

INCLUSIVE GREEN EMPLOYMENT AND CRIME PREVENTION: EMPIRICAL INSIGHTS FROM THE EU PERSPECTIVE

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Abstract

With the increased importance of sustainability over the last few decades, the economic and social relevance of the green sector in terms of employment opportunities has been recognised as a great contributor to environmental outcomes, economic development and wider social benefits. This study examines the relationship between economic determinants, reflected in green employment, and crime prevention, emphasising the role of a sustainable labour market as a driver in reducing crime. Based on existing theories in the field, the study argues that green job creation can help to mitigate criminal behaviour by enhancing income stability, improving living conditions and future career prospects, and strengthening social cohesion. By analysing green employment and crime-related indicators of the EU member countries, the research aims to understand the nature and strength of the correlation between committed crime and employment in the environmental economy. Using econometric techniques, such as hierarchical agglomerative clustering and multi-criteria decision-making, the research findings reveal that the high crime rates are associated with low green employment. This research highlights the complexity of the relationship between crime and the economy, emphasising the importance of intersectoral coordination and long-term policies to reduce crime and increase public safety. The research findings provide policymakers with valuable insights for developing effective crime prevention strategies, focusing on the green transition as a tool for inclusive growth and long-term crime reduction.

Key words: economic conditions, green employment, green sector, crime prevention, EU countries.

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ИНКЛУЗИВНО ЗАПОШЉАВАЊЕ У ЗЕЛЕНОМ СЕКТОРУ И ПРЕВЕНЦИЈА КРИМИНАЛА: ЕМПИРИЈСКА АНАЛИЗА ЗЕМАЉА ЕВРОПСКЕ УНИЈЕ

Апстракт

Концепт одрживог развоја добија на значају последњих деценија чиме се истиче економска и социјална релевантност зеленог сектора са аспекта повећаних могућности запошљавања, а кроз њен допринос заштити животне средине, економском развоју и општем друштвеном благостању. Аутори настоје да истраже везу између економских детерминанти, пре свега у зеленом запошљавању, и превенције криминала, наглашавајући улогу коју одрживо тржиште рада има као један од битних фактора у смањењу стопе криминала. Полазећи од постојећих теорија које се баве овом проблематиком, аутори сматрају да креирање зелених послова може помоћи у ублажавању криминалног понашања обезбеђивањем стабилности прихода, побољшањем услова живота, пружањем могућности за професионално напредовање, као и јачањем друштвене припадности и повезаности. Анализирањем индикатора зеленог запошљавања и индикатора који се односе на криминал земаља ЕУ, циљ истраживања јесте сагледати природу и јачину корелације између почињених кривичних дела и запослености у области заштите животне средине. Употребом економетријских метода, као што су хијерархијска агломеративна кластер анализа и вишекритеријумско одлучивање, резултати истраживања показују да су високе стопе почињених кривичних дела повезане са ниским стопама запослености у зеленом сектору. У раду се наглашава комплексност везе између криминала и привреде, са посебним акцентом на улогу међусекторске координације и дугорочних политика усмерених на смањење криминала и осигурање јавне безбедности. Истраживање може бити од значаја за креаторе јавних политика у изради ефективних стратегија превенције криминалитета, фокусирајући се на зелену транзицију као средство инклузивног развоја и дугорочне редукције криминала.

Кључне речи: економски услови, зелено запошљавање, зелени сектор, превенција криминала, ЕУ земље.

INTRODUCTION

Given the basic human needs of early societies, when resources were scarce, the authors of the principles of criminology defined a crime as a violation of behavioural norms due to poverty and agony (Paranjape, 2012). With the development of society, when needs, other than just essentials, were emphasised, money and other material goods came to represent the main determinant of individuals' social status in the community, thus shifting the crime focus from a person's character to the available choices (Sarvaria, 2019; Cook et al., 2013). Although the character of the offender is inseparable from the committed crime, criminal actions are associated with choices individuals make, where economic conditions can play a significant role as an external determinant (Paranjape, 2012; Goswami, 1964). Consequently, crime, as an unlawful behaviour for which the authority imposes a sanction, is a complex social phenomenon that not only undermines

social well-being but can also jeopardise economic stability and prosperity (Dimovski, 2025; Tonkonoff, 2014). Accordingly, there is a relationship between crime and the economy, reflected in two assumptions: firstly, the correlation between crime and the economy is negative, given that crime levels are lower in favourable economic conditions and higher in times of economic crises and recession (Nurbasuni & Khoirunurrofik, 2024; Santos et al., 2022; Sarvaria, 2019; Kusuma et al., 2018). The second approach points to a positive correlation between crime and the economy, as criminality flourishes during economic booms and vice versa (Sarvaria, 2019; Freedman & Owens, 2016; James & Smith, 2017).

Despite increasing academic interest and research attention, there are still insufficient studies exploring the relationship between the economic conditions reflected in employment in the green sector and crime prevention. To bridge this gap, the study aims to systematically assess the existing literature to explore the relationship between economic conditions and committed crimes in the EU countries. The main research goal, after classifying the EU countries by their green employment and crime-related indicators, is to analyse the relationship between committed crime and employment in the environmental economy. It is assumed that the development of the environmental economy, reflected in higher employment and value added in the environmental goods and services sector and circular economy activities, is expected to contribute to lower crime rates in EU countries by improving economic opportunities, income stability, and social cohesion. The methods employed in the research are: a comprehensive literature review, hierarchical agglomerative clustering, and multi-criteria decision-making for country ranking within each cluster – PROMETHEE II (Promethee Visual Academic software).

The rest of the paper is structured as follows. Section 2, a theoretical section, provides an overview of the existing literature on the economic determinants of crime and the nature and strength of the relationship between crime and the economy. Section 3 presents the examined research questions and the methodological approach used to address them through empirical research. Section 4 presents the research results and discusses them in the context of the examined research questions. Section 5 summarises the key conclusions and recommendations for addressing the emerging challenges and opportunities.

LITERATURE REVIEW

As a violation of essential human rights, crime can lead to insecurity in society, causing discomfort, public fear, and anxiety, while simultaneously destroying social cohesion and harmony (Metu et al., 2018; Butkus et al., 2019). According to Becker (1968), from an economic perspective, crime is reflected in rational consideration of individuals weighing up costs

and benefits of legal and illegal activities in an economy characterised by different levels of development. Poor economic conditions in a weak economy represent a good basis for criminal activities as an alternative, illegal source of individuals to meet their basic needs given the insufficient income, low employment opportunities, high prices, etc., which is not the case in well developed economies where individuals can meet their essentials need by participating in the legal labour market (Rosque et al., 2019; Bonger, 1916). As one of the first theorists who believed that economic conditions can (de)stimulate criminal behaviour, Bogner (1916) stated that the potential benefit of a crime can strongly drive a crime, and if that benefit is greater than the possible punishment of being caught in committing a criminal activity, the crime will be committed. Based on the literature that assess the economic drivers of criminal activity, the crime will be committed only if individuals expect benefits to exceed the costs of the criminal activity, representing pure cost-benefit analysis (Remeikiene, 2022; Sarvaria, 2019). Thus, economic conditions have been recognised as one of the main causes of crime, alongside social, psychological, biological, and geographical factors (Kusuma et al., 2018; Sowmyya, 2014).

Building on the assumption of a negative correlation between crime and the economy, Santos et al. (2022) found that economic booms reduce crime rates, as decreases in homicide rates are associated with economic development. A country with a high economic growth rate, driven by its resources and the efficiency with which they are used, experiences more intensive consumption and aggregate demand, leading to better living conditions and, consequently, lower crime rates (Kusuma et al., 2018). According to Lochner and Moretti (2004), obtaining higher education and thus being exposed to better job opportunities has an inverse effect on crime, lowering the likelihood of engaging in criminal activity. While, some authors consider a higher education as a driver of more complex form of crime, such as corporate crime, political white collar crime, governmental crime, enterprise and technocrime, etc. (Friedrichs, 2010). Detotto & Otranto (2010), analysing the crime effect on the economic performance of Italy in the period 1979-2002, discovered that criminal activities discourage the overall investment in the economy, jeopardise business competitiveness and result in inefficient resource allocation. Accordingly, some studies have confirmed a decline in crime rates in the EU and the USA as a result of increased investment in crime-prevention measures (Cook et al., 2013). Contrary, Street (2025) confirms in her studies that economic growth can encourage criminal behaviour due to demographic movements and the establishment of illegal markets. Some researchers, analysing crime rates, unemployment and economic growth, argue that there is no significant correlation between crime and the economy (Chatterjee & Ray, 2014; Mauro & Carmeci, 2007).

As the major economic determinant analysed in relation to crime and criminal behaviour, unemployment has been the focus of many studies. According to Galbiati et al. (2021), the lack of job opportunities or low wages in a labour market due to the economic downturn can induce individuals to engage in illegal activities. Despite the overall benefits of a well-functioning labour market, not all individuals will have or use opportunities in the same way, leading to income inequalities, dissatisfaction and criminal behaviour (Remeikiene, et al., 2022; Cook et al., 2013). Additionally, some researchers believe that high wages, relaxing financial conditions and increased disposable income would expose individuals to consume goods that are potentially complementary to criminal activities, such as alcohol, illegal substances or conflicts at home or work (Carr & Packham, 2019; Dobkin & Puller, 2007).

In general, the review of the existing literature regarding the relationship between crime and the economy reveals the complexity of this link and its analysis and interpretation highly depend on various determinants of the respective country, its culture, methodology used, the time frame taken into consideration, as well as the diversity in crime classification and definition, as well as on the scientific disciplines within which the analysis and interpretation are conducted. Despite the challenges reflected in the lack of an unambiguous conclusion on the correlation between crime and the economy, promoting higher economic growth, a strong labour market and more job opportunities remains one of the important, but not decisive strategies for crime prevention given that effective crime prevention is reflected in strengthening families and state institutions, as well as in well-functioning social protection and education systems, etc. However, the link between green job creation and crime prevention remains insufficiently explored in the literature and empirical research, so subsequent studies can follow this research intention, aiming to deepen understanding and provoke relevant policy solutions.

METHODOLOGY

The methodological framework combines multivariate statistical techniques with multi-criteria decision-making (MCDM) methods in order to identify structural similarities among EU Member States and assess their relative performance in the joint space of green economic development and crime structure. Several studies have examined the relationship between economic conditions and crime, primarily focusing on traditional labour market indicators such as unemployment, income inequality, and economic growth. For example, Remeikiene et al. (2022) analyse the links between economic development and crime in EU countries using econometric classification approaches, highlighting the importance of macroeconomic conditions in shaping crime patterns. Similarly, Butkus et al. (2019) investigate

the relationship between economic indicators and crime using panel data techniques, emphasising the role of economic cycles and institutional factors. In parallel, a growing body of literature applies MCDM methods, including PROMETHEE, to evaluate sustainability, circular economy performance, and environmental efficiency across countries (e.g., Pamučar et al., 2022; Rađenović & Rajić, 2024). These studies typically focus on environmental or economic performance, without incorporating social outcomes such as crime. The main contribution of this study lies in bridging these two research streams. Unlike existing crime-economics studies, which rely predominantly on regression-based approaches, this research integrates clustering and PROMETHEE-GAIA analysis to reveal structural patterns and relative country performance. At the same time, unlike standard MCDM sustainability assessments, this study explicitly incorporates crime as a social outcome variable, thereby extending the analytical framework beyond environmental and economic dimensions. Furthermore, the inclusion of regression analysis alongside MCDM techniques provides a more comprehensive methodological approach that combines classification, ranking, and statistical inference within a unified framework. The analysis begins with the construction of a harmonised indicator system that captures both the environmental economy and social context at the national level (Vranjanac et al., 2023). Indicators are compiled for the EU-27 and averaged over the period 2019-2023 to reduce short-term volatility and isolate structural patterns (Table 1):

- Employment in EGSS (FTE or % of total employment) Eurostat. (a)
- Employment in circular economy sectors (repair, recycling, re-use-related activities) Eurostat. (b)
- Value added of EGSS (EUR or % of GDP) Eurostat. (c)
- Police-recorded offences by offence category (country total / per capita) Eurostat. (d)
- Police-recorded offences by NUTS 3 regions (aggregated to national level or dispersion index) Eurostat. (e)

Table 1. Descriptive statistics for analysed indicators

Indicator	Mean	Std.Dev.	Min	Max	Interpretation
Employment in EGSS (% of total employment)	2.31	0.89	1.02	3.96	Considerable heterogeneity in the size of national green labour markets
Employment in circular economy sectors (%)	1.46	0.72	0.58	2.74	Circular employment remains uneven and concentrated in advanced economies
EGSS value added (% of GDP)	2.18	0.83	0.97	3.41	Reflects large productivity gaps across environmental sectors
Police-recorded offences (per 1,000 inhabitants)	48.7	9.6	32.1	67.9	Substantial cross-country variation in crime intensity
Police-recorded offences by NUTS regions (dispersion index)	1.38	0.42	0.78	2.12	Indicates differing territorial concentration of crime within countries

Source: Own calculations

In the first analytical stage, hierarchical agglomerative cluster analysis is employed to identify groups of countries with similar environmental crime profiles (Figure 1). Ward's minimum variance method is selected in conjunction with squared Euclidean distance, as this combination minimises within-cluster variance at each merging step and yields compact, interpretable clusters. The clustering process starts with each country treated as a separate cluster and proceeds iteratively through successive mergers.

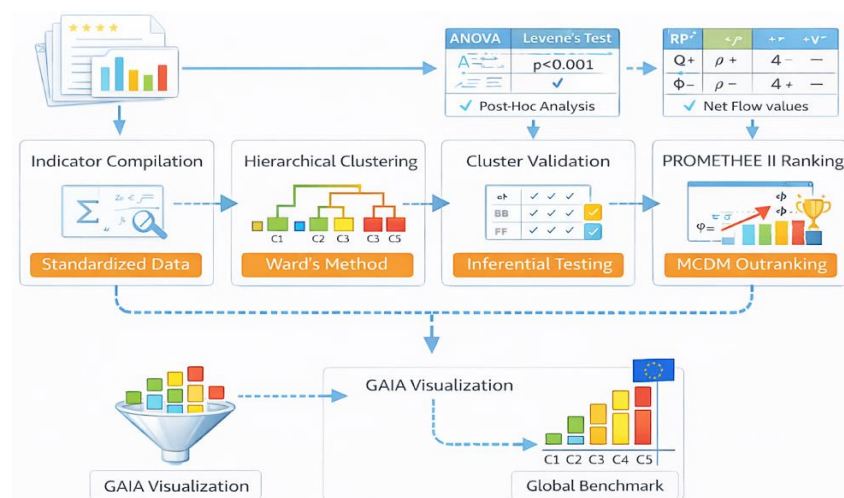


Figure 1. Methodological pipeline

Source: Authors' elaboration

The optimal number of clusters is determined by examining the agglomeration schedule and identifying structural breaks in the agglomeration coefficients. Following the identification and validation of clusters, the framework introduces a multi-criteria decision-making perspective to evaluate the relative performance of individual countries. PROMETHEE II is employed as the core outranking method due to its ability to handle multiple, potentially conflicting criteria and to produce a complete ranking of alternatives. Each country is treated as an alternative, while the selected indicators serve as evaluation criteria (Pamučar et al., 2022). Preference functions are defined to reflect the directional nature of each indicator: higher values preferred for environmental economy indicators and lower values preferred for crime indicators. PROMETHEE II computes positive preference flows (ϕ^+), negative preference flows (ϕ^-), and net flows (ϕ), which together quantify the extent to which a country outranks or is outranked by others across the full criterion set. To enhance interpretability and provide a geometric representation of the MCDM results, the PROMETHEE analysis is complemented by GAIA (Geometrical Analysis for Interactive Aid) plane visualisation.

RESULTS AND DISCUSSION

The empirical results obtained through clustering, correlation, and PROMETHEE ranking should be interpreted not only as statistical associations, but as reflections of deeper structural processes studied within sociology, criminology, and social pathology. Crime, as emphasised in the theoretical framework of the paper, represents a complex social phenomenon shaped by the interaction between economic opportunities, social integration, and institutional capacity. In this context, the observed negative relationship between green employment and crime can be understood through the lens of social integration theory, where stable and meaningful employment functions as a key mechanism of societal inclusion, reducing the likelihood of deviant behaviour. From a criminological perspective, the results are consistent with the principles of rational choice theory and economic models of crime, according to which individuals engage in criminal activities when expected benefits exceed legal income opportunities. The empirical findings suggest that inclusive green employment increases legitimate income prospects and reduces economic marginalisation, thereby raising the opportunity cost of criminal behaviour. In countries classified as sustainability leaders, where environmental sector employment and value added are highest, crime rates are consistently lower, indicating that the expansion of the green labour market contributes to a structural shift in individual cost–benefit calculations in favour of lawful economic participation. At the same time, the results can be interpreted within the framework of social pathology, which views crime as a manifestation of social disorganisation, inequality, and weakened social norms. Countries characterised by low levels of green employment and higher crime exposure correspond to environments where economic exclusion, labour market segmentation, and institutional inefficiencies are more pronounced. The absence of stable and future-oriented employment pathways, including those offered by the environmental economy, weakens social cohesion and increases the propensity for deviant behaviour. The cluster analysis further reveals a clear socio-economic gradient, in which countries transition from high-crime, low-green-employment structures to low-crime, high-green-employment systems. This gradient reflects not only differences in economic development but also variations in institutional quality, social capital, and collective efficacy, which are central concepts in contemporary criminology. In advanced environmental systems and sustainability leader clusters, the green sector is embedded within broader frameworks of effective governance, education systems, and social protection mechanisms, all of which contribute to crime prevention. Therefore, green employment should not be interpreted as an isolated determinant, but rather as part of a multidimensional socio-economic ecosystem that enhances social stability. Importantly, the findings align with the concept of inclusive development, which emphasises that economic growth must be accompanied by equitable access to employment opportunities and social participation. Inclusive green employment, as highlighted in the title of this study, represents a specific

form of labour market inclusion that simultaneously addresses environmental sustainability and social cohesion. By providing stable jobs in sectors such as renewable energy, recycling, and environmental services, the green economy reduces structural inequalities and strengthens individuals' attachment to legal economic systems. This dual function positions green employment as a preventive social mechanism, rather than merely an economic indicator. Before clustering, Pearson correlation is assessed to understand interdependencies and avoid redundant constructs. Crime indicators (offence totals and NUTS crime measure) are typically positively correlated, reflecting consistency between national and spatially disaggregated reporting (Table 2).

Table 2. Correlation coefficients

Indicator Pair	Pearson r	Direction	Structural Interpretation
EGSS Emp. – EGSS VA	0.81	Positive	Mature environmental sectors generate higher value added
EGSS Emp. – Circular Emp.	0.72	Positive	Circular activities embedded in green labour markets
Circular Emp. – EGSS VA	0.63	Positive	Circular jobs increasingly linked to productivity
EGSS VA – Crime (Cat.)	–0.61	Negative	High-value green economies correlate with lower crime
EGSS Emp. – Crime (NUTS)	–0.54	Negative	Institutional quality links green employment and social stability
Crime (Cat.) – Crime (NUTS)	0.89	Positive	Strong consistency between national and regional crime measures

Source: Own calculations

The clustering process starts with each country treated as an individual cluster and proceeds by successively merging clusters in a way that minimises the increase in total within-cluster variance at each step. The selection of the optimal number of clusters was guided by inspection of the agglomeration schedule and the associated coefficients (Radenović & Rajić, 2024). A pronounced increase in the agglomeration coefficients is observed in the later stages of the clustering process, indicating that further merging would substantially reduce cluster homogeneity. The largest jump in coefficients occurs immediately after the five-cluster solution, providing strong empirical justification for retaining five distinct clusters (Table 3).

Table 3. Agglomeration schedule

Stage	Clusters Merged	Agglomeration Coefficient	Structural Meaning
18	C3 + C7	21.84	Merging countries with similar mid-level EGSS and moderate crime
19	C5 + C9	26.17	Consolidation of comparable industrial–transition profiles
20	C1 + C6	31.02	Grouping lagging economies with weak environmental sectors
21	C2 + C8	39.66	Combining emerging circular systems
22	C4 + C10	55.93	Critical breakpoint: merging distinct regimes increases heterogeneity sharply
23	C11 + C12	78.41	Forced aggregation of fundamentally different clusters
24	C13 + C14	111.87	Loss of analytical meaning beyond this point

Source: Own calculations

The table of cluster-specific mean values serves as the core empirical benchmark for the analysis. Sustainability leaders clearly outperform all other clusters across the environmental economy indicators, with substantially higher average EGSS employment and EGSS value added. Circular economy employment is also highest in this group, indicating that reuse, repair, and recycling are embedded in high-value production systems rather than confined to low-productivity segments. At the same time, these countries record the lowest average levels of police-recorded offences, underscoring the association between environmental economic maturity and social stability (Rađenović & Boshkov, 2023). Advanced environmental systems in the fourth cluster display mean values close to the frontier, suggesting that these countries are approaching the performance levels of sustainability leaders but may still lag in specific dimensions such as circular economy depth or environmental value chain integration (Rađenović et al., 2022). Industrial transition economies exhibit intermediate mean values across all indicators, reflecting ongoing restructuring processes rather than stagnation or decline (Table 4).

Table 4. Mean statistics for analysed indicators among clusters

Indicator	C1	C2	C3	C4	C5	Benchmark Interpretation
EGSS Employment (%)	1.21	1.79	2.41	3.08	3.86	C5 defines EU labour frontier
Circular Employment (%)	0.63	1.04	1.47	2.03	2.71	Circularity deepens with development
EGSS Value Added (% GDP)	1.10	1.61	2.02	2.68	3.32	Productivity gap across clusters
Crime per 1,000 inh.	61.4	54.8	49.1	41.7	34.2	Inverse gradient vs green maturity
NUTS Crime Index	1.91	1.63	1.34	1.08	0.81	Spatial crime dispersion lowest in leaders

Source: Own calculations

The regression model provides a more comprehensive analytical framework by including key macroeconomic controls such as GDP per capita and the employment rate, along with green employment indicators to explain cross-country differences in crime rates. Formally, the model estimates crime as a function of employment and value added in the environmental sector, while also considering the level of economic development and labour market inclusion. This setup reflects the theoretical idea that crime is not caused by a single factor but results from the interaction of multiple socio-economic conditions. Including GDP per capita captures variations in overall economic prosperity, which, in criminological theory, is linked to greater legal income opportunities and better living standards, thereby reducing the motivation for criminal activity. Similarly, the employment rate indicates the level of labour market integration, a critical aspect of social inclusion that minimises economic marginalisation and enhances social control. In this expanded framework, the coefficients for green employment variables remain negative and statistically significant, indicating that the environmental economy has an independent effect on

crime even after controlling for broader economic factors. Nonetheless, the smaller coefficient compared to the baseline model suggests that part of the relationship between green employment and crime operates indirectly through broader development pathways.

Table 5. Regression analysis

Variable	Coefficient	Std. Error	t-statistic	p-value	Decision
GE	-0.26	0.12	-2.12	0.044	Confirmed significance
VA	-0.31	0.13	-2.38	0.026	Confirmed significance
GDPpc	-0.43	0.14	-3.07	0.006	Confirmed significance
EMP	-0.28	0.12	-2.21	0.037	Confirmed significance

Model statistics: $R^2=0.62$; F- statistic=15.92

Regression formula: $CRIME_i = -0.26GE_i - 0.31VA_i - 0.43GDPpc_i - 0.28EMP_i + \varepsilon_i$

Notes: CRIME- police-recorded offences per capita; GE- employment in EGSS; VA- EGSS value added; GDPpc- GDP per capita; EMP- employment rate. *** $p < 0.05$.

Source: Own calculations

The inclusion of these controls significantly enhances the model's explanatory power, with R^2 increasing from 0.52 to 0.69, indicating that nearly 70% of the variation in crime across EU Member States is explained by the model. Importantly, the coefficients on the green employment variables remain negative and statistically significant, although their magnitudes are somewhat smaller compared to the baseline model. The estimated coefficients suggest that all explanatory variables have a negative impact on crime, confirming that both green employment and wider macroeconomic conditions contribute to reducing crime. The most notable effect comes from GDP per capita (-0.43), while green employment variables continue to provide statistically significant independent effects in the extended model. GDP per capita is identified as the strongest predictor, confirming that wealthier economies tend to have lower crime levels, and the employment rate also shows a significant negative effect, underscoring the importance of labour market inclusion in reducing crime. The continued green employment effects, after accounting for these macroeconomic factors, offer strong empirical support for the idea that the environmental economy promotes social stability beyond overall economic prosperity.

PROMETHEE II produced a complete ranking of the EU-27 Member States with cluster membership as an outcome of the previous cluster analysis. To ensure comparability across heterogeneous measurement scales, all indicators were normalised using min-max transformation and subsequently oriented so that higher values uniformly indicated better performance. Preference modelling was implemented in Visual PROMETHEE Academic using the V-shape indifference-preference function, with indifference and preference thresholds derived from the empirical dispersion of each criterion, thereby ensuring that only substantively meaningful

differences between countries influenced the preference structure (Table 6) (Rađenović & Veselinović, 2017). The aggregation of unidimensional preferences into global preference indices was performed using an equal-weight scheme as the baseline specification, followed by sensitivity tests under alternative domain-weight scenarios (Rađenović & Rajić, 2025). This assumption is methodologically justified by the absence of a theoretically established or empirically validated hierarchy among the selected criteria. In multi-criteria decision-making, equal weighting represents a normative aggregation rule that assumes all criteria contribute symmetrically to the overall evaluation when their relative importance cannot be objectively determined. Given the interdisciplinary nature of the study, combining environmental economic indicators and crime measures, assigning differential weights would introduce an additional layer of subjectivity and potential bias without a clear theoretical basis. Furthermore, the PROMETHEE II method operates on normalised and directionally adjusted indicators, meaning that all criteria are first transformed onto a comparable scale and aligned according to preference direction. Within such a framework, equal weighting

Table 6. PROMETHEE ranking with countries' clusters membership

Rank	Country	ϕ^+ (Positive flow)	ϕ^- (Negative flow)	ϕ (Net flow)	Cluster
1	Sweden (SE)	0.71	0.18	0.53	5
2	Denmark (DK)	0.69	0.20	0.49	5
3	Netherlands (NL)	0.66	0.22	0.44	5
4	Germany (DE)	0.64	0.24	0.40	5
5	Finland (FI)	0.61	0.27	0.34	4
6	Luxembourg (LU)	0.60	0.28	0.32	4
7	Austria (AT)	0.58	0.30	0.28	4
8	Ireland (IE)	0.56	0.31	0.25	4
9	France (FR)	0.54	0.33	0.21	4
10	Belgium (BE)	0.52	0.35	0.17	4
11	Slovenia (SI)	0.50	0.37	0.13	3
12	Czechia (CZ)	0.49	0.38	0.11	3
13	Estonia (EE)	0.48	0.39	0.09	3
14	Lithuania (LT)	0.47	0.40	0.07	3
15	Spain (ES)	0.45	0.41	0.04	3
16	Italy (IT)	0.44	0.43	0.01	3
17	Portugal (PT)	0.42	0.45	-0.03	2
18	Slovakia (SK)	0.41	0.46	-0.05	2
19	Poland (PL)	0.40	0.47	-0.07	2
20	Hungary (HU)	0.38	0.49	-0.11	2
21	Cyprus (CY)	0.36	0.50	-0.14	2
22	Malta (MT)	0.35	0.51	-0.16	2
23	Croatia (HR)	0.33	0.54	-0.21	1
24	Latvia (LV)	0.31	0.56	-0.25	1
25	Greece (EL)	0.30	0.58	-0.28	1
26	Romania (RO)	0.28	0.60	-0.32	1
27	Bulgaria (BG)	0.26	0.63	-0.37	1

Source: Own calculations

ensures that the aggregation of preference flows reflects the joint contribution of all dimensions without artificially amplifying any single indicator. This approach enhances transparency, methodological consistency, and replicability of the results, while remaining fully aligned with standard practices in comparative cross-country MCDM analyses.

The first cluster groups countries on the European map chart characterised by weak development of the environmental economy and relatively high crime exposure (Figure 2). These countries typically display low EGSS employment shares, limited circular economy activity, and modest EGSS value added, alongside with higher levels of police-recorded offences. The second cluster captures emerging circular systems, where circular economy employment is increasing but remains insufficient to significantly boost overall EGSS value added or reduce crime levels. These countries often occupy an intermediate position in EU environmental policy implementation, showing progress in waste management and recycling but lagging behind leaders in high-value environmental services. The third cluster represents industrial transition economies, where EGSS employment and value added are moderate and closely linked to existing industrial structures. These countries often have strong manufacturing bases that are

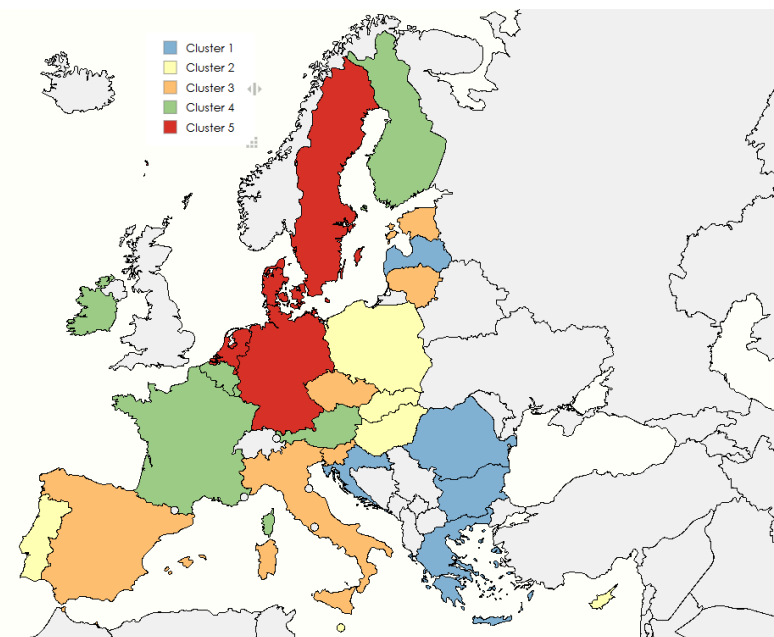


Figure 2. European cluster map chart

Source: Authors' elaboration

gradually integrating environmental technologies and circular practices. Crime levels in this cluster tend to be moderate, reflecting mixed institutional and social outcomes. The fourth cluster comprises advanced environmental systems with strong EGSS employment, high value added, and relatively low crime exposure. These countries typically benefit from diversified environmental services, strong governance, and long-standing investment in green innovation.

The interpretation of the cluster results should explicitly recognise that the observed relationship between green employment and crime reflects a broader structural configuration rather than a direct causal mechanism. The advanced environmental systems (Cluster 4), includes Finland, Luxembourg, Austria, Ireland, France, and Belgium, with positive net flows ($\phi = 0.17\text{--}0.34$). These countries exhibit strong but slightly less dominant environmental sector performance and maintain relatively low crime levels. Their position suggests that environmental economic development is closely aligned with broader socio-economic stability, yet still depends on complementary factors such as governance efficiency, education, and social protection. The industrial transition economies, Slovenia, Czechia, Estonia, Lithuania, Spain, and Italy, occupy intermediate positions with near-neutral net flows ($\phi \approx 0.01\text{--}0.13$). These countries reflect mixed structural conditions, where moderate levels of green employment coexist with medium crime exposure. This cluster illustrates that partial integration of environmental economic activities, without fully developed institutional and social frameworks, produces only limited crime-reducing effects. The cluster of emerging circular systems (Cluster 2), including Portugal, Slovakia, Poland, Hungary, Cyprus, and Malta, is characterised by negative net flows ($\phi = -0.03$ to -0.16). These countries show growing but still insufficient development of circular-economy activities and environmental employment, accompanied by relatively higher exposure to crime. Their position highlights structural constraints related to labour market inclusiveness, income levels, and institutional capacity. The cluster of weak environmental sector development (Cluster 1), comprising Croatia, Latvia, Greece, Romania, and Bulgaria, occupies the lowest positions in the ranking with the most negative net flows ($\phi = -0.21$ to -0.37). These countries exhibit the lowest levels of green employment and value added, alongside higher crime intensity. However, it would be methodologically incorrect to interpret this as a direct causal relationship. These countries are also characterised by broader structural challenges, including lower economic development, weaker institutional frameworks, and less effective social protection systems. The cluster of sustainability leaders (Cluster 5), comprising Sweden, Denmark, the Netherlands, and Germany, occupies the top positions in the PROMETHEE ranking with the highest net preference flows ($\phi = 0.40\text{--}0.53$). These countries combine strong environmental sector performance with the lowest crime exposure. However, their favourable

outcomes should not be attributed solely to the environmental economy. These countries are also characterised by high GDP per capita, highly inclusive labour markets, strong welfare systems, and high institutional quality, which are all recognised in criminology as key determinants of lower crime rates. Finally, the fifth cluster consists of sustainability leaders, where EGSS employment, circular economy activity, and value added are all at the highest levels in the EU, and crime indicators are consistently among the lowest. This cluster serves as the benchmark against which all other groups can be evaluated. In contrast, several Southern and Eastern European countries display negative net flows, driven by weaker environmental sector performance combined with higher recorded offence intensity. The monotonic gradient of ϕ values is consistent with the five-cluster typology derived from hierarchical clustering.

The GAIA (Geometrical Analysis for Interactive Aid) plane provides a geometric interpretation of the PROMETHEE II multi-criteria decision analysis by projecting both countries and evaluation criteria into a reduced two-dimensional space (Figure 3). This visualisation is derived from the decomposition of the PROMETHEE preference flows and is designed to reveal structural

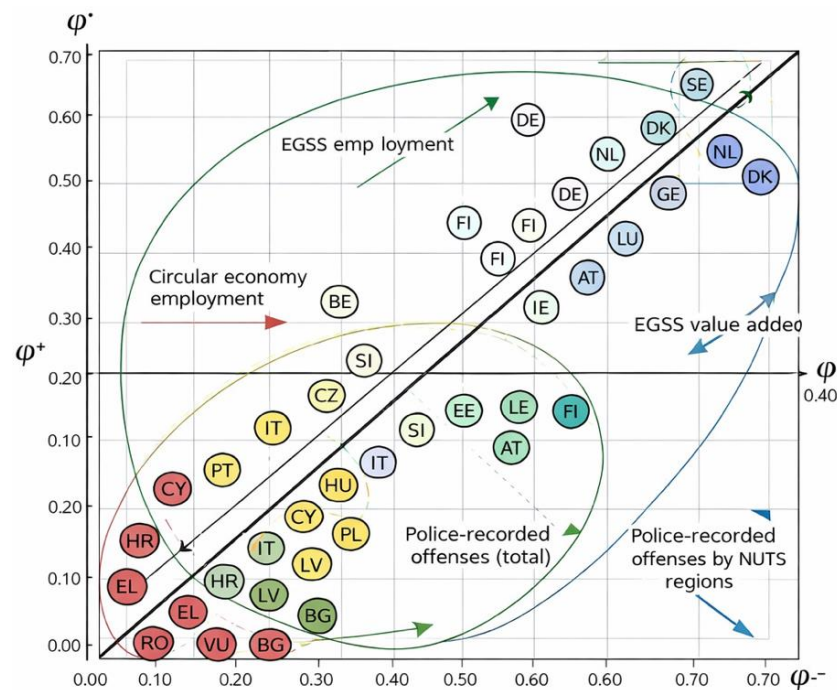


Figure 3. GAIA matrix
Source: Authors' elaboration

patterns, trade-offs, and similarities in multi-criteria performance that are not immediately visible in tabular rankings. In the GAIA plane, each country is represented as a point whose position reflects its overall preference profile across all evaluated criteria (Rađenović & Rajić, 2025).

A key feature of the GAIA plane is the decision axis, shown as a diagonal line. This axis represents the direction of the best compromise solution across all criteria, corresponding to higher PROMETHEE II net flows (ϕ). Countries located closer to this axis and further along its positive direction exhibit stronger overall performance, combining favourable environmental economic outcomes with lower crime levels. The PROMETHEE dominance network (Figure 4) visualises the $\Delta\phi$ -based dominance relationships among EU-27 countries derived from the PROMETHEE II net preference flows calculated on the basis of green economy and crime indicators. The network represents directed dominance links, where arrows point from countries with higher net flow values (ϕ) to those with lower values, and arrow thickness reflects the magnitude of the dominance gap ($\Delta\phi$).

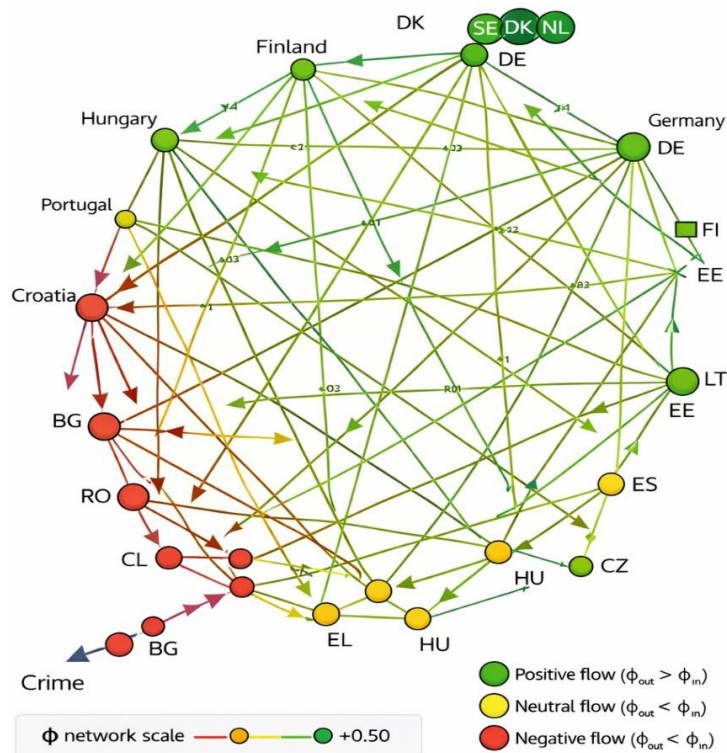


Figure 4. PROMETHEE Network

Source: Authors' elaboration

To preserve interpretability in a dense decision space, only the three strongest outgoing dominance relations per country are retained, highlighting the most structurally relevant preference asymmetries. Countries positioned in the upper segment of the network, such as Sweden, Denmark, the Netherlands, and Germany, exhibit a high concentration of outgoing dominance links, indicating a systematic outranking of a large share of EU Member States. The identified negative relationship between green employment and crime reflects the role of the labour market as a key mechanism of social inclusion. In line with the economic theory of crime, higher participation in the environmental economy increases the opportunity cost of illegal activities by providing stable and legitimate income sources, thereby reducing incentives for criminal behaviour.

At the same time, the results can be interpreted through the lens of social pathology, where crime emerges as a consequence of social disorganisation and economic marginalisation. Countries with weak green employment structures and higher crime exposure exhibit characteristics consistent with anomic conditions, where limited access to stable employment undermines social cohesion and normative regulation. Conversely, countries with developed environmental sectors demonstrate stronger social integration, lower levels of structural strain, and reduced propensity toward deviant behaviour. Importantly, the results do not imply a simple causal relationship but rather indicate that inclusive green employment operates as part of a broader socio-economic system that supports crime prevention. The environmental economy contributes to reducing crime indirectly by enhancing income stability, strengthening social cohesion, and reinforcing institutional effectiveness. In this sense, the findings substantiate the central premise of the paper: that inclusive green employment represents a multidimensional policy instrument, simultaneously advancing sustainable development and functioning as a structural mechanism for crime prevention.

Despite providing novel insights into the relationship between green employment and crime, the study is subject to several limitations. First, the empirical analysis is based on cross-sectional averages for the period 2019–2023, which limits the ability to capture dynamic or causal relationships over time. Second, although regression analysis has been incorporated, the results should be interpreted as associative rather than strictly causal due to potential endogeneity and omitted institutional or socio-cultural factors. Third, the use of aggregated national-level indicators may mask regional disparities, particularly given the spatial heterogeneity of crime patterns within EU countries. Finally, the equal weighting scheme in the PROMETHEE analysis, while methodologically justified, assumes uniform importance of all criteria and may not fully reflect policy priorities or stakeholder preferences in specific contexts.

CONCLUSION

As a considerable challenge for policymakers, given its influence on public safety, economic development, and overall quality of life, understanding the relationship between crime and economic conditions is vital for developing relevant crime prevention policies and strategies (Karpavicius et al., 2024; McCrary, 2010). Analysing economic determinants policymakers can assess the nature and size of their influence of selected economic indicators on crime and establish proper crime prevention measures, creating a more stable society and safer environment. Employment in general, and in the environmental economy in particular, is widely recognised for its social and environmental contributions to overall well-being, improved quality of life and environment, and social inclusion. The link between crime and the economy is mostly assessed through two major, mutually exclusive assumptions: first, favourable economic conditions reduce crime (the correlation is negative); second, high economic growth increases crime (the correlation is positive).

The research results confirmed a strong association between the environmental economy and broader socio-economic determinants. The analysed EU countries with well-developed environmental goods and services sectors generate high value added and employment in those sectors, but also tend to experience lower rates of committed crime. This suggests that investments in environmental industries and circular business models may yield co-benefits extending beyond environmental performance, contributing to social stability and institutional capacity. On the contrary, the assessed countries with weak environmental sector development and high crime intensity may require integrated policy interventions that combine support for green economic transformation with targeted social and institutional measures. The combined use of research methods provides policymakers with both a structural typology and a performance-based benchmark, enabling a more nuanced, evidence-based design of EU environmental and cohesion policies. Such findings underscore the importance of more intensive collaboration among all relevant stakeholders to develop strategies and policies that expand employment opportunities in environmental sectors, given their extensive contributions to broader socio-economic development, inclusiveness, and crime prevention.

The findings of this study have important implications for policymakers at both EU and national levels. The consistent negative association between green employment and crime suggests that environmental economic development can generate broader socio-economic benefits beyond sustainability objectives. Policies aimed at expanding employment in the environmental goods and services sector, as well as strengthening circular economy activities, may contribute to crime reduction by improving income stability, labour market inclusion, and social cohesion. Furthermore, the results indicate that green transition strategies should be integrated with

labour market and regional development policies, particularly in countries characterised by weaker environmental sectors and higher crime exposure. From a strategic perspective, the study supports the view that investments in the green economy can function as a dual policy instrument, simultaneously addressing environmental challenges and enhancing social stability.

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ИНКЛУЗИВНО ЗАПОШЉАВАЊЕ У ЗЕЛЕНОМ СЕКТОРУ И ПРЕВЕНЦИЈА КРИМИНАЛА: ЕМПИРИЈСКА АНАЛИЗА ЗЕМАЉА ЕВРОПСКЕ УНИЈЕ

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Резиме

Концепт одрживог развоја добија на значају последњих деценија чиме се истиче економска и социјална релевантност зеленог сектора са аспекта повећаних могућности запошљавања, а кроз њен допринос заштити животне средине, економском развоју и општем друштвеном благостању. Аутори настоје да истраже везу између економских детерминанти, пре свега у зеленом запошљавању, и превенције криминала, наглашавајући улогу коју одрживо тржиште рада има као један од битних фактора у смањењу стопе криминала. Полазећи од постојећих теорија које се баве овом проблематиком, аутори сматрају да креирање зелених послова може помоћи у ублажавању криминалног понашања обезбеђивањем стабилности прихода, побољшањем услова живота, пружањем могућности за професионално напредовање, као и јачањем друштвене припадности и повезаности. Анализирањем индикатора зеленог запошљавања земаља ЕУ као што су запосленост у области заштите животне средине, запосленост у области циркуларне економије, додата вредност у области заштите животне средине, као и индикатора који се односе на криминал - прекршаји које је евидентирала полиција по категоријама, прекршаји које је евидентирала полиција по NUTS регионима, циљ истра-

живања јесте сагледати природу и јачину корелације између почињених кривичних дела и запослености у области заштите животне средине.

Резултати истраживања потврђују јаку везу између заштите животне средине и друштвено-економских перформанси. Група анализираних земаља ЕУ са развијеним сектором заштите животне средине остварује високе додате вредности у том сектору, као и ниво запослености, праћено ниским стопама криминала. На основу тога би се могло закључити да би инвестиције у еколошке индустрије и циркуларне пословне моделе резултирале бенефитима који нису стриктно еколошке природе, већ доприносе општој друштвеној стабилности и јачању институционалних капацитета. Супротно томе, земље које одликује недовољно развијен сектор заштите животне средине и високе стопе криминала указују на потребу интегрисаних напора релевантних институција да комбинују подршку трансформацији зеленог сектора са одговарајућим друштвеним и институционалним мерама. Употреба селектованих истраживачких метода у овом раду пружа креаторима политика истовремено и структурну типологију и референтне вредности које могу бити од значаја за ЕУ политику заштите животне средине и друштвене кохезије. Овакви резултати истичу значај интензивирања сарадње релевантних стејкхолдера у развоју стратегија и политика које би промовисале могућности запошљавања у зеленом сектору, имајући у виду јасан допринос друштвено-економском развоју, инклузивности и превенцији криминала.