

PATH ANALYSIS OF SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF LARGE-SCALE PUBLIC INVESTMENT PROJECTS

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Highlights:

- residents' perceptions of three major infrastructure projects in İstanbul are examined;
- separate models were developed for social, economic, and environmental impacts;
- migration and safety concerns reduce desire to live in the neighborhood;
- employment fosters income diversification, but inequalities challenge inclusive growth;
- forest loss and climate change drive perceived ecological degradation.

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Abstract. This study examines the perceived social, economic, and environmental impacts of İstanbul Airport, Yavuz Sultan Selim Bridge (YSS), and Northern Marmara Motorway (NMM) based on surveys with 995 residents across 25 neighborhoods. Three separate path models were developed to analyze perceived social, economic, and environmental impacts. The social model shows that residents' desire to live in the neighborhood is shaped by neighbor relations and a sense of belonging, whereas migration inflows and safety concerns weaken social cohesion. The economic model highlights how infrastructure fosters employment and income diversification, though persistent inequalities point to the need for inclusive development. The environmental model reveals that forest loss and climate change drive ecological degradation, affecting water sources, bird habitats, and landscapes. These findings emphasize the interconnected yet distinct nature of each impact and underline the importance of integrated planning. The main recommendations are to strengthen community ties, support more equitable economic growth, and promote sustainable land-use practices that balance development with social and ecological well-being.

Keywords: large-scale infrastructure projects, forest land-use change, social impacts, path analysis, perception of local people.

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1. Introduction

Growing pressures on land and natural resources make it increasingly urgent to understand how development affects social and ecological systems. Land-use change, driven by both planned and unplanned interventions, has multidimensional consequences. Planned interventions such as policies and projects are designed to achieve specific development goals, but they also generate intended and unintended social impacts that can reshape community life (Williams & Schirmer, 2012; Vanclay et al., 2015). The complexity of land-use change necessitates a more comprehensive understanding of its social, economic, and environmental dimensions, particularly in contexts where forested areas are under threat. In an era of rapid urbanization, large-scale infrastructure projects have become a key driver of these transformations, changing landscapes and livelihoods, often at the expense of fragile ecosystems

and local communities. While these projects are frequently presented as drivers of economic growth, their social and environmental impacts remain contentious.

Research on large-scale transportation infrastructure such as motorways and airports demonstrate that these investments generate complex and uneven economic, spatial and environmental consequences across different contexts. Motorway development has been linked to population growth and employment expansion, with particularly strong effects on population growth in suburban areas (Rocha et al., 2023). In peripheral regions, road infrastructure improvement is also associated with demographic stabilization and positive migration trends, potentially through improved access to employment and services (Bjarnason, 2021).

At the same time, motorway construction is widely associated with substantial land-use change, including the expansion of residential, industrial and commercial areas

at the expense of agricultural land, forests and other natural landscapes (Demirel et al., 2008; Keken et al., 2014). These spatial transformations are often accompanied by ecosystem fragmentation, deforestation and altered hydrological systems, which contribute to environmental degradation, particularly in ecologically sensitive regions (Alamgir et al., 2017; Kuncoro et al., 2024).

A similar dual pattern characterizes airport development. Airports are frequently framed as catalysts for regional growth, with studies highlighting employment generation, tourism activity and investment attraction as potential regional benefits (Aguirre et al., 2019; Song & Suh, 2022). In rural areas where farming remains the dominant source of income, evidence suggests that airport development may alter livelihood structures, with some households experiencing reduced farm income alongside increased reliance on non-farm employment (Matufany et al., 2021).

However, airport development also imposes significant environmental pressures, including land consumption, biodiversity loss and ecosystem disruption, especially in ecologically sensitive locations and bird migration corridors (Zhao et al., 2019). Comparative research further indicates that the scale and intensity of these ecological impacts vary across institutional settings, with less effective environmental protection mechanisms associated with wider and more severe environmental effects (Xiong et al., 2022). Spatial analysis additionally suggests that airports can act as powerful nodes of urban expansion, reorganizing surrounding settlement hierarchies and inducing concentrated growth and service development in their vicinity (Swangjang & Iamaram, 2011; Sharma & Ram, 2022).

Although airports are often seen as sources of economic opportunity, local acceptance tends to decline when environmental impacts and daily-life disruptions intensify (Monterrubio et al., 2020). Environmental justice research further reveals that disadvantaged and vulnerable populations are frequently more exposed to negative externalities resulting from airport expansion, while planning processes do not consistently identify or mitigate these inequalities (McNair, 2020). Comparative community-based studies also show that although airports contribute to regional development and employment creation, residents report noise and other environmental nuisances, with perceptions of these impacts varying according to proximity to the airport (Piotrowska-Trybull et al., 2022). Moreover, Sanchez (2019) shows that tensions between airports and local communities can be moderated through governance and engagement strategies, noting that weak communication, limited transparency and insufficient public participation amplify conflict, whereas long-term engagement, institutional trust and inclusive planning practices can improve social acceptance and cooperation.

Motorways and airports act as powerful drivers of economic restructuring and spatial transformation while at the same time generating environmental pressures and social challenges. Nevertheless, much of the existing research examines these dimensions separately, focusing either on economic development, land-use change or environmental

impact. As a result, limited attention has been paid to how multiple infrastructure projects interact spatially and socially, or how their combined effects shape livelihoods, environmental perceptions and community experiences, particularly in regions undergoing rapid infrastructure-driven transformations of land use and natural resources.

In Istanbul, pressures on forests are intensifying due to rapid population growth and unplanned urbanization. Studies have documented significant declines in forest and agricultural areas, accompanied by the expansion of residential and industrial areas (Cengiz et al., 2019; Şahin, 2020; Uygur Erdoğan et al., 2024). This process exacerbates environmental problems in Istanbul's forests (Şengönül & Serengil, 2014; Karacor & Korshid, 2015; Tolunay, 2016; Erol & Şahin, 2017; Dogru et al., 2020; Menteşe & Tezer, 2021; Uygur Erdoğan, 2022) and intensifies social pressures, including rising recreational demand (Kuvan, 2013; Bekiroglu et al., 2015; Hayir-Kanat & Breuste, 2020). The allocation of forest areas for non-forestry uses, such as highways, airports, mining, electric transmission lines and tourism facilities, further reinforces these trends (Cengiz et al., 2019; Atmiş et al., 2024; Şahin & Yurdakul Erol, 2026).

In rapidly expanding cities like Istanbul, these projects lead to significant land-use changes, particularly in forested areas, with profound implications for ecosystems, social dynamics, and perceptions of community well-being (Şahin et al., 2025). This study examines the perceived social, economic, and environmental impacts of three major infrastructure projects in Istanbul, Yavuz Sultan Selim (YSS) Bridge, Northern Marmara Motorway (NMM), and Istanbul Airport, from the perspective of local communities, and models these impacts using path analysis to identify both direct and indirect relationships among variables. By incorporating community-level evaluations into impact assessment, the research aims to generate a more comprehensive understanding of how large-scale infrastructure projects reshape local environments and livelihoods. The findings contribute to the literature on land-use change driven by large-scale infrastructure projects and provide practical insights for policymakers in terms of balancing economic objectives with environmental conservation and social well-being.

2. Data and methodology

2.1. Study area and data

The study focuses on the impact of large-scale infrastructure projects in Istanbul, specifically Istanbul Airport, Yavuz Sultan Selim (YSS) Bridge, and the Northern Marmara Motorway (NMM). These projects have led to significant land-use changes, particularly in forested areas, with notable social and economic consequences for local communities. To assess these impacts, neighborhoods in close proximity to the projects were selected as the study area.

These megaprojects are predominantly situated on state-owned forestlands and other ecologically sensitive areas. The Istanbul Airport project covers 7,650 ha,

of which 5,230 ha are forest areas (68.3%), alongside rangelands, former agricultural lands, mining sites and numerous water bodies within close proximity to Terkos Lake (ENVIRON, 2015). Similarly, the Northern Marmara Motorway and Yavuz Sultan Selim Bridge corridor cuts through extensive forest areas on the European and Asian side of Istanbul, with an estimated 3,374 ha of land-use change including forest land (79.2%), treasury areas and privately owned parcels (AECOM, 2013). These land characteristics and ownership structures demonstrate that the megaprojects are largely located on publicly owned forest ecosystems that carry significant ecological value, making land-use decisions particularly consequential for both environmental integrity and local livelihoods.

Data were collected through face-to-face questionnaire covering socio-demographic characteristics, social, economic and environmental impacts. A total of 995 participants were randomly selected from 25 neighborhoods

near the projects. Surveys were conducted on both week-days and weekends to ensure a diverse sample. Table 1 presents 21 statements related to environmental, economic, and social impacts, measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) included in the path analysis models, which were analyzed to examine their relationships within the study framework. All participants were informed about the study details, and participation was voluntary and anonymous.

Given the limited use of path analysis in both national and international studies examining large-scale infrastructure and land-use change projects, the identification of influencing factors in this research followed a theory driven and context informed process. First, a review of international literature on the social, economic and environmental impacts of megaprojects was conducted, highlighting recurring themes such as changes in neighbor relations, sense of belonging, welfare and employment

Table 1. Explanation and measurement of influencing factors

Abbreviation	Explanation and measurement
Social structure and impact on local people's perception	
Migration influx (A9)	The region receives a lot of immigration and the population density is increasing (5-point Likert scale)
Neighbor relationships (A1)	Neighbor relationships have weakened with the moving of new people to the region (5-point Likert scale)
Accident risk (A6)	Developments and changes in the region increase the risk of accidents (caused by traffic, cars, planes, etc.) (5-point Likert scale)
Family relationships (A2)	Family structure and relationships have been adversely affected (5-point Likert scale)
Sense of belonging (A3)	I no longer feel like I belong in this neighborhood (5-point Likert scale)
Safety of the place (A5)	I think where I live is more unsafe now (5-point Likert scale)
Desire to live in the neighb. (A8)	I don't want to live here anymore (5-point Likert scale)
Perceived economic impact	
Change and increase of income sources (B7)	Sources of income will change (tourism, industry, transportation, etc.) and increase (5-point Likert scale)
Employment opportunities (B8)	It has developed employment opportunities for the region (5-point Likert scale)
Increase of welfare (B2)	My welfare is increasing (5-point Likert scale)
Ease of earning money (B3)	I easily earn enough money to live on (5-point Likert scale)
Distribution of income to local people (B4)	A large part of the local people benefit from the income from the airport (5 point Likert scale)
Strengthen the local economy (B11)	The airport will strengthen the local economy (5-point Likert scale)
Perceived environmental impact	
Decreasing forest areas (C2)	Forest areas have been severely reduced or damaged (5-point Likert scale)
Living cond. of migr. birds (C6)	The arrival of migratory birds to the region has decreased, and their living conditions have been adversely affected (5-point Likert scale)
Quality and quantity of water resources (C4)	The water resources in the region have decreased and the resources that provide drinking water (especially Terkos Lake) have been adversely affected (5-point Likert scale)
Changing climate conditions (C5)	It has caused changes in climatic conditions in the region (decreased precipitation, extreme temperature, excessive precipitation, etc.) (5-point Likert scale)
Visual landscape quality (C10)	The quality of the region's visual landscape has decreased (5-point Likert scale)
Environmental problems (C7)	I think that environmental problems (environmental pollution, damage of forest resources, etc.) will increase (5-point Likert scale)
Demographic characteristic	
Age (Z4)	Age (Ordinal scale)
Duration in the neighb. (Z2)	Length of residence in the neighborhood (Ordinal scale)

opportunities, forest loss, water resource degradation and climate related effects. Second, preliminary fieldwork in the study area, including semi structured interviews with headmen and some local residents, provided context specific insights into the issues experienced by communities living near the project corridors. As noted by Vanclay et al. (2015), accurately identifying relevant influencing factors requires grounding the analysis in local realities and drawing upon community knowledge to understand how impacts are perceived and experienced. Accordingly, the influencing factors used in this study were shaped through the combined input of established literature and local contextual information gathered during fieldwork.

The demographic distribution of the research participants is presented in Table 2. Of the participants, 65.57% were male, and 34.43% were female. More than half of the respondents, 53%, were over 50. The most frequent education level achieved was elementary (44.81%). More than one-third (36.66%) of participants' economic levels were at or less than minimum wage. Most of the participants (67.41%) have lived in the region for more than 30 years.

2.2. Development of hypothesis and variables

2.2.1. Social structure and impact on local people's perceptions

The construction of large-scale infrastructure projects has long been recognized as a catalyst for urban transformation, influencing various aspects of social life. These projects alter neighborhood dynamics by affecting migration patterns, population density, and residents' perceptions of safety and belonging. As infrastructure developments reshape the built environment, they also impact community cohesion, social relationships, and local identity. The hypothesized relationships among demographic characteris-

tics, migration patterns and population density, and social dynamics are illustrated in Figure 1. Relationships within this scope were formulated with 14 hypotheses.

H₁–H₂: *Longer duration of residence (Z2) increases perceived migration influx and population density while younger age (Z4) reduces perceived migration influx and population density (A9).*

H₃–H₄: *Higher migration influx and population density (A9) weakens neighbor relationships (A1) and increases accident risks (A6).*

H₅–H₆: *Weaker neighbor relationships (A1) reduce family cohesion (A2), while higher accident risks (A6) diminish safety perceptions (A5).*

H₇–H₈: *Strong neighbor relationships (A1) enhance sense of belonging (A3), and perceived safety (A5) increases desire to remain (A8).*

H₉–H₁₀: *Higher accident risks (A6) weaken belonging (A3), and reduced family cohesion (A2) lowers desire to remain (A8).*

H₁₁–H₁₂: *Perceived safety (A5) strengthens family cohesion (A2) and belonging to the neighborhood (A3).*

H₁₃–H₁₄: *Higher sense of belonging (A3) and perceived safety (A5) increase individuals' desire to live in the neighborhood (A8).*

The model proposes that the duration of residence and age of individuals shape their perception of migration and population density, which in turn influences neighborhood relationships and accident risk. These interactions further affect perceptions of safety, family structure, and sense of belonging, ultimately shaping individuals' desire to remain in the neighborhood.

Table 2. Demographic profiles of participants

Variable	Freq.	Percent	Variable	Freq.	Percent
Gender			Income (\$)		
Female	262	34.43	Retired	60	7.88
Male	499	65.57	Min. wage	219	28.78
Age			Min. wage-460\$	182	23.92
18–24	51	6.70	461\$–920\$	202	26.54
25–34	113	14.85	921\$–1380\$	58	7.62
35–49	197	25.89	1381\$–1730\$	16	2.10
50–64	245	32.19	1731\$+	24	3.15
65+	155	20.37			
Education			Length of residence		
Illiterate	9	1.18	<10 years	51	6.70
Less than elementary	5	0.66	10–19 years	84	11.04
Elementary	341	44.81	20–29 years	113	14.85
Secondary/Vocational	113	14.85	30+ years	513	67.41
High School	172	22.60			
Bachelor	110	14.45			
Graduate	11	1.45			

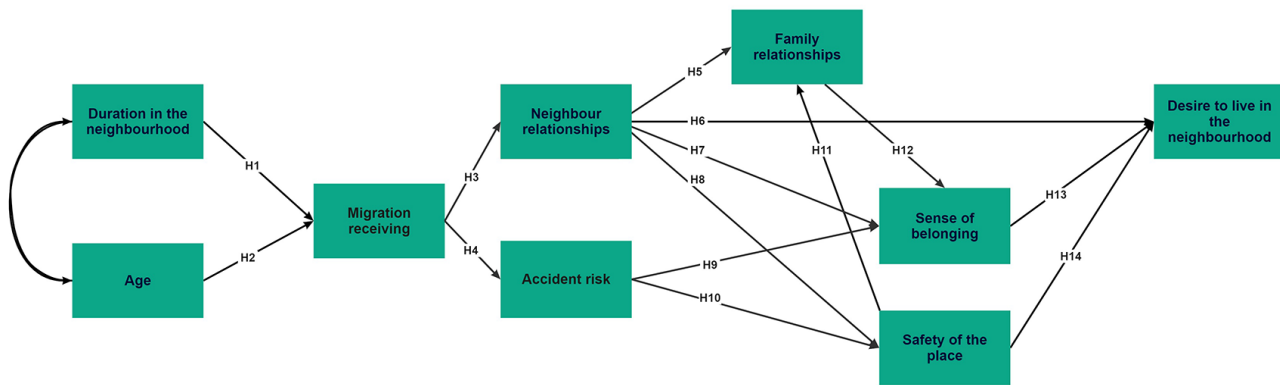


Figure 1. Path model of social structure and impact on local people's perception

Population changes resulting from land use transformations in rural areas can significantly impact social ties and community dynamics, even if the changes are not substantial (Williams & Schirmer, 2012). Regarding the perception of these changes, individual characteristics such as age and duration of residence play a crucial role. Long-term residents may have developed strong attachments to their neighborhood, which can be disrupted by changes in its familiar social and physical environment (Brown & Perkins, 1992). These demographic shifts may lead to the loss of social connections, a weakened sense of community, and cultural conflicts with newcomers (Williams & Schirmer, 2012; Petrova & Marinova, 2013). Moreover, land use changes can alter community identity and connectedness (Langbroek & Vanclay, 2012). Such changes in the social structure, with weakened neighbor relationships and reduced feelings of security, can undermine residents' attachment to the neighborhood and their willingness to stay (Clark et al., 2017). Furthermore, rapid population turnover may weaken trust and cooperation among neighbors, thereby undermining neighborhood collective efficacy (Sampson, 2012).

Place attachment is expressed in how people feel about, think about and interact with places, yet its social dimension is particularly pivotal as it fosters a sense of belonging through interpersonal interactions and group identity (Scannell & Gifford, 2010). Similarly, Hidalgo and Hernandez (2001) emphasize that social bonds often outweigh physical settings in shaping attachment. Thus, a sense of belonging is strongly influenced by social ties and networks, which are shaped by the length of residence (Toruńczyk-Ruiz & Martinovic, 2020). However, as Brown et al. (2012) note, environmental changes and societal disruptions can threaten these established attachments. Rapid population growth and infrastructure changes can disrupt the stability required for these bonds. Consequently, such environmental transformations can sever the social connections that sustain belonging, so that long-term residents begin to feel like strangers in their own neighborhood (Hummon, 1992). Moreover, increasing population density may increase the risk of accidents. Ancaes et al. (2017) highlight residents' concerns about accident risk and personal safety associated with increased traffic.

Ultimately, these social disruptions converge to shape the residents' desire to remain in the neighborhood. When the continuity of place is disrupted by physical risks or social fragmentation, psychological bonds may weaken (Brown & Perkins, 1992), potentially contributing to a desire for voluntary relocation. Thus, as the model hypothesizes, the loss of belonging and family cohesion, coupled with increased accident risks, diminishes the desire to stay, increasing the likelihood of leaving the neighborhood.

2.2.2. Perceived economic impacts

Large-scale infrastructure projects and resulting land-use changes have significant economic implications for local communities. These transformations can significantly impact employment opportunities, income distribution, and well-being. Understanding the economic consequences of these projects requires analyzing how they influence employment, income sources, and local market structures. The hypothesized relationships among employment opportunities, income dynamics, welfare levels, and local economic strength are illustrated in Figure 2. Relationships within this scope were formulated with 12 hypotheses. The model suggests that employment opportunities directly influence welfare, changes in income sources, and the distribution of income among local people. These economic dynamics thereby shape the local economy by affecting income distribution, and ease of earning money.

H₁₅–H₁₉: *Employment opportunities (B8) increase welfare (B2), diversify income sources (B7), improve earning ease (B3), strengthen the local economy (B11), and enhance income distribution (B4).*

H₂₀–H₂₂: *Higher welfare (B2) boosts the local economy (B11), enhances earning ease (B3), and reduces income inequality (B4).*

H₂₃–26: *Income inequality (B4) hinders earning ease (B3), while diversified income (B7), fair income distribution (B4) and earning ease (B3) strengthen the local economy (B11).*

Large-scale infrastructure projects, such as airports and motorways, are widely recognized as powerful drivers of economic transformation. These developments significantly

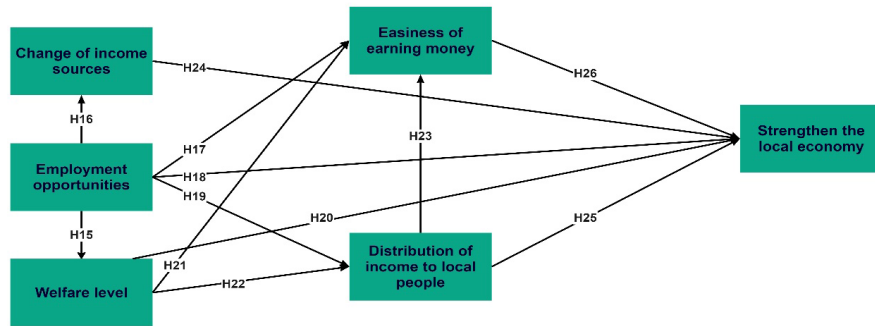


Figure 2. Path model of perceived economic impacts

influence regional dynamics by enhancing connectivity, facilitating trade, and creating employment opportunities. By stimulating industrial expansion, urbanization, and regional economic integration, these infrastructure projects contribute to local and national economic development. Specifically, airports contribute to economic growth by generating direct and indirect jobs, supporting related industries such as tourism and logistics, and attracting businesses to surrounding areas, thereby stimulating local economies through increased demand for services (Blonigen & Cristea, 2015; Graham, 2023). Similarly, motorways can contribute to regional development by reducing transportation costs and supporting urban employment growth (Duranton & Turner, 2012).

In rural contexts, these infrastructure improvements are particularly critical for poverty reduction and income diversification. Improved road networks facilitate access to urban labor markets and inputs, enhancing agricultural productivity and increasing income for rural communities (Asomani-Boateng et al., 2015; Iimi et al., 2015). Infrastructure investments create temporary job openings during construction and foster long-term employment expansion by improving accessibility (Calderón & Servén, 2008; Challoumis, 2024). Such employment opportunities can improve household income levels and living standards, ultimately contributing to overall economic well-being and local and regional development (Todaro & Smith, 2020; Sobieralski, 2021).

2.2.3. Perceived environmental impacts

Large-scale infrastructure projects and the resulting land-use changes have significant environmental implications for forest ecosystem. Transformations in forest areas often begin with deforestation, which triggers a cascade of effects including disrupted migratory bird habitats, reduced water quality, and altered climatic conditions. Understanding the environmental impacts of these projects requires analyzing how they influence land use, water dynamics, and ecosystem stability. The hypothesized relationships among changes in forest areas, water resources, climatic conditions, and environmental problems are illustrated in Figure 3. Relationships within this scope were formulated with 15 hypotheses. The model suggests that changes in forest areas directly influence water resources, migratory bird habitats, and climatic conditions, and environmental problems.

H₂₇–H₃₂: Older residents perceive greater forest loss (C2), which disrupts bird habitats (C6), reduces water quality/quantity (C4), worsens climatic conditions (C5), degrades landscapes (C10), and increases environmental problems (C7).

H₃₃–H₃₅: Reduced water resources and quality (C4) harms bird habitats (C6), diminishes landscape quality (C10), and intensifies environmental problems (C7).

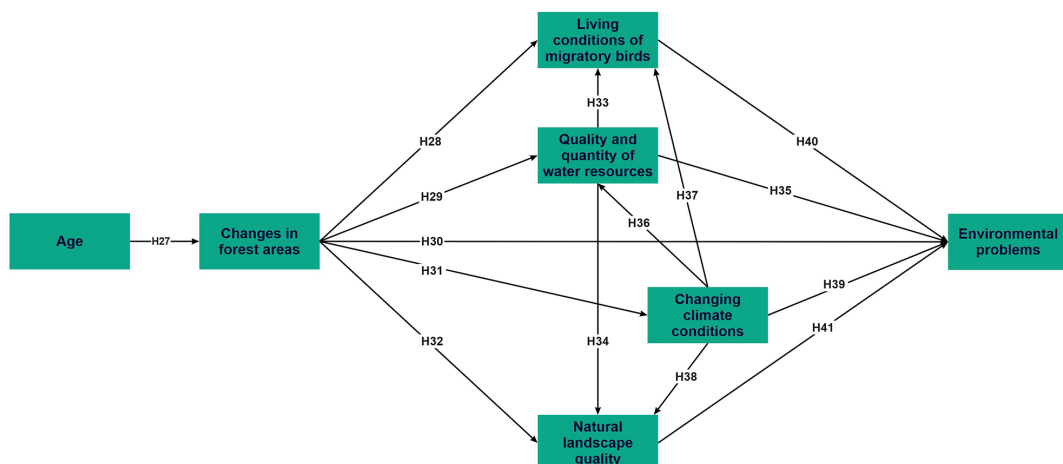


Figure 3. Path model of environmental impacts of forest land-use change

H₃₆–H₃₉: *Climatic changes (C5) reduce water quality/quantity (C4), disrupt bird habitats (C6), degrade landscapes (C10), and worsen environmental problems (C7).*

H₄₀–H₄₁: *Migratory bird loss (C6) and poor landscapes (C10) signal and amplify environmental problems in the future (C7).*

Large-scale infrastructure projects, including airports, motorways, and bridges, significantly impact natural environments by altering land use patterns, affecting water resources, and contributing to environmental challenges. These projects can result in deforestation, changes in hydrological systems, and modifications to local thermal conditions, leading to complex environmental consequences (Coffin, 2007; Li et al., 2022; Wan et al., 2023). Regarding the perception of this loss, age plays a significant role; older residents, having witnessed the landscape's transformation over a longer period, are often more sensitive to the reduction in forest areas and the degradation of the broader natural environment. In contrast, younger generations may view the rapidly transformed landscape as the norm, a phenomenon known as shifting baseline syndrome (Soga & Gaston, 2018).

Following these land-use changes, specific ecological consequences emerge. Airport expansions contribute to deforestation and habitat fragmentation, impacting migratory bird populations, especially in areas near wetlands and lakes. The decline in migratory bird sightings after airport construction is linked to habitat disruption and changes in local ecosystems (Monterrubio et al., 2020; Zhao et al., 2019). Concurrently, motorways affect the perceived visual quality of landscapes, with impacts varying according to landscape characteristics and road design (Jiang et al., 2015). Bridges also have notable environmental impacts, including changes in water dynamics and the loss of green spaces (Li et al., 2022). Construction activities and land-use changes associated with bridge building can raise concerns among local residents about damage to natural habitats, loss of green spaces, and water pollution (Varlier & Özçevik, 2015).

Forests play a critical role in maintaining ecological balance and providing essential ecosystem services such as carbon sequestration, water regulation, and soil conservation. Large-scale infrastructure projects contribute to deforestation, reducing forest cover and diminishing these vital ecosystem services. The decrease in forested areas not only affects local climatic conditions but also impacts water cycles and carbon storage capacity, leading to environmental degradation (Lambin et al., 2003). Preserving forest areas is therefore essential for maintaining ecosystem stability and environmental resilience.

In addition to ecological functions, these transformations degrade visual landscape quality. This is significant as aesthetic value and scenery are vital environmental components that directly contribute to human well-being (Millennium Ecosystem Assessment, 2005; Daniel et al., 2012). However, changes in aesthetic quality due

to infrastructure projects disrupt these services, creating adverse social impacts by altering people's perception and connection to their environment. Specifically, large-scale transportation projects reduce the visual appeal of landscapes, which negatively affects local residents' well-being and sense of place (Jiang et al., 2015; Langbroek & Vanclay, 2012). Ultimately, the convergence of these specific degradations -loss of birds, water scarcity, and poor landscape quality- shapes the overall perception of environmental problems.

2.3. Path analysis

Path analysis is a method used to examine direct and indirect relationships between variables of interest (Pedhazur, 1997). Path analysis allows the evaluation of cause-effect relationships of a hypothetical model (Carney et al., 2018). Using a path diagram conveniently represents exogenous and endogenous variables in the model. Two arrows represent the relationships between variables; a straight one-headed arrow shows a causal relationship, whereas a curved two-headed arrow represents a correlation. This study aimed to develop and test path models that represent the direct and indirect effects of the project on social, environmental, and economic issues, based on the views of the local people. Participants' responses were entered in SPSS IBM 24 and path analysis was employed using AMOS 20. Several goodness of fit indices evaluated the model fit (Hu & Bentler, 1999; Byrne, 2001). The evaluation model fit was based on the Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA). Values exceeding 0.90 for CFI, TLI, NFI, GFI, and AGFI indicated a reasonable model fit (Hu & Bentler, 1999; Schumacker & Lomax, 1996; Kline, 2005). Values below 0.05 for RMSEA are considered a good fit, and values between 0.05 and 0.08 suggest an adequate fit (Hu & Bentler, 1999). The minimum discrepancy per degree of freedom (CMIN/DF) was used as another goodness of fit measure; CMIN/DF < 3 corresponds to a good fit between the hypothetical model and sample data (Kline, 1998), and CMIN/DF < 5 indicates a reasonable fit (Schumacker & Lomax, 2004).

3. Results

The overall fits of the three hypothetical models based on social, economic, and environmental impact were assessed. The ratios between the chi-square and degrees of freedom were lower than suggested criterion 5 (at 3.93, 0.66, and 2.87, respectively). It was observed that the RMSEA values of all three models were at or below 0.05 (at 0.05, 0.02, and 0.04, respectively) and most of the other goodness-of-fit values were above the value of 0.95. As can be seen from Table 3, path analyses yielded good fits for the three path models.

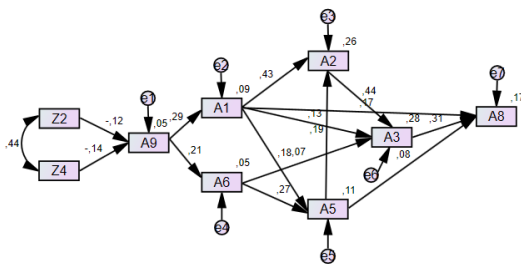
Table 3. Goodness-of-fit measures for path models

Index	Reference	Model I (social)	Model II (economic)	Model III (environ.)
Chi-square/df	<5 (good fit)	3.93	0.66	2.87
RMSEA	<0.05 (good fit)	0.05	0.00	0.04
GFI	>0.95 (good fit)	0.98	0.99	0.99
AGFI	>0.90 (good fit)	0.96	0.99	0.98
NFI	>0.95 (good fit)	0.94*	0.99	0.99
CFI	>0.97 (good fit)	0.96*	0.99	0.99

Note: * acceptable fit.

3.1. Social structure and impact on local people's perceptions

Figure 4 shows the result of the path model of social structure and local people's perception. And the regression weights among the parameters for each path model given in the Appendix.

**Figure 4.** Path model result of social structure and local people's perception

According to the model evaluating social effects, the factor with the most significant direct effect on the desire to live in the neighborhood was sense of belonging (H_{13} , $\beta = 0.305$, $p < 0.001$). The next two significant factors with direct effects on the desire to live in the neighborhood were neighbor relationships (H_6 , $\beta = 0.166$, $p < 0.001$) and safety of the place (H_{14} , $\beta = 0.077$, $p < 0.01$). As the sense of belonging decreased, the desire to live in that region also decreased. Similarly, weakening neighbor relations and the feeling of being unsafe in the area also reduced the desire to live in that area. The age of the individuals and the length of time they had lived in the neighborhood both negatively affected the perception that the region was migrant-receiving (H_2 , $\beta = -0.136$, $p < 0.001$; H_1 , $\beta = -0.122$, $p < 0.001$). It was observed that those who had just moved to the region and young individuals had relatively less information on this subject. The fact that the area received migration led to the weakening of neighborly relations (H_3 , $\beta = 0.293$, $p < 0.001$) and an increased accident risk (H_4 , $\beta = 0.213$, $p < 0.001$). Weakening neighborhood relationships and the feeling of being unsafe in the neighborhood similarly affected family relationships (H_5 , $\beta = 0.434$, $p < 0.001$; H_{11} , $\beta = 0.188$, $p < 0.001$). On the other hand, weakening neighborhood relations (H_7 , $\beta = 0.130$, $p < 0.001$) and family relations (H_{12} , $\beta = 0.441$, $p < 0.001$) also affected people's attachment to the place. Unsurprisingly, an increased accident risk (H_{10} , $\beta = 0.271$,

$p < 0.001$) and weakened neighbor relations (H_8 , $\beta = 0.180$, $p < 0.001$) also affected the feeling of being unsafe in the neighborhood.

Table 4. The direct, indirect, and total effects of Model I

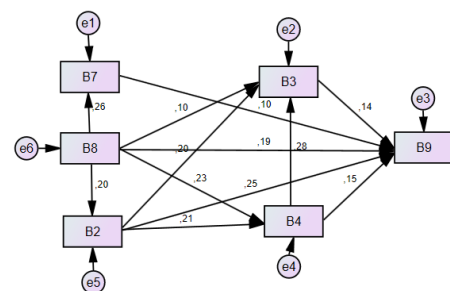
Desire to live in the neighborhood			
Model I (Social)	Direct effect	Indirect effect	Total effect
Migration receiving	–	0.094***	0.094***
Neighbor relations	0.166***	0.117***	0.283***
Accident risk	–	0.050***	0.050***
Family relations	–	0.135***	0.135***
Sense of belonging	0.305***	–	0.305***
Safety of place	0.077***	0.025***	0.102***

Notes: Bootstrap standard errors for total and indirect effects were calculated using 2000 replications. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 4 illustrates the detailed standardized total, direct, and indirect effects between observed variables. The sum of a given variable's direct and indirect effects gives the total effect. For the model evaluating the social impacts, namely the desire to live in the neighborhood, the factors with the most pronounced effect were sense of belonging ($\beta = 0.305$, $p < 0.001$) and neighbor relations ($\beta = 0.283$, $p < 0.001$ respectively).

3.2. Perceived economic impacts

Figure 5 shows the result of the path model of perceived economic impacts. And the regression weights among the parameters for each path model given in the Appendix.

**Figure 5.** Path model result of economic impacts

The model evaluating economic impacts (Figure 5) showed that change and increase in income sources (H_{24} , $\beta = 0.101$, $p < 0.001$), employment opportunities (H_{18} , $\beta =$

0.187, $p < 0.001$), welfare level (H_{20} , $\beta = 0.246$, $p < 0.001$), easiness of earning money (H_{26} , $\beta = 0.137$, $p < 0.001$), and fair income distribution (H_{25} , $\beta = 0.147$) had direct effects on the strengthening of the local economy. Increasing employment opportunities directly impact welfare level (H_{15} , $\beta = 0.256$, $p < 0.001$), change and increase of income sources (H_{16} , $\beta = 0.201$, $p < 0.001$) and easiness of earning money (H_{17} , $\beta = 0.099$). Increasing employment opportunities (H_{19} , $\beta = 0.233$, $p < 0.001$) and increasing welfare levels (H_{22} , $\beta = 0.211$, $p < 0.001$) affected the fair income distribution of local people.

Table 5. The direct, indirect, and total effects of Model II

Strengthen the local economy			
Model II (Economic)	Direct effect	Indirect effect	Total effect
Change of income sources	0.101***	–	0.101***
Employment opportunities	0.187***	0.146***	0.333***
Welfare level	0.246***	0.067***	0.313***
Ease of earning	0.137***	–	0.137***
Distribution of income	0.147***	0.039***	0.185***

Notes: Bootstrap standard errors for total and indirect effects were calculated using 2000 replications. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 5 shows the detailed standardized total, direct, and indirect effects between observed variables. Nevertheless, employment opportunities ($\beta = 0.333$, $p < 0.001$), and welfare level ($\beta = 0.313$, $p < 0.001$) had the most considerable effects on the model evaluating economic impacts.

3.3. Perceived environmental impacts

Figure 6 shows the result of the path model of perceived environmental impacts of forest land-use change. And the regression weights among the parameters for each path model given in the Appendix.

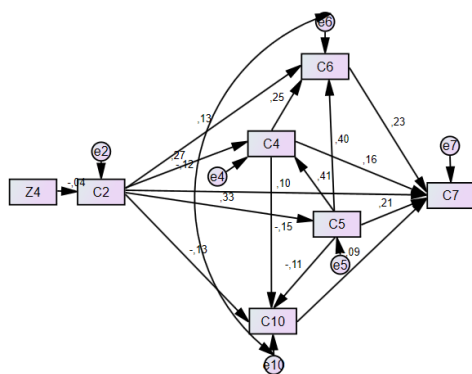


Figure 6. Path model result of environmental impacts of forest land-use change

According to the model evaluating the environmental impacts of forest land-use change (Fig 6), changing living conditions of migratory birds (H_{40} , $\beta = 0.227$, $p <$

0.001), quality and quantity of water resources (H_{35} , $\beta = 0.161$, $p < 0.001$), changing climate conditions (H_{39} , $\beta = 0.211$), and decrease in visual landscape quality (H_{41} , $\beta = -0.089$, $p < 0.01$) had the effect of increasing environmental problems. Conversely, the decrease in forest areas (H_{28} , $\beta = 0.129$), decreasing quality and quantity of water resources (H_{33} , $\beta = 0.246$, $p < 0.001$), and changing climate conditions (H_{37} , $\beta = 0.403$, $p < 0.001$) negatively affected the living conditions of migratory birds. The decrease in natural landscape quality was directly affected by the decline of forest areas (H_{32} , $\beta = -0.125$, $p < 0.001$), quality and quantity of water resources (H_{34} , $\beta = -0.147$, $p < 0.001$), and changing climate conditions (H_{38} , $\beta = -0.106$, $p < 0.01$). The direct effect of changing climate conditions on the quality and quantity of water resources (H_{36} , $\beta = 0.408$, $p < 0.001$) had the most considerable direct effect in this model; the decrease in forest areas also directly affected the quality and quantity of water resources (H_{29} , $\beta = 0.269$, $p < 0.001$). Further, the decrease in forest areas affected climate change (H_{31} , $\beta = 0.332$, $p < 0.001$). Lastly, as people aged, they increasingly perceived forest areas as decreasing (H_{27} , $\beta = 0.039$, $p < 0.05$); however, this effect was very weak.

Table 6. The direct, indirect, and total effects of Model III

Environmental problems			
Model III (Environ.)	Direct effect	Indirect effect	Total effect
Change of forest areas	0.099*	0.237***	0.336***
QQ of water resource	0.161***	0.069***	0.230***
Changing climate con.	0.211***	0.195***	0.406***
Natural Landscape quality	-0.089***	–	-0.089***
Living cond.of migr. birds	0.227***	–	0.227***

Notes: Bootstrap standard errors for total and indirect effects were calculated using 2000 replications. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 6 illustrates the detailed standardized total, direct, and indirect effects between observed variables. The sum of a given variable's direct and indirect effects gives the total effect. For the third model assessing environmental impacts, changing climate conditions ($\beta = 0.406$, $p < 0.001$) was determined to have the most significant effect.

4. Discussion

The social structure model indicates that family structure and relationships significantly influence a person's sense of belonging to their neighborhood. Similarly, the strength of neighbor relationships affects family dynamics. When new residents move in, neighbor relationships may weaken. This negatively affects family structure and relationships and ultimately reduces a person's sense of belonging to the region. Eken (2023) found that in Konya province, social relations, particularly neighbor ties, serve as essential cultural bonds, and urbanization weakens these social ties. Wu (2008) demonstrated that land use changes in rural

areas negatively impact cooperation activities, information exchange, and both formal and informal business relationships among neighbors. De Jong et al. (2021) revealed that land use changes lead to conflicts among people, and deforestation around commodity frontiers further exacerbates these conflicts. Population growth, overlapping land rights, ethnic fragmentation, and economic inequality are identified as primary drivers of these conflicts. Together, these dynamics create serious and persistent social challenges.

A weakened sense of neighbor relationships and an increased risk of accidents also negatively affect a person's desire to live in the area. Zeng et al. (2023) highlight a significant relationship between perceived safety, the built environment, and social surroundings. Therefore, it is crucial to evaluate the built and social environments around residential areas in terms of safety perceptions. Du et al. (2023) found that perceived neighborhood environments have a more substantial impact on community belonging than objective neighborhood environments. They emphasize that perceived environmental characteristics influence neighborly interactions and community satisfaction through their effect on the sense of belonging. Furthermore, the study reveals that local attachment is the most significant factor in determining a person's desire to live in their neighborhood. In a case study, Candan and Kazak (2019) emphasized that individuals' sense of belonging to their residence is significantly influenced by the ability of small groups to form strong, sincere connections and by their satisfaction with the surrounding community. Göksoy and Hacıhasanoğlu (2023) state that a sense of security is directly proportional to belonging and commitment to a place. Those with a strong sense of belonging to their locality are more likely to continue living in the area. The study also finds that the strength of neighbor relationships directly and indirectly impacts a person's desire to live in their neighborhood. Weakening of these relationships can reduce a person's willingness to continue living in the area. Köten (2015) found that the desire to live in a neighborhood is associated with the quality of neighborhood relations. Michalski et al. (2020) observed that weaker community belonging is linked to poorer general and mental health, with a stronger association noted for mental health.

Sairinen (2004) states that urban projects consider social balance at the neighborhood level, the availability and quality of local services, traffic and accessibility, neighborhood safety, opportunities for privacy and social interaction, and the presence of essential areas for residents. Haim-Litevsky et al. (2023) explored the effects and relationships between well-being, sense of belonging, community connectedness, and meaningful participation in daily life. Feor et al. (2023) emphasize that the Sustainable Development Goals provide a foundation for identifying tools to measure social impact. However, they argue that customized indicators are necessary, and that measurement tools should evaluate both inputs and outputs.

In the economic model, the most influential factor is the fair distribution of income among locals. This is associated with easier access to income, higher welfare levels, increased employment opportunities, and more diversified income sources. As a result, many residents believe that these projects benefit a large segment of the population and make daily life easier. Others perceive that the projects enhance the regional economy by raising overall welfare. Başer (2019) found that public investment in Ordu-Giresun Airport increased the value of real estate, including land and housing, positively affecting local economic life. Haughwout (2002) also emphasized that infrastructure investment influences the attractiveness of a region at the local level. Moreover, government investments have been found to reduce income inequality, although the impact varies by investment type. Transportation infrastructure investments have a relatively lower effect but still contribute to stabilizing income inequality (Lian et al., 2024).

The employment opportunities created by the projects are believed to benefit a significant percentage of the local population, leading to increased income sources. The level of welfare was found to have the most substantial impact on strengthening the local economy. Those who perceived an increase in welfare also expected the projects to enhance the local economy. Xie et al. (2023) noted that population growth and the pursuit of improved living standards have increased the demand for infrastructure in cities, driving the need for large-scale infrastructure projects. This trend significantly increases GDP. For laborers from suburban areas, these projects create employment opportunities and increase the demand for housing and transportation infrastructure. In contrast, Sims et al. (2019) found that land protection measures can stimulate local economic growth rather than hinder it.

Graham (2023) states that airports contribute to local economies by creating job opportunities and attracting new businesses. Hakfoort et al. (2001) showed that the expansion of Schiphol Airport generated additional employment in the region, and Ulfah et al. (2017) found that airports create new job opportunities and stimulate local economies. However, Woodburn (2017) showed that in some U.S. states, airports do not necessarily improve the socio-economic status of nearby communities, despite being major activity centers. In some cases, even when local people benefit, their socio-economic level remains below the regional average. Conversely, Hossain and Fuller (2021) argued that conflicts arise in transport-related mega-projects when governments prioritize economic development over community needs and social welfare.

Asomani-Boateng et al. (2015) noted that roads contribute to economic development by enhancing transportation, particularly in rural areas. Iimi et al. (2015) observed that job opportunities and household incomes tend to rise, although this varies by region's economic structure. Focusing on the YSS Bridge, Varlier and Özçevik (2015) suggested that improved transportation would increase economic opportunities. The airport, bridge, and road projects are

expected to enhance economic opportunities. Roads and bridges contribute by improving transportation, while airports stimulate development in surrounding areas.

The natural environment enhances community well-being by supporting livelihoods, health, and cultural values, while strengthening human connections to nature. However, rapid development often compromises these assets, as replacing green spaces with impervious surfaces degrades air quality, biodiversity, and water regulation. Crucially, as Yee et al. (2021) highlight, even measurable improvements in environmental conditions do not guarantee enhanced well-being, as these outcomes are deeply influenced by the broader social and economic context.

The model demonstrates that changes in climatic conditions significantly impact water quality and quantity, as well as migratory bird habitats. These changes adversely affect drinking water availability and the environment for birds. In this study, migratory bird patterns were included because they are observable by locals, and the area is an important migratory route. In future applications, the model can be expanded to include questions regarding broader wildlife (flora and fauna) in other research contexts. Vandas et al. (2002) noted that urban growth and associated infrastructure developments alter historical water uses, affecting natural environments. Kalfas et al. (2024) proved that there is a significant relationship between land use planning, water resources, and climate change policies. These changes are also associated with habitat loss. Mugatha et al. (2024) found out that species richness and variety decrease when land use changes, and natural animal habitats are altered with fundamental implications for biodiversity. Additionally, changes in forest cover contribute to climatic shifts, influencing environmental problems.

The model shows that the foremost factor contributing to environmental issues is a change in climatic conditions, followed by the decline in forest areas. Essentially, the locals believe that such changes will lead to a rise in environmental problems. Lawrence et al. (2022) found that changes in forest cover affect biophysical processes and carbon emissions. These changes consequently influence climate conditions, forest ecosystems, agricultural species, and the livelihoods of local communities. Alves de Oliveira et al. (2021) observed that deforestation and global warming increase social inequality, and vulnerability. In an analysis of 30 years of data from Turkey, Özcanlı and Yılmaz (2024) observed major changes in land use patterns, particularly the expansion of artificial areas into agricultural, forest, and meadow-pasture lands. This shift has contributed to the occurrence of extreme weather events, including floods, storms, and heat waves, in certain regions as a consequence of climate change. It was determined that the decrease in agricultural and then forest areas in the Marmara Region, where the area subject to our study is located, has reached significant dimensions. Aksoy and Atasagun (2023) point to the loss of biodiversity due to land use change and climate change.

Beeram et al. (2023) found that land use and land cover changes, particularly the increase in built-up areas, are significant factors contributing to reduced groundwater recharge. There are concerns that these projects may accelerate settlement in the region, further exacerbating environmental pressures. Yu et al. (2021) highlights that land use changes driven by rapid urbanization pose serious risks to the value of ecosystem services. Additionally, the reduction and fragmentation of forest areas negatively impact wildlife habitats and biodiversity.

5. Conclusions

In large-scale projects that involve significant land use changes and impact local communities, it is crucial to thoroughly evaluate all resulting effects. Typically, impact assessments prioritize environmental aspects, often overlooking the social dimension. However, understanding local residents' perceptions of these projects is equally important, as these projects generate significant social, economic, and environmental impacts. This study modeled the impacts of such projects on social structures, the economy, and the environment based on the perspectives of the local population, providing valuable insights into the interconnectedness of these factors.

The model assessing social impacts revealed that a sense of belonging and neighbor relations had the most substantial direct effects on the desire to live in the neighborhood. The study suggests that individuals with stronger social ties tend to have a stronger attachment to their locality and prefer to continue living there. Conversely, the weakening of these social bonds, coupled with perceptions of unsafe living conditions, negatively impacted residents' desire to live in the region. Additionally, migration into the area strained neighborhood relations, increasing feelings of insecurity. Stronger social ties were found to enhance residents' sense of belonging and attachment to their locality, emphasizing the need to protect and strengthen these connections in the context of large-scale projects and land allocation processes.

The economic model revealed that employment opportunities, welfare levels, and fair income distribution played crucial roles in strengthening the local economy. Notably, improvements in employment opportunities had cascading effects on other economic indicators, such as income sources and welfare levels. Those who perceived an increase in their welfare levels were more likely to view the project as beneficial to the regional economy. These findings highlight the importance of prioritizing sustainable job creation and equitable economic development in public investments to build economic resilience and reduce disparities.

The environmental model identified various factors contributing to environmental issues, emphasizing the critical link between changing climatic conditions, reduction in forested areas, and a decline in water resources. The most significant finding is the relationship between

changing climatic conditions and reduced forested areas. The decrease in forest areas not only exacerbates climate-related challenges but also impacts wildlife habitats and species diversity, including a decline in migratory bird populations. This reduction in forested areas has a considerable impact on climatic conditions and water resources, suggesting that environmental issues in the region are likely to worsen in the future.

When the results are evaluated, some critical points emerged that should be strengthened in terms of the assessment of large-scale projects that lead to land-use change:

- *Social Impacts:* Prominent factors such as family structure, neighborhood relations, lifestyle changes, and a sense of belonging should be integrated into impact assessments. Efforts should be made to protect and enhance social cohesion.
- *Economic Impacts:* Strengthening the local economy, increasing local employment, and improving welfare are key factors influencing community perceptions. Investments should prioritize these areas to ensure equitable and sustainable development.
- *Environmental Impacts:* The perception of environmental degradation -including deforestation, climate-related challenges, and impacts on wildlife and biodiversity-neecessitates a more sensitive and detailed approach during evaluation processes.

Additionally, for large-scale projects leading to land-use changes, priority should be given to areas requiring minimal land conversion. Comprehensive studies on local perceptions should be conducted, and the findings should be integrated into decision-making processes. Long-term effects should be evaluated, and the true public benefit of the projects should be critically evaluated.

This study emphasizes the interconnectedness of social, economic, and environmental factors in large-scale projects. A comprehensive, multi-faceted approach is essential to ensure positive, lasting outcomes for local communities while minimizing negative impacts. Integrating these considerations into planning and policy-making can help achieve a balanced and sustainable approach to development.

5.1. Policy implications

Developing sustainable policies for large-scale infrastructure requires moving beyond purely technical or macro-economic evaluations to a more holistic approach that centralizes local perceptions and public participation. These projects are not merely physical interventions but complex social processes that reshape the lived experiences of communities. Therefore, effective governance depends on shifting from top-down decisions to collaborative frameworks where residents are recognized as stakeholders. Integrating local perception and ensuring transparency in decision-making in the early stages of planning are essential for securing social acceptance, mitigating conflicts, and ensuring that development goals align with community realities.

Within this context, the findings of this study offer several important directions for planners, policymakers, and public agencies responsible for large-scale infrastructure development. Regarding the social dimension, desire to remain in their communities highlights the importance of socially sensitive planning approaches. Infrastructure projects should incorporate mechanisms that protect and strengthen local social networks and support broader social cohesion, particularly in areas experiencing shifts in social composition due to in-migration or changing community dynamics. Participatory planning processes, transparent communication with residents, and community-level monitoring mechanisms can help sustain this social sustainability during and after project development.

Economically, local employment opportunities, improvements in welfare, and fair income distribution play key roles in shaping residents' perceptions of the project's impact on the local economy. Policies that strengthen these economic dimensions and provide support to residents most affected by the social, economic, and/or environmental changes introduced by large-scale developments may contribute to more equitable and socially responsive outcomes.

Environmentally, perceptions of a strong link between forest loss, climate-related changes, and declining water resources, underscoring the importance of integrating local environmental perceptions into infrastructure planning. Because respondents consistently identify state-owned forest lands and ecologically sensitive zones as areas most affected by megaprojects, governance frameworks should treat these perceived risks as critical input when deciding on land allocation and the acceptable levels of forest conversion. Rather than relying solely on biophysical indicators, incorporating perception-based measures such as perceived water resource quality, landscape degradation, and wildlife disturbance into Environmental and Social Impact Assessment (ESIA) procedures can help planners design mitigation strategies that are both more context-specific and socially legitimate.

Overall, these implications highlight the importance of an infrastructure governance model that safeguards ecological integrity, supports community well-being, and ensures the equitable distribution of economic benefits, while systematically institutionalizing local perceptions into planning and evaluation processes.

5.2. Data limitations and future research

The study offers important insights into the social, economic, and environmental impacts of large-scale infrastructure projects; however, several limitations should be taken into account when interpreting the findings and guiding future research. First, the study relies on perception-based questionnaire data, which reflect residents' lived experiences and their interpretations of project impacts. To obtain a more comprehensive understanding, future research could complement these perceptions with physical and ecological measurements such as land-use

change analyses, biodiversity assessments, or water-resource monitoring.

Although the sample size is substantial, the research focuses on neighborhoods surrounding three specific large-scale projects and the findings should therefore be interpreted primarily with respect to similar geographic and socio-economic contexts. Moreover, the cross-sectional design does not capture long-term changes or causal dynamics in social cohesion, economic well-being, or environmental degradation.

The selection of variables was based on existing literature and field insights; however, future research should jointly measure subjective perceptions and objective physical indicators (e.g., environmental and socio-economic metrics) to better capture the multi-dimensional nature of project impacts. Longitudinal designs and mixed-method approaches that combine surveys, in-depth interviews, and participatory techniques could deepen the analysis of residents' perceptions and offer a more holistic understanding of the evolving impacts of large-scale infrastructure projects.

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Ethical approval

The study was approved by the Social Sciences and Humanities Research Ethics Committee of Istanbul University–Cerrahpaşa (protocol code 2021/189, approval date: 30 June 2021).

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APPENDIX

End of Table A1

Table A1. Regression weights among parameters in path models

H _n	Relationship between variables		Weights (Standardized)
Model I (Social)			
H ₁	Migration receiving	← Duration in the neighborhood	−0.122***
H ₂	Migration receiving	← Age	−0.136***
H ₃	Neighbor relations	← Migration receiving	0.293***
H ₄	Accident risk	← Migration receiving	0.213***
H ₅	Family relations	← Neighbor relations	0.434***
H ₆	Desire to live in the neighborhood	← Neighbor relations	0.166***
H ₇	Sense of belonging	← Neighbor relations	0.130***
H ₈	Safety of the place	← Neighbor relations	0.180***
H ₉	Sense of belonging	← Accident risk	0.074**
H ₁₀	Safety of the place	← Accident risk	0.271***
H ₁₁	Family relations	← Safety of the place	0.188***
H ₁₂	Sense of belonging	← Family relations	0.441***
H ₁₃	Desire to live in the neighborhood	← Sense of belonging	0.305***
H ₁₄	Desire to live in the neighborhood	← Safety of the place	0.077**
Model II (Economic)			
H ₁₅	Welfare level	← Employment opportunities	0.256***
H ₁₆	Change and increase of income sources	← Employment opportunities	0.201***
H ₁₇	Easiness of earning money	← Employment opportunities	0.099***
H ₁₈	Strengthen the local economy	← Employment opportunities	0.187***
H ₁₉	Distribution of income to local people	← Employment opportunities	0.233***
H ₂₀	Strengthen the local economy	← Employment opportunities	0.246***
H ₂₁	Easiness of earning money	← Welfare level	0.203***
H ₂₂	Distribution of income to local people	← Welfare level	0.211***
H ₂₃	Easiness of earning money	← Distribution of income to local people	0.282***
H ₂₄	Strengthen the local economy	← Change and increase of income sources	0.101***

H _n	Relationship between variables		Weights (Standardized)
H ₂₅	Strengthen the local economy	← Distribution of income to local people	0.147***
H ₂₆	Strengthen the local economy	← Easiness of earning money	0.137***
Model III (Environ.)			
H ₂₇	Changes in forest areas	← Age	− 0.039*
H ₂₈	Living conditions of migratory birds	← Changes in forest areas	0.129***
H ₂₉	Impact on quality and quantity of water resources	← Changes in forest areas	0.269***
H ₃₀	Environmental problems	← Changes in forest areas	0.099***
H ₃₁	Changing climate conditions	← Changes in forest areas	0.332***
H ₃₂	Natural landscape quality	← Changes in forest areas	−0.125***
H ₃₃	Living conditions of migratory birds	← Quality and quantity of water resources	0.246***
H ₃₄	Natural landscape quality	← Quality and quantity of water resources	−0.147***
H ₃₅	Environmental problems	← Quality and quantity of water resources	0.161***
H ₃₆	Quality and quantity of water resources	← Changing climate conditions	0.408***
H ₃₇	Living conditions of migration birds	← Changing climate conditions	0.403**
H ₃₈	Natural landscape quality	← Changing climate conditions	−0.106**
H ₃₉	Environmental problems	← Changing climate conditions	0.211***
H ₄₀	Environmental problems	← Living conditions of migratory birds	0.227***
H ₄₁	Environmental problems	← Natural landscape quality	−0.089***

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05 (←) direction of relationships.