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ECONOMIC ASPECTS OF NUCLEAR WASTE DISPOSAL AT THE TRGOVSKA GORA SITE

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Abstract: The disposal of nuclear waste is a highly sensitive issue in the sphere of social and economic relations. Public acceptance is directly proportional to the risk. The public finds it very difficult to accept the nuclear industry given the relatively small benefits compared to the risks, which are hard to accept. The perception of the public based on the unknown actual risk of radioactive nuclear waste leads to irrational fear.

Keywords: nuclear waste disposal, economic consequences, Trgovska Gora site

1. INTRODUCTION

The potential negative impacts of nuclear radioactive waste on human health and safety are significant due to its radioactive behavior. If the population is concerned about their survival or feels life-threatened, as the research results for this study indicate, no economic incentives in the form of compensation are effective. When the Dutch government announced plans in 1976 to begin trial drilling in salt domes for the underground storage of nuclear waste, it faced significant public opposition, leading to conflicts between technicians and the population (Damveld, 2000)

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2. NEGATIVE CONSEQUENCES OF NUCLEAR WASTE DISPOSAL ON SOCIO-ECONOMIC DEVELOPMENT

2.1. Empirical Research

There are significant international discussions about the storage of radioactive waste. The most relevant discussions for the purposes of this study will be highlighted. Chauncey Starr indicates that the acceptance of any risk depends more on trust in risk management than on quantitative risk assessments. Accordingly, public fears and opposition to nuclear waste disposal plans can be viewed as a crisis of trust in the process of managing nuclear waste in a scientific and technological sense. Erikson (1990) describes horrific accidents that expose people to radiation and chemicals in ways that cause long-term damage and pollution to human tissue, indirectly, and not just through superficial wounds and injuries. Unlike natural disasters, these accidents have no end. "Invisible pollutants remain a part of the human environment - absorbed into body tissues and, worst of all, into the genetic material of survivors. You never hear 'all clear,' and that book of devastating consequences never closes."

The public's fear of a potential catastrophic nuclear accident, in relation to long-term demographic and economic growth and market conditions in areas near nuclear facilities and transport routes, is widespread. Public opinion also reveals a strong belief that a major traffic accident could occur during the transport of nuclear waste to a central storage facility. It is assumed that such an accident would result in the release of large amounts of radiation, causing widespread damage to health and property.

Fifty-two percent of Las Vegas residents stated that the transport of waste would pose a serious risk to their health. Sixty-three percent said they would not buy a house within 5 miles of a nuclear waste transport route. Damveld and van der Berg (2000) created a list of 14 factors that influence the acceptance of risk:

1. The possibility of serious disasters.
2. Small accidents signal that things can go wrong.
3. Distribution over time and justice: no risks should be passed on to future generations.
4. Globality: the more people can be victimized, the more unacceptable it is.

5. Involuntariness: not accepting risks imposed by the government or industry.
6. Trust in the government and science is of utmost importance in storage plans.
7. Persistent beliefs: once opinions are formed, they are not easily changed quickly.
8. Knowledge of the risk.
9. Personal control and reversibility: people feel they cannot control the nuclear waste storage, and accidents are irreversible when things go wrong.
10. In risk perception, there is no difference between above-ground and underground waste storage.
11. In people's opinion, the risks of nuclear waste, nuclear energy, and nuclear weapons are the same.
12. Stigmatization: fear that the community will get a bad reputation due to nuclear waste and suffer economic damage.
13. The possibility of avoiding risk: there is a difference in risk perception between discussions about waste produced from closed nuclear power plants and discussions about ongoing production from operational or under-construction nuclear power plants.
14. The idea that there is insufficient money reserved for future storage costs.

2.2. Negative Economic Consequences of Nuclear Waste Disposal at the Trgovska Gora Site

Citizens in affected communities also focus on opportunity costs - unrealized economic benefits that the community must forgo due to the nuclear waste facility. Nuclear waste storage can cause future damage, making the application of the principle of fair distribution difficult: future generations will bear the burden but will not benefit from the advantages. For nuclear waste, this is a long-term responsibility. In the wider region around Trgovska Gora and downstream along the Una River towards Kostajnica, the primary resource for employment and economic development is in the production of healthy food and tourism development. One of the reasons for the lack of industrial development is precisely

the natural values that were sought to be protected in the earlier period. The construction of a nuclear waste disposal site at this location will completely eliminate the possibility of further agricultural production and tourism development, condemning the population to economic decline and emigration. The support that local communities would receive in their budgets as compensation cannot adequately match the permanent consequences of nuclear waste storage, even in cases where there would be no incidents resulting in increased radiation.

2.3. Economic Compensation

The population tends to accept or reject the nuclear waste disposal site based on their perception of risk. When they perceive a high risk in nuclear waste disposal technology, they completely reject any compensation. When considering economic compensations, there are several options:

- Land and property value – a government guarantee for the value before the construction of the nuclear waste disposal site. This can include a program allowing individuals who wish to relocate from the disposal site area to sell their property and be paid at fair market value.
- Formation of a Fund with contributions from the government and industries producing nuclear waste. Payments in countries that have introduced the Fund are either a one-time lump sum or annual amounts, with interest accumulation. Funds are also used to compensate the population in case of an accident or if a certain anomaly in the nuclear waste disposal process is discovered. Difficulties arise in determining the initial level of money to be placed in the fund due to uncertainties and disagreements about the risks and potential damage of possible accidents or unforeseen health consequences. For example, the state of Florida, under the Hazardous Waste Management Trust Fund Recovery and Management Act, collects a 4% excise tax until the assessment reaches $30,000,000, and 2% thereafter (Carnes et al., 1982).
- The federal government and/or the nuclear waste-producing industry can provide written assurances that they assume responsibility for a certain level of damage from accidents or anomalies. Most states that have developed hazardous waste management statutes require investors to assume responsibility for harmful impacts on health and safety and the degradation of environmental conditions.

• Individual or annual payments can be made to communities or households and individuals residing in the community.

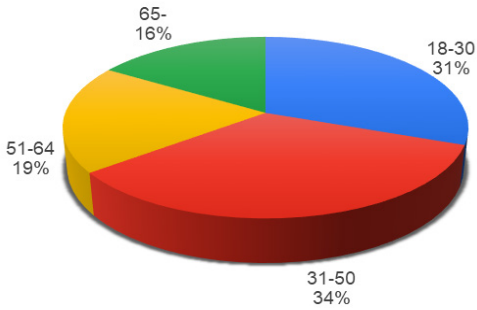
• The federal government and/or the industry can enter into an agreement with the local government to provide compensation in case of an accident or anomaly.

• Potential schemes of past financial constructions, in countries with nuclear waste disposal sites, include government fees, user fees, revenue sharing, gross revenue taxes, and waste surcharges. For example, Indiana's Hazardous Waste Facility Site Authority Act stipulates that the local community receives $50 per ton of hazardous waste. A proposed tax on the nuclear industry would provide grants to communities of $5,000 per household (NGA, 1981). Georgia introduced a 1% gross revenue tax on hazardous waste. Ohio approved an expenditure of $500,000 over 3 years for various forms of local grants due to the nuclear waste disposal site (NGA, 1980).

2.4. Public Opinion Survey Results

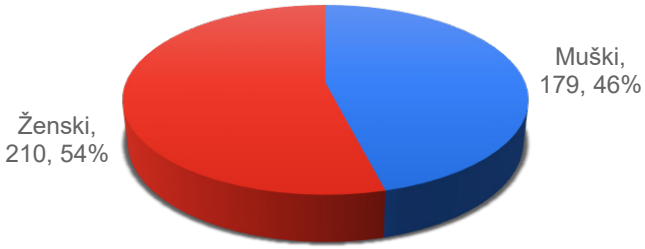
The following are the results of a public opinion survey on the issue of establishing a nuclear waste disposal site at the Trgovska Gora location. The survey was conducted physically in the municipality of Novi Grad through a questionnaire. The results are as follows:

From Graph 1, it can be observed that the highest percentage of respondents are aged 31 to 50 years (34%), followed by 18 to 30 years (31%), 51 to 64 years (19%), and over 65 years (16%).



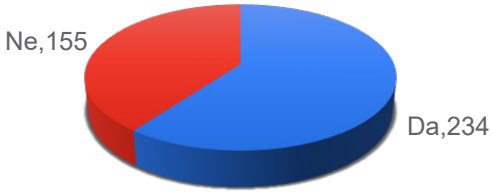
Graph 1: Age of respondents

The gender structure of the respondents is 54% female and 46% male.



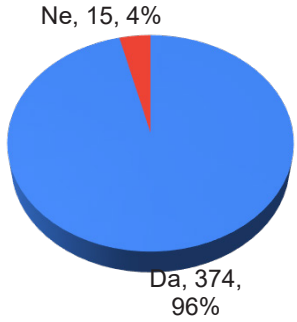
Graph 2: gender structure of respondents

Regarding employment, 60% of the respondents are employed, while 40% are unemployed

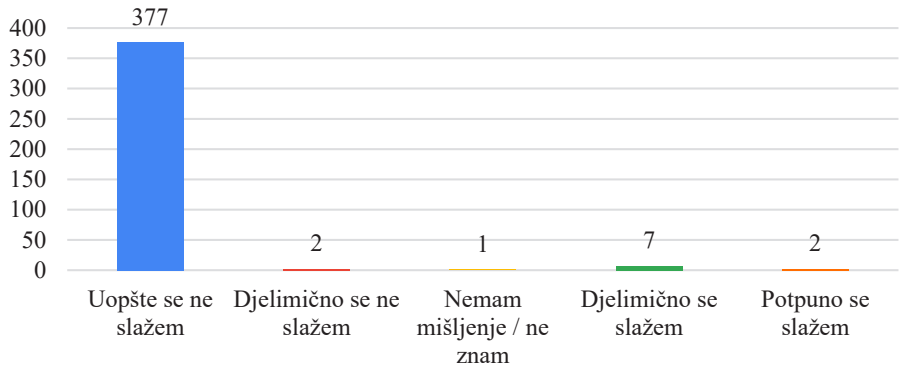


Graph 3: Employment Status of Respondents

From Graph 4, it is evident that a very high percentage of respondents (96%) are aware of the Republic of Croatia's intentions regarding the disposal of nuclear waste at Trgovska Gora. This is not surprising because this issue directly affects all aspects of life in the surveyed area.

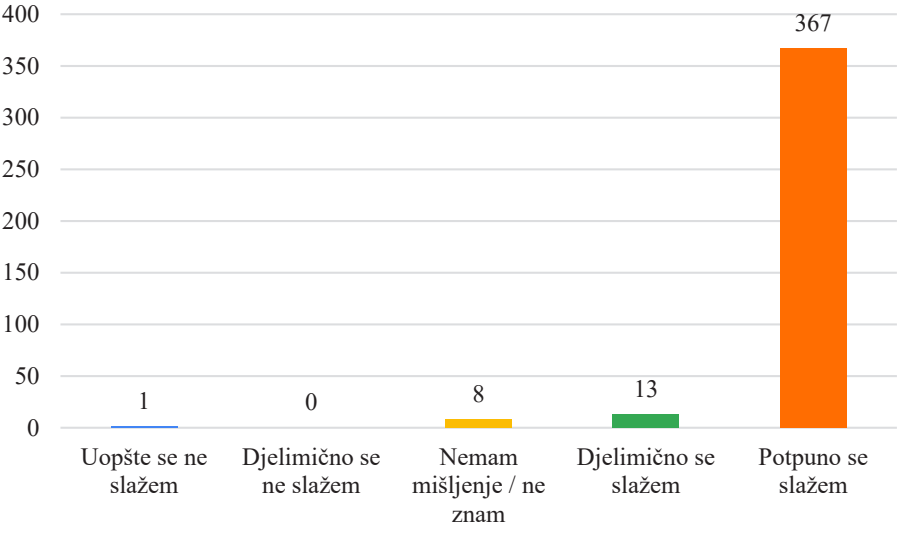


Graph 4: Are you familiar with the Republic of Croatia's intention to "dispose of" radioactive waste generated in Slovenia and institutional wastegenerated in Croatia at Trgovska Gora ?



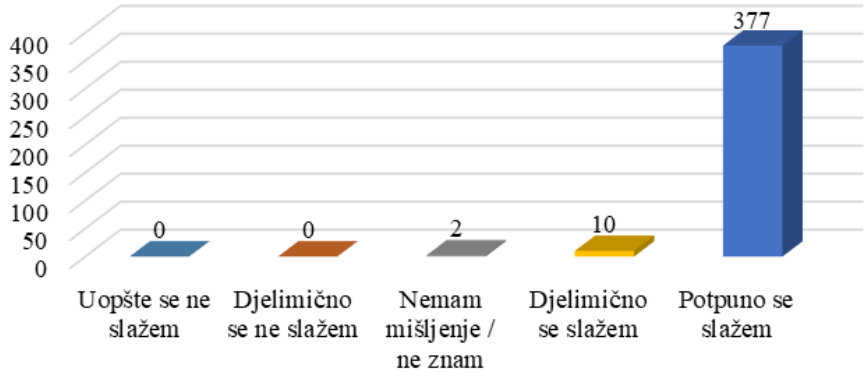
Graph 5: To what extent do you agree that radioactive waste from the Krško Nuclear Power Plant (Slovenia), as well as institutional waste generated in Croatia, should be stored at the Trgovska Gora site?

Also, a high percentage of respondents (94%) consider nuclear waste disposal activities to be a direct threat to the economic aspects of life (Graph 6).



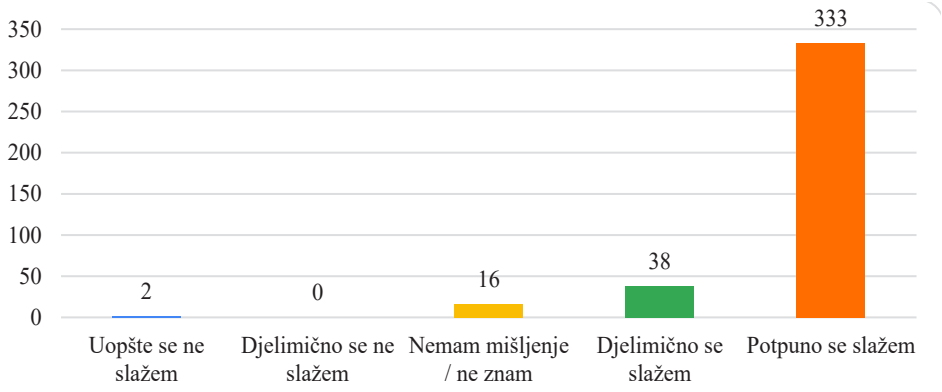
Graph 6: Storage of radioactive waste and institutional waste at the Trgovska Gora site represents a direct threat to the economic aspects of my life in Novi Grad.

Regarding the impact of nuclear waste disposal on health, 97% of respondents believe that the nuclear waste repository poses a direct threat to the health of the population in the surveyed area.



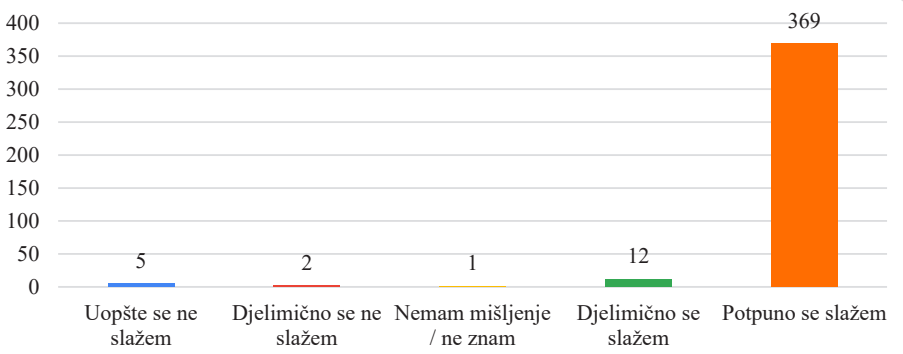
Graph 7: Storage of radioactive waste and institutional waste at the Trgovska Gora site represents a direct threat to my health.

Building on the previous graph, Graph 8 shows a high percentage (86%) of respondents who believe that storing nuclear waste places psychological pressure on the population living in the surveyed area.



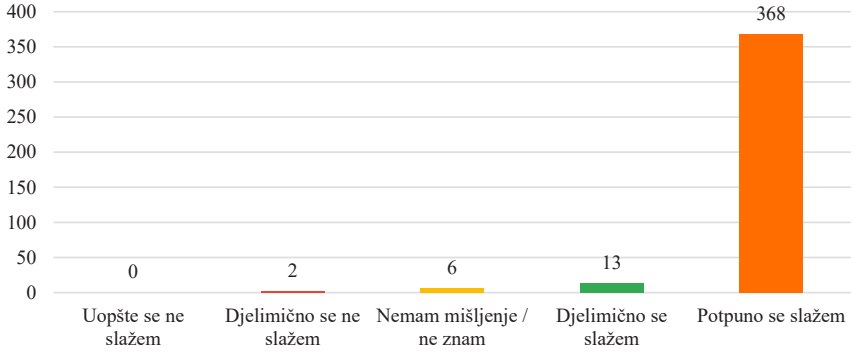
Graph 8: Storage of radioactive waste and institutional waste at the Trgovska Gora site represents psychological pressure on me.

95% of respondents stated that the nuclear waste repository negatively affects the quality of life of the population living in the municipality of Novi Grad.



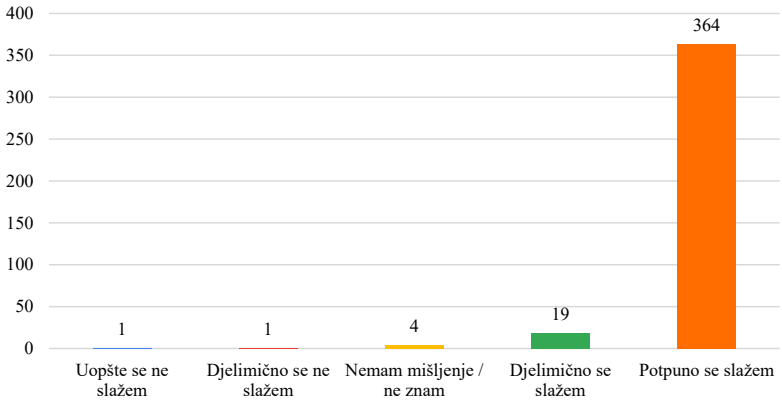
Graph 9: Storage of radioactive waste and institutional waste at the Trgovska Gora site negatively affects the quality of my life.

The area of the municipality of Novi Grad is significant for tourism development (the Una River offers numerous opportunities for tourism, Lješljani spa has great potential and a large number of visitors, etc.), which will necessarily experience a significant decline with the nuclear waste disposal process. Therefore, it is not surprising that a high percentage of respondents (95%) believe that the repository poses a direct threat to tourism development (Graph 10).



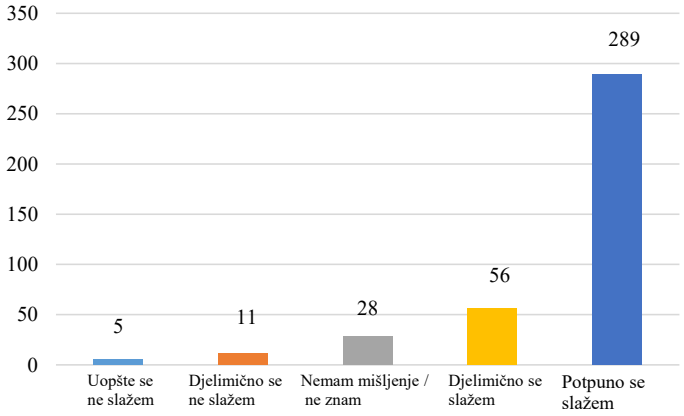
Graph 10: Storage of radioactive waste and institutional waste at the Trgovska Gora site represents a direct threat to tourism development in Novi Grad.

When it comes to future generations, 94% of respondents consider the nuclear waste repository a direct threat to sustainable development, which further influences the attitude of young people towards migrating to that area (Graph 11).



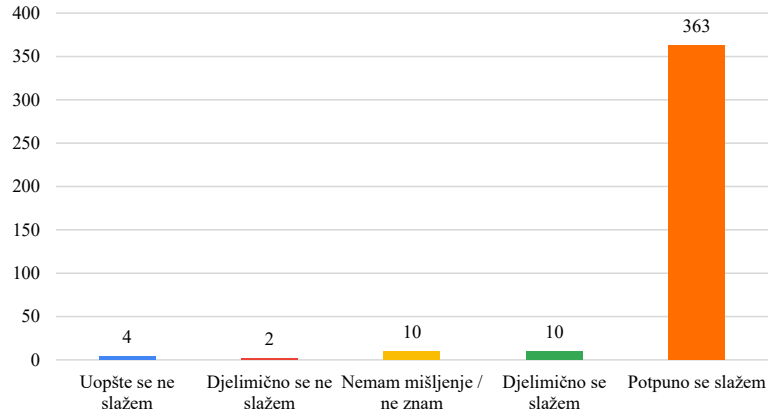
Graph 11: Storage of radioactive waste and institutional waste at the Trgovska Gora site represents a direct threat to the sustainable development of Novi Grad.

A high percentage of 74% of respondents would consider relocating their residence if the nuclear waste repository is implemented. Considering that 35% of respondents are over 51 years old, this is indeed an alarming statistic.



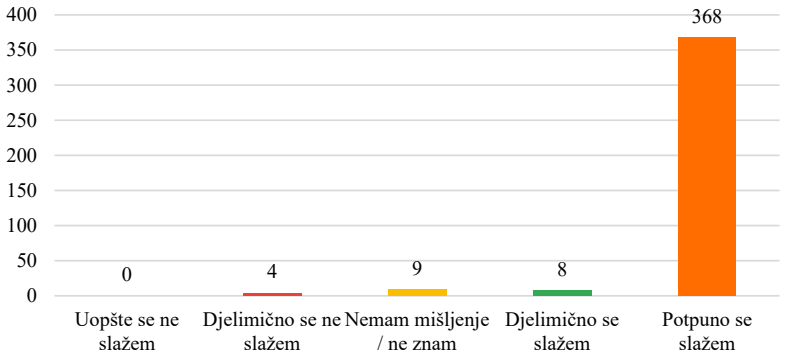
Graph 12: Storage of radioactive waste and institutional waste at the Trgovska Gora site will significantly influence consideration of changing my place of residence.

A significant portion of young people would migrate to other areas if the nuclear waste repository is implemented at the Trgovska Gora site, as confirmed by the results from Graph 13.



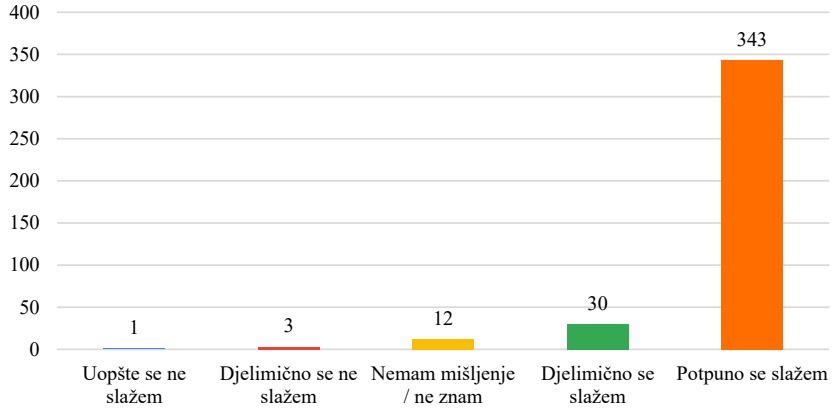
Graph 13: Storage of radioactive waste and institutional waste at the Trgovska Gora site, if implemented, will influence younger generations to decide to move out of Novi Grad.

When it comes to the impact of the nuclear waste repository on the increase of malignant and other dangerous diseases, a very high percentage of respondents (95%) expressed the expectation of such negative consequences (Graph 14).



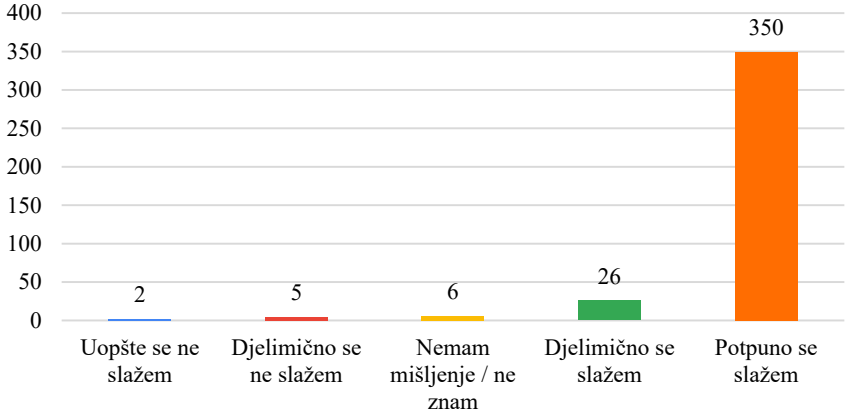
Graph 14: Storage of radioactive waste and institutional waste at the Trgovska Gora site will significantly impact the increase in occurrence of malignant and other diseases that can affect individuals' ability to work.

Another economic consequence, with which 88% of respondents completely agree, is shown in Graph 15.



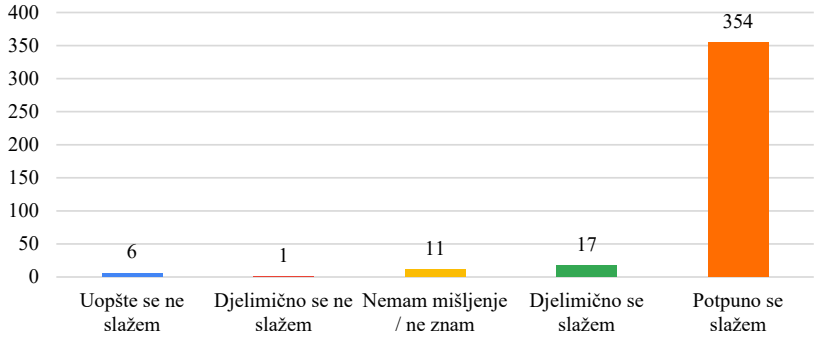
Graph 15: Storage of radioactive waste and institutional waste at the Trgovska Gora site will significantly impact the reduction in interest of imported work-force to stay and work in Novi Grad.

When it comes to the impact of the nuclear waste repository on the labor market, 90% of respondents believe that it will endanger the labor market, while 6% partially agree with this statement, making a combined very high percentage of 96%.



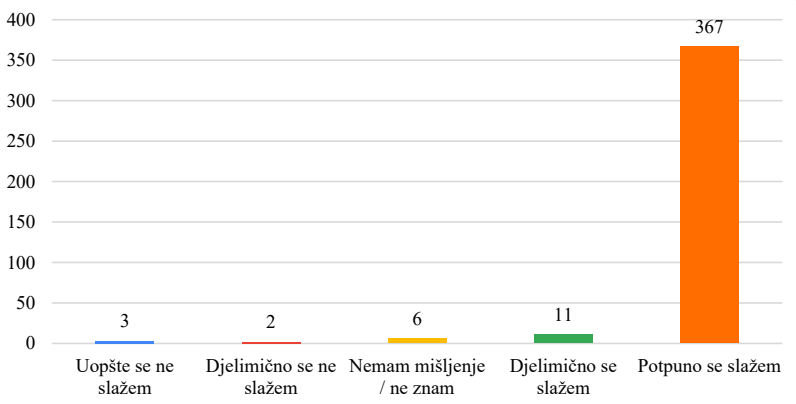
Graph 16: Storage of radioactive waste and institutional waste at the Trgovska Gora site will significantly jeopardize the labor market in Novi Grad

A significant segment in the economic field is investments. 91% of respondents completely agree with the statement that the nuclear waste repository will negatively impact investment inflows, while 4% partially agree with this statement, making a total of 95%.



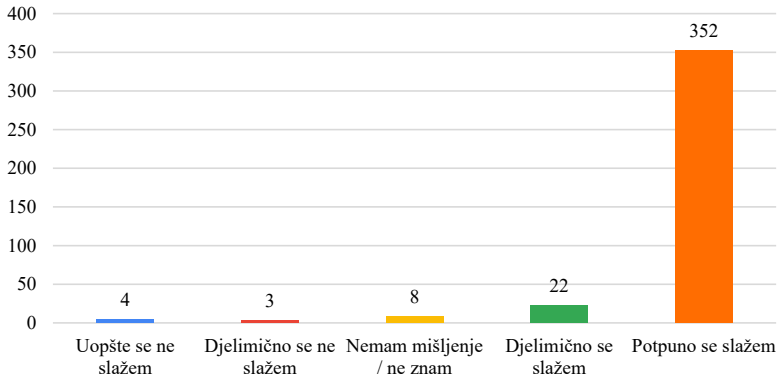
Graph 17: Storage of radioactive and institutional waste at the Trgovska Gora site will significantly impact investment inflows in Novi Grad.

The area of the municipality of Novi Grad is significantly rural, and the market for agricultural products is developed. Fear of contamination of agricultural products due to radiation will lead to a significant decrease in demand for agricultural products from this area, as confirmed by 94% of respondents.



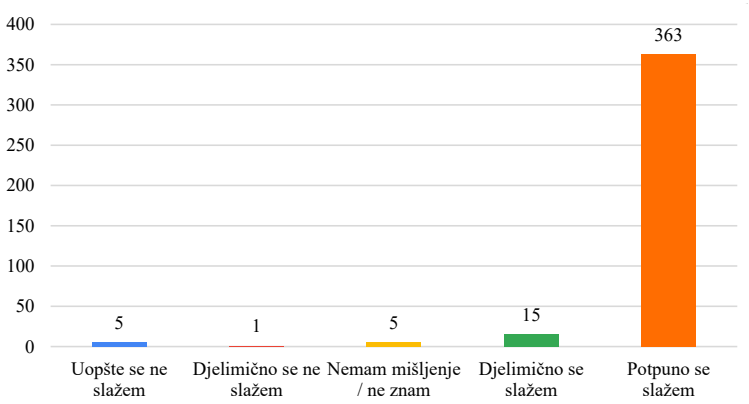
Graph 18: Storage of radioactive and institutional waste at the Trgovska Gora site will significantly reduce demand for agricultural products produced in the area of Novi Grad.

Like in question 17, a high percentage of respondents, 90%, believe that there will be a decline in investment placement in the municipality of Novi Grad. Adding the 6% of respondents who partially agree with this statement results in a total of 96%.



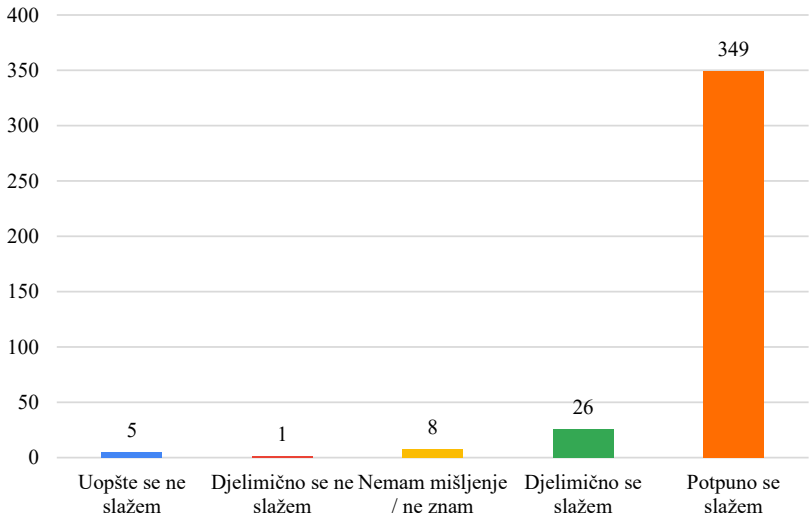
Graph 19: Storage of radioactive and institutional waste at the Trgovska Gora site will impact investment placement in Novi Grad.

If we consider the impact of the nuclear waste repository on economic conditions in daily life, 93% of respondents believe there will be a deterioration, while 4% partially agree with this statement, resulting in a total of 97%.



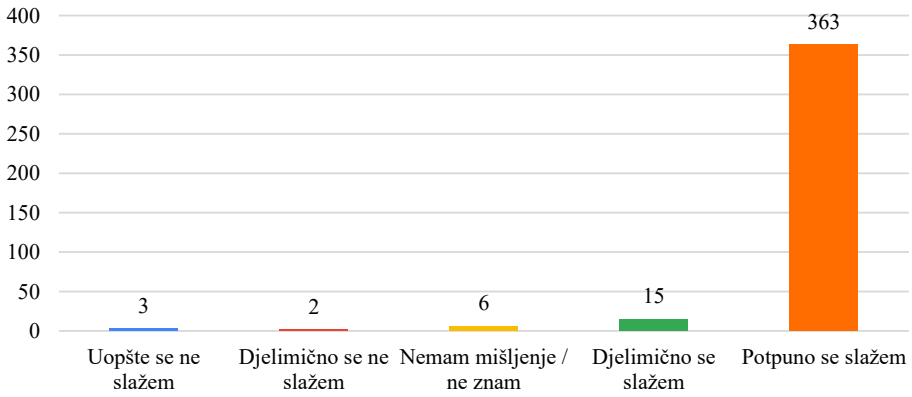
Graph 20: Storage of radioactive and institutional waste at the Trgovska Gora site will significantly impact the deterioration of economic conditions in the area of Novi Grad.

The construction sector is important for the economy as a whole. 90% of respondents completely agree with the statement that the nuclear waste repository will lead to a collapse of economic activities in that sector, while 7% partially agree with this statement, making a total of 97%.



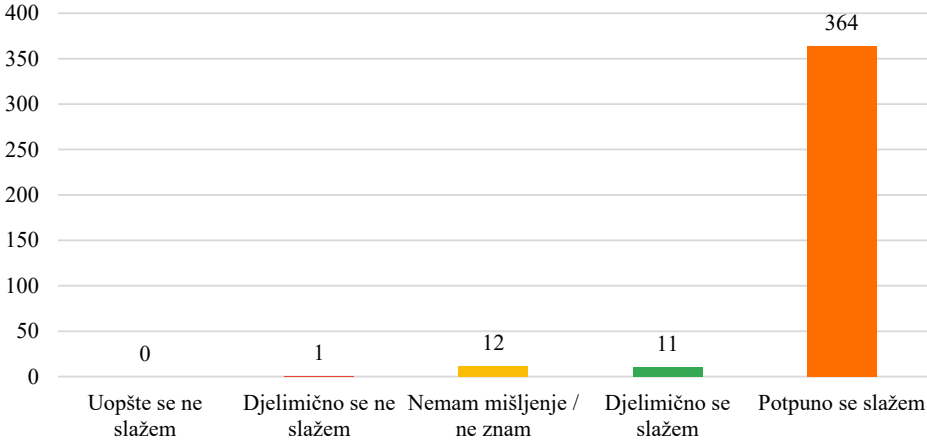
Graph 21: Storage of radioactive and institutional waste at the Trgovska Gora site will lead to a "stagnation" of economic activities in the construction sector in the area of Novi Grad.

Earlier, there was mention of the expected significant decline in demand for agricultural products, which will consequently lead to a significant decrease in economic activities in the agriculture sector. Therefore, it's not surprising that a high percentage of 93% of respondents believe that the nuclear waste repository will lead to a "stagnation" of economic activities in the agriculture sector. Adding the 4% of respondents who partially agree with this statement results in an extremely high total of 97%.

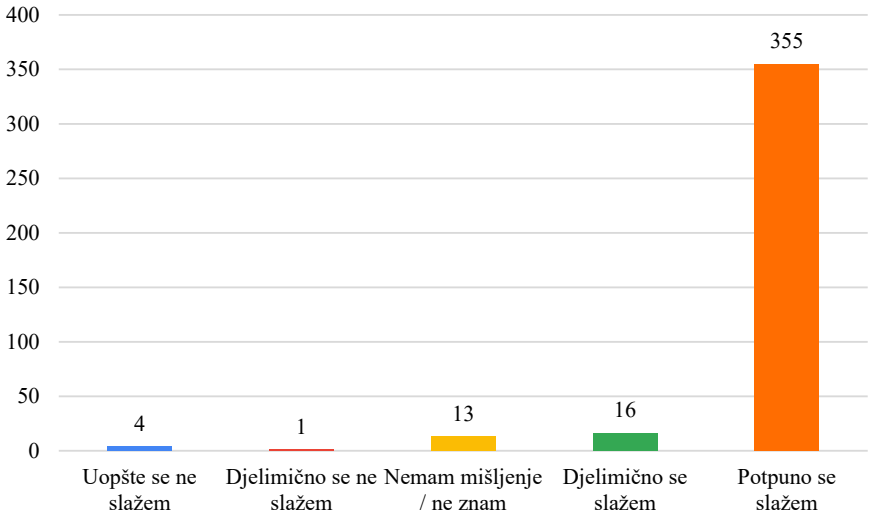


Graph 22: Storage of radioactive and institutional waste at the Trgovska Gora site will lead to a "stagnation" of economic activities in the agriculture sector in the area of Novi Grad.

Previous empirical research in this area has shown that forms of economic compensation are present to local communities and their residents. 94% of respondents believe that it is necessary to demand compensation in economic terms if the nuclear waste repository at the Trgovska Gora site is implemented.



Graph 23: Novi Grad as a local community should demand compensation for the economic and other damages suffered so far.



Grafikon 24: The storage of RAW and institutional waste in the area of Trgovska Gora represents the transfer of risk to Bosnia and Herzegovina, due to the economic and energy benefits that Slovenia and Croatia had from the operation of the Krško nuclear power plant.

The nuclear waste repository always carries certain risks, which are weighed against the benefits that nuclear energy brings. In this case, the risk is transferred to Bosnia and Herzegovina, while the benefits accrue to Croatia and Slovenia. This is a fact, and therefore it's not surprising that 91% of respondents completely agree with this statement and 4% partially agree with it, making a total of 95%.

3. CONCLUSION

Empirical research in previous studies conducted in various countries regarding nuclear waste repositories indicates that respondents express a mildly aggressive attitude towards nuclear activities, particularly radioactive nuclear waste. Empirical studies suggest that the behavior of the population in the vicinity of nuclear waste repositories favors environmental concerns, health issues, or socio-economic development. Furthermore, the results of previous research highlight that the placement

and location of radioactive nuclear waste repositories cause a high degree of concern among the population, which is a reason for rejection. The results of the conducted research for the purposes of this study indicate a very high level of concern among the residents of Novi Grad regarding the nuclear waste repository at the Trgovska Gora site, specifically its negative impact on health safety and all aspects of economic life in the community and for individuals in this area. In general, very high percentages ranging from 90% to 97% have been expressed for all statements regarding the negative impact of the repository on the economic conditions and health safety of life in the observed area.

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