****Environmental Concerns in Porto Romano: Impact of Industrial to Suburban Shift****

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| **Abstract**  **Aim** This research aims to analyze the impact of air quality on community health and develop a strategy for proper waste management. Proper waste management is a significant challenge for the community, academic staff, and students.  **Place and Duration of Study.** The area of Port Romano, situated 7 km north of Durres city and facing the Adriatic Sea, holds great significance for the Durres municipality. In the past, it was known as a chemical enterprise that produced pesticides for agriculture and sodium dichromate for leather tanning in the country’s western cities. However, after the fall of communism, the area transformed, and its population grew due to internal migration, mainly from northern Albania.  Many families settled in this highly contaminated area. 2009, an energetic park was implemented, which impacted air quality due to the thermal power plant and oil and gas installations.  In the vicinity of Porto Romano lies Aleksander Moise University, a topic of dispute amongst civil society and academic staff since 2012 due to its controversial location. **Methodology**.  For this study, the data were provided by respondents from the Porto-Romano area. A total of 102 questionnaires divided into three sessions were analyzed using factor analysis, data reliability analysis, and multiple regression analysis. All analyses were performed using SPSS version 23.0 for Windows. The results show that special attention should be paid to these factors: (a) Environmental problems in the well-being of residents and (b) the need for support from government bodies in terms of infrastructure to increase the economic well-being of residents.  **Conclusion**. This paper's implications relate only to certain variables studied and only to Porto-Romano. In case of future analysis by different researchers, other variables can be analyzed for different problems by making comparisons with the presented data. The government should provide more facilities and interventions to protect the environment, ensuring that stakeholders observe the rules and adapt residents’ destinations to ensure viability. |

***Keywords****: Air quality, Waste disposal, Migration, waste management, urbanization*

INTRODUCTION

The district of Durres in the central region of the Adriatic coast houses the coastal area of Porto-Romano. Its location has been significant since ancient times, serving as a port area. Trade has been the economic foundation for centuries, indicating relations with neighboring countries. However, during the communist regime, the government transformed the area into an industrial zone, disrupting its traditional function. The area spans around 859 ha in the lands of the former swamp, consisting of lagoon and marsh deposits. It is situated in the northwestern region of the former Durres marshland at an almost equal sea-level elevation. The plain of Durres is easily accessible from the coast and directly connected to the Gulf of Durres and Porto Romano. The Energy and Industrial Zone Porto Romano (ZEIPR) defines the plans to transfer some economic activities related to the energy sector from the port of Durres to Porto Romano, which requires the development of infrastructure for hydrocarbon import-export to transform the area into a complex Industrial-Energy park. However, it is important to note that the area's demographic transformation since the 1990s, with people settling here and building their homes, has also changed its economic function.

**Materials and method**

This research examines the effect of environmental problems in Porto-Romano by using 102 questionnaires and econometric models regarding the impacts on the well-being of local communities where similar research has not been conducted before.

This research critically analyzes the perceptions of environmental problems among Porto-Romano residents resulting from the industrial to suburban transformation after the 1990s. The study was conducted for the first time, with 102 participants from the area responding to the questionnaires. Several theoretical and practical methods focused on natural and human factors influencing socioeconomic development. The interview method has been an efficient way of gathering opinions about the possibilities of environmental protection based on national and international legislation. All the conducted interviews were based on answering questions such as:

*How is the situation particularly related to solid waste? Is there a concern regarding waste disposal and its impact on the environment, human health, and safety? Is the land suitable for agriculture? How is the local government involved in solid waste management in this region? How did the community respond to the local government's lack of action?*

We were allowed to obtain sufficient and necessary information to carry out the analysis of the Porto-Romano area. Based on these questionaries, we have also built tables, which gave us a clear overview of the environmental situation.

**Method of observation**

The method of observation in the field has been realized through expeditions with students in the area under study. This method has helped us highlight current problems, such as the local population's environmental and socio-economic problems. Group analysis is a statistical method with many variables that classify data according to their similarities (Hastie et al.,2009) according to the algorithms of the groups contributed by the authors [(Yuan&Yung,2019)](#_top) as well as according to maximum expectations (Ankerst et al., 1999). Returning to the idea of these econometric models (Steinhaus, 1957). The term “k-means” was used for the first time by Duan & Mao (Mac Queen,1967), suggesting that some algorithms be tried to gain the best possible understanding of the database (Lloyd,1982). Cluster analysis is efficient and effective if it includes as few groups as possible and should be statistically significant (Sig.000)

**Data analyses**

As mentioned above, the questionnaire was used to realize the research in terms of purpose and methods. The questionnaire was developed based on the analysis of the authors mentioned above( and using the Liqueur scales (1 strongly disagree & 5—strongly agree), divided into general question sessions (country, age, gender, occupation /education). After data collection, the above metamethods were appropriate for this research.

**Results and discussion**

**Table 1 Perception of Porto Romano Community**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Perceptions of community** | | | | | | | | | | |
| **Rotated Component Matrix** | | | | | | | | | | **Friedman Test** |
| **Nr.** | **Variables** | | | | | | **Component** | | |
| **Sub. F1** | **Ranks** | | |
| **Q1.1** | Collection of health information by residents (, such as water problems, land and use.) | | | | | | **0.771** | 5.04 | | |
| **Q1.2** | Environmental problems in the well-being of residents | | | | | | **0.684** | 4.95 | | |
| **Q1.3** | Are these environmental, human health, and safety risks associated with waste disposal? | | | | | | **0.640** | 4.24 | | |
| **Q1.4** | How do the local government activities relate to solid waste management in this area | | | | | | **0.514** | 3.89 | | |
| **Q1.5** | Can the land be used for agricultural products? | | | | | | 0.495 | **5.53** | | |
| **Q1.6** | If the local government supported them | | | | | | −0.045 | **4.04** | | |
| **Q1.7** | If the citizens are sensitive to environmental problems | | | | | | 0.032 | 4.14 | | |
| **Q1.8** | If taken to managing solid waste, the local government | | | | | | 0.387 | 4.16 | | |
| KMO  Sig. | Total  Variance | ANOVA with Tukey’s Test for No Additivity | Hotelling’s  T-Squared | Friedman Test | Cronbach’s Alpha | Guttman Split-Half Coefficient | Split-half model  Spearman-Brown Coefficient | Guttman Model  Lambda | Parallel Model  Reliability of Scale | Strict Parallel Model  Reliability of Scale |
| Reliability of Scale (Unbiased) | Reliability of Scale (Unbiased) |
| 0.843 | 79.71 | Sig. | Sig. | Sig. | 0.839 | 0.824 | 0.827 Jain | 0.859 | 0.839 | 0.803 |
| 0.867 |
| 0.839 |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.824 | 0.846 | 0.815 |
| 0.852 |
| 0.879 |

Table 1 presents the results for the importance of the eight variables from the Rotated Component Matrix to the factor analysis for Factor (0.771; 0.684 0.640; 0.514; 0.495; −0.045; 0.032; 0.387) as well as the results from the

Friedman test rankings (5.04; 4.95; 4.24; 3.89; 5.53; 4.04; 4.14; 4.16). According to the matrix in the factor analysis, it is emphasized that the variables that have an effect are F1.1 = Q4.2; Q4.1; Q4.3; Q4.6. In the table, the variable with the highest value is Q4.2 = 0.771 (Collection of health information by residents (, such as water problems and land use.) According to the Friedman test rankings, all variables are essential in the model, while the highest values are Q1.and Q1. 6

* 1. **An overview of demographic changes in the Porto Romano area**

According to the demographic data, this area underwent demographic changes after the 1990s. During the communist period, Porto-Romano served as an internment camp for opponents of the communist system. The internees and the outclass were placed in those buildings, but now the Neighbourhoods with those former buildings have remained modern-day ghettos. This area has been isolated as part of the rest of the city of Durres.

After the 1990s, this area was affected by major demographic transformations with social-economic impacts. Location in the vicinity of the two most important cities in the country, Tirana and Durres, the coastal area of Porto Romano was an attractive destination for internal migrants, mainly families from the poorest, such as the north and northeast of Albania country, started in the 1990s**,(Sirika, Sh. 2015).** Internal migration from 1991 continued rapidly until 2014 when new residents from Dibra, Kukësi, Tropoja, and Mirdita settled in this area **(INSTAT, 2020).** Handers argued that national government policies and non-democratic institutions are the factors that promote excessive concentration in an urban area, and they should have planned economies and intervention in it, primarily where immigration restrictions are enforced **(Henderson, V. 2003**).

* 1. **Land and air pollution**

In Porto-Romano, the sewage system is a constant source of pollution. In this area, the sewers collected rainwater as good sewage from the city of Durres and the surrounding villages. All these waters are collected in an open channel that flows into the sea through the hydration of Porto-Romano. Spilling into the sea is done without first going through cleaning treatment, and the result is the pollution of the seawater. A big problem for the Porto-Romano area is the former chemical plant's raw materials and technological waste, which are still in the open sky and cause environmental and human health problems. This problem became more acute, especially after the migration of the population during the 90s, when entire land was polluted by chemical waste and populated with unsuitable environmental, urbanistic, and hygienic-sanitary conditions, causing many problems for the community.

In Porto-Romano, the most impact on air quality is related to the strong smell of chemicals and dust contaminated with chemicals from the former Chemical Enterprise. Not very good air quality is also confirmed in the energy zone of Porto Romano by the strong smell of hydrocarbons and the gases released by the trucks that transport oil products. Even after the realization of a project (a project finalized with the rehabilitation of 3 hot spots in this area in 2010) the feasibility of cleaning from chemical waste supported by the Dutch government and the World Bank, this land has been defined by UNEP as an area of hot environmental in the country. In the impossibility of development as an urban area, the Porto-Romano area is undergoing restoration through territorial planning projects and the orientation of this territory towards sustainable development. The use of this territory for industrial and commercial activities in the field of hydrocarbons is optimal and efficient to realize the interest of the community of this area, as it cannot be recommended for the development of tourism, agriculture, or other activities ( **Durres, Municipality** **Strategy, 2015-2030**).

Likewise, the interviews conducted with the area's residents show that the problem of pollution in the area is a concern, not only because of the inherited pollution from the communist system but also after the 1990s, when this problem became more evident.

* 1. **Environmental situation of Porto-Romano**

General environmental condition. The state of ecological health before the 1990s in Porto-Romano is one of the ``Hot spots'' and was not valued with due importance by the political-economic system established during that period. The technologically outdated industry based on the use of natural resources, their development without environmental criteria, the lack of legislation and institutions necessary for environmental protection, and the disallowance of environmental movements had their impact on environmental pollution and damage. The environment appeared with these indicators, as described below by Majlinda Muka in her dissertation (**Muka, 2015**).

a. Industries relying on outdated technology continue to receive state subsidies despite causing significant environmental pollution. These include chemical, pesticide, rubber, plastic, cigarette, and leather manufacturing, primarily concentrated in urban and peri-urban areas like Porto Romano's industrial zone.

b. The landfill site faces several issues, including scavengers, waste distributors, and unwanted visitors. It is concerning that the academics working on-site do not utilize any personal protective equipment. Additionally, there are health risks associated with infected pets and other animals like dogs and birds. The fires in the landfill pose a significant danger due to the presence of dioxins and other pollutants. These problems harm the residents’ community and the food chain.

c. Low level of citizen awareness of environmental problems.

This study's sources are the complete lack of data and the low level of ecological education in the school system. After the 1990s, the Porto-Romano area saw a massive arrival from the northern and northeastern parts of the country.

d Leaving for a long time without managing the quantities of chemical products, pesticides, and other toxic materials in the "Hot spot" of Porto Romano constitutes a crime against the health of the community that lives in this area, and not only him, with health effects extended over a long period - The significant increase in the number of the population due to migratory movements located near this peri-urban area of the Durres district has caused a part of the population in the informal area to live in difficult hygienic conditions

e. Absences in the legal framework of administrative measures and institutional competencies for the follow-up and implementation of environmental laws and regulations constituted a handicap on itself.

Migratory movements after the 90s, which were vigorous, were accompanied by the settlement of a new population in these areas. This spontaneous urbanization was associated with several social problems along with hygiene and sanitary difficulties, as well as with the infrastructure, etc. (**Raucher& Momtaz, 2017**).

* 1. **The impact of air pollution on the health of human beings**

The concentration of PM10 and NO2 particles in Durrës exceeds the national standards and those of the World Health Organization. The toxic poisons released from urban waste disposal here in the Porto-Romano area. Even the massive pollution of the land they accumulate without realizing it is "silently" killing the residents of this area through those of the city of Durrës.

Bacteriological analysis shows that they are generally polluted waters. Based on the hydrogeological characteristics above, which are primarily qualitative, these waters cannot be used for drinking water supply. In Porto Romano, pollution from chemical substances also plays a vital role in addition to the above factors. From the analyses carried out by the Environmental Institute, it was found that the content of dissolved oxygen in the waters after hydrovor is 1.33 mg/l O2. At the same time, 10 m after the discharge of polluted waters into the sea, this value increases to 4.81 mg/l O2. The respective values of phosphates (as total phosphorus) are 7.08 mg/l Pt and 1.7 mg/l Pt. Phosphorus pollution is related to the use of phosphorus detergents.

Also, visually, the waters behind the hydrovor pump station have a high content.

Of foam. Also, the values of Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (NBO) appear high: 82.50 mg/l O2 for NKO, 29.85 mg/l O2 for NBO, and 29.25 mg/l O2, 9.75 mg/l O2 for NBO5. Also, bacteriological pollution is beyond the allowed norms. Such a situation makes the area around the discharge of polluted waters into the sea unsuitable for bathing.

The State of the Environment Report for 2021-2022 classifies the hydrovor waters in Porto-Romano as "maximum polluted" **(Evaluation Report of Tirana, 2021-2022**).

The National Environment Agency, in the implementation of the National Monitoring Program, carries out the annual monitoring of the impact of urban discharges on the quality of surface waters. The urban waters discharged from the hydro bor in Porto Romano, according to the analyses carried out by KTA from the parameters of the average values of the measured indicators, result in a high content of organic matter expressed through NBO5, even if the values exceed the limit norm. The area of Porto-Romano follows the channel that starts from Spitalla and collects the wastewater of the neighborhoods, discharging it to the coast of Porto-Romano, where a part of the wastewater of the area of the former Swamp through the hydrovor (**Lala &Zajmi, 2011**).

"The problem with us is the flooding from the canal when it rains tremendously. We isolate ourselves because we cannot cross the roads", say residents of the Porto-Romano area. Based on our survey in June 2022 and from the testimonies of the residents, as a result of the lack of a central pipeline for drinking water in the area of Porto-Romano result, they were forced to get drinking water with plastic pipes that stay on the surface and often pass over the sewage channel. Likewise, solid waste is disposed of in Porto-Romano. It has been operational since 1994 and is state property under the ownership of the Ministry of Economy and under the administration of the Municipality of Durres.

The Porto Romano location has been identified as an environmental hazard hotspot. Despite having a remaining capacity of five years, it has been recommended that it be abandoned and closed as soon as possible. The potential options for waste disposal are a new landfill in the Durres area or a joint/regional landfill in a different region. To meet the minimum functional standards, Porto Romano must have a controlled entry gate, a basic scale, a car cleaning area, and new equipment that can be purchased even if it has used to reduce costs, but it must be kept in good working condition. The presence of different animals, such as cows, lambs, and sheep, being brought or fed in that environment is both concerning and problematic. Their control level is at a minimum, which is a severe issue. The cattle are sent to the slaughterhouse, where everyone in Durres consumes that meat and Albania. We must understand and act as soon as possible since the danger caused by Porto-Romano is everywhere—in water, air, land, and food.

**Conclusions and Recommendations**

The most urgent environmental problem in the area is the disposal and treatment of solid waste. In this context, the solution to the new waste deposit is urgent and strategic. The main risks related to the environment, human health, and safety are as follows:

*Soil and surface pollution endangers flora and fauna in wetlands;*

*• Hygiene problems cause disease among waste diggers, staff, private waste distributors, and unwanted visitors. The academics working on-site do not use any personal protective equipment;*

*• Health risks from the food chain (infected pets) and other animals (dogs, birds);*

*• The fires in the landfill are dangerous because of dioxins and the content of other pollutants, causing problems not only for the community of residents of Porto-Romano but also for students and academic staff who have been part of this area since 2012*.

Based on the observation of the legislation as a whole, the legal and sub-legal acts, and the strategies of the central and local government, we see that they talk about the development perspective of this area and consider it an area with a high pollution intensity. Otherwise, we did not see any concrete strategy for cleaning waste inherited from before the 90s.

In this research, we are based on the factors taken in our study, and the questions raised are confirmed. The results show that special attention should be paid to these factors: (a) Environmental problems in the well-being of residents and (b) the need for support from government bodies in terms of infrastructure to increase the economic well-being of residents.

Today, in Albania, there are still significant obstacles to the effective participation of civil society and non-governmental organizations in protecting community health. On the one hand, the local government needs to effectively use all the instruments available for the involvement of citizens; on the other hand, citizens, in general, are not very active in decision-making. There is often a lack of trust between citizens and local government. An excellent opportunity to build a "bridge" to overcome this situation is to use appropriate strategies and instruments to encourage citizens and local officials to interact regularly, increase their knowledge, and develop trust. The government should provide more facilities and interventions to protect the environment, ensuring that stakeholders observe the rules and adapt residents’ destinations to ensure viability.

Even though this study focuses on Porto-Romano, the elements identified regarding the challenges and problems for other small-scale economies, our findings reinforce the need to implement strategies or policy interventions focusing on protecting the community from environmental concerns.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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