use in agriculture and the list of contaminants to be checked in monitoring.

Table 2. Summary of the main provisions in EU, national, and regional legislation on sewage sludges.

	Sludges Admissible in Agriculture	Monitored Contaminants
EU directive	Urban and domestic wastewaters and others of similar composition	List of heavy metals likely to be found in urban and domestic wastewaters
National law	Civil wastewaters and productive sites	List of heavy metals (same as EU)
National law since 2006	Domestic, urban, and industrial wastewaters	List of heavy metals (same as EU)
Regional regulation: Emilia Romagna	Industrial wastewaters admitted only from the agro-food industry	Extended list of contaminants to be monitored
Regional regulation: Lombardy	Industrial wastewaters admitted, including chemical and pharmaceutical	List of heavy metals (same as EU); no additional requirements

These developments suggest that regional authorities were in charge of crucial choices that could potentially rectify national provisions in significant ways. Yet, the discretion given to regional governments led them to design rules that fit the characteristics of their own waste management systems in order to guarantee the smooth functioning of existing wastewater treatment plants. The negative environmental consequences of such choices materialized during the enforcement phase, as described in Section 5.4.

5.4. Enforcement

The reuse of sewage sludges in farming can indeed represent a virtuous example of a circular economy, provided that rigorous safety criteria are met. Decision-makers were aware of the possibility of contamination and its dangers, and D.lgs 99/1992 introduced sanctions for the use of toxic sludges (it is of note that the Italian penal code did not include any specific sanction in relation to environmental damage until the 2016 reform that introduced so-called ‘eco-crimes’ (Renzi government)). Unfortunately, controls by regional agencies revealed that soil improvers contaminated with hydrocarbons and other

substances were used in northern Italy [62]. Defendants made the argument that the law indicated limits only in relation to heavy metals; as noted above, it did not mention any other chemicals. However, the judges considered that decree 99/1992 was not the only pertinent legal reference for the correct management of sewage sludges and that—in the absence of specific national or regional provisions—relevant norms can be found in the general environmental legislation, specifically in legislation on soil contamination [63]. This means that, even if decree 99/1992 did not set limits for contaminants beyond heavy metals, such limits could be deduced from other sources. In particular, the judges indicated that limits for the presence of hydrocarbons should be set at 50 mg/kg, as indicated in TUA. The legal case was of interest for its policy consequences. As a reaction to the sentence, Lombardy decided to set its own limits and, in 2017, adopted a revised version of the guidelines [64]. Of note is the highly tolerant parameter for the presence of hydrocarbons, set at 10,000 mg/kg. This decision was contested by municipal and provincial authorities at the centre of the legal case. They started, and won, a legal action against the region to have the lenient limit to hydrocarbons cancelled.

A ‘sludge emergency’ exploded. The plants working on the reprocessing of sludge stopped their collection from wastewater treatment plants that could not guarantee clean sludge according to the new limits, de facto threatening to halt the depuration of waters. This in turn required emergency legislation to be adopted—in derogation to existing norms—to avert the paralysis of the entire waste management system (for example, the Lazio region adopted an emergency decree to allow extra storage of sewage sludges).

Into this vacuum stepped the national government (second Conte government), which introduced a series of limits for organic compounds and specifically set those for hydrocarbons to 1000 mg/kg. The difference between the TUA limit of 50 mg/kg and the article 41 limit of 1000 mg/kg was justified by the fact that the former refers to soil and the latter to sludge, which is more concentrated. According to this reasoning, the limit of 50 mg/kg refers to the concentration of hydrocarbons after the spread of sludges or soil improvers. Provisions were included out of context, embedded in an emergency decree issued to address the tragedy of the Morandi bridge in Genoa [65], when in August 2018, the Polcevera overpass, known as the Morandi bridge, in Genoa collapsed, killing 43 people. The inclusion of these limits in a highly visible decree suddenly changed the public and political salience of sewage sludges. Indeed, so far in the tracing of the process, no attention has been given to civil society organisations because of the absence of significant advocacy and protest. There were instances of citizen mobilisation at the municipal level, initiated to protest against nuisances resulting from operations of specific plants. Local mobilisations did not network nor scale-up. However, the new visibility of sludges changed, albeit temporarily, the salience of the issue, alerting national environmental organisations that denounced the environmental crimes linked to the management of wastewaters. Farming organisations also took a critical position, asking to modify norms and guarantee the safety and traceability of sludges, as well as soil improvers [66]. In May 2021, the government (Draghi) adopted a modification to the TUA that explicitly forbid the use of sewage sludges in the preparation of soil improvers. Further, the Draghi government introduced a clause in the national plan for the implementation of the Common Agricultural Policy in the period 2023–2027, which excluded from eligibility for funding those farmers who made use of sewage sludges [67]. Despite these marginal changes, provisions of D.lgs 99/1992 remained fundamentally unmodified. As noted above, the reform drafted in 2018 has not been adopted or further discussed, and at present, the issue does not seem on the agenda. Table 3 below provides a summary of main steps in the implementation of the SSD.

Table 3. Chronology of the implementation of the SSD in Italy.

Year	Sequence of Decisions
1986	Approval of EU legislation on the utilisation of sewage sludge in agriculture.
1992	Transposition of EU legislation into national law.
2003	Secondary legislation temporarily forbids the use of sludges from productive sites in agriculture.
2004	The Ministry for Environment gives regions the discretion to decide their own criteria for the use of SSD.
2004	Region Emilia Romagna forbids the use of sludge from productive sites in agriculture; Lombardy and other regions do not.
2006	Systematic review of environmental legislation omits to rule out the use of industrial sludges that are admissible if comparable to civil ones. Definition of criteria for evaluation is left to regional authorities to decide.
2010	Reform of fertiliser regulations allows the use of sewage sludges in the production of soil improvers.
2012	Evidence of contamination in Tuscany and Lombardy.
2014	The Lombardy region adopts its own guidelines, allowing the use of industrial sludge from pharmaceutical and chemical industries. No additional monitoring of industrial contaminants is required.
2017	Sentence rules that limits for chemicals set in general environmental legislation apply to SSD too, unless specified differently.
2017	Sludge crisis: Waste water treatment plants are unable to comply with general environmental criteria on hydrocarbons.
2017	Emergency legislation is adopted at the regional level to avoid the sludge crisis.
2017	The Lombardy region sets its own criteria on hydrocarbons to bypass sentence 6 June 2017, n. 27,958.
2017	Municipal authorities in Lombardy take legal action against regional criteria.
2018	National government sets limits, forcing Lombardy to correct them.
2018	Formulation of a proposal of reform of national legislation on SSD (never adopted).

6. Discussion and Conclusions: Laggard by Design

The analysis of the transposition, application, and enforcement of the SSD shows that, while compliant on paper, Italy has been non-compliant in practice. The equivalence of domestic sludge with that coming from chemical industries, the eruption of the sludge crises, and the ‘discovery’ of widespread fraud were three illustrations of policy failures. These represent serious threats to public health and the environment, whose scale are still to be fully ascertained.

The analysis reinforced some of the findings of empirical policy research on Italy that highlighted the poor capacity for the coordination of central government, as well as the lack of long-term planning in wastewater management. The implementation of EU wastewater regulatory provisions resulted in a growing and unexpected production of sewage sludge that proved problematic to manage. However, the poor performance of the SSD cannot be explained by factors related to incompetence and negligence. Rather, the empirical evidence points towards intentional decisions that made this outcome possible.

Lenient criteria for the utilization of sewage sludge in farming were necessary to avoid a gridlock in the wastewater treatment system. Indeed, national and regional policymakers proved rather effective in taking advantage of the 1992 customisation that allowed the use of ‘industrial sludges’. National governments never reformed the original decree to introduce stricter criteria. On their part, regions differed in their choices on guidelines: while Emilia Romagna ruled out the utilization of sludges from industrial wastewaters, Lombardy allowed them, including pharmaceutical and chemical productions. In other words, the poor policy outcomes were made possible by the weak safety criteria and standards adopted at different territorial levels. Because policy outcomes result from specific and intentional decisions that made it possible to use potentially dangerous sludges in farming, one might conclude that, in the implementation of the SSD, Italy has been a laggard by design.

In more general terms, the case study showed that substantial non-compliance resulted from chains of events that were triggered by three main factors: first, the customisation of EU rules that left open the possibility to enact lenient environmental and public health safety criteria and, second, the decentralisation of policy competencies on the safety criteria to regional authorities. Third, regions adopted criteria that matched local conditions.

Following the proposal for the visualisation of PT results advanced by Beach and Pedersen [43], the Figure 1 below provides an illustration of the causal chain identified in the analysis.

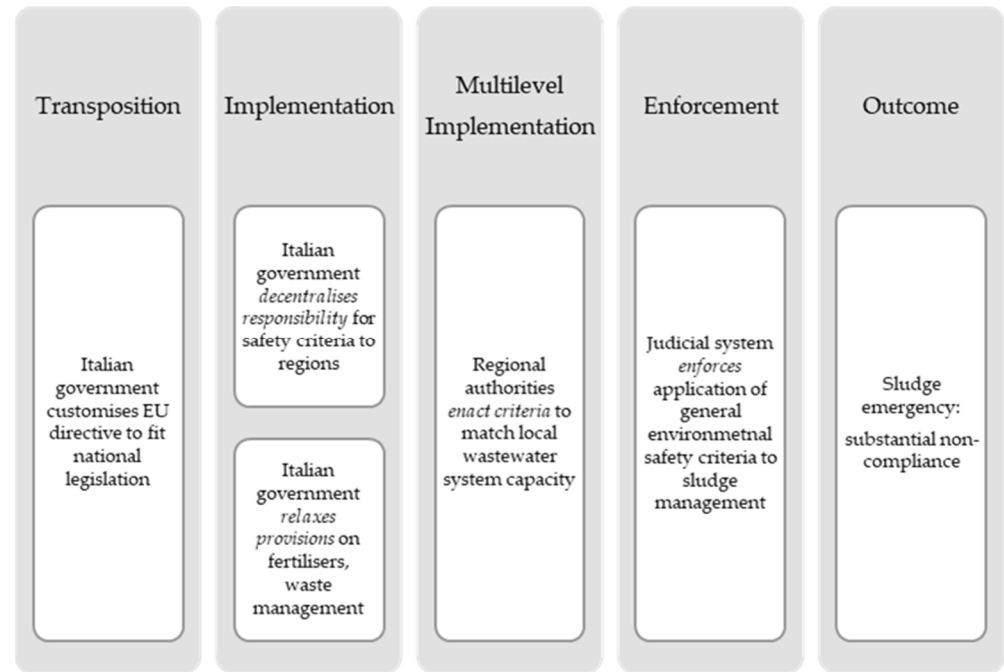


Figure 1. Chain of cause-effect relationships that explain the SSD outcome.

By showing the intentional design of rules that made it legally possible to utilise sludge from industrial sites in farming, the analysis showed a causal path to substantial non-compliance with an EU policy that is an alternative to the pathway previously identified by scholars, since it is not related to poor administrative capacity. In other words, whereas the extant literature explains implementation gaps by pointing at deficits in the political and administrative structures of the country, like lack of competence, low administrative capacity, and neglect, and classifies Italy as a laggard by incapacity, this paper suggested that a second option exists. This alternative path to non-compliance is termed laggard by design and highlights the intentional adoption of national and regional rules that make Italy compliant on paper and non-compliant in practice.

In so doing, this paper contributes to the emerging literature on practical compliance [10,11,15]. However, there are some limitations to be accounted for. Since this paper was based on a single case study, the results cannot be generalised. It is possible that the implementation of the SSD represents a unique case and that the classification of Italy as ‘laggard by design’ cannot be extended beyond this specific example. However, the paper is in line with one of the main goals of process tracing methodology: to use evidence from within-case analysis to develop new hypotheses about causal mechanisms. The ‘laggard by design’ hypothesis that emerged from this study on the SSD should be tested in additional case studies to provide more evidence on its relevance to the literature on the implementation of EU policy.

Future Research and Developments

As noted at the beginning of this paper, this analysis referred to legislation that officially does not present any specific problematic issue. The EU Commission has consistently evaluated Italy as ‘fully compliant’ with the SSD. By shedding light on an apparent successful case that has turned out to be highly problematic, this paper suggests that the degree of non-compliance with EU regulations could be significantly higher than suggested by the extant literature. Along these lines, more research could be carried out that goes beyond

the notion of formal compliance and investigates the EU environmental policy in action. This paper also suggests that future research should pay specific attention to the multilevel structure of EU governance. The SSD case clearly shows that highly consequential decisions are taken by sub-national authorities and that it could be misleading to limit the analysis to decisions taken at the national level. Finally, this paper argues that future research could be directed to extend the range of policy issues under investigation. The scope of EU legislation on environmental protection is vast, to the point that ‘there is almost no virgin territory for environmental regulation anymore in the EU’ [3]. Yet, the extant literature focuses on landmark legislation on water and climate, largely ignoring issues that are apparently minor or marginal, like the SSD.

One might note that EU institutions have recently been discussing the SSD in the context of the Green Deal. The 2023 EU evaluation report of the SSD—while reaffirming the continuing relevance of the directive—states that ‘it is necessary to consider recent and upcoming research and monitoring of pollutants in sludge and soil and review the set of pollutants to be regulated’ [22]. Proposals for stricter regulation of the use of sewage sludge are under discussion and, if finalised, could force Italian authorities to overcome the current gridlock and reform provisions in the country.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The documentary database is available from the author upon request.

Conflicts of Interest: The author declares no conflict of interest.

References

- Jordan, A.; Adelle, C. (Eds.) *Environmental Policy in the EU*. In *Actors, Institutions and Processes*; Routledge: London, UK, 2012.
- Börzel, T.A. *Why Noncompliance*. In *The Politics of Law in the European Union*; Cornell University Press: Ithaca, NY, USA, 2021.
- Delreux, T.; Happaerts, S. *Environmental Policy and Politics in the European Union*; Palgrave Macmillan: London, UK, 2016.
- European Commission. *Environmental Implementation Review 2022*; COM (2022) 438 Final; European Commission: Brussels, Belgium, 2022.
- Falkner, G.; Treib, O.; Hartlapp, M.; Leiber, S. *Complying with Europe: EU Harmonisation and Soft Law in the Member States*; Cambridge University Press: Cambridge, UK, 2005.
- Liefferink, D.; Arts, B.; Kamstra, J.; Ooijevaar, J. Leaders and laggards in environmental policy: A quantitative analysis of domestic policy outputs. *J. Eur. Public Policy* **2009**, *16*, 677–700. [[CrossRef](#)]
- Falkner, G.; Hartlapp, M.; Treib, O. Worlds of compliance: Why leading approaches to European Union implementation are only ‘sometimes-true theories’. *Eur. J. Political Res.* **2007**, *46*, 395–416. [[CrossRef](#)]
- Pridham, G. Environmental policies and problems of European legislation in Southern Europe. *South Eur. Soc. Politics* **1996**, *1*, 47–73. [[CrossRef](#)]
- Treib, O. Implementing and complying with EU governance outputs. *Living Rev. Eur. Gov.* **2014**, *9*, 1–47. [[CrossRef](#)]
- Versluis, E. Even rules, uneven practices: Opening the ‘black box’ of EU law in action. *West Eur. Politics* **2007**, *30*, 50–67. [[CrossRef](#)]
- Thomann, E.; Sager, F. Moving beyond legal compliance: Innovative approaches to EU multilevel implementation. *J. Eur. Public Policy* **2017**, *24*, 1253–1268. [[CrossRef](#)]
- Bondarouk, E.; Mastenbroek, E. Reconsidering EU Compliance: Implementation performance in the field of environmental policy. *Environ. Policy Gov.* **2018**, *28*, 15–27. [[CrossRef](#)]
- Börzel, T.A.; Buzogány, A. Compliance with EU environmental law. The iceberg is melting. *Environ. Politics* **2019**, *28*, 315–341. [[CrossRef](#)]
- European Commission. *Report from the Commission to the Council and the European Parliament the European Social and Economic Committee and the Committee of the Regions on the Implementation of Community Waste Legislation for the Period 2007–2009. Directive 2006/12/EC on Waste, Directive 91/689/EEC on Hazardous Waste, Directive 75/439/EEC on Waste Oils, Directive 86/278/EEC on Sewage Sludge, Directive 94/62/EC on Packaging and Packaging Waste, Directive 1999/31/EC on the Landfill of Waste, and Directive 2002/96/EC on Waste Electrical and Electronic Equipment*; COM (2013) 6 Final; European Commission: Brussels, Belgium, 2013; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52013DC0006&qid=1701678491510> (accessed on 3 November 2023).
- Zhelyazkova, A.; Kaya, C.; Schrama, R. Decoupling practical and legal compliance: Analysis of member states’ implementation of EU policy. *Eur. J. Political Res.* **2016**, *55*, 827–846. [[CrossRef](#)]

16. Thomann, E. *Customized Implementation of European Union Food Safety Policy: United in Diversity?* Palgrave: London, UK, 2019.
17. Hartlapp, M.; Falkner, G. Problems of Operationalization and Data in EU Compliance Research. *Eur. Union Politics* **2009**, *10*, 281–304. [[CrossRef](#)]
18. La Spina, A.; Sciortino, G. Common agenda, southern rules: European integration and environmental change in the Mediterranean states. In *European Integration & Environmental Policy*; Liefferink, D., Lowe, P., Mol, J., Eds.; Belhaven: London, UK, 1993; pp. 217–236.
19. Pridham, G.; Cini, M. Enforcing environmental standards in the European Union: Is there a southern problem? In *Environmental Standards in the European Union in an Interdisciplinary Framework*; Faure, M., Vervaele, J., Weale, A., Eds.; Maklu, Nomos, Blackstone: Antwerp, Belgium, 1994; pp. 251–277.
20. Andersen, M.; Liefferink, D. *The Impact of the Pioneers on EU Environmental Policy*; Manchester University Press: Manchester, UK, 1997; pp. 1–39.
21. Knill, C.; Heichel, S.; Arndt, D. Really a front-runner, really a Straggler? Of environmental leaders and laggards in the European Union and beyond—A quantitative policy perspective. *Energy Policy* **2012**, *48*, 36–45. [[CrossRef](#)]
22. European Commission. *Commission Staff Working Document Evaluation. Council Directive 86/278/EEC of 12 June 1986 on the Protection of the Environment, and in Particular of the Soil, When Sewage Sludge Is Used in Agriculture. SWD (2023) 157 Final*; European Commission: Brussels, Belgium, 2023; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52023SC0157&qid=1701678881794> (accessed on 3 November 2023).
23. Milieu Ltd.; WRC; Risk & Policy Analysts Ltd. (RPA). *Environmental, Economic and Social Impacts of the Use of Sewage Sludge on Land; Final Report, Part III: Project Interim Reports*; Milieu Ltd: Brussels, Belgium, 2010.
24. European Commission. *Ensuring Availability and Affordability of Fertilisers*; COM (2022) 590 Final/2; European Commission: Brussels, Belgium, 2022; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52022DC0590%252801%2529&qid=1701683104186> (accessed on 3 November 2023).
25. Kacprzak, M.; Neczaj, E.; Fijałkowski, K.; Grobelak, A.; Grosser, A.; Worwag, M.; Rorat, A.; Brattebo, H.; Almås, Å.; Singh, B.R. Sewage sludge disposal strategies for sustainable development. *Environ. Res.* **2017**, *156*, 39–46. [[CrossRef](#)] [[PubMed](#)]
26. Mininni, G.; Blanch, A.R.; Lucena, F.; Berselli, S. EU policy on sewage sludge utilization and perspectives on new approaches of sludge management. *Environ. Sci. Pollut. Res.* **2015**, *22*, 7361–7374. [[CrossRef](#)] [[PubMed](#)]
27. Council of the European Communities. *Council Directive of 12 June 1986 on the Protection of the Environment, and in Particular of the Soil, When Sewage Sludge Is Used in Agriculture*; 86/278/EEC; Council of the European Communities: Brussels, Belgium, 1986.
28. Hudcová, H.; Vymazal, J.; Rozkošný, M. Present restrictions of sewage sludge application in agriculture within the European Union. *Soil Water Res.* **2019**, *14*, 104–120. [[CrossRef](#)]
29. Joint Research Centre of the European Commission. *Occurrence and Levels of Selected Compounds in European Sewage Sludge Samples*; Publications Office of the European Union: Luxembourg, 2012.
30. Eurostat. *Sewage Sludge Production and Disposal*; Eurostat: Luxembourg, 2023; Available online: https://ec.europa.eu/eurostat/databrowser/view/env_ww_spd/default/table?lang=en (accessed on 3 November 2023).
31. ISPRA. *Rapporto Rifiuti Speciali*, 2023 ed.; ISPRA: Rome, Italy, 2023.
32. Council of the European Communities. *Council Directive of 21 May 1991 Concerning Urban Waste Water Treatment*; 91/271/EEC; Council of the European Communities: Brussels, Belgium, 1991.
33. Kelessidis, A.; Stasinakis, A.S. Comparative study of the methods used for treatment and final disposal of sewage sludge in European countries. *Waste Manag.* **2012**, *32*, 1186–1195. [[CrossRef](#)] [[PubMed](#)]
34. European Commission. *Report from the Commission to the Council and the European Parliament on the Implementation of Community Waste Legislation for the Period 1998–2000. Directive 75/442/EEC on Waste, Directive 91/689/EEC on Hazardous Waste, Directive 75/439/EEC on Waste Oils and Directive 86/278/EEC on Sewage Sludge and Directive 94/62/EC on Packaging and Packaging Waste*; COM (2003) 250 Final/3; European Commission: Brussels, Belgium, 2003; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52003DC0250&qid=1701684204143> (accessed on 3 November 2023).
35. European Commission. *Report from the Commission to the Council and the European Parliament the European Social and Economic Committee and the Committee of the Regions on the Implementation of Community Waste Legislation for the Period 2010–2012. Implementation of Directive 2008/98/EC on Waste, Directive 86/278/EEC on Sewage Sludge, Directive 1999/31/EC on the Landfill of Waste, Directive 94/62/EC on Packaging and Packaging Waste, Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE), and Directive 2006/66/EC on Batteries and Accumulators*; COM (2017) 88 Final; European Commission: Brussels, Belgium, 2017; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52017DC0088&qid=1701684260874> (accessed on 3 November 2023).
36. ISPRA. *Rapporto Rifiuti Speciali*, 2020 ed.; ISPRA: Rome, Italy, 2020.
37. Utilitalia. *Indagine UTILITALIA sui Fanghi dal Trattamento Delle Acque Reflue Urbane nel 2018*; Utilitalia: Rome, Italy, 2021.
38. ISTAT. *Censimento delle Acque per Uso Civile*; ISTAT: Rome, Italy, 2022.
39. Lucci, S. Uso dei fanghi di depurazione in agricoltura. Attività di controllo e vigilanza del territorio. In *Proceedings of the Seminario Fanghi di Depurazione Delle Acque Urbane*, Università di Tor Vergata, Rome, Italy, 9 February 2017.

40. European Commission. *Report from the Commission to the Council and the European Parliament on the Implementation of Community Waste Legislation for the Period 2001–2003. Directive 75/442/EEC on Waste, Directive 91/689/EEC on Hazardous Waste, Directive 75/439/EEC on Waste Oils, Directive 86/278/EEC on Sewage Sludge, Directive 94/62/EC on Packaging and Packaging Waste and Directive 1999/31/EC on the Landfill of Waste*; COM (2006) 406 Final; European Commission: Brussels, Belgium, 2006; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52006DC0406&qid=1701684512751> (accessed on 3 November 2023).
41. European Commission. *Report from the Commission to the Council and the European Parliament the European Social and Economic Committee and the Committee of the Regions on the Implementation of Community Waste Legislation for the Period 2004–2006. Directive 2006/12/EC on Waste, Directive 91/689/EEC on Hazardous Waste, Directive 75/439/EEC on Waste Oils, Directive 86/278/EEC on Sewage Sludge, Directive 94/62/EC on Packaging and Packaging Waste, Directive 1999/31/EC on the Landfill of Waste and Directive 2002/96/EC on Waste Electrical and Electronic Equipment*; COM (2009) 633 Final; European Commission: Brussels, Belgium, 2009; Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%253A52009DC0633&qid=1701684568169> (accessed on 3 November 2023).
42. European Economic and Social Committee. *Opinion of the Economic and Social Committee on ‘The Revision of Council Directive 86/278/EEC on the Use of Sewage Sludge in Agriculture’*; 2001/C 14/26; European Economic and Social Committee: Brussels, Belgium, 2001.
43. Beach, D.; Pedersen, R.B. *Process-Tracing Methods: Foundations and Guidelines*; University of Michigan Press: Ann Arbor, MI, USA, 2013.
44. Bennet, A.; Checkel, J.T. (Eds.) *Process Tracing: From Metaphor to Analytic Tool*; Cambridge University Press: Cambridge, UK, 2015.
45. Blatter, J.; Haverland, M. Case Studies and (Causal-) Process Tracing. In *Comparative Policy Studies: Conceptual and Methodological Challenges*; Engeli, I., Allison, C.R., Eds.; Palgrave Macmillan UK: London, UK, 2014; pp. 59–83.
46. Checkel, J.T. Process Tracing—Towards a New Research Agenda. In *Proceedings of the Annual Convention of the American Political Science Association, Seattle, WA, USA, 15–18 September 2021*.
47. Governo Italiano. *Decreto Legislativo 27 Gennaio 1992, n. 99 Attuazione della Direttiva n. 86/278/CEE Concernente la Protezione Dell’ambiente, in Particolare del Suolo, Nell’utilizzazione Deifanghi di Depurazione in Agricoltura*; D.lgs 99/1992; Governo Italiano: Rome, Italy, 1992.
48. European Commission. *Working Document on Sludge*, 3rd ed.; ENV.E.3/LM; European Commission: Brussels, Belgium, 2000.
49. Bio Intelligence Service; Arcadis; Institute for European Environmental Policy. *Ex-Post Evaluation of Certain Waste Stream Directives. Final Report*; European Commission: Brussels, Belgium, 2014.
50. European Commission. *Environmental, Economic and Social Impacts of the Use of Sewage Sludge on Land, Final Report Part I: Overview Report*; European Commission: Brussels, Belgium, 2008.
51. Ministero dell’Ambiente e della Tutela del Territorio. *DECRETO 6 Novembre 2003, n. 367 Regolamento Concernente la Fissazione di Standard di Qualita’ Nell’ambiente Acquatico per le Sostanze Pericolose, ai Sensi Dell’articolo 3, Comma 4, del Decreto Legislativo 11 Maggio 1999, n. 152*; DM 367/2003; Ministero dell’Ambiente e della Tutela del Territorio: Rome, Italy, 2003.
52. Albertazzi, B. La disciplina dei fanghi di depurazione tra norme statali e regionali. *ARPA Riv.* **2009**, *3*, 55–57.
53. APAT; ONR. *Rapporto Rifiuti 2005*; APAT: Rome, Italy, 2005.
54. Governo Italiano. *Decreto Legislativo 10 Dicembre 2010, n. 219. Attuazione della Direttiva 2008/105/CE Relativa a Standard di Qualita’ Ambientale nel Settore della Politica delle Acque, Recante Modifica e Successiva Abrogazione delle Direttive 82/176/CEE, 83/513/CEE, 84/156/CEE, 84/491/CEE, 86/280/CEE, Nonche’ Modifica della Direttiva 2000/60/CE e Recepimento della Direttiva 2009/90/CE Che Stabilisce, Conformemente Alla Direttiva 2000/60/CE, Specifiche Tecniche per L’analisi Chimica e Il Monitoraggio dello Stato delle Acque.* (10G0244); D.lgs 219/2010; Governo Italiano: Rome, Italy, 2010.
55. Governo Italiano. *Decreto Legislativo 11 Maggio 1999, n. 152 Disposizioni Sulla Tutela delle Acque Dall’inquinamento e Recepimento della Direttiva 91/271/CEE Concernente Il Trattamento delle Acque Reflue Urbane e Della Direttiva 91/676/CEE Relativa Alla Protezione delle Acque Dall’inquinamento Provocato Dai Nitrati Provenienti da Fonti Agricole*; D.lsg 152/1999; Governo Italiano: Rome, Italy, 1999.
56. Governo Italiano. *Decreto Legislativo 3 Aprile 2006, n. 152. Norme in Materia Ambientale*; D.lgs 152/2006; Governo Italiano: Rome, Italy, 2006.
57. Governo Italiano. *Bozza D.lgs XXX. Disciplina della Gestione dei Rifiuti Costituiti da Fanghi di Depurazione delle Acque Reflue e Attuazione della Direttiva 86/278/CEE Concernente la Protezione Dell’ambiente, in Particolare del Suolo, Nell’utilizzazione dei Fanghi di Depurazione in Agricoltura*; Governo Italiano: Rome, Italy, 2018. Available online: https://www.mase.gov.it/sites/default/files/archivio/allegati/rifiuti/direttive_rifiuti/contributi/discariche_fanghi/02bozza_fanghi.pdf (accessed on 3 November 2023).
58. Governo Italiano. *Relazione Illustrativa Decreto Fanghi*; Governo Italiano: Rome, Italy, 2018. Available online: https://www.mase.gov.it/sites/default/files/archivio/allegati/rifiuti/direttive_rifiuti/contributi/discariche_fanghi/01relazione_fanghi.pdf (accessed on 3 November 2023).
59. Giunta della Regione Emilia Romagna. *Primi Indirizzi alle Province per la Gestione e L’autorizzazione All’uso dei Fanghi di Depurazione in Agricoltura*; SSR/04/105217; Giunta della Regione Emilia Romagna: Bologna, Italy, 2004.
60. Giunta della Regione Emilia Romagna. *Disposizioni Urgenti in Materia di Utilizzo Agronomico dei Fanghi di Depurazione*; Delibera 326 del 04/03/2019; Giunta della Regione Emilia Romagna: Bologna, Italy, 2019.

61. Giunta della Regione Lombardia. *Disposizioni Regionali per il Trattamento e L'utilizzo, a Beneficio Dell'agricoltura, dei Fanghi da Depurazione delle Acque Reflue di Impianti Civili ed Industriali in Attuazione Dell'art. 8, Comma 8, della Legge Regionale 12 Luglio 2007, n. 12. Conseguente Integrazione del Punto 7.4.2, Comma 6, n. 2) della d.g.r. 18 Aprile 2012, n. IX 3298, Riguardante le Linee Guida Regionali per L'autorizzazione degli Impianti per la Produzione di Energia Elettrica da Fonti Energetiche Rinnovabili*; d.g.r. 1 Luglio 2014, n. X/2031; Giunta della Regione Lombardia: Milan, Italy, 2014.
62. ISPRA. *Uso dei Fanghi di Depurazione in Agricoltura: Attività di Controllo e Vigilanza del Territorio*; ISPRA: Rome, Italy, 2015.
63. Laraia, R. *L'utilizzo dei Fanghi di Depurazione in Agricoltura. La Normativa, La Giurisprudenza e Le Prossime Revisioni della Legislazione di Settore. Diritto all'Ambiente*. 2020. Available online: http://dirittoambiente.net/file/acque_articoli_258.pdf (accessed on 3 November 2023).
64. Giunta della Regione Lombardia. *Disposizioni Integrative, in Materia di Parametri e Valori Limite da Considerare Per I Fanghi Idonei All'utilizzo in Agricoltura, Alla dgr 2031/2014 Recante Disposizioni Regionali per Il Trattamento e L'utilizzo, a Beneficio Dell'agricoltura, dei Fanghi di Depurazione delle Acque Reflue di Impianti Civili ed Industriali in Attuazione Dell'art. 8, Comma 8, della Legge Regionale 12 Luglio 2007, n. 12; d.g.r. 11 Settembre 2017, n. X/7076*; Giunta della Regione Lombardia: Milan, Italy, 2017.
65. Governo Italiano. *Disposizioni Urgenti per La Citta' di Genova, la Sicurezza della Rete Nazionale Delle Infrastrutture e dei Trasporti, Gli Eventi Sismici del 2016 e 2017, il Lavoro e le Altre Emergenze*; DECRETO-LEGGE 28 Settembre 2018, n. 109; Governo Italiano: Rome, Italy, 2018.
66. Coldiretti. *Osservazioni Alla Proposta di d.lgs Inerente la Disciplina della Gestione dei Fanghi di Depurazione*; Coldiretti: Rome, Italy, 2019. Available online: https://www.mase.gov.it/sites/default/files/archivio/allegati/rifiuti/direttive_rifiuti/contributi/discariche_fanghi/280619/coldiretti_nota.pdf (accessed on 3 November 2023).
67. Governo Italiano. *Piano Strategico Nazionale 2023–2027; Politica Agricola Comune*: Rome, Italy, 2022. Available online: https://www.reterurale.it/PAC_2023_27/PianoStrategicoNazionale (accessed on 3 November 2023).

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.