

SOCIAL IMPACTS DUE TO LANDSCAPE DISRUPTION CAUSED BY THE CENTRAL EXPRESSWAY: WITH REFERENCE TO KADAWATHA - MIRIGAMA SECTION

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Abstract: The construction of expressways in Sri Lanka has been a critical force in the country's development. However, most of the expressway projects will cause large-scale landscape disruptions to the natural landscape fabric. Somehow gaps in the analytical stages before the construction cause mass disruptions to the living landscapes. The study was conducted based on the ongoing central expressway to investigate the social impacts caused by the landscape disruption of the project. Under the project title, an environmental impact assessment was conducted, but the social impact assessment was not discussed responsibly. This quantitative and qualitative research was based on the selected case study locations with the highest social disturbance. The study was structured by the parameters found from the field expert's structured interviews. Data was collected through field surveys, GIS data analysis, and satellite imagery analysis. The study will analyse the social fabric of the study areas before and after the project as a comparative study. Used parameters mentioned in the methodology can be used as a framework to analyse the social impact assessment criteria in a relevant context. The contribution of this study will be beneficial in future construction projects in Sri Lanka, to mitigate the social consequences caused by large-scale landscape disruptions.

Keywords: *Landscape disruption, expressway construction, social impacts, landscape fragmentation*

1. Introduction

The impacts of expressway constructions come under categories of environmental, economic, social, and cultural impacts. The progressive destruction of physical landscapes and cultural landscapes during highway construction has caused significant social landscape fragmentation along the highway route. These impacts can be both positive and negative, and they often vary depending on factors such as the project's scale, location, and level of community engagement. To comprehensively understand the consequences of landscape disruption caused by expressway projects, this study will embark on a multidisciplinary exploration.

This research project was based on the Central Expressway project in Sri Lanka. From Kadawatha interexchange to Mirigama interexchange is considered as section 01 which is 36.59 km in distance. To address these issues, conducting thorough social impact assessments, engaging in early and inclusive planning processes, and implementing measures to mitigate the impacts are important. With the mainstreaming of education into the international development landscape, research in the field advanced, producing a body of analytical frameworks, research methods and empirical evidence that has guided the global governance of international education development. (Sustainable Development Disciplines for Humanity, et al.)

Existing research often lacks standardized and comprehensive assessment frameworks that capture the multi-dimensional nature of social impacts. Many studies primarily focus on environmental or economic impacts, neglecting the intricate social aspects. This research project will be a pilot project for the social impact assessment because in the analytical stage of the project social impact assessment was not done properly.

1.1, RESEARCH QUESTION

- How the social fabric has been affected by the central expressway project in the construction stage of the project?
- What kind of social impacts that had been made during the landscape disruption caused by the project?

1.2, RESEARCH OBJECTIVES

- To identify the major social factors that resulted from the landscape disruption caused by the expressway construction.

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- Evaluating the degree of impacts according to both experts' and inhabitants' perspectives.

2. Literature review

2.1 EXPRESSWAY CONSTRICTION AND THE VULNERABLE SOCIAL FABRIC

Mass-scale linear development projects like expressway construction can directly affect the landscapes in several different ways. Expressway construction implies the integration of economic, environmental, and social-cultural qualities in physical settings. It is about natural features, the farmed and wooden landscape or countryside, the patterns of human settlements, and the relationship between all these things. Where human activities and land uses are more independent of the distribution of natural resources, the boundaries of landscapes tend to be less distinct. (Eliou & Kehagia, 2007)

An intimate relationship between roads and land use grows because where roads are built new settlements, farms, fields, or other human facilities are likely to follow. For newly designed projects, landscape considerations are examined by the engineers with the help of specialists (environmental professionals and landscape architects) to determine the sites along the road, highlight prevailing characteristics, identify the openings provided by the route, and measure their impact on the existing landscape patterns. (Eliou & Kehagia, 2007) This is more serious regarding mega-scale infrastructure development projects such as expressways. Thus, environmental impact assessment together with environmental management and monitoring programs play significant roles in feasibility studies of such projects. (karunathilaka et al., 2021) Social impacts can be defined as any public or private activities which change the organized living, working and behavioural patterns of any group of people. (Jani and Shukla, 2018)

Challenges faced in expressway construction projects, occur due to the external influencing factors around the construction project such as environmental, social, and economic factors. (Karunasena, 2017) According to the field area of this research, Analysing and evaluating the potential social impacts of a project is essential to ensure and enhance the living conditions of the inhabitants of the affected areas. Thus, a social impact assessment should highlight preventive, mitigate, managing, and monitoring mechanisms against potential social impacts (Amarasinghe, 2011)

2.2 DEFINITION OF THE LANDSCAPE DISRUPTION THAT CAUSED THE SOCIAL IMPACTS

The disruption of the social landscape is based on some crucial problems which are physical marginalization and psychological marginalization, loss of social-cultural values of ancestral properties, social insecurity, landlessness, homelessness, occupational changes, breakdown of livelihood and loss of common facilities (Sarojini, Sri Lanka Foundation)

The major consequence is resettlement that social landscapes must face when it comes to the relevant context of this research. Resettlement is a response to displacement or involuntary movement. Displacement is forced migration where people move because of an external whether it is a development project, a natural disaster, or a civil conflict. These displacements are the source of the disruption of the social landscape fabric. Involuntary resettlements are often the consequence of planned change generated by major development projects like expressway construction. The main cause of involuntary resettlement is the acquisition of their land or water sources for major development. (Sarojini, Sri Lanka foundation)

The following are the certain areas for social change processes that caused the disruption:

- **Demographic processes:** In migration, out-migration, Presence of temporary residents, seasonal residents, Displacement, and dispossession (loss of lands & assets), Rural to Urban Migration, Urban to rural migration etc.
- **Economic Process:** alteration and variations in economic activities, Inflation, Currency exchange fluctuation (devaluation), Concentration of economic activity, Economic globalization
- **Geographic Process:** Changes in land use patterns, Urban sprawl, Urbanization, Gentrification, Enhanced transportation, and rural accessibility
- **Institutional and legal processes:** Institutional globalization and centralization, Decentralization, Privatization
- **Emancipator and empowerment processes:** Democratization, Marginalization, Capacity building
- **Socio-cultural processes:** Social globalization, Segregation, Social disintegration, Cultural differentiation. (Jani and Shukla, 2018)

2.3 SOCIAL IMPACTS

The reduced uncertainty of specific types of impacts will enable highway planners to prepare designs that avoid adverse consequences or to design mitigating features into the project from the beginning where adverse consequences cannot be completely avoided. The reduced uncertainty will reduce the fears of negative consequences, which are often exaggerated, this increased ability to predict and alleviate concern over adverse impacts can lead to reductions in highway construction costs by eliminating serious delays. (Jon,Transportation research record) Those social impacts can be identified as,

- Breakdown of the Ancestral History
- Disconnection of the relationships

- Confused social states
- Questionable quality of life
- Assets and liabilities variation
- Monetary value inequality under the resettlement guidelines
- Access to basic human needs
- Lack of equal opportunities
- Mental uncomfortably and the stress



Figure 1 - Interrelationship between social implications (source: Sarojini, Sri Lanka Foundation)

3. Theoretical framework

The central expressway project impacts both the landscape and human elements, leading to landscape fragmentation and social fragmentation. This relationship is explored through Place Attachment Theory, which explains the human connection to the physical environment and the psychological significance of places in people's lives. The theory examines three main components: Person, Place, and Process. These components are crucial for conducting a social impact assessment.

Place attachments are profoundly disrupted when environments change rapidly, such as when floods or other environmental disasters strike (Brown & Perkins, 1992). Yet the more gradual process of neighbourhood decline is likely to affect more residents and continue over longer periods (Fishman, 2000). Place attachment involves dynamic but enduring positive bonds between people and prized sociochemical settings, such as homes (Brown & Perkins, 1992). These bonds reflect and help cultivate group and individual identity. Residential place attachments often translate into feelings of pride in the residential area and its appearance and a general sense of well-being (Harris, Werner, Brown, & Ingebritsen, 1995). It can be seen from the definition that emotions play a central role in the relationship between people and land. To sum up, place attachment refers to the attachment relationship between people and places based on emotion, cognition, and practice. (Xing j. et al., 2023)

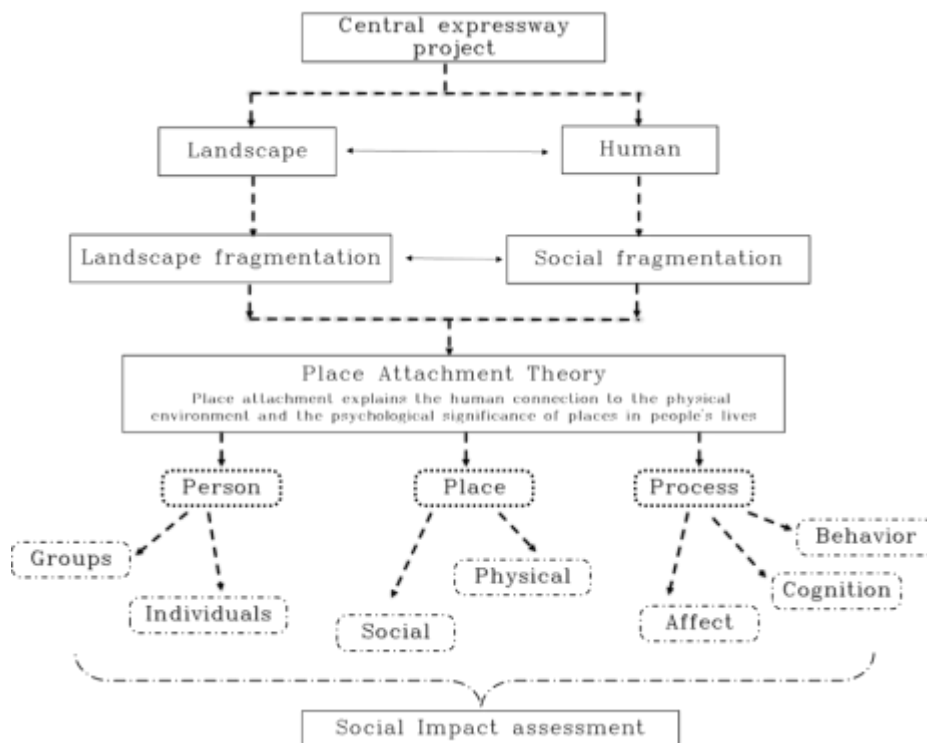


Figure 2 - Theoretical framework. (Source: Author)

Three major parts of this research project were directly derived from the place attachment theory's 3 base components and the study was conducted according to the above framework and below flow.

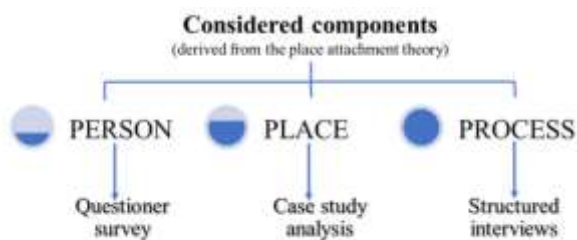


Figure 3 – How the theoretical framework guided the research flow. (Source: Author)

The person dimension in this framework refers to the definition of individuals or groups in the place, emphasizing who has an attachment to the place and the degree of attachment. The place dimension emphasizes the characteristics of the place, divided into social level and physical level, used to explain which places people are attached to and what characteristics these places have. (Xing j. et al., 2023)

There are three primary types of home ownership **possessive individualism, communal societies, and familial societies**. Possessive individualism is characterized by a strong emphasis on private property rights, where individuals have exclusive rights to their property and can freely use and modify it. This aligns with the dominant Western notion of property ownership. In communal societies, property ownership is shared and managed collectively by the community, with decisions regarding property use and maintenance made collectively, resulting in less individual autonomy. Familial societies emphasize family ties and view the property as a family asset, with decisions about housing influenced by familial relationships and the extended family unit playing a crucial role in space utilization. Rapoport's categorization provides a framework for understanding the diverse cultural and social perspectives on home ownership, highlighting how cultural values, social structures, and historical contexts shape people's perceptions and utilization of living spaces. These categories are not mutually exclusive, and many societies exhibit elements of all three types of ownership to varying degrees. (Rapoport, 1969).

4. Methodology

This study will employ a mixed-methods research design, combining both quantitative and qualitative approaches to gain a comprehensive understanding of the topic. Conduct in-depth interviews with key informants, such as local community leaders, environmentalists, designers, planners, and relevant experts. These interviews will provide rich qualitative data on cultural impacts and heritage preservation efforts. Conducted structured surveys with residents living near expressway projects to gather quantitative data on their perceptions, experiences, and socio-economic changes.

The multidisciplinary character of the research can inspire deeper collaboration among landscape architects, environmental scientists, sociologists, and cultural specialists. This collaborative approach has the potential to result in more comprehensive and informed landscape design techniques that consider both the environmental and cultural characteristics of a site.

This research project was conducted concerning the central expressway project section 01. The Central Expressway is an under-construction road project that will link the Sri Lankan capital, Colombo, with Dambulla & Kandy. The project consists of 4 stages and Section 02, the Mirigama-Kurunegala segment, has already been finished, while Section 01 is still under construction. Section 01 runs 39.7 km from Kadawatha interchange to Mirigama interchange.

- Selected case study locations – 3 (Gampaha, Veyangoda & Mirigama)
 - Site selection was based on satellite maps and GIS data along with the data from the survey department's land use maps.
 - Location selection was done covering 3 types of contexts (Urban, semi-urban & rural) within the Kadawatha-Mirigama stretch
 - Conducting field surveys and site visits along the selected 3 main case study areas of the construction corridor to assess the current situation and get the exact locations sorted out for the case study
- Questioner survey – 32 entries
 - Interviewing the vulnerable people of the project, along with on-site observations, while conducting an online questionnaire survey, and tracking the physical changes of the case study locations.
 - Recorded entries covered all 3 locations including all types of social backgrounds discussed in the analysis

- Structured interviews – 4 experts
 - Selected experts were experienced professionals in expressway construction projects and relevant industries, they were
 - EIA committee member
 - Resettlement committee member
 - Design Engineer
 - Site Engineer

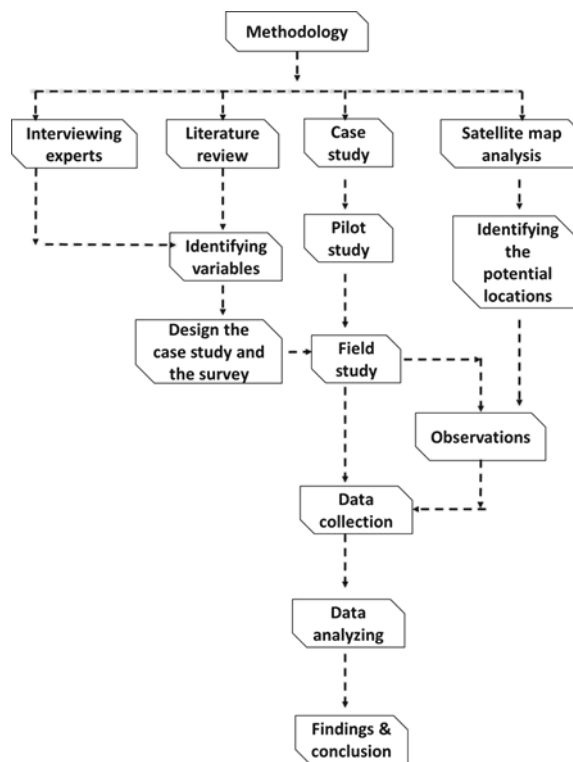


Figure 4 - Methodology. (Source: Author)

The case study location was chosen based on the scale of the CEP project's influence on social landscape fabric, communities, and culture. These case study locations comprehend and evaluate the social impacts that arise because of the disruption of the landscape caused by the Central Expressway. The chosen location exhibits a diverse array of social impacts related to the disruption of the landscape which includes urban, peri-urban, and rural contexts used to conduct interviews, surveys, observations, and data collection.

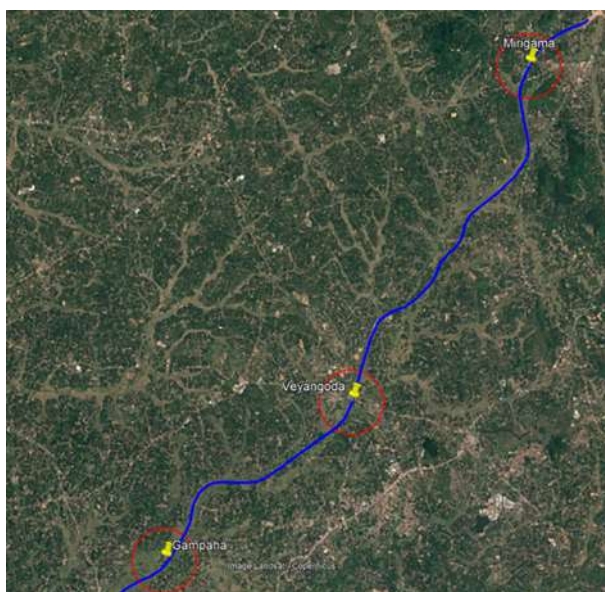


Figure 5 - Case study locations. (Source: Author)

Table 1 - Profile of expert interviewees. (Source: Author)

No.	Designation	Experience in the industry	Experience with expressway projects
01	EIA committee member	12	6
02	Resettlement committee member	14	10
03	Design Engineer	3	3
04	Site Engineer	3	2

Table 2 - Case study locations coordinates. (Source: Author)

Location	Coordinates
Mirigama	7.244041, 80.111879
Veyangoda	7.153010, 80.062636
Gampaha	7.109329, 80.011658

Case study locations were analysed on Google Earth pro, open street maps and survey maps, and those maps were used to formulate the land-use maps. The case study location was selected by satellite map analysis and quantitative data analysis related to the land and the land value. Selected case study locations were 1000 m radius circular areas with 6318 sq. m of land extension. Selected locations were Gampaha, Veyangoda and Mirigama which bear the highest potential to study the social landscapes from Kadawatha - Mirigama stretch. All the qualitative and quantitative data were gathered around those 3 locations and questionnaire surveys were done by the vulnerable people of the central expressway project. Target inhibits were from selected 3 case study areas. Comparison analysis was done with the qualitative data from the EIA report and the resettlement action plan. Structured interviews involving subject matter experts in transportation, urban planning, environmental research, and social impact evaluations were conducted. These professionals have expertise in the Central Expressway project and its possible socioeconomic consequences. Created a questionnaire with a series of open-ended questions aimed primarily at gathering information regarding the social impacts of landscape disruption.

5. Discussion

5.1 CASE STUDY ANALYSIS

According to the recorded data a comparative analysis done based on the three case study locations, shows Mirigama has the highest population density and highest property loss, on behalf of that highest degree of disruption to the social fabric happened there. Mirigama can be considered as a rural context from the above study locations, it holds most of the population and the most active social interactions were high. Field study findings reveal the mutual connection between the neighbourhood and natural landscapes is the critical factor that the community has held for the past few generations.

Table 3 - Commercial land value and land areas of case study locations. (Source: Author)

Location	Paddy Lands		Residential Lands	
	Land area (Sq. m)	Land value (Rs)	Land area (Sq. m)	Land value (Rs)
Mirigama	55059	18503310	117155	926388000
Veyangoda	110236	37046570	734	11608000
Gampaha	100378	33733525	21518	170150000
Total	265673	89283405	139407	1108146000

Considering the above data residential lands are more valuable than paddy lands and most of the land extent covered by paddy lands. 65% of the acquitted lands were paddy and the rest were residential lands, 7.45% of the compensation was reserved for the paddy lands and the rest of the compensation went for residential lands. Comparing those percentages shows residential lands were valued 12 times more than paddy lands. Based on the above analysis the most acquitted land type is paddy lands but they hold the lowest amount of land value than the residential lands. In the planning stage of the project designers chose the paddy lands as the anchor pathway as a design strategy to lower the project cost

In summary, Veyangoda has the highest estimated and compensated land values, indicating its perceived high value. Mirigama follows closely behind, with both estimated and compensated values being lower than Veyangoda. Gampaha has the lowest estimated and compensated values, suggesting it may be considered less valuable compared to the other two locations.

Table 4 - Land value comparison of case study locations. (Source: Author)

Location	Estimated land value	Compensated Land value (Rs. Millions)	Anticipated land value
Mirigama	1419.60	1560	2340
Veyangoda	3712.80	4368	6333.6
Gampaha	1261.26	1287	1673.1

Table 5 - Case study locations land use and satellite imagery comparison. (Source: Author)

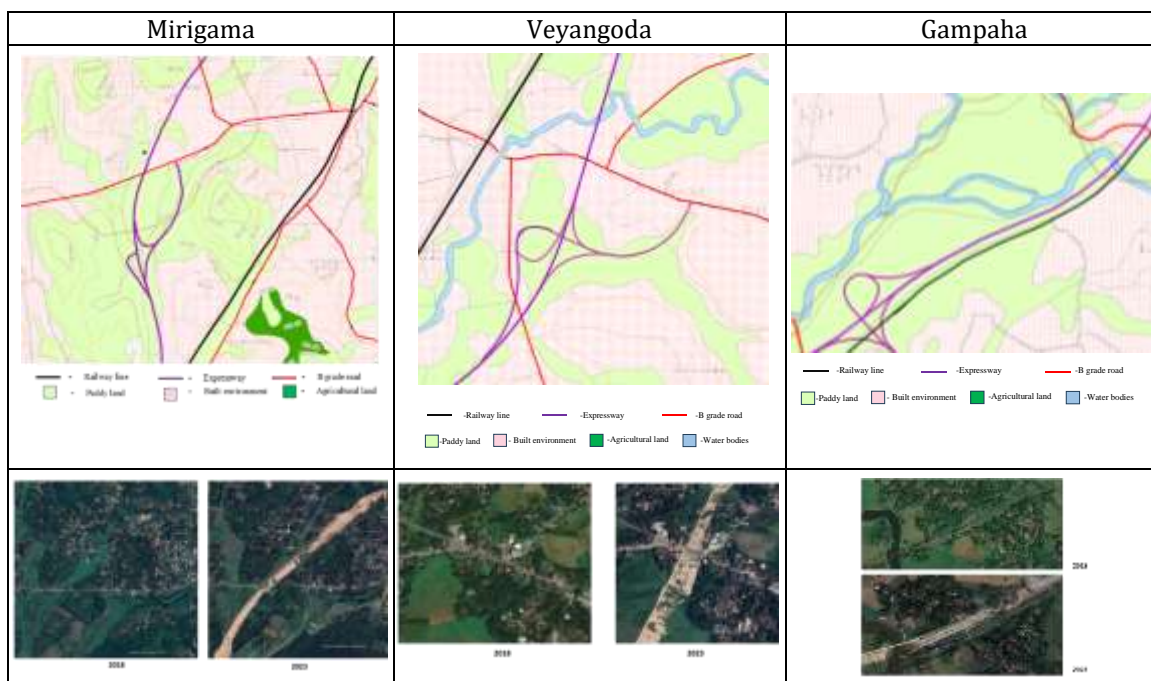


Figure 6: Comparison of social impacts showing landscape disruption. (Source: Author)



Figure 7: Natural landscape disruption (Source: Author)

5.2 ANALYSIS OF STRUCTURED INTERVIEWS OF EXPERTS

The interview guideline has been designed based on factors identified through the literature under each aspect. Interviewees were asked to share their opinions on the context based on their own experience. It is structured under several parameters and each could be summarised as below.

- **Homelessness:** caused by expressway building projects, when people lose their houses due to property acquisition. This often involves demolishing homes, informal settlements, or villages. While resettlement plans may offer alternative housing or compensation, the effectiveness varies.
- **Landlessness:** it involves a broader range of land-related issues. Land acquisition can displace residences, agricultural fields, and communal spaces, severing connections to vital income sources like farming or grazing and causing economic fragility. Displacement from ancestral lands disrupts social and cultural ties.
- **The loss of ancestral properties:** it forces people to give up lands with significant historical, cultural, and family value. This development leads to involuntary relocation, disrupting traditions, ceremonies, and customs, and causing intense emotional distress. The degradation of cultural assets and disturbance of customs can have long-term impacts.
- **Occupational changes:** It can lead to financial stress and anxiety. Individuals may experience a drop in earnings, with some becoming unemployed or facing underemployment, where they take on less secure or lower-paying jobs compared to their previous positions.
- **Loss of social connectivity:** This can disrupt communities by creating barriers that divide neighbourhoods and reduce social interaction. The loss of public open spaces limits social engagement, while changes in traffic patterns can harm local businesses and lead to economic challenges.
- **Marginalization:** Displacement disrupts cultural customs, social networks, and a sense of belonging, leading to cultural erosion and loss of identity. Educational disruptions for children can hinder future opportunities, perpetuating socioeconomic disparities.
- **Quality of life:** It may disrupt daily routines, making it hard to access schools, healthcare, businesses, and other essential services, causing discomfort and worry. Changes or losses of key assets such as homes, land, and businesses can affect economic well-being, social stability, and overall quality of life.
- **Loss of access to common services:** It can lead to societal problems and negative outcomes. their loss reduces opportunities for gathering and socializing. Cultural heritage sites and landmarks hold significant value, and losing access to them can erode cultural identity. These disruptions can cause stress, anxiety, dissatisfaction, and a lower sense of well-being in affected communities.

5.3 ANALYSIS OF QUESTIONER SURVEY DATA

According to the data of the questionnaire which is based on before and after of resettlement process, Homelessness can be concluded as the reduction of the floor area of a house per family and landlessness can be concluded as the reduction of land area that belongs to a family. With the reduction of the land areas and floor areas, monetary value is also reduced.

In the resettlement process changing the home base is a process of mental transformation and physical transformation. Transitioning from an old neighbourhood to a brand-new neighbourhood contains a large amount of social anxiety and stress. These negative impacts will break down the livelihood of a community and the quality of living will be lower than before.

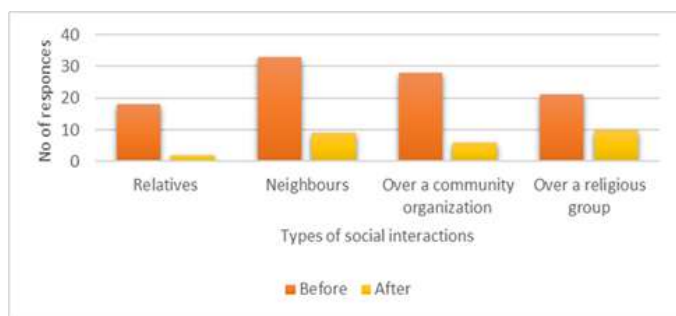


Figure 8 - Before and after comparison of the social interactions of the neighborhood. (Source: Compiled by Author)

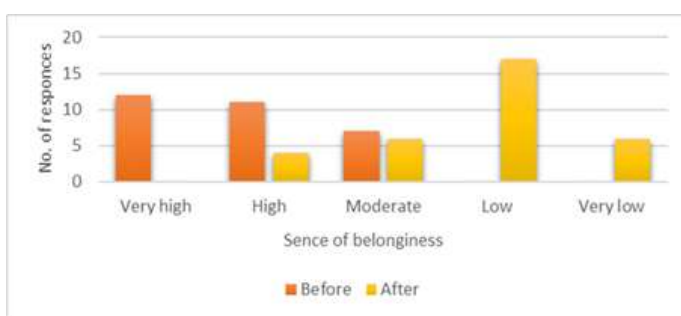


Figure 9 -Before and after comparison of the sense of belongingness in the community. (Source: Compiled by Author)

Considering the numbers as a conclusion 72% of the social interactions were disconnected due to the resettlement process and 50% of them agreed that they show the low level of social activeness. Data show the community was rather satisfied in their previous neighbourhood in the level of comfortability they experienced and the sense of belongingness they felt there. The cause of relocation, which breaks these relationships, can have serious consequences for the affected populations' well-being and identity.

Survey respondents compared the visibility of landscape elements (vegetation, water bodies, sky, and ground) in their previous and new homes. Most had a higher percentage of vegetation before resettlement, which decreased in the new location. Exposure to water bodies was also lowered in the new neighbourhood. Sky visibility remained the same for most respondents. Ground exposure was generally lower in the new location. Overall, respondents reported that their old neighbourhood had a better surrounding landscape compared to the new one. Most of the respondents considered their life

before the resettlement as a moderate to very high-quality life but after the relocation they considered their life moderate to very low-quality life. Only 15% of the respondents considered their life had high quality after the relocation. This result shows that the resettlement process has not affected their quality of life in a very positive way.

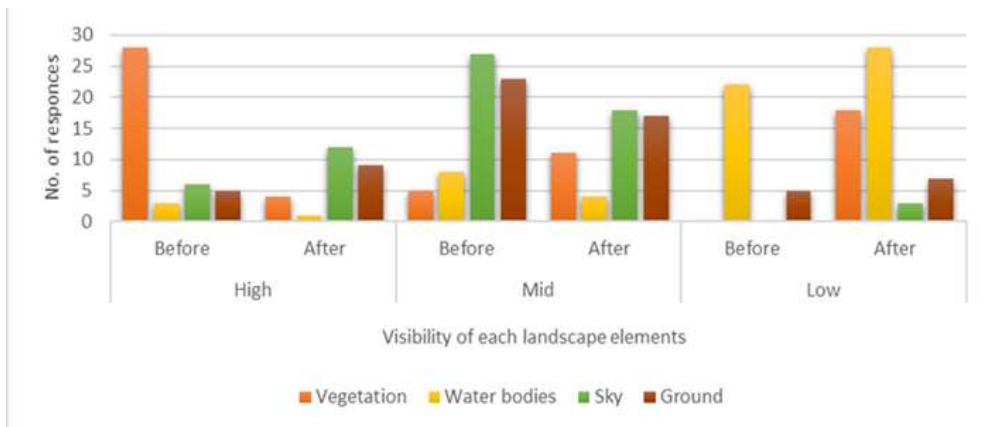


Figure 10 - Before and after comparison of the visibility of different landscape elements in the context. (Source: Compiled by Author)

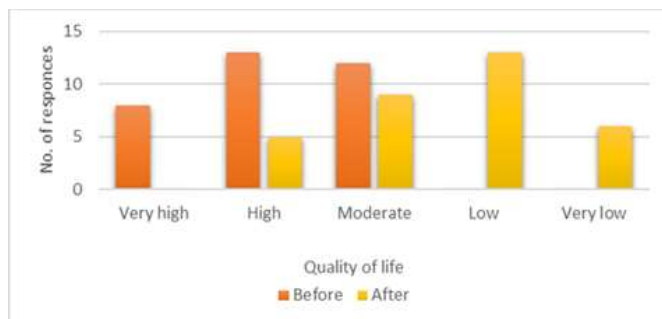


Figure 11 - Before and after comparison of the overall quality of life. (Source: Compiled by Author)

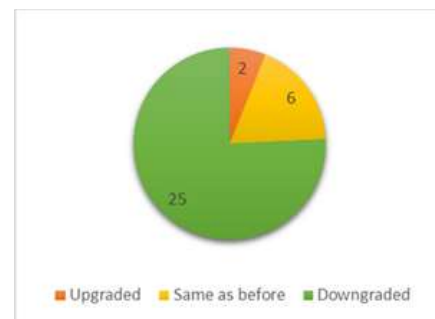


Figure 12 - Before and after comparison of the status of life as a family. (Source: Compiled by Author)

Data analysis shows the degree of social activeness and the number of social interactions were reduced after the resettlement process. Distance between the houses where increased and 80 % of relationships between relatives were disconnected. Community organizations and religious groups acted as the main mode of connection between the basic units of the neighbourhoods. Changing locations was the main reason for the disconnection of the above-mentioned social interactions.

Place Attachment Theory emphasizes the notion that people have deep emotional attachments with certain areas, often because of their historical, cultural, and personal significance. When people are forcibly removed from these places, their emotional connections are disrupted, leading to sentiments of mourning, estrangement, and the possibility of psychological distress in the communities affected by such displacement. In the context of relocation, the loss of access to these resources can disrupt established routines and economic activities, resulting in a loss of livelihoods and an increased sense of vulnerability. To summarize, the Place Attachment Theory provides a framework for understanding the significant emotional and psychological bonds that individuals and groups form with their physical surroundings.

6. Conclusion

The landscape disruption caused by expressway projects in Sri Lanka has emerged as a complex and multifaceted challenge, intertwining the aspirations of modernization with the preservation of cultural heritage and environmental sustainability. This comprehensive study has endeavoured to navigate the intricate terrain of social, cultural, and environmental impacts arising from expressway construction, offering a nuanced understanding of the implications for the nation's present and future.

Survey data have revealed shifts in livelihood patterns, socio-economic dynamics, and community cohesion. These findings underscore the need for holistic development strategies that prioritize the well-being and resilience of these communities. Qualitative insights drawn from in-depth interviews and participant observation have illuminated the cultural metamorphosis brought about by expressway construction. Narratives from local leaders, environmentalists, historians,

and cultural experts have woven a narrative of heritage at risk and preservation efforts that require urgent attention. These voices resonate with the urgency of safeguarding the nation's rich cultural tapestry. Policy and document analyses have illuminated the regulatory framework governing expressway construction.

The case studies, rooted in specific expressway projects across Sri Lanka, have enriched our understanding of localized realities. These case studies have underscored the importance of context-specific solutions, the effectiveness of mitigation measures, and the resilience of local communities. Engaging stakeholders and local communities throughout the research process has not only ensured the relevance of findings but also contributed to the democratization of knowledge and the empowerment of those most affected by these projects.

In conclusion, this comprehensive study has illuminated the multifaceted impacts of expressway construction in Sri Lanka. The synthesis of quantitative and qualitative data, coupled with interdisciplinary collaboration and community engagement, has yielded a holistic perspective. The nation's development agenda must strike a harmonious balance between modernization and the preservation of cultural heritage and environmental sustainability. The policy recommendations emerging from this research serve as a roadmap toward more sustainable expressway development. These recommendations underscore the necessity of community-centric planning, the incorporation of green infrastructure, and the preservation of cultural heritage sites. They advocate for a holistic approach that safeguards the nation's rich cultural and environmental legacy, steering expressway projects toward a future where development is not achieved at the expense of the nation's heritage and well-being.

As the final output of the study shows Mirigama is the most affected area from selected 3 case study locations. It affected most of the population and properties. It held the largest area of the land but considering the land value it's lower than Veyangoda. Quantifying qualitative data also shows that most of the social disturbances happened in Mirigama and the quality of life was higher than in other locations. Analysing the background of the location shows this area was severely affected because of the previously completed section of the central expressway connected to Mirigama. On behalf of that impact mitigation changes have not been made. As a result of the study, there was a set of parameters that can be used to assess the degree of social impacts caused by landscape disruption from projects like the central expressway.

- Landlessness
- Homelessness
- Loss of ancestral properties
- Loss of social connections
- Quality of life

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