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Formal education and environmental behaviour in Burkina Faso evidence a Conditional Mixed Process model

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Research Article

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Abstract

This research analyses the effect of formal education on the environmental behaviour of individuals in Burkina Faso. Based on survey data from 383 randomly selected individuals, the Conditional Mixed Process model was used to correct for endogeneity. The results reveal that primary and secondary education levels and literacy negatively affect the ecological behaviour of individuals in Burkina Faso. On the other hand, higher education levels affect individuals' ecological behaviour, but not to a statistically significant degree. Nevertheless, the results show that environmental education positively affects the ecological behaviour of individuals by 52.87 percentage points in Burkina Faso. In terms of economic policy recommendations, these results suggest that formal education, as currently structured in Burkina Faso, is not sufficient to promote ecological behaviour among individuals. Therefore, environmental education should be integrated into education systems and awareness-raising mechanisms, while improving coordination between education and environmental policies.

1.Introduction

The transition to environmentally friendly behaviours remains a major challenge for achieving sustainable development goals, particularly SDG 4 in developing countries (UNESCO, 2025). Eco-friendly behaviours refer to behaviours that consciously seek to minimise the negative impact of human actions on natural and built ecosystems (Kollmus and Agyeman, 2002). According to Balundė et al. (2019), these eco-friendly behaviours can be explained by four important values, namely: biospheric values, i.e. concern for nature and environmental protection; altruistic values, implied by concern for the well-being of others; egoistic values, in terms of preserving and promoting personal well-being; and hedonistic values, measured by the pursuit of pleasure and the reduction of effort. Statistics reveal that in Africa, approximately 250 million people face water stress, which could reach around 700 million people by 2030 (World Meteorological Organization, 2024). At the same time, estimates indicate an average production of approximately 165 kg of waste per capita per year without a collection and treatment system (World Meteorological Organization, 2024). These dynamics are exacerbated by climate change, the adaptation costs of which represent between 2% and 5% of GDP in many developing countries, increasing economic and social vulnerability, according to the World Meteorological Organization in 2024. As a result, adopting environmentally friendly behaviours is now seen as an essential lever for mitigating pressure on natural resources and supporting the achievement of sustainable development goals.

In recent decades, a broad consensus has emerged regarding the impact of educational resources in raising awareness of environmental behaviour. It has been shown that education plays an essential role in raising awareness of the interactions between humans and nature (Ardoin and Ferreira 2021). Formal education aims to equip individuals with the skills and knowledge to gain a comprehensive understanding of the environment and to develop environmental awareness that translates into positive, respectful and equitable behaviour towards the environment (Cantu, 2014; UNESCO, 2014).

Theoretically, Ajzen's (1991) theory of planned behaviour, based on psychological factors, explains that individuals' behaviour is influenced by accessible information; their individual attitudes in terms of positive or negative evaluation of behaviour according to beliefs and norms. In the same vein, human capital theory (Becker, 1967) shows that the skills individuals acquire through education and training increase their productivity, which is likely to increase their commitment to environmental actions. Empirically, several studies have addressed the issue of pro-environmental behaviour (Ekwessaranna et al., 2025; Jaoul-Grammare and Stenger, 2023; Casalo et al., 2019; Perez Arango and Camacho Murillo, 2022; Hoffmann and Mullarack, 2020).

Burkina Faso, with its capital Ouagadougou, is no exception to this environmental problem. Indeed, the latest General Population and Housing Census (RGPH, 2019) reveals that Ouagadougou accounts for approximately 45.1% of Burkina Faso's urban population. This population explosion, combined with rapid urbanisation and precarious living conditions, further compromises the quality of life of its inhabitants. Statistics show that the eating habits of residents, combined with their living conditions, have contributed to an 18% increase in household waste between 2006 and 2009, estimated at 300,000 tonnes per year and 500,000 tonnes per year respectively (MEEVCC, 2016). This is evident in the fact that in urban areas, 43.7% of households use private collection services, 18.9% throw their rubbish on rubbish dumps and 14.4% on the street. At the same time, in rural areas, 29.6% of households use rubbish dumps and 29.3% use the street as a means of waste disposal (INSD, 2019). Furthermore, statistics from the Yale Environmental Performance Index (EPI) in 2024 indicate that Burkina Faso has a low score in terms of environmental performance, with specifically low scores of around 15.7 out of 100 in terms of water management and sanitation, and a score of 2 out of 100 for wastewater treatment. All these factors contributing to poor environmental performance highlight the importance of a transition to more environmentally friendly behaviours.

In response to this issue, public policymakers have undertaken major environmental management policies and strategies. These include the Environment Plan for Sustainable Development (PEDD) implemented in 2006 and the National Climate Change Adaptation Plan (PNA) implemented in 2015, which are national environmental planning and adaptation policies designed to address climate challenges and strengthen resilience. In addition, Law No. 045-2024/AN of 30 December 2024 prohibits the production, import, marketing and distribution of non-biodegradable plastic packaging and bags.

Despite these actions and initiatives by national policymakers aimed at improving the living conditions of the population, environmental issues remain persistent. This leads us to ask the following research question: what is the effect of education on the ecological behaviour of the inhabitants of the city of Ouagadougou in Burkina Faso? According to an Afrobarometer study, approximately 57% of citizens believe that it is primarily ordinary citizens who must reduce environmental pollution, and more than the majority of citizens (approximately 59%) disapprove of the government's actions to reduce environmental pollution. This shows that there is environmental awareness but also a gap between awareness and actual behaviour, suggesting a need for educational strategies to transform this awareness into concrete actions for greater impact. Therefore, the objective of this research is to

analyse the effect of education on the ecological behaviour of the inhabitants of the city of Ouagadougou in Burkina Faso. In order to carry out this research, we postulate that the education of inhabitants has a positive effect on the transition to ecological behaviour in the city of Ouagadougou in Burkina Faso.

This research contributes to the existing literature on the growing environmental problems in cities in most developing countries. Survey data from an exhaustive random sample was analysed using the Conditional Mixed Process (CMP) model in order to correct for potential endogeneity and obtain robust results on the relationship between education and the ecological behaviour index constructed using Multiple Correspondence Analysis (MCA).

The rest of this research is structured as follows. The first section presents the conceptual framework and review of empirical literature. The second section presents the analysis methodology. The third section presents and discusses the empirical results. Finally, the conclusion and economic policy implications are presented.

2. Literature review

2.1 Research conceptual framework

Figure 1 below presents the conceptual framework, considering ecological behaviour as the result of a multidimensional process integrating socio-economic, cognitive, normative and motivational factors. To this end, the socio-demographic characteristics of households, such as gender, income and household size, constitute a first level of explanation for environmental behaviour. Several studies show that these factors influence access to education, the ability to bear the costs associated with ecological practices and exposure to environmental standards (Gifford & Nilsson, 2014). Income, in particular, influences the possibility of adopting water-saving technologies, waste reduction and nature protection, while household size is likely to cause a trade-off between budgetary constraints and environmental concerns.

Education in this conceptual framework is understood through two complementary dimensions. Traditional education, measured by schooling and general knowledge levels, strengthens cognitive abilities and understanding of long-term environmental issues. According to Schultz (1961) and Becker (1964), education increases human capital and improves individuals' ability to make rational decisions when faced with complex problems, such as the sustainable management of natural resources. In the environmental field, several empirical studies show that more educated individuals are more likely to adopt pro-environmental behaviours (Meyer, 2015). At the same time, environmental education through awareness-raising and ecological training has a more direct impact on specific knowledge related to the environment. It improves understanding of the links between individual behaviour and ecological degradation, and strengthens the perception of environmental risks (Kollmuss and Agyeman, 2002). This dimension is particularly important in developing countries, where access to environmental information remains limited.

Thus, both forms of education could subsequently influence environmental knowledge, values and attitudes, as well as motivation for ecological skills. At this stage, the literature shows that knowledge, although insufficient on its own, is a necessary condition for the adoption of ecological behaviours (Frick, Kaiser & Wilson, 2004). Environmental values and attitudes, on the other hand, reflect individuals' normative preferences and their sense of responsibility towards the environment (Stern, 2000). Finally, ecological motivation reflects an individual's willingness to act, even when the environmental benefits are deferred or collective.

The conceptual framework also incorporates the role of social norms and peer influence, which have been widely highlighted by social norms theory. Environmental behaviours are strongly influenced by social expectations, community practices and the behaviours observed among peers (Cialdini-Reno and Kallgren, 1990). In community contexts, these norms can amplify the effect of education by creating social incentives for the adoption of ecological practices.

All of these mechanisms converge towards the formation of an ecological intention, in accordance with the theory of planned behaviour developed by Ajzen (1991). According to this theory, intention is the immediate determinant of behaviour and results from attitudes, subjective norms and perceived behavioural control. Numerous empirical studies confirm the relevance of this approach for analyzing environmental behaviour (Bamberg and Möser, 2007).

Finally, adopted ecological behaviours gradually reinforce knowledge, attitudes and motivation, generating a cumulative process of behavioural change (Bandura, 1986). This dynamic highlights the evolutionary nature of ecological behaviour and the importance of long-term educational policies.

Source : Author’s, adapté de Ajzen et Fishbein (2010)

2.2 Empirical literature review

The economic literature reveals several studies that have addressed the issue of education and environmental behaviour. On the one hand, some studies have reached positive conclusions (Jaoul-Grammare and Stenger, 2023; Casalo et al., 2019; Perez Arango and Camacho Murillo, 2022; Hoffmann and Mullarack, 2020), while others have reached negative conclusions or found no conclusion (Inglesi-Lotz and Morales, 2017; Ameli and Brandt, 2015; Kriström and Kiran, 2014; Ayalon et al., 2014; Grafton, 2014; Ek and Söderholm, 2008). For example, Jaoul-Grammare and Stenger (2023) and Casalo et al. (2019) used binary and multinomial logistic regressions to show that educational attainment influences households' pro-environmental behaviour. Similarly, Hoffmann and Mullarack (2020) and Perez Arango and Camacho Murillo (2022) have revealed, using the propensity score method and primary data, that the level of education promotes the adoption of pro-environmental behaviour. On the other hand, other studies by Inglesi-lotz and Morales (2017); Grafton (2014) found a negative relationship between educational attainment and pro-environmental behaviour, particularly with regard to water conservation. Furthermore, Kiran and Kriström (2014) reveal a lack of correlation between education and choice and the choice to consume green energy. These results demonstrate the complexity of the interactions

between education and environmental behaviour, and suggest that the effect of education may vary depending on the context, the behaviours studied and the indicators used.

Despite extensive literature on the issue, to our knowledge very few studies (Zoungrana and Sawadogo, 2025) have explored the relationship between education and pro-environmental behaviour among households in Burkina Faso. This research therefore aims to fill the gap in the literature on the issue by analysing the effect of formal and environmental education on the ecological behaviour of households in Burkina Faso. This research makes an original contribution by controlling for endogeneity using the Conditional Mixed Process (CMP) model, unlike previous studies (Jaoul-Grammare and Stenger, 2023; Casalo et al., 2019) which use simple regression methods.

3. Research methodology

3.1 Study area and justification

The study area selected for this research is the city of Ouagadougou, the political and economic capital of Burkina Faso. According to the INSD (2019), the city has a population of approximately 2.4 million inhabitants and covers an area of 54,000 hectares, of which nearly 32,000 hectares are urbanized. The city is located in the heart of the Central Region and is divided into twelve districts, comprising urban areas and outlying villages, characterised by rapid population growth and accelerated urbanization. The choice of Ouagadougou is justified for several reasons. On the one hand, the city is highly socio-economically and educationally heterogeneous, combining different levels of education, income and exposure to public environmental awareness policies. This justifies the choice to analyse the differentiated effect of traditional education and environmental education on individuals' ecological behaviour. On the other hand, Ouagadougou faces major environmental challenges, particularly in terms of waste management, water management, energy efficiency and consumption of organic products. Annual household waste production is estimated at over 500,000 tonnes, with disposal methods still largely informal, despite the growing use of private collection services (INSD, 2019). These environmental constraints highlight the importance of individual and collective behaviour in urban sustainability. Finally, Ouagadougou, like several other sub-Saharan African capitals, has the same structural characteristics in terms of rapid urbanization, inadequate environmental services and behavioural change.

3.2 Data collection techniques and tools

A survey was conducted from 5 July to 5 August 2025 to gather the necessary information. A training session will be organised to familiarize surveyors with the questionnaire and the Kobocollect application. This survey was conducted in three phases: (1) selection of localities, (2) exploratory survey, and (3) large-scale survey. The choice of localities took into account their geographical location in the city and their accessibility. The localities studied are representative of all localities in the capital. Individuals were selected at random, with the help of representatives from each locality, from a list proposed by the latter, taking care not to select individuals from the same household. Based on these criteria, 10% of the

inhabitants of each of the twelve (12) localities were interviewed, for a total of 384 individuals. The informed consent of the individuals was obtained before the survey began. Next came the exploratory survey phase, which consisted of two stages: the first was a questionnaire and the second was a semi-structured interview. The questions were asked by trained interviewers who spoke the local dialect. The exploratory survey highlighted important unanswered questions and helped to formulate avenues for further research. Some questions proved to be vague or required clarification. They were therefore reworded to improve comprehension. Other questions, particularly those relating to respondents' assessment of a parameter, proved to be unclear or required clarification. They were therefore reworded. More specifically, the concept of environmental knowledge and awareness. Finally, the administration of the questionnaire to the selected individuals. The low level of education of the population studied made it difficult to understand the questions asked, which required a great deal of patience on the part of the interviewers. The data collected covered the socio-demographic characteristics of the inhabitants, the characteristics of the inhabitants, environmental problems, the adaptation strategies used and the level of environmental knowledge. The raw data collected will be processed for better analysis and interpretation. To this end, Excel software will be used to analyse the questionnaire. Statistical processing will be carried out using EXCEL and STATA18 software. Econometric analysis will be carried out using STATA 18.

Source: author’s, taken from Ouedraogo (2024)

3.3 Model variables and justification

- Dependent variable

Ecological behaviour is a variable that takes into account a multidimensional aspect of well-being and individual choices, reflecting all the practices adopted by individuals to reduce their ecological footprint and preserve their environment. In order to better capture individuals' behaviours towards the environment, a set of daily practices related to consumption and/or production in terms of organic product consumption, waste management, water management and energy efficiency is used to measure pro-environmental behaviours, constructed in the form of a composite index (Kollmuss and Agyeman, 2002; OECD, 2013). These indicators are widely used in the literature as measures of individuals' ecological behaviour, particularly in developing countries (Stern, 2000; Meyer, 2015). The consumption of organic products reflects environmental preferences in food choices; waste management captures the adoption of sorting, recycling or waste reduction practices; energy efficiency refers to the rational use of energy and the adoption of energy-saving technologies; finally, water management measures behaviours aimed at limiting waste and preserving a scarce resource.

The literature shows that an index would be appropriate to comprehensively capture ecological behaviours. We will therefore use an approach that takes into account the multidimensional and qualitative nature of each dimension, with the index constructed using Multiple Correspondence Analysis (MCA). This method is particularly suited to qualitative variables and allows the information contained in several binary indicators to be synthesised into a continuous synthetic variable, while taking into account

the correlations between different environmental practices (Greenacre, 2017). ACM is widely used in applied economics to construct composite indices of behaviour, living conditions or social practices (Michelson et al., 2013). In terms of output, the index obtained thus reflects the individual's overall degree of pro-environmental commitment, with high values indicating a greater adoption of ecological practices. This approach avoids the arbitrariness of subjective weighting and provides a robust and synthetic measure of pro-environmental behaviours.

- Independent variables

Economic literature reveals that certain factors are likely to influence individuals' behaviour towards environmental awareness, such as gender, age, income, area of residence, environmental knowledge, formal education and environmental education.

Level of formal education is a qualitative variable that takes the value 0 if the individual has no education; 1 if the individual has a primary education; 2 if the individual has a secondary education; and 3 and 4 if the individual has a higher education. This categorization reflects a hierarchical progression of formal human capital, in line with approaches based on the human capital theory developed by Becker (1964). Economic literature emphasizes that higher levels of education are associated with a better understanding of environmental externalities and a greater propensity to adopt pro-environmental behaviours (Grossman and Krueger, 1995; Dinda, 2004).

Level of environmental education: this is a qualitative variable that takes the value 1 if the individual has benefited from environmental awareness training and 0 if not. This variable captures individuals' aptitude for environmental awareness or training initiatives on their ecological behaviour. Unlike traditional education, which reflects the formal accumulation of general human capital, environmental education refers to targeted learning about ecological issues, environmental externalities and sustainable practices. Previous studies show that environmental education acts as a mechanism for reinforcing social norms and pro-environmental values, thereby promoting the adoption of ecological behaviours (Kollmuss and Agyeman, 2002).

Income: a continuous quantitative variable that highlights an individual's annual income. Economic literature indicates that income reflects individuals' economic capacity to bear the costs associated with adopting environmentally friendly practices. This is consistent with the conclusions of the literature, which emphasize that income plays a decisive role in the adoption of environmentally friendly behaviours, particularly when these behaviours involve higher initial costs, such as the use of energy-efficient equipment, waste management and water resource management (Kahn, 2002; Meyer, 2015).

Number of dependents: a continuous quantitative variable that shows the number of people the individual has dependents. This variable captures the intensity of family obligations that directly influence economic trade-offs and the choice of environmentally responsible behaviour. Economic literature shows that the number of dependents significantly affects consumption and investment behaviour towards the environment (Deaton, 1997).

Age: a continuous quantitative variable that determines the number of years since the individual's birth. Studies have shown that the number of years is a determining variable in environmental action (Meyer, 2015; Powdthavee, 2020).

Gender: a binary qualitative variable that takes the value 1 if the head of the household is male and 0 if the head of the household is female. Scientific studies have shown that gender is a determining factor in environmental engagement. In this sense, some findings reveal that women are more concerned about the environment than men, as they perceive the threats associated with environmental degradation more acutely and engage in environmental conservation practices, including recycling projects (Meyer, 2015).

Residential area: this is a binary qualitative variable that takes the value 1 if the household lives in an urban area and 0 if the household lives in a rural area. The literature shows that spatial factors linked to individuals' living conditions and location also influence the adoption of environmentally friendly behaviours. The residential area can be a key factor: individuals who live in highly urbanized areas and close to protected areas are more sensitive to natural disasters, noise and air pollution (Jaoul-Grammare & Stenger, 2022). Furthermore, people living in urban areas are less likely to adopt environmentally friendly behaviours than those living in rural areas (Meyer, 2015).

Environmental knowledge is a binary qualitative variable that takes the value 1 if the individual has knowledge about the environment and 0 if the individual has no knowledge about the environment. Environmental knowledge therefore enables greater awareness of issues, which allows individuals to take action to protect the environment. The literature shows that a person's environmental behaviour is directly determined by their level of environmental knowledge (Zareie and Navimipour, 2016). Therefore, increasing environmental knowledge improves awareness of better waste management (Tangwanichagapong et al., 2017).

Marital status is a multinomial qualitative variable that takes the value 0 if the individual is single, 1 if the individual is divorced, and 2 if the individual is married. Married individuals generally have greater economic stability and an increased ability to plan for the long term, which can encourage the adoption of pro-environmental behaviours requiring initial investment or an intertemporal perspective. Economic and socio-economic literature emphasizes that marital status influences individuals' consumption and investment behaviour (Becker, 1981; Kahn, 2002). The variables used in the model are summarized in Table 1 below.

Table 1
Description of model variables

Variables	Description	Expected signs
Classical education	Categorical qualitative variable that takes the value 0 if the individual has no education; 1 if the individual is literate; 2 if the individual has primary education; 3 if secondary education; 4 if higher education	+/-
Environmental education	Qualitative variable that takes the value 1 if the individual has received environmental training and 0 otherwise.	+
People in charge	Continuous quantitative variable describing the number of dependants of the individual	+/-
Marital status	Qualitative variable that takes the value 1 if the individual is married and 0 otherwise	+/-
Age	Quantitative variable that measures the number of years an individual has lived	+/-
Gender	Qualitative variable that takes the value 1 if the individual is male and 0 if female	+/-
Income	Quantitative variable that measures an individual's income level in monetary terms in CFA francs.	+
Area of residence	Qualitative variable that takes the value 1 if the individual lives in an urban area and 0 if in a rural area.	+
Economic status	Categorical qualitative variable that takes the value 0 if the individual is unemployed; 1 if self-employed; 2 if manual worker; and 3 if formal sector employee.	+/-
Ecological Behaviors	Quantitative variable measured by the ecological behaviour index	
Source : Author's		

3.4 Estimation method and strategy

The analysis of ecological behaviour can be explained by Ajzen's theory of planned behaviour (1991), which shows that an individual's behaviour is the result of behavioural intention, which is determined by attitudes, subjective norms and perceived behaviour. In this context, education plays a decisive role in influencing the formation of environmental attitudes, the perception of social norms and the ability of individuals to translate their intentions into concrete actions. Thus, the theoretical model of the effect of education on ecological behaviour can be formalised as follows :

$$C = f(E) \quad \#(1)$$

Where C represents individuals' ecological behaviour and E refers to all educational resources, including traditional and environmental education. f is a function that describes the process of

converting educational resources into observable behaviours, reflecting the decision-making mechanisms highlighted (Ajzen, 1991). This function is positive in E since an increase in educational resources should result in improved ecological behaviours.

Empirically, the link between ecological behaviour and education can be estimated as follows (Alhassan et al., 2020) :

$$Education_i = \beta_0 + \beta_1 X_{1i} + \epsilon_{1i} \quad \#(2)$$

$$\text{behaviours}_{Ecol\,i} = \propto_0 + \propto_1 X_{2i} + \partial\, Education_i + \epsilon_{2i} \quad \#(3)$$

Where X_{1i} refers to a vector of explanatory variables influencing the level of education. X_{2i} refers to a vector of explanatory variables influencing ecological behaviours. $\epsilon_{1i}\ and\ \epsilon_{2i}$ are the error terms, while β, α, ∂ represent the parameters to be estimated in the equations. The level of education is not random; it is therefore likely that unobserved factors influence ecological behaviour. Furthermore, it is likely that individuals who exhibit ecological behaviour may be individuals with high levels of education in both conventional and environmental terms. Estimating equations (2) and (3) as a model is likely to produce biased and inconsistent estimates due to selection and endogeneity issues. In order to overcome these econometric problems, this research uses the Conditional Mixed Process (CMP) developed by Roodman (2011), which allows for the simultaneous estimation of the equation for the level of education (categorical dependent variable) and that for ecological behaviour (continuous dependent variable), while correcting for selection and endogeneity. Thus, following the CMP format, equations (2) and (3) are formalized as follows:

$$Z_1^* = \sigma_1 + \epsilon_1 \quad \#(4)$$

$$Z_2^* = \sigma_2 + \epsilon_2 \quad \#(5)$$

$$\sigma_1 = \beta_1 X; \qquad \sigma_2 = \alpha_1 X + \vartheta\, Z_1$$

Where Z_1^* and Z_2^* represent the latent factors of educational attainment and environmental behaviour, respectively. X represents a vector of explanatory variables.

4. Results and discussion

The descriptive analysis presented in Table 2 highlights a demographically, economically and educationally heterogeneous population, which provides a relevant framework for studying ecological behaviour. The results reveal that the average age of individuals is 38, with a wide dispersion, while the average number of dependents is three, suggesting family constraints that may influence environmental choices. The average income is 104,408 CFA francs, but its high variability reveals significant economic inequalities among individuals in urban and rural areas. The majority of individuals are men (61.75%) compared to 38.25% women, and 64.84% reside in urban areas compared to 35.16% in rural areas, which presents a more favourable context for the dissemination of information and environmental policies.

Secondly, the findings indicate that the educational structure shows a significant proportion of individuals who have attained higher education (36.81%), but also a significant proportion of people with no formal education or only literacy skills, reflecting heterogeneity in educational capital. Furthermore, the results indicate that only 40.05% of individuals report having received environmental education. Finally, the predominance of manual workers and entrepreneurs indicates that some individuals are in precarious employment situations, which may moderate the effect of education on ecological behaviour. Overall, these descriptive statistics justify the econometric analysis aimed at identifying the specific effect of formal education and environmental education on ecological behaviour, taking into account the socio-economic constraints of individuals.

Table 2
Results of descriptive statistics

Continuous variables	**Average**	**Standard deviation**	**Minimum**	**Maximum**
Dependent persons	3	2.90	0	16
Age	38	19.79	20	67
Income	104408	141193.8	0	2000000
Discrete variables	**Average**	**Standard deviation**	**1 (%)**	**0 (%)**
Gender	0.6175	0.0237	61.75	38.25
Marital status	0.4703	0.0243	47.03	52.97
No level	0.1045	0.0149	10.45	89.55
Alphabetized	0.1211	0.0159	12.11	87.89
Primary	0.2256	0.0203	22.56	77.44
Secondary	0.1805	0.0187	18.05	81.95
Higher	0.3681	0.0235	36.81	63.19
Area of residence	0.6484	0.0232	64.84	35.16
Environmental education	0.4005	0.0261	40.05	59.95
Unemployed	0.1235	0.0160	12.35	87.65
Workers	0.4513	0.0242	45.13	54.87
Entrepreneurs	0.2589	0.0213	25.89	74.11
Formal employment	0.1662	0.0181	16.62	83.38
Source : Author’s				

Table 3 presents the results of tests comparing the averages of the ecological behaviour index according to different individual characteristics. The results indicate statistically significant differences in several

variables. Marital status appears to be a strong discriminating factor, with an average difference of 0.43 and a significance level of 1%, suggesting that married and unmarried individuals adopt significantly different ecological behaviours, possibly related to distinct domestic responsibilities and long-term preferences. Level of education is also associated with a significant difference in the ecological behaviour index, with an average difference of 0.37 and significance, confirming the central role of formal education in raising awareness of environmental issues and the adoption of environmentally responsible practices. Similarly, environmental education stands out with a high negative average difference of 0.87, significant at the 1% threshold, indicating a substantial divergence in behaviour between individuals who have received environmental education and those who have not, which highlights the specific importance of this form of education beyond traditional schooling. On the other hand, the differences observed according to place of residence and economic status are not statistically significant, suggesting that, in the sample studied, these factors do not induce systematic variations in ecological behaviour. Finally, gender shows a marginally significant difference at the 10% threshold, indicating the existence of disparities in ecological behaviour between men and women, although this effect remains relatively small. Overall, these descriptive results highlight the important role of education, and in particular environmental education, in explaining ecological behaviour.

Table 3
Comparison test of individuals' averages according to their ecological behaviour

Variables	**Set**	**Ecological behaviour index**	
	Average	**Difference**	**P-value**
Gender	1.33e-08	.1753	0.0803*
Area of residence	1.33e-08	.1219	0.2327
Marital status	1.33e-08	.4300	0.0000***
Economic status	1.33e-08	− .1652	0.2651
Level of education	1.33e-08	.3666	0.0212**
Environmental education	− .0166	− .8681	0.0000***
Source : Author’s, *** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level			

4.2 Econometric results

The results concerning the effect of classical education on ecological behaviour are presented in Table 4. The LR test (Prob >chi2 = 0.000) shows that the model is statistically significant. The multicollinearity test reveals that all calculated VIFs are less than 5 and the average VIF is less than 3, implying that there is no multicollinearity problem among the explanatory variables used in the model. Furthermore, the results highlight the significance of Atanhrho (P >|z|=0.0000) at 1%, which shows that

the endogeneity suspected at the outset is taken into account in the model and the results are consistent and robust.

The results of the Conditional Mixed Process (CMP) model highlight a statistically significant but negative effect of several types of formal education on individuals' ecological behaviours, measured using a synthetic index constructed by Multiple Correspondence Analysis. Compared to individuals with no education, literacy levels and primary and secondary education levels are associated with a decrease in the ecological behaviour index. This would suggest that literate individuals and those with primary and secondary education adopt less ecological behaviours than those who have received no education, all other things being equal. These results may seem counterintuitive in light of economic theories, which consider education to be a lever for improving productivity gains and promoting environmentally friendly behaviour. However, these results could be justified in the context of developing countries, in this case Burkina Faso. This could be explained by the fact that in Burkina Faso, as in many African countries, traditional primary and secondary education remains focused on the acquisition of general cognitive skills without integrating environmental issues into the curriculum. This limits the ability of formal education to shape responsible environmental behaviour in individuals by transforming their general knowledge into concrete ecological actions. In this context, individuals who are literate or have completed primary and secondary education are generally exposed to energy-intensive consumption practices, increased waste production, non-organic consumption and poor management of drinking water resources, which reflects non-ecological behaviour. Finally, these results suggest that formal classical education is not a sufficient determinant of ecological behaviour in developing countries, in this case Burkina Faso. These results corroborate those found by Chankrajang and Muttarak (2017) and are diametrically opposed to the work carried out by Piao et al. (2024) and Bhattarai et al. (2024).

The results also show that environmental education has a positive and statistically significant effect on individuals' ecological behaviour. This would suggest that individuals who have benefited from environmental education in terms of training and awareness have a higher level of ecological behaviour than those who have not. These individuals are likely to consume organic products and have better reflexes in terms of waste management, efficient water use and efficient energy use. This can be verified in developing countries such as Burkina Faso, in the sense that, compared to formal education, environmental education provided through community programmes, awareness campaigns or local initiatives has a direct impact on specific knowledge, social norms and perceptions of environmental risks, thereby promoting a more immediate translation of knowledge into concrete practices. Furthermore, environmental education could strengthen individual motivation to adopt more responsible behaviours, even in the absence of strong economic incentives. These results are confirmed by the work of Burgos-Espinoza et al. (2025).

In addition, the results revealed that socio-economic variables such as income and marital status have a significant effect on individuals' level of ecological behaviour. For example, an individual's income has a negative and statistically significant effect on the level of environmentally friendly behaviour. This would suggest that an increase in an individual's income is associated with a decrease in the level of

environmentally friendly behaviour. In the context of developing countries, in this case Burkina Faso, an increase in income is often associated with an intensification of consumption patterns, characterised by increased use of goods and services and much higher waste production, rather than the adoption of more responsible behaviours. This result is consistent with the work of Qadri et al. (2025). Furthermore, marital status has a significant negative effect on individuals' levels of environmentally conscious behaviour. Unlike women, men are less likely to adopt environmentally friendly behaviours, all other things being equal. This result could be explained in the context of many developing countries by the fact that women, unlike men, are involved in domestic activities such as daily water management, waste management and food production, and are therefore more inclined to adopt more sustainable and economical practices, taking into account the negative impact of their activities on their environmental conscience. This result is in line with those found by Casaló et al. (2019); Ifegbesan et al. (2022) for six African countries; and Qadri et al. (2025).

Table 4
Results of the marginal effects of the Conditional Mixed Process model

Variables	Classical education	Behaviors ecological
Education level (Réf= none)		
Alphabetized		-0.6615***
		(0.0291)
Primary		-0.2647***
		(0.0419)
Secondary		-1.0486*
		(0.5572)
Higher		1.1904
		(0.8212)
Area pf residence	0.3497***	-0.00917
	(0.1162)	(0.1193)
Environmental education	-	0.5287***
		(0.1322)
Gender	0.1599	-0.0436
	(0.1223)	(0.1039)
Age	-0.009***	-0.0027
	(0.0028)	(0.0028)
Income in log	-0.021	-0.0884**
	(0.044)	(0.0343)
People in charge	-0.1033***	0.0057
	(0.0239)	(0.0296)
Marital status	-0.5383***	-0.3217**
	(0.1302)	(0.1522)
Economic status (Ref= unemployed)		
Entrepreneur	0.7561***	0.2304
	(0.1825)	(0.2154)

Source : author's ; *** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level

Variables	Classical education	Behaviors ecological
Worker	0.1199	0.2291
	(0.1995)	(0.1773)
Formal employee	1.794***	0.0991
	(0.2316)	(0.3852)
LR Chi2 (23)	294.21	
Observations	384	
Atanhrho	0.2689***	
	(0.0282)	
Source : author's ; *** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level		

5. Conclusion and economic policy implications

This research analyzes the effect of formal education on the ecological behaviors of individuals in Burkina Faso, within a context marked by increasing environmental degradation and the need to achieve the Sustainable Development Goals. By using survey data collected from 383 randomly selected individuals, and employing the Conditional Mixed Process (CMP) model to correct for endogeneity issues related to education, the analysis provides new empirical insights into the determinants of individual ecological behaviors in a developing country. The empirical results highlight that primary and secondary education levels, as well as literacy, have a negative and statistically significant effect on individuals' ecological behaviors. This finding suggests that formal education, as currently provided in Burkina Faso, does not automatically lead to the adoption of environmentally friendly practices. Furthermore, although higher education levels do have an effect on environmentally friendly behavior, this effect is not statistically significant, reinforcing the idea that the accumulation of years of schooling, in the absence of explicit environmental content, remains insufficient to induce lasting behavioral changes.

Conversely, environmental education emerges as a key lever, with a positive and highly significant effect on individuals' environmentally responsible behavior, estimated at 52.87 percentage points. This result underscores the central role of educational resources specifically geared towards the environment in transforming individual behavior, fostering a better understanding of environmental issues and facilitating the transition from knowledge to action. From an economic and educational policy perspective, these results suggest that formal education, in its current structure, is insufficient to promote environmentally responsible behavior in Burkina Faso. They highlight the need for a more systematic integration of environmental education into school curricula at all levels, as well as into non-formal awareness-raising initiatives. Improved coordination between educational and environmental

policies also appears necessary to ensure the coherence and effectiveness of public interventions aimed at encouraging sustainable environmentally responsible behavior.

Declarations

Disclosure statement

The authors declare that they have no know competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Finding

No funding was received for conducting this study.

Data availability

Data will be available on request**.**

Ethical Statement

The research protocol was submitted to the Research Ethics Committee (REC) of the Center for Economic and Social Studies, Documentation and Research at Thomas Sankara University (Burkina Faso). After review, the Committee determined that the research presented minimal risk, consisted exclusively of collecting anonymous survey data from adult participants, and involved no medical interventions or experimentation on human or animal subjects. In accordance with the Committee's ethical guidelines and institutional procedures, the study received an exemption from ethical approval, meeting the exemption criteria. The research was conducted in full compliance with institutional ethical standards and applicable national guidelines governing research involving human participants. Informed consent was obtained from all participants prior to data collection.

Consent to participate

Participation in the survey was voluntary. Before data collection, participants were informed of the study's objectives, the strictly scientific use of the information collected, and their right to withdraw at any time without consequence. Free, informed, and oral consent was obtained from all participants before their inclusion in the study.

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Figures

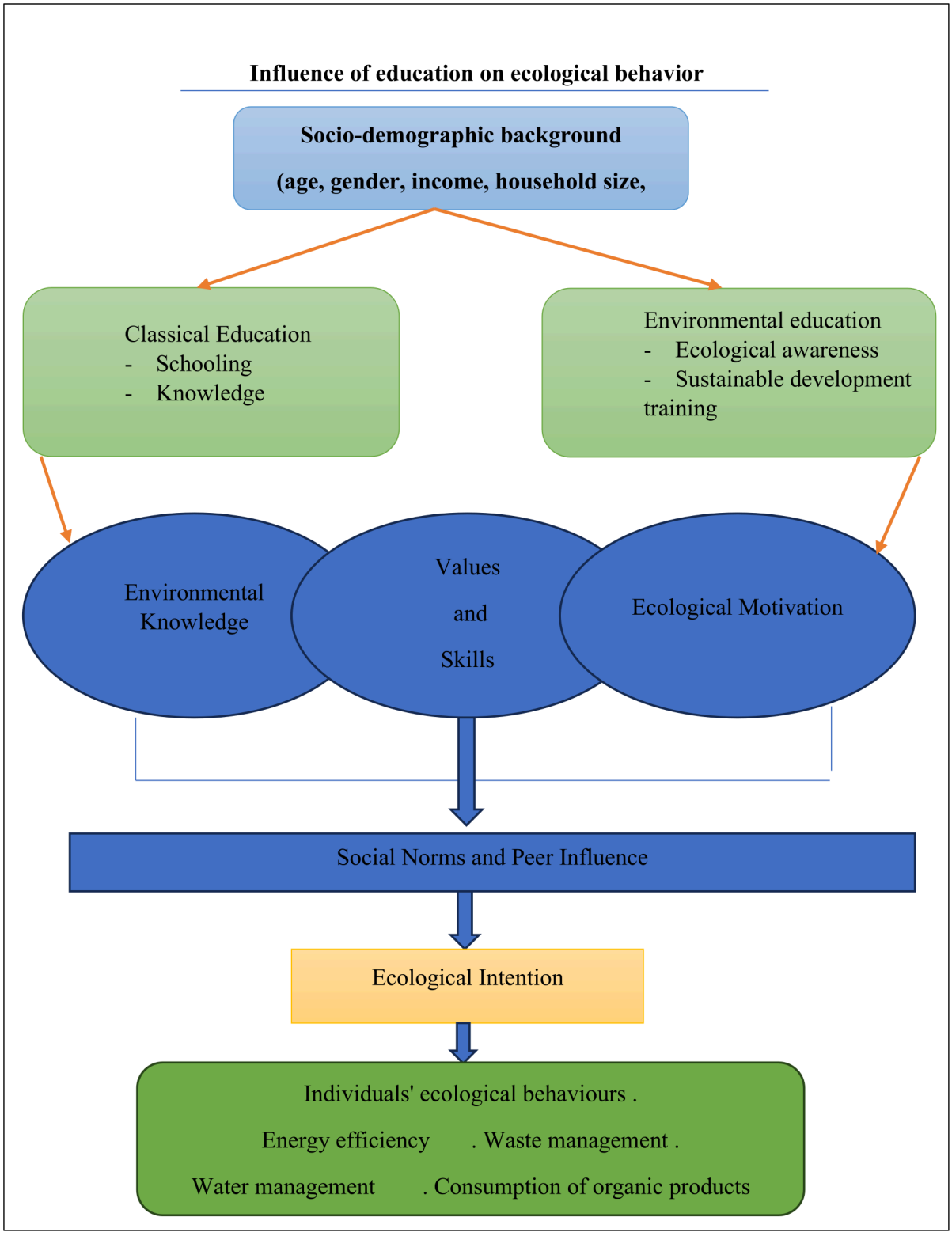


Figure 1

Legend not included with this version

Source : Author's, adapté de Ajzen et Fishbein (2010)

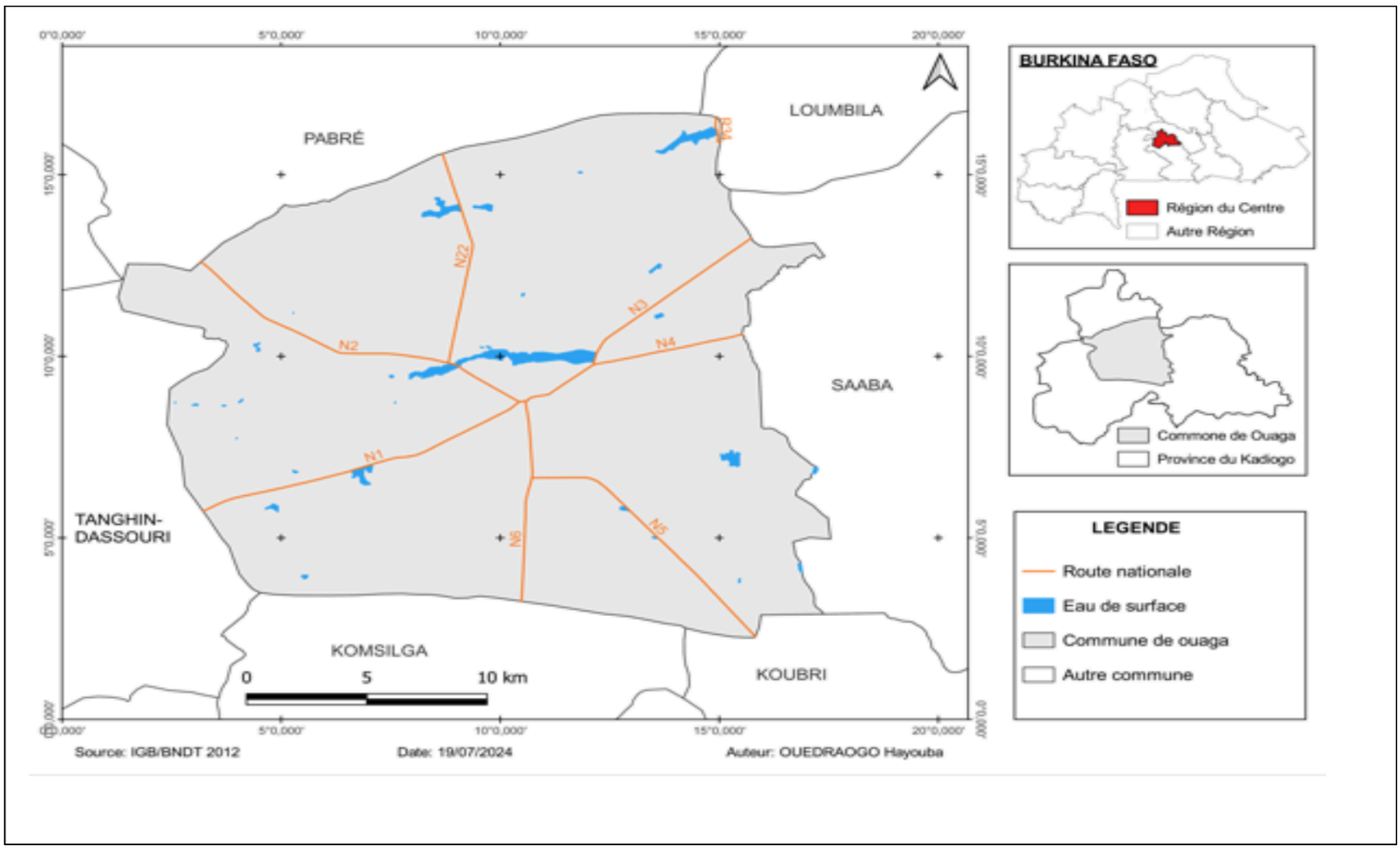


Figure 2

Location map of the city of Ouagadougou

Source: author's, taken from Ouedraogo (2024)