

THE PHYSIOGNOMY AND SUSTAINABILITY OF RAFINA CITY THROUGH STUDENTS' PERSPECTIVE

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Abstract

The present study explores the physiognomy and sustainability of the city of Rafina, a coastal urban area in Eastern Attica, Greece, through the eyes of its young citizens. Conducted within the framework of the postgraduate course "Sustainability and Smart Cities" at Harokopio University of Athens, this research aims to examine how students perceive their city's identity, environmental and cultural characteristics, and its transition toward a more sustainable and "smart" future.

A structured questionnaire was distributed to 250 students from the 2nd and 3rd grades of the 1st Gymnasio of Rafina. The survey, based on the official guidelines of the course, focused on key dimensions such as local landscape, heritage monuments, traditional customs, environmental challenges, and the implementation of sustainability projects by the school, including Erasmus+ "Protect Your Nature, Protect Your Future," "E.A.R.T.H.," and "Create Project," as well as participation in the Blue Schools Network and the municipal CLIMAAX climate resilience initiative.

The Results indicate that students strongly associate Rafina's identity with its coastal ecosystem, pine forests, and maritime life, while acknowledging both the beauty and environmental vulnerabilities of their city. They emphasize the value of civic engagement and environmental education as pathways to sustainability. The positive perceptions include the sense of community, the natural landscape, and the school's active engagement in green initiatives, while the concerns focus mainly on pollution, the port's expansion, the pressures on the Megalo Rema stream, and urban congestion..

The study highlights the importance of integrating youth perspectives into local sustainability planning. It demonstrates how school-based environmental education can strengthen civic responsibility and foster a collective vision for a resilient, inclusive, and environmentally conscious smart city.

Keywords: Rafina, city physiognomy, sustainable development, smart cities, environmental education-literacy, civic engagement.

1. INTRODUCTION

The physiognomy of a city is a complex and multidimensional concept that reflects its unique identity through its physical, cultural, social, and economic characteristics. It is not limited to the city's form or landscape but also encompasses its collective memory, historical continuity, and social values. The physiognomy of a city includes both its "logos" and its "myth"—the way a community perceives itself and expresses its relationship with space and time (*Astara κ.ά., 2008*).

The preservation of urban physiognomy is closely linked to the principles of sustainable urban development, which seek to balance environmental protection, economic viability, and social cohesion. Sustainability requires maintaining harmony between the natural and built environment, promoting civic participation, and ensuring intergenerational justice (*Astara et al., 2008*). Within this framework, the contemporary concept of “smart cities” emerges as a new model of urban governance that integrates technology and innovation to enhance quality of life, improve energy efficiency, and reduce environmental impact (*Badas, 2019*).

Within this theoretical and developmental context lies the case of Rafina, a coastal city in Eastern Attica where natural beauty coexists with significant development pressures. Surrounded by pine forests and connected to the Aegean Sea through its port, Rafina functions both as a residential area and as a hub of touristic activity. The city’s physiognomy is shaped by its maritime identity, its refugee heritage, and its vibrant social life; however, it simultaneously faces growing challenges related to port expansion, traffic congestion, and the need to protect its coastal ecosystem (*Municipality of Rafina–Pikermi, 2024*).

This study aims to investigate the physiognomy and sustainability of Rafina through the perspective of its young citizens. Drawing on data collected from 251 students of the 1st Gymnasio of Rafina, the research seeks to capture their perceptions of the city’s identity, its environmental characteristics, and its prospects for a more sustainable and “smart” future. The findings are expected to highlight the role of environmental education in cultivating civic responsibility and strengthening participatory planning processes. As emphasized by UNESCO, empowering young people to actively engage in local sustainability issues is a key factor in shaping resilient, inclusive, and future-oriented communities (*UNESCO, 2025*).

2. PURPOSE AND OBJECTIVES OF THE STUDY

The purpose of this study is to investigate how students perceive the physiognomy and sustainability of the city of Rafina. More specifically, the research aims to explore young citizens’ views regarding the city’s identity, its cultural and environmental characteristics, and the main challenges it faces on its path toward sustainable development. Particular emphasis is placed on understanding students’ perceptions of the city’s potential transition toward a “smart” urban model that integrates environmental protection, technological innovation, and community well-being.

In addition to examining students’ conceptualizations of Rafina, the study aims to document their assessment of sustainability-related challenges, such as environmental pressures, coastal vulnerability, and issues of urban management. An equally important objective is to analyze how students interpret the role of their school in promoting environmental awareness, civic engagement, and sustainable practices. This includes the impact of school-based European and environmental initiatives—such as Erasmus+ *Protect Your Nature, Protect Your Future*, Erasmus+ *E.A.R.T.H.*, the *Create Project*, participation in the Blue Schools Network, and the municipal CLIMAAX climate resilience program—on shaping students’ attitudes and values related to sustainability.

Through these interconnected objectives, the study seeks to highlight the importance of youth perspectives in local planning, while demonstrating how educational environments can function as catalysts for cultivating responsible, informed, and actively engaged future citizens.

3. THEORETICAL FRAMEWORK

3.1 City Physiognomy

The physiognomy of a city is a multidimensional concept that encompasses the physical, morphological, cultural, and social characteristics that shape its identity. Beyond the visible

elements of the urban landscape, city physiognomy integrates historical memories, residents' values, collective narratives, and cultural representations that define the "character" of a place (Astara et al., 2008). In coastal cities such as Rafina, physiognomy is strongly influenced by the marine environment, forests, coastline, and sociocultural factors such as refugee heritage and maritime identity. The study of urban physiognomy serves as a key tool for understanding how a city evolves, develops, and adapts to emerging challenges (Astara et al., 2008).

3.2 Sustainability

Sustainability refers to a place's ability to ensure the harmonious coexistence of environmental, social, and economic dimensions. In the urban context, sustainable development seeks to preserve natural resources, reduce environmental pressures, strengthen social cohesion, and guarantee fair and equitable access to essential infrastructure (Mitoula, 2023). It encompasses actions such as ecosystem protection, improvement of quality of life, enhancement of public spaces, and the promotion of green modes of mobility. In sensitive coastal areas, sustainability also involves addressing risks such as erosion, sea-level rise, and pressures stemming from tourism and urban expansion (Mitoula, 2023).

3.3 Smart Cities

The concept of "smart cities" refers to a contemporary model of urban governance that leverages digital technologies, innovation, and information systems to improve quality of life, enhance the efficiency of urban services, and reduce environmental impact (Badas, 2019). Smart cities develop digital management systems—such as smart waste bins, environmental sensors, and digital information displays—promote open governance, and create tools that strengthen citizen participation in decision-making processes. An effective transition to a smart city model requires not only technological infrastructure, but also active, informed, and engaged citizens (Badas, 2019).

3.4 The Role of Environmental Education

Environmental education constitutes a fundamental pillar for cultivating ecological awareness, responsibility, and active student participation in issues affecting their city. Through experiential activities, school-based programs, and engagement in European initiatives, students develop knowledge, critical thinking, and collaboration skills that enable them to contribute to the sustainable development of their community (UNESCO, 2025). Initiatives such as Erasmus+ School Education, the Blue Schools Network, and the CLIMAAX programme strengthen students' understanding of environmental issues, encourage responsibility, and promote the role of the school as an active agent of change. Empowering students, as highlighted by UNESCO, is a critical tool for fostering resilient and participatory communities (UNESCO, 2025).

4. METHODOLOGY

4.1 Sample

The sample for this study consists of 251 students from the 1st Gymnasium of Rafina, which is the only public lower secondary school in the city and serves the entire adolescent population of the area. With an overall enrolment of 371 students, the school provides a representative setting for the research, as the sample corresponds to a substantial proportion of the school population.

Participants were drawn from Grade 1 and Grade 3 and included students who were present at school on the day of data collection. Specifically, 145 students from Grade 3 (76

boys and 69 girls) and 106 students from Grade 1 (65 boys and 41 girls) participated in the study. The age range of the participants was 12 to 15 years.

Data collection was conducted anonymously, without the recording of any personal information, and in accordance with the ethical standards of educational research. The high participation rate and the population-wide coverage of the school strengthen the reliability and validity of the study's findings.

4.2 Study Area: The City of Rafina

Rafina is one of the most characteristic coastal municipalities of Eastern Attica, combining a long historical presence, a distinctive cultural identity, and a natural environment of high ecological value. The area has been continuously inhabited since prehistoric times, as demonstrated by findings of rectangular dwellings and copper-processing facilities. During the Classical period, Rafina—known as *Araphin*—was one of the one hundred demes of ancient Athens established by Cleisthenes, taking its name from the mythical local hero and governor of the region. Archaeological remains from the Roman era, including baths, statues, and building structures, further attest to the enduring importance of the site. In the area of Asketario (Marikes Beach), fortified settlements from the Early Bronze Age have also been excavated.

The modern physiognomy of Rafina was decisively shaped after 1923 by the arrival of refugees from Triglia in Asia Minor. The expropriation of the Skouze estate and the establishment of the refugee settlement created strong social cohesion, a new architectural character, and cultural features that remain present today. Over the following decades, the town continued to grow by leveraging the strategic position of its port, which functioned both as a leisure destination and as a small-scale tourist hub. During the German occupation, fortified structures were constructed along the coastline, while the post-war period brought rapid economic and residential development, marked by the creation of key public infrastructures, the first hotels, and improvements to the main road network (*Municipality of Rafina–Pikermi, 2024*).

Geographically, Rafina forms part of the natural and social mosaic of Eastern Attica, a region characterized by coastal ecosystems, small wetlands, hills with Mediterranean maquis, and extensive forests of Aleppo pine (*Pinus halepensis*). At the same time, its proximity to Athens has made the area particularly vulnerable to anthropogenic pressures such as urban sprawl, tourism-driven expansion, and the lack of coherent spatial planning. Eastern Attica has experienced significant demographic growth in recent decades, further intensified by major infrastructure projects such as the Attiki Odos motorway and the Athens International Airport. Increased housing demand, the expansion of holiday-home zones, and dispersed unregulated construction have led to habitat fragmentation and environmental conflicts (*Samara, 2025*).

Adding to this already pressured environment was the devastating wildfire of 23 July 2018, which struck the wider region of Eastern Attica, with the tragedy centered in nearby Mati and with direct consequences for Rafina. The fire resulted in the loss of dozens of lives, leaving a profound social and psychological impact on the community and highlighting the need for enhanced civil protection and climate-resilience mechanisms. The event exposed weaknesses in spatial planning, the absence of fire-break infrastructure, and the challenges facing coastal and peri-urban ecosystems under extreme weather events. Its effects remain visible in both the landscape and the collective memory of the local population, making Rafina a significant case study for issues of sustainable reconstruction and climate adaptation (*Samara, 2025*).

Beyond environmental pressures, Rafina has undergone substantial demographic shifts over the past three decades. The population increased from 8,894 residents in 1991, to 13,625

in 2001 (+53%), 20,266 in 2011 (+49%), and 22,328 in 2021 (+10%). This continuous increase has strained existing infrastructures, heightened demand for housing, and intensified the need for modernization of municipal services.

A major factor shaping the city's sustainability challenges is the role of the Port of Rafina, the second-largest passenger port in Attica. Intense summer activity leads to dramatic increases in traffic congestion, with large accumulations of private cars, buses, and freight vehicles, especially during peak departure times for the Cyclades. This seasonal surge produces significant air pollution, traffic-related disturbances, and acoustic pressure on nearby residential areas.

Additionally, the municipality's proximity to Athens International Airport contributes to persistent aircraft noise pollution, particularly in flight and overflight corridors. This chronic acoustic burden is now recognized as an environmental and public-health factor influencing residents' quality of life.

As a coastal city with critical infrastructures, Rafina stands at a transitional point between urban and natural space. Its coastal ecosystem, pine forests, the Rafina stream, and areas of high biodiversity coexist with increasing pressures from traffic, port expansion, tourism flows, and climate vulnerability. These combined dynamics make Rafina an ideal study area for examining issues of sustainability, urban physiognomy, climate resilience, and participatory planning.

4.3 Research Tool

The research data were collected using a structured online questionnaire developed with Google Forms. The instrument was designed specifically for this study, following the pedagogical principles of the course *Sustainability & Smart Cities* (Harokopio University), and was informed by contemporary literature on city physiognomy, sustainability education, youth civic engagement, and smart city frameworks. The questionnaire consisted of nine thematic sections, combining closed-ended Likert-scale items with open-ended qualitative prompts, in order to capture both measurable trends and rich personal perceptions of the students.

The first section included a brief introductory statement outlining the purpose of the study, assuring anonymity, and explaining that there were no "correct" or "incorrect" answers. The second section collected basic demographic information, specifically gender and grade level, allowing for comparative analysis across student groups.

The third section explored students' perceptions of the physiognomy, cultural identity, and sensory landscape of Rafina. This part employed open-ended questions inviting students to describe key colors, sounds, smells, natural elements, foods, cultural events, monuments, and personal meanings associated with the city. Additional items examined the perceived influence of Rafina's refugee heritage and historical past on the city's contemporary identity.

The fourth section addressed sustainability and environmental challenges, using 5-point Likert scales (1 = strongly disagree, 5 = strongly agree). Items measured students' understanding of sustainable development, their assessment of the city's environmental problems (e.g., waste management, traffic, forest and coastal protection), and the perceived role of the school in developing environmental awareness and resilience. Students were also asked to rank environmental challenges according to personal significance (e.g., pollution, urban expansion, wildfires, floods).

The fifth section focused on youth participation and active citizenship. Students reported whether they had taken part in environmental or community actions, the types of activities involved (e.g., tree planting, beach clean-ups, school programs, collaborations with the Municipality), and the extent to which they felt their opinions could influence local

decision-making. Additional questions examined preferred forms of school–municipality collaboration and sources of environmental information.

The sixth and seventh sections investigated perceptions of European and school-based programmes related to sustainability (e.g., Erasmus+, Blue Schools, CLIMAAX). Through Likert-scale items, students evaluated their awareness of these initiatives, their perceived educational value, their influence on students’ environmental habits, and their contribution to Rafina’s image as a “green” or sustainability-oriented city. Students also reflected on whether participation in Erasmus+ activities strengthened their environmental knowledge, motivation, and sense of agency as active citizens.

The eighth section examined views on Rafina as a “smart” and sustainable city of the future. Students assessed how “smart” they consider the city today and the potential benefits of green technologies (e.g., sensors, renewable energy, smart lighting). They also evaluated the importance of citizen–municipality cooperation and proposed their own ideas for sustainable or digital improvements. Open-ended questions invited them to imagine Rafina in 2035 and to suggest smart-city solutions they would like to see implemented.

Finally, the ninth section included reflective questions such as “If you were the mayor for one day, what action would you start to make Rafina more environmentally friendly?”, enabling the collection of deeper insights into students’ priorities, creativity, and sense of responsibility toward their city.

Overall, the questionnaire was designed to generate comprehensive data on how students perceive Rafina’s identity, environmental challenges, civic engagement opportunities, and future development as a sustainable and smart coastal city. The combination of quantitative and qualitative items allowed for a multi-layered analysis consistent with the study’s mixed-methods approach.

5. DATA ANALYSIS

5.1 Descriptive Statistics (Demographics)

A total of 251 students from the 1st Gymnasium of Rafina participated in the study. The sample included 141 boys and 110 girls, while 106 students were enrolled in Grade 1 and 145 students in Grade 3 of lower secondary education. These distributions reflect the population structure of the school and ensure adequate representation across gender and grade levels.

The demographic variables were used descriptively to contextualize the findings, while the subsequent analysis focused on thematic patterns related to city physiognomy, sustainability awareness, civic participation, and smart-city perspectives.

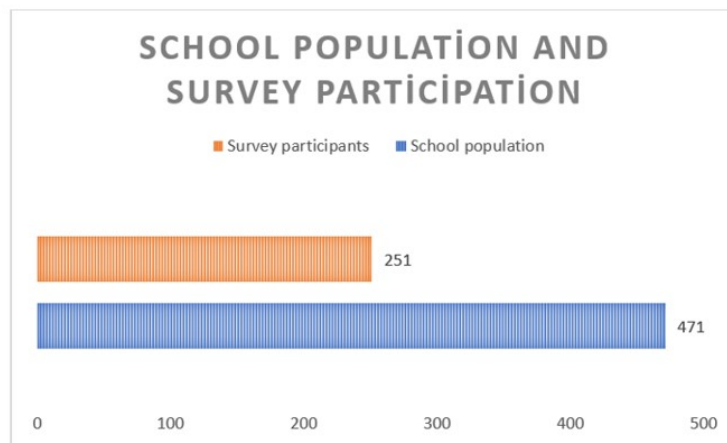


Figure 1: School population vs. survey participants (53.3% participation rate)

5.2 Physiognomy

The first thematic cluster explored how students perceive the physiognomy of Rafina through sensory associations, symbolic elements, and personal experiences. The responses reveal a consistent and vivid image of the city, strongly connected to its coastal character and natural environment.

Colours Associated with the City

The vast majority of students described Rafina using blue and light-blue tones, directly linked to the sea and the sky. Secondary references included green, reflecting the presence of pine forests and coastal vegetation.

Characteristic Sounds of Rafina

The dominant soundscape described by students includes waves, the sea, and ship engines, which form the core of the city's acoustic identity. Additional sounds such as wind and cicadas were also frequently mentioned, particularly by students living near natural areas. A smaller but meaningful proportion referred to traffic noise and aircraft sounds, indicating awareness of human-induced noise and the influence of nearby transport infrastructure.

Smells and Scents Associated with the City

The most common scent linked to Rafina was the smell of the sea, confirming the strong emotional and sensory connection to the coastal environment. However, many students also mentioned the smell of ship exhaust, often described as "the smell of the port," highlighting the environmental burden of maritime activity. Natural aromas such as pine, tamarisk, olive trees, and vineyards were also noted.

Plant or Tree Representing Rafina

Students most frequently selected pine trees as the plant symbol of the city, followed by tamarisk and olive trees, reflecting the typical vegetation of Eastern Attica and the coastal landscape.

Foods Associated with Rafina

The gastronomic identity of the city, according to the students, is mainly represented by seafood and fish, consistent with Rafina's maritime character. Souvlaki also appeared frequently as a common local food preference.

Traditional Events and Festivals

Students identified the Panagia Pantovasilissa celebration and the national parades as the most characteristic local events of the city.

Favourite Places in the City

The most frequently mentioned favourite places include Agios Nikolaos, Marikes Beach, the port area, Karamanlis Park, and the central square, indicating the importance of both natural landscapes and social public spaces.

Monuments Linked to Rafina

Students referred to symbolic sites such as the War Memorial, the Monument of Saint Chrysostomos of Smyrna, and, in several cases, the statue of the refugee girl, reflecting the strong presence of Asia Minor refugee memory in the city's collective identity.

One-Sentence Description of Rafina

When asked to describe Rafina in one sentence for someone who has never visited, students most commonly characterized the city as "coastal," "small," "peaceful," and "beautiful." A smaller number of students described it as "boring," suggesting differentiated levels of emotional engagement with the urban environment.

Students' Perceptions of the Influence of Refugee Heritage on Rafina's Contemporary Identity

The responses indicate that students generally acknowledge the strong influence of Rafina's historical and refugee heritage on the city's contemporary identity. Most participants selected values of 4 or 5, indicating that they believe the Asia Minor origins of the local population continue to shape cultural memory, social life, and the symbolic character of the city.

A smaller proportion of students selected value 3, suggesting a moderate perception of influence, while only a few participants chose values of 1 or 2, indicating limited recognition of this historical dimension.

Overall, the results highlight that the refugee past remains a central component of the city's physiognomy, particularly for the younger generation, who appear aware of the significance of monuments, traditions, and local narratives associated with Asia Minor heritage.

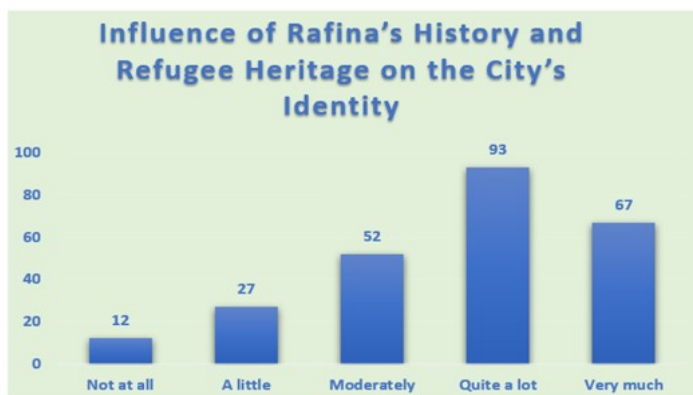


Figure 2: Students' perceptions of the extent to which Rafina's history and refugee heritage influence the city's contemporary identity (n = 251). Responses are presented on a 5-point Likert scale (1 = Not at all, 5 = Very much).

5.3 Students' Perceptions of Sustainability and Local Environmental Challenges

This section presents the findings related to students' perceptions of sustainability, local environmental challenges in Rafina, and the role of the school in promoting environmental awareness and active citizenship. The analysis is based on a series of Likert-scale questions (1 = "Strongly disagree" to 5 = "Strongly agree") that examined students' understanding of key sustainability concepts, their evaluation of environmental pressures affecting the city, and their views on how effectively the school supports environmental education and resilience.

The descriptive results provide insight into how young residents perceive both the natural and urban environment of Rafina, as well as their level of engagement with issues related to environmental protection and community well-being. The visual representations that follow (bar charts) illustrate the distribution of responses and highlight emerging trends in students' attitudes toward sustainability, environmental challenges, and the school's contribution to shaping environmentally responsible citizens.

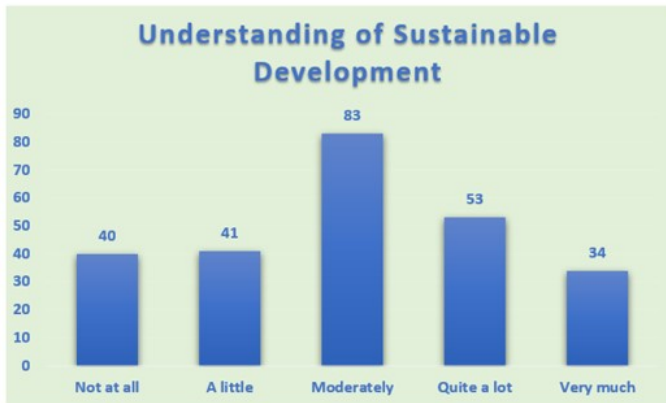


Figure 3: Distribution of students' responses regarding their understanding of the concept of sustainable development (1 = Strongly disagree, 5 = Strongly agree).

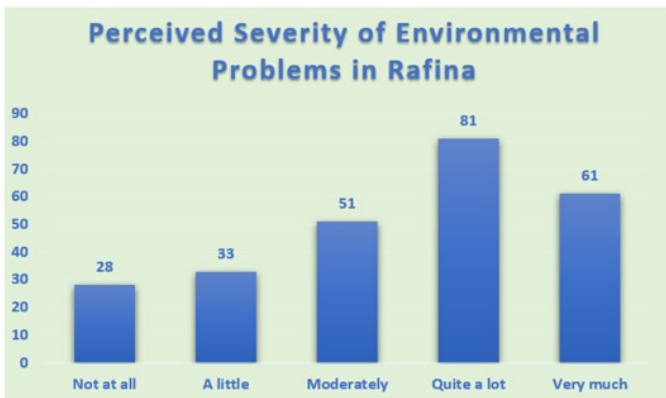


Figure 4: Students' perceptions of the severity of environmental problems in Rafina (N = 251). Responses range from 1 = "Not at all" to 5 = "Very much".

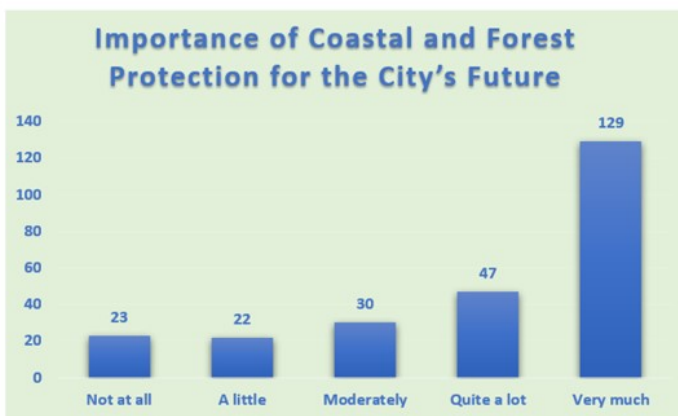


Figure 5: Students' views on the importance of protecting Rafina's coasts and forests for the city's future (N = 251). Responses range from 1 = "Not at all" to 5 = "Very much."

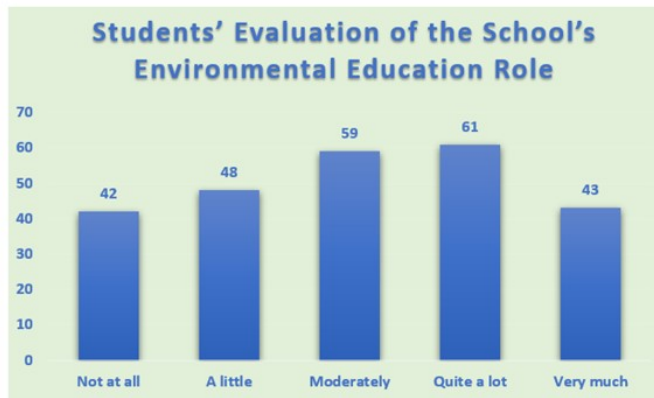


Figure 6: Students' evaluation of their school's role in promoting environmental education and awareness (N = 251). Responses range from 1 = "Not at all" to 5 = "Very much."

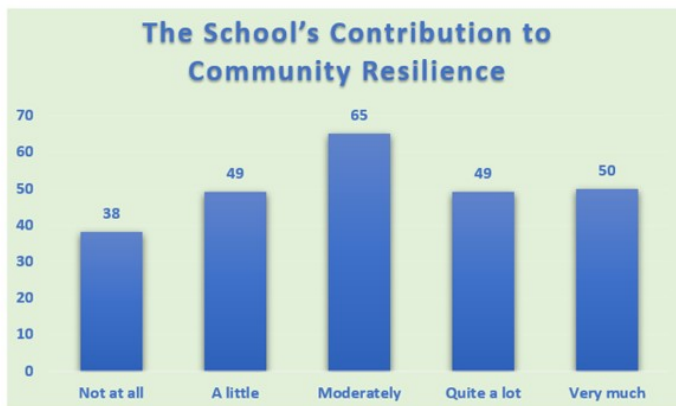


Figure 7: Students' evaluation of their school's role in promoting environmental education and awareness (N = 251). Responses range from 1 = "Not at all" to 5 = "Very much."

5.4 Environmental Concerns Identified by Students

When students were asked to select the single most important environmental problem in Rafina, pollution (including waste, noise, and vehicle emissions) emerged as the top concern, chosen by 62 participants. The expansion of the port (48 votes) and the degradation of the Megalo Rema stream (47 votes) also ranked highly, indicating students' awareness of pressures affecting the coastal and natural environment. Issues such as forest loss and wildfire risk (39 votes) and reduction of green areas (31 votes) followed, while traffic and parking problems (19 votes) were considered less critical in comparison. Flooding and coastal erosion received the fewest first-choice selections (5 votes), suggesting that students prioritize everyday and visible environmental pressures over seasonal or long-term risks. Overall, the ranking demonstrates a clear emphasis on pollution and coastal environmental challenges as the city's most urgent problems.

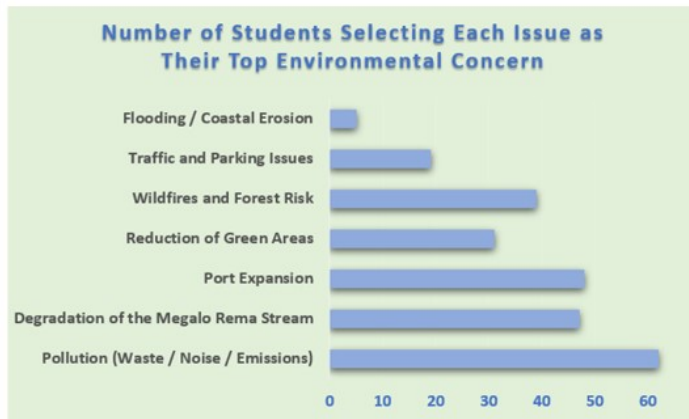


Figure 8: Distribution of students selecting each environmental issue as their top concern.

5.5 Students' Civic Engagement and Participation

This section examines the extent to which students in Rafina are actively engaged in environmental or community-related actions, either individually, through school initiatives, or in collaboration with the municipality. The analysis focuses on students' participation in activities such as tree planting, beach clean-ups, school environmental programs, and municipal actions, as well as their perceived ability to influence decisions affecting their city.

The findings provide insight into students' sense of agency, their willingness to participate in collective efforts, and their expectations for stronger cooperation between the school community and the local authorities. These indicators are essential for understanding the development of active citizenship and environmental responsibility among young people.

To better understand students' level of civic engagement, the first indicator examined was whether they have ever proposed or participated in an action aimed at improving their school or their city.

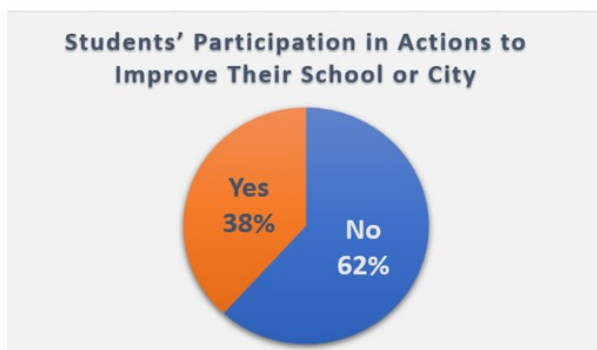


Figure 9: Distribution of students who reported having proposed or participated in an action aimed at improving their school or the city of Rafina. The majority (62%) indicated that they have not yet engaged in such initiatives, while 38% reported active involvement

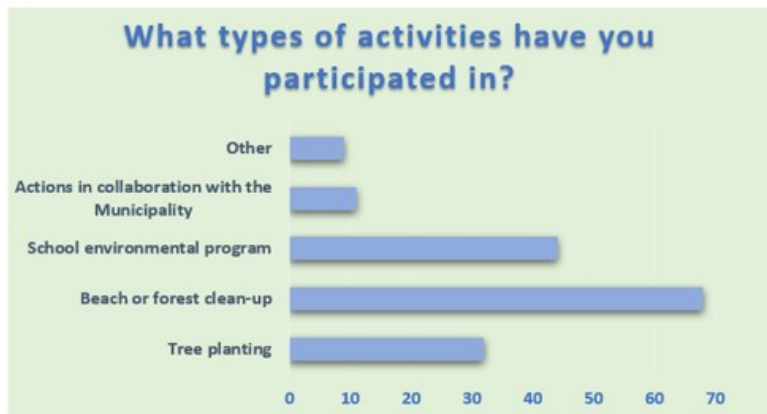


Figure 10: Distribution of students’ participation across different types of environmental and community activities.

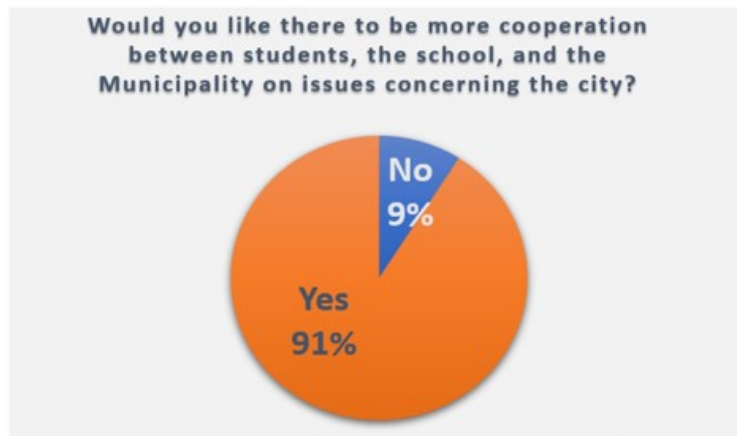


Figure 11: Students’ willingness to see stronger cooperation between the school and the Municipality.

5.6 Students’ Perceptions of European and School Programs

European and school-based programs—such as Erasmus+, Blue Schools, and environmental education initiatives—play a crucial role in strengthening students’ environmental awareness, sustainability literacy, and sense of European citizenship. These programs provide experiential learning opportunities, foster intercultural understanding, and promote active engagement with real-world environmental challenges. In the context of Rafina, where coastal and forest ecosystems are central to local identity, such initiatives help students connect global sustainability principles with the needs of their own community.

This section presents students’ perceptions of how effectively these programs contribute to environmental knowledge, influence daily habits, enhance the city’s environmental image, and motivate young people to participate in positive change.



Figure 12: Distribution of responses among the 56 students who reported personal participation in a European program, regarding the statement "I learned more about the environment and sustainable development through these programs." The results illustrate the educational impact of European initiatives on participating students.

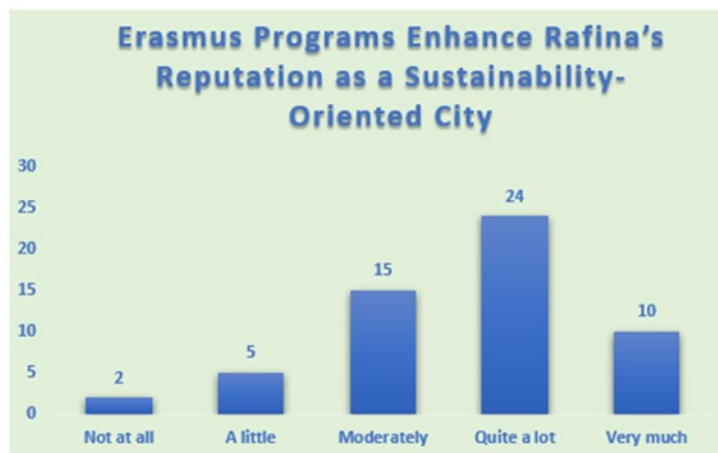


Figure 13: Distribution of responses among the 56 students who reported personal participation in a European program, regarding the statement "I believe that Erasmus Erasmus programs make Rafina more well-known as a city that cares about sustainability." The results highlight students' perceptions of the external visibility and local impact of European initiatives.

As part of the open-ended responses, several students shared personal reflections on how their participation in European programs influenced their environmental awareness and sense of responsibility. One student expressed the following:

"What I appreciated most about my participation was the feeling of belonging to a group of students who were genuinely trying to address important environmental issues in each city. Through this experience, we learned meaningful ways to respond to environmental challenges, such as climate change. I believe that the school also benefited positively, as our actions encouraged greater awareness and efforts to reduce environmental problems in our community."

This testimonial illustrates how European programs can foster a deeper sense of collective purpose, strengthen students' environmental literacy, and enhance the school's contribution to promoting sustainable values.

5.7 Students' Vision for a "Smart" and Sustainable City

As part of the questionnaire, students were invited to reflect on what constitutes a "smart" and environmentally sustainable city and to evaluate the future prospects of Rafina through this lens. Their responses offer valuable insight into how young citizens perceive the role of technology, green infrastructure, and community participation in shaping urban development. This section examines students' views on the current level of "smartness" in Rafina, their expectations for digital and environmental improvements, and their ideas for building a city that is modern, inclusive, and ecologically responsible. These perspectives contribute to understanding how future generations imagine the evolution of Rafina and highlight the importance of integrating youth-driven proposals into municipal planning.

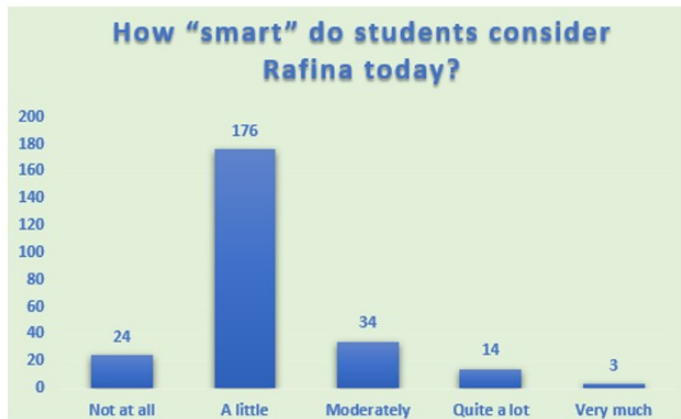


Figure 14: This figure illustrates the distribution of students' responses to the question "How smart do you consider Rafina today?". The results show that the majority selected "A little" (176 students), indicating that most perceive Rafina as having limited smart-city characteristics. Only a small proportion rated the city as "Quite a lot" or "Very much", suggesting substantial room for technological and sustainable urban development.

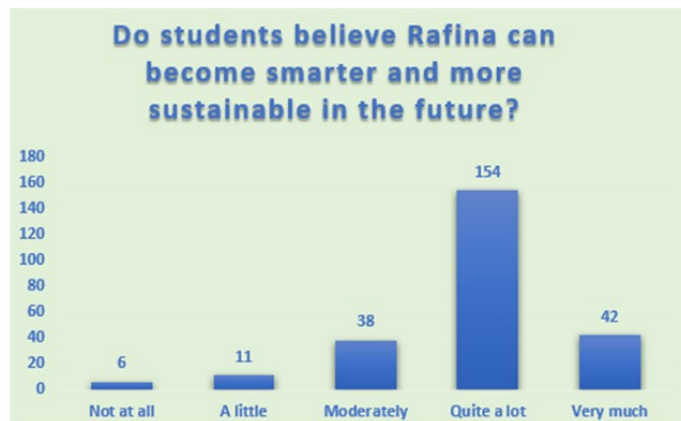


Figure 15: This figure presents students' responses to the question "Do you believe Rafina can become smarter and more sustainable in the future?". The majority expressed strong optimism, with 154 students selecting "Quite a lot" and 42 selecting "Very much." Only a small number of students chose lower agreement levels, indicating that most young residents view substantial potential for future development through technology, green innovation, and collaborative local action.

Beyond evaluating their current city, students were invited to imagine Rafina in the year 2035 and propose specific solutions that would make it smarter, greener, and more sustainable. Their responses—drawn from both open-ended questions and multiple-choice items—provide a forward-looking perspective and reveal a clear willingness to engage in shaping the city's future.

Across the dataset, several recurring priorities emerged. Students emphasized the need for smart waste-management technologies (such as smart bins with sensors), expanded bike lanes, and green mobility options. Strengthening coastal protection measures and preserving beach ecosystems were also highlighted frequently, reflecting their awareness of local

environmental vulnerabilities. Many students proposed digital solutions, including real-time information systems, smart lighting, and digital signage for public spaces. Additional priorities included the creation of green corridors, more trees, pocket parks, and the enhancement of public transport to reduce traffic and emissions.

Overall, students envision a future Rafina that remains beautiful and familiar, yet also significantly improved through thoughtful environmental planning and smart innovation. Their proposals reflect optimism, creativity, and a strong belief that the city can evolve into a model of sustainable coastal living—provided that technology, environmental care, and community collaboration move hand in hand.

6. DISCUSSION

The findings of this study demonstrate that students hold a clear, consistent, and multidimensional understanding of Rafina’s physiognomy, sustainability challenges, and future prospects. Their responses—both qualitative and quantitative—showcase how young residents interpret the city’s identity, evaluate its environmental pressures, engage with civic and school-based initiatives, and imagine a “smart” Rafina in the years ahead. The discussion below synthesizes these insights, structured according to the major thematic clusters reflected in the results.

6.1 Students’ Perceptions of Rafina’s Physiognomy

The sensory and symbolic associations provided by students reveal a cohesive and vivid image of Rafina. The predominance of blue and light blue tones, the recurrent reference to the sound of waves and ship engines, and the characteristic smell of the sea all underline the strong emotional and spatial connection students have with the coastal environment. At the same time, natural references such as pine trees, tamarisks, and Mediterranean vegetation highlight the significance of the surrounding forests and green areas.

Cultural identity also emerges strongly in this cluster. Many students refer to monuments linked to the Asia Minor refugee heritage, traditional celebrations, and symbolic public spaces. These findings indicate that younger residents perceive Rafina not only through its natural landscape but also through its cultural memory and everyday social life. Their “one-sentence descriptions” of the city—frequently “beautiful,” “peaceful,” “small,” and “coastal”—confirm a well-formed and balanced perception of Rafina’s character.

6.2 Awareness of Environmental Concerns

Students show a high level of environmental awareness, demonstrated by their prioritization of issues such as pollution, port-related pressures, and the degradation of the Megalo Rema stream. These results reflect their sensitivity toward both visible, everyday environmental problems and broader ecological risks affecting the city.

The emphasis on pollution (waste, noise, emissions) suggests that students experience these pressures directly in their daily lives, while concerns about the stream, forest loss, and wildfire risk indicate a deeper understanding of ecological systems and vulnerabilities. Less frequently mentioned issues—such as flooding and coastal erosion—show that students tend to prioritize immediate environmental conditions over long-term or seasonal threats. Overall, this cluster illustrates a youth population with strong observational awareness and critical engagement with environmental quality.

6.3 Civic Engagement and School-Based Participation

The analysis of civic engagement reveals that students are willing to participate in environmental and community-oriented actions, particularly when these are facilitated or

encouraged by the school. Many students have taken part in activities such as tree planting, beach clean-ups, or environmental projects, demonstrating that experiential learning plays a key role in shaping attitudes and behaviors.

Furthermore, the belief that school initiatives can influence the community—and that student ideas can meaningfully contribute to local improvement—highlights an emerging sense of agency. Students express interest in stronger cooperation between schools and municipal structures, even if they do not yet feel fully empowered to impact decision-making. This suggests that environmental education and participatory school programmes can serve as foundational mechanisms for developing active citizenship

6.4 The Impact of European and School Programs on Students' Environmental Attitudes

The students' perceptions of Erasmus+, the Blue Schools Network, and climate-related projects indicate that these programmes significantly shape environmental knowledge, motivation, and personal responsibility. Many students report that participation enhances their awareness of climate change, strengthens environmentally friendly habits, and fosters a sense of belonging to a group working toward meaningful goals.

The qualitative testimonials further illustrate this impact. Students describe these experiences as opportunities to learn practical solutions, collaborate with peers from different contexts, and cultivate a deeper commitment to sustainability. In this sense, the school functions not only as a learning environment but also as a platform for developing environmental citizenship, where international cooperation broadens perspectives and reinforces positive ecological behaviors.

6.5 Students' Vision for a Smart and Sustainable Rafina

In their future-oriented reflections, students articulate a clear, hopeful, and realistic vision for Rafina in 2035. The most frequent proposals—smart waste bins, expanded bike lanes, digital information systems, smart lighting, and enhanced public transportation—indicate that students understand smart-city solutions both technologically and environmentally.

Equally important is the emphasis on nature-based approaches, such as coastal protection, preservation of beach ecosystems, creation of green corridors, and planting more trees. This dual focus suggests that students view “smartness” not merely as digital innovation but as the integration of technology with ecological care and sustainable mobility.

Their responses demonstrate optimism and creativity, but also a grounded awareness of the city's needs. The consistency of their proposals across open-ended and multiple-choice items confirms that young people hold well-developed ideas about the directions in which Rafina should evolve—ideas that could contribute meaningfully to long-term planning if incorporated into participatory processes.

Overall, the students' views reveal an integrated understanding of identity, environmental responsibility, and technological potential, highlighting the role of young people as co-creators of sustainable urban futures.

7. CONCLUSIONS

This study examined how students of the 1st Gymnasio of Rafina perceive the physiognomy, environmental challenges, and future prospects of their city. The findings reveal a youth population with strong place-based awareness, ecological sensitivity, and a clear understanding of both the city's strengths and its vulnerabilities. Through their responses, students demonstrate a comprehensive appreciation of Rafina's natural and cultural landscape, as well as a genuine interest in contributing to its sustainable development.

First, students show that they hold a well-formed and multidimensional understanding of Rafina's identity. Their sensory descriptions, symbolic references, and cultural associations reflect a deep connection to the coastal environment, pine forests, and the historical legacy of the city. These perceptions highlight the coexistence of natural beauty, cultural memory, and everyday social life as defining elements of the city's character.

Second, the study indicates that environmental awareness among students is consistently high. Pollution, pressures related to port activity, degradation of the Megalo Rema stream, and wildfire risk emerge as the most urgent environmental issues. Students' ability to identify these challenges demonstrates a keen observational understanding of ecological conditions and a sensitivity to both immediate and long-term threats facing their community.

Third, students recognise the important role of the school as an agent of environmental education, civic engagement, and sustainability. Participation in Erasmus+, Blue Schools, and climate-related programmes enhances their knowledge of environmental issues, shapes positive habits, and increases their sense of responsibility toward their city. The school functions as a key catalyst in fostering environmental citizenship and encouraging young people to take part in collective action.

Fourth, students express a strong willingness to engage in actions that improve their city. They believe that youth participation can influence positive change, especially when supported by school-based initiatives. Their future-oriented ideas illustrate not only creativity but also an understanding of the practical steps needed to make Rafina greener, smarter, and more resilient.

Finally, the students' vision for Rafina in 2035 demonstrates a coherent and hopeful outlook. Their proposals combine technological innovation with ecological care, indicating that they perceive smart-city development as a balanced integration of digital tools, sustainable mobility, green infrastructure, and environmental protection. This future-oriented thinking underscores the potential of young people to contribute meaningfully to participatory urban planning and long-term sustainability strategies.

Overall, the study concludes that students are not passive observers but active, informed, and engaged members of the community. Their perspectives offer valuable insights into the identity, challenges, and potential of Rafina, underscoring the importance of incorporating youth voices into environmental education, local decision-making processes, and sustainable urban development.

8. RECOMMENDATIONS

The students' responses highlight specific needs, priorities, and opportunities for strengthening sustainability education and promoting a more environmentally conscious future for Rafina. Based on these insights, the following recommendations aim to translate the students' perspectives into meaningful actions.

Creating Joint School–Community Initiatives

Students express a desire to participate in actions that benefit their city, especially when these activities are organised through school structures. Collaborative projects—such as shared clean-up efforts, tree-planting days, thematic workshops, or small-scale environmental campaigns—can provide young people with hands-on experience while supporting the local community. Involving students in the planning stages of such initiatives reinforces their sense of responsibility and encourages a more participatory culture.

Strengthening Urban Nature and Everyday Access to Green Spaces

Many students highlight the importance of forests, coastal zones, and natural vegetation in shaping Rafina's identity. Their comments suggest that protecting and expanding green

areas should remain a priority. Establishing small green pockets, improving biodiversity in schoolyards, and promoting activities that bring students into closer contact with nature can support long-term ecological awareness. Approaches based on nature—such as restoring damaged areas or enhancing natural shading and greenery—can also contribute to a healthier urban environment.

Improving Mobility Through Environmentally Friendly Options

A recurring theme in students' suggestions is the need for safer, more sustainable ways to move around the city. Their interest in bike lanes and pedestrian-friendly streets shows that they view sustainable mobility as a core element of a better everyday life. Schools can support this mindset by integrating awareness activities on mobility choices, encouraging walking or cycling to school where feasible, and engaging students in discussions about how mobility affects the environment.

Using Digital Tools to Support Environmental Learning

Students associate “smart” elements with both environmental protection and practical daily improvements. Their suggestions—ranging from smart waste bins to digital information panels—indicate that technology can play a supportive role in sustainability education. Schools may consider incorporating digital sensors, environmental monitoring apps, or data-based student projects into classroom activities. These tools can help students understand environmental change in real time while simultaneously strengthening digital skills.

Expanding International and European Opportunities

Students clearly recognise that programmes like Erasmus+, Blue Schools, and climate-related projects broaden their understanding of environmental issues. Continuing and expanding involvement in such programmes can enrich students' experiences and expose them to different approaches to sustainability. Encouraging collaborative student projects, virtual exchanges, and thematic mobility experiences can further support their growth as environmentally active young citizens.

Encouraging Youth Voices in Planning and Decision-Making

Throughout the questionnaire, students demonstrate not only awareness of environmental challenges but also a desire to contribute ideas for improving their city. Creating structured opportunities—such as youth consultation groups, student panels, or idea-sharing platforms—would allow young people to express their views more systematically. Their perspectives, grounded in personal experience, can offer valuable input for shaping future initiatives that concern their daily life and the environment.

Cultivating Long-Term Environmental Awareness

The students' strong sense of concern for pollution, forests, and coastal areas highlights the importance of sustaining environmental education over time. Activities such as river monitoring, beach observation, or student-led environmental clubs can help maintain this awareness. Embedding long-term practices into the school culture supports continuity, helping students develop a lasting connection with their local environment and a deeper understanding of ecological stewardship.

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