Community Satisfaction and Livelihood Challenges of Water Resource Development The Case study of the Uma Oya Multipurpose Project, Sri Lanka

Ashani Rathnasinghe*
University Of Moratuwa, Moratuwa, Sri Lanka,

Abstract

This study examines the social and livelihood impacts of the Uma Oya Multipurpose Development Project in Sri Lanka, focusing on downstream communities near the Puhulpola and Dyraaba dam sites. While such large-scale water infrastructure projects support irrigation, hydropower, and regional development, they often trigger population displacement and disrupt local livelihoods, social cohesion, and ecological systems. Grounded in Place Attachment Theory and Environmental Satisfaction Theory, the research employs a mixed-methods approach that includes household questionnaires, field observations, key informant interviews, and secondary data analysis. The Modified Cantril Ladder scale is used to assess environmental satisfaction and perceived quality of life before, during, and after project implementation. Findings reveal significant declines in household income, agricultural productivity, access to farmland, housing conditions, and community relationships. These disruptions are further intensified by uncertainty over land tenure and limited participatory planning. Despite these challenges, affected communities' express cautious optimism and demonstrate adaptive resilience. The study highlights the need for development planning that integrates environmental sustainability with community resilience. It calls for inclusive, context sensitive policies that reflect the lived experiences of displaced populations and prioritize long-term satisfaction and social cohesion. By examining the social consequences of the Uma Oya Project, this research provides field based insights into the broader social implications of infrastructure-led development in Sri Lanka.

Keywords: Uma Oya Multipurpose Development Project, Modified Cantril Ladder, Livelihood Disruption, Social Consequences, Satisfaction

* Corresponding Author: Rathnasinghe A.S; E-mail- ashanir98@gmail.com

Introduction

Large scale water resource projects have long sparked debate in development planning. While these initiatives generate benefits such as irrigation and hydropower, they often profoundly affect established communities by altering livelihoods, local environments, and social structures. In Sri Lanka, the Uma Oya Multipurpose Project demonstrates these challenges. Downstream communities near the Puhulpola and Dyraaba dam sites have experienced disrupted agricultural systems, habitat degradation, and ongoing uncertainty regarding their livelihood security. This research focuses on exploring these effects, with particular attention to the impacts experienced at the household level through changes in resettlement and living conditions.

Research Need of Study

While the socio-economic effects of development projects have been widely studied, less attention has been given to environmental satisfaction and everyday living conditions during the adaptation process. This gap is important because a community's ability to adapt and rebuild depends not only on restoring income but also on how satisfied individuals feel with their new environment. Exploring these aspects within the Uma Oya Project is essential for promoting community centered and sustainable approaches to managing change. Ongoing discussions about the impacts of development, detailed empirical evidence from Sri Lanka remains limited. Although the Uma Oya Project is recognized for its contributions to energy and irrigation, its social and environmental effects on downstream communities are not well documented. This research addresses this gap by providing a detailed case study of households near Puhulpola and Dyraaba, focusing on both material and non-material challenges faced during adaptation.
It mainly focuses on,

1.How do affected communities downstream of the Puhulpola and Dyraaba dam sites perceive their environmental satisfaction due to the project?

2.What are the impacts of the Uma Oya Multipurpose Project on the livelihoods and daily living of affected communities?

Research Objectives

• To assess perceived environmental satisfaction among resettled communities downstream of the Puhulpola and Dyraaba dam sites.

• To evaluate livelihood and daily living impacts after the Uma Oya Multipurpose project.

• To analyze changes in community cohesion and adaptation strategies.

Limitations and Scope of the Study

This study examines communities downstream of the Puhulpola and Dyraaba dam sites, focusing on environmental perceptions, changes in livelihoods, and social cohesion. It does not provide a comprehensive economic or engineering assessment of the project. Data collection relied on a small-scale survey and the Modified Cantril Ladder to assess overall life and agricultural livelihood satisfaction. While integrating both qualitative and quantitative data provides meaningful insights, the findings may be influenced by the subjective perceptions of respondents, the limited sample size, and the specific geographic scope of the study.

Livelihood Disruption in Communities Affected by Large Scale Water Projects

Global Perspectives on Livelihood Impacts of Water-Based Development

Worldwide, dam construction has affected between 40 and 80 million people (World Commission on Dams, 2000). The impacts extend beyond the physical relocation of communities. Displaced populations often face loss of land, unsuitable living conditions, unemployment, social marginalization, food insecurity, and weakened community networks (Cernea, 2000, 2003). The Impoverishment Risks and Reconstruction (IRR) Model illustrates these effects, showing how inadequate resettlement planning can lead to ongoing difficulties. Researchers such as Scudder (2005) and Tilt et al. (2009) emphasize that involuntary resettlement typically threatens both the economic security of affected people and the ecological sustainability of their environments.

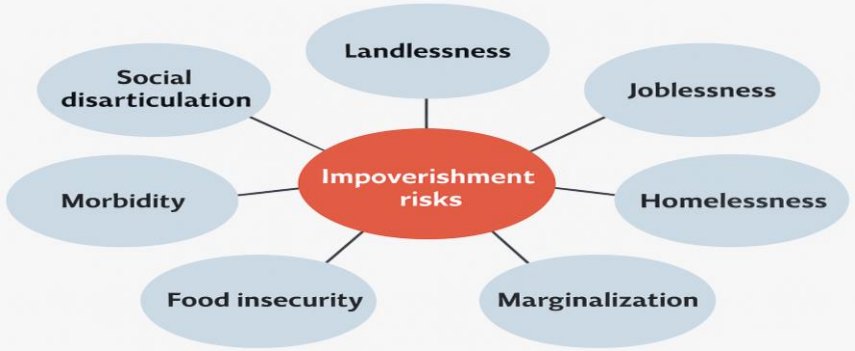


Figure 2: Impoverishment Risks and Reconstruction (IRR) Model by Cernea (1990) (Source: https://moscow.scihub.se/5139/af59ced84faaea2bc1b3f5853cfcbbcc/10)

Uma Oya Multipurpose Project

The Uma Oya Multipurpose Project has significantly influenced the daily lives and well-being of communities downstream of the Puhulpola and Dyraaba dam sites (Athukorala & Perera, 2016). Changes in land access, water availability, and farming opportunities have affected households' ability to maintain their traditional livelihoods, which in turn influences their perceived environmental satisfaction. Disruptions to familiar spaces and social networks have also altered community cohesion and interpersonal relationships. These effects highlight the importance of examining both material and non-material consequences of the project, as perceived by the affected residents themselves, using tools such as surveys and the Modified Cantril Ladder to capture life and agricultural livelihood satisfaction.

Figure 2: 'New Village' and Affected Families after the Uma Oya Project
(Source: Sunday Times, March 17, 2024)

Global Perspectives on Social and Environmental Impacts of Dam Projects

International studies on large-scale water development projects highlight that involuntary resettlement affects communities in multiple dimensions, including livelihoods, social cohesion, and perceived environmental satisfaction. Displacement often results not only in loss of land, income, and productive resources, but also in weakened social networks and reduced community engagement, which can negatively influence overall well-being (Cernea, 2000; Tilt et al., 2009; Scudder, 2005). Research demonstrates that the perception of environmental quality is closely linked to residents' life satisfaction and adaptive capacity following resettlement (Berkoz, 2009; Khaef & Zebardast, 2016). These global insights underscore the need to assess both material and psychosocial consequences of projects like the Uma Oya Multipurpose Development, providing a comparative context that strengthens understanding of environmental satisfaction, livelihood disruptions, and community cohesion in downstream communities.

Social disarticulation

Displacement and large-scale infrastructure projects often lead to social disarticulation, where neighborhood networks and community support systems are fractured. The ability of affected households to maintain social unity, trust, and collective coping strategies in resettlement areas (Cernea, 2000; Scudder, 2005). Studies have shown that relocation frequently fragments social groups, resulting in reduced neighborhood connections and increased risk. for marginalized populations (Tilt et al., 2009; Bocarejo et al., 2015). Understanding social disarticulation is therefore critical for assessing not only the economic and environmental impacts of displacement but also the adaptive capacity of displaced communities.

Table 11: Indicators and Measurement of Social Dimensions in Community Contexts

Dimension	Indicator	Description	Measured by	Supporting Literature
Social	Change in level of interaction	Relationship of residents within and between communities	Perception of social networks (support from friends, relatives, neighbours)	Berhe, Martinez, & Verplancke (2014); Luker, Robins, & Kremer (2010)
	Change in level of integration	Residents' engagement in communal activities and access to shared properties	Perception of togetherness in communal services	Khaef & Zebardast (2016); Sabatini & Salcedo (2007)
	Change in level of friendship making	Rate and quality of friendship formation among residents	Perception of neighborhood relationships	Berköz (2009)

The Significance of Satisfaction

Satisfaction reflects the extent to which an environment fulfills individuals' needs, preferences, and desires, shaping their engagement, perceptions and overall performance. This study draws on Place Attachment Theory and the concept of Perceived Environmental Quality, which suggest that satisfaction arises from emotional, functional, and identity-based connections to a place. In this context, satisfaction is conceptualized through three dimensions,

- Place Identity – The sense that the environment reflects oneself, belonging and personal connection.

- Place Dependence –The perception that the environment supports daily activities and sustains livelihoods
- Affective Attachment – The experience of positive emotions, comfort, and enjoyment within the environment.

Theoretical background and theoretical framework

This study is mainly focused on two main theories, Place Attachment Theory and Environment Satisfaction Theory to explore the impact of affected communities. Place Attachment Theory provides the foundation for understanding how individuals form emotional and functional bonds with their environment, articulated through three key dimensions like identity, dependence, and attachment. These elements serve as independent variables that influence the community's response to spatial and social disruption. Environment Satisfaction Theory, positioned as the dependent framework, evaluates how changes in physical and social conditions such as interaction levels, friendship formation, integration, accessibility, safety, and adequacy shape overall satisfaction.

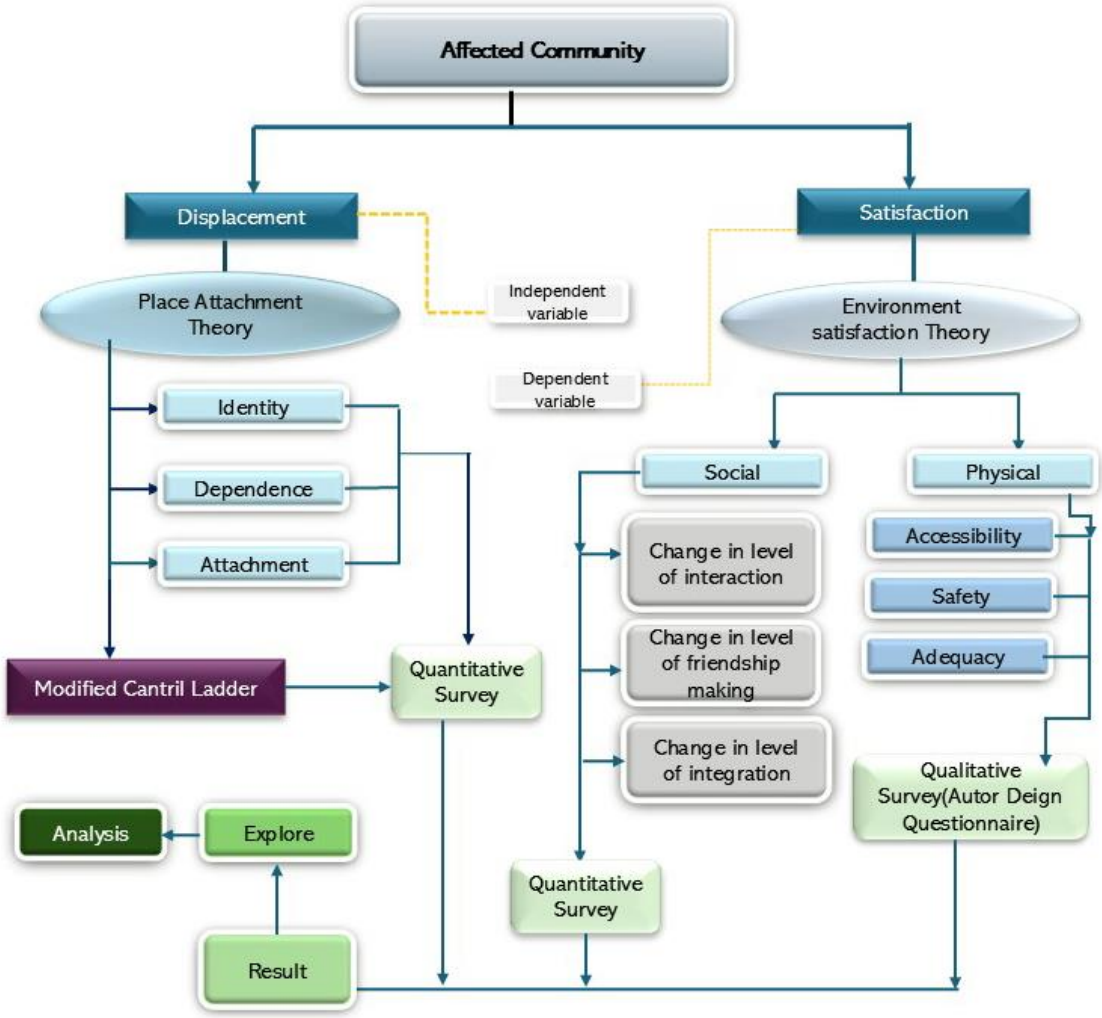


Figure 3: The theoretical framework of the study
(Source- compiled by the author)

Research Methodology

This study employed a mixed-methods approach, combining quantitative and qualitative techniques to investigate the relationship between overall life satisfaction and the social and livelihood impacts of displacement from the Uma Oya Multipurpose Project. The research aimed to understand how resettlement conditions affect psychological wellbeing and community adaptation, focusing on households in Puhulpola and Dyaraaba.Data for this research study were gathered through a two-stage process:

1. Literature Survey – to establish theoretical foundations, understand global and local experiences of water resource displacement, and identify relevant frameworks such as Place Attachment Theory and Environmental Satisfaction Theory.

2. Case Study-to obtain empirical, field-based data from the most affected communities downstream of the Puhulpola and Dyaraaba dams.

Field study data collection

1.Primary Data Collection

- Field observations and photographic documentation- Observed household conditions, farming areas, and community interactions. Photographs and annotated maps captured spatial changes and resettlement impacts.

2.Secondary Data Collection

- Structured questionnaires- (Questionnaire-A) assessed social and livelihood impacts. Respondents could complete the survey either physically or online, minimizing disturbance to daily routines.
- Life Satisfaction Assessment-The Modified Cantril Ladder measured overall life satisfaction at three temporal points: before the project, currently, and expected five years into the future. Respondents rated satisfaction on a 0–10 scale, allowing comparative analysis across time

Table 2: Data collecting methods (Source- compiled by the author)

Method	Description	Data Use
1. Field Observations	Photographs, maps, layouts, and field notes	Analyze spatial and social changes; triangulate with survey data
2. Structured Questionnaire	Household survey on social, economic, and environmental impacts	Quantitative analysis of community satisfaction and livelihood changes
3. Life Satisfaction Scale	Modified Cantril Ladder (0–10 scale)	Assess perceived overall wellbeing before, today, and projected five years ahead

Case Study Sample Selection

The areas selected surrounding the two dam sites are part of the Uma Oya Multi-Purpose Development Project in Sri Lanka's Uva Province. The two main dams, Puhulpola Dam and Dyraaba Dam, are constructed across two main tributaries of the Uma Oya River at Welimada and Dyraaba, respectively. These dam sites and their surrounding areas were chosen due to their significant impacts**.** Each affected site near the two main dams had 40 households selected, (20 per each) representing families impacted by displacement severity and their dependence dependence on agriculture and water resources downstream of the Puhulpola and Dyraaba dams.

Study Limitations

1. Limited sample size and time constraints may restrict generalizability to the entire Uma Oya Project area.
2. Access to some households was constrained due to resettlement locations and logistical challenges.
3. Findings primarily reflect perceptions of residents in the selected case study areas.

Case Studies, Data Analysis, and Presentation

Case Studies

The selected study area is the Welimada Divisional Secretary division, known for its long history of cropping on sloping lands. Located at latitude 6°54'4" N and longitude 80°55'22" E, Welimada covers a total land area of 192.61 km² and sits at an average altitude of 1017 meters above mean sea level, classifying it as an upcountry region. Situated approximately 204 km east of Colombo, Welimada lies within the Uma Oya catchment area, a tributary of Sri Lanka's largest river, the Mahaweli. Surrounding the Puhulpola and Dyraaba dams both situated within this region are several communities affected socially and economically by these dam projects. The dams, located on tributaries of Uma Oya, have influenced agricultural practices, water availability, and livelihoods in the adjacent areas, shaping the social context for this study.

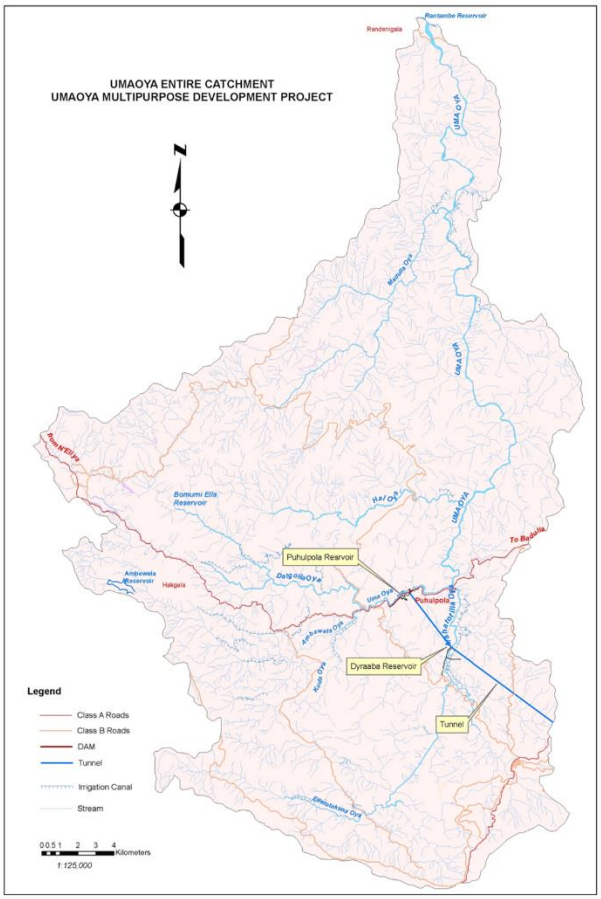


Figure 4: Uma oya Multipurpose Development Project Area
(Source- University of Sri Jayewardenepura Uma Oya EIA Study – Draft Final Report - Volume II)

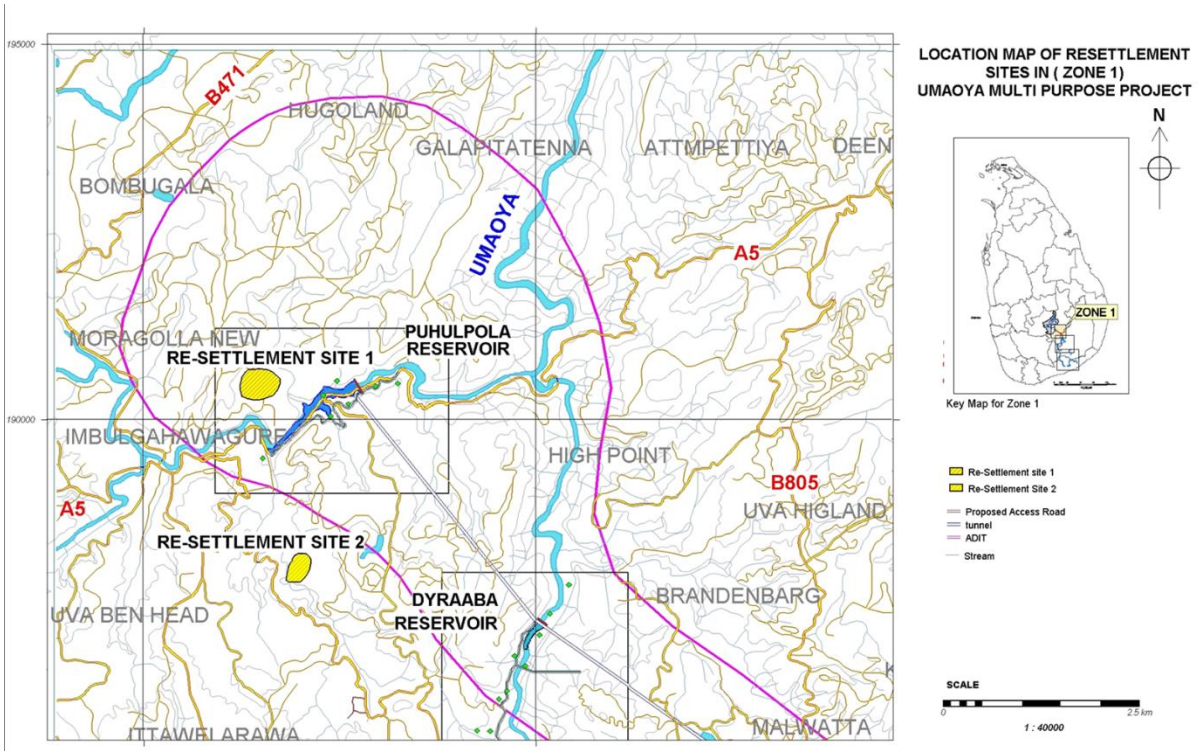


Figure 5: Selected site for case studies (Uma oya Multipurpose Development Project Area)
(Source- University of Sri Jayewardenepura Uma Oya EIA Study – Draft Final Report - Volume II)

Place Identity

Land ownership types before water-based development

Figure 6 shows land ownership before and after the Uma Oya water-based development. Before the project, most households owned private land, a few rented, and some used common land. After the project, private ownership fell, tenancy became rare, access to common land declined, and some households lost all land. The changes highlight how the project reshaped land. This pattern reflects the landlessness risk highlighted in Cernea's (2000) IRR model, where loss of productive assets undermines livelihood security and community attachment.

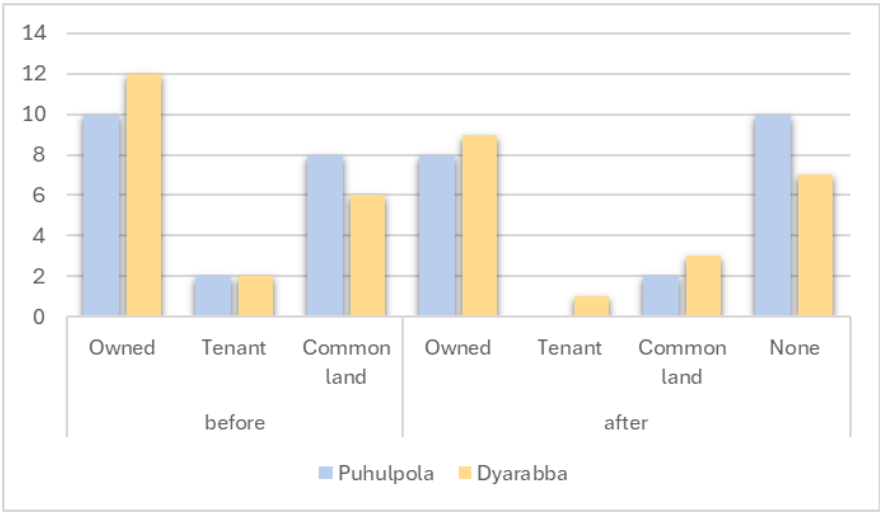
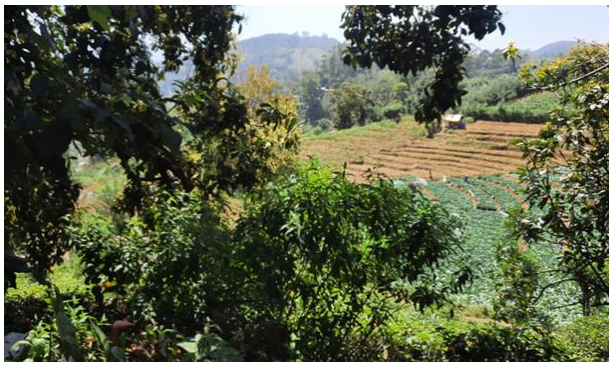


Figure 6: Land ownership types before and after the water-based development
(Source: compiled by the author)

Impact on Agricultural Lands and livestock activities

Dyaraaba site	Puhulopla Site
 Figure 7 : Vegetable cultivation near the dam before the Uma Oya project strated (Source: compiled by the author)	 Figure 8 : Tea cultivation near the dam before the Uma Oya project strated (Source: compiled by the author)
 Figure 9 : Abonded cultivation near the dam after the Uma Oya project (Source: photograph by the author)	 Figure 10 : Abonded Tea cultivation near the dam after the Uma Oya project because of materilization (Source: photograph by the author)

Impact on farming and livestock activities

Figure 11 shows how families in Puhulpola and Dyaraaba have been affected in their agricultural and livestock activities after the Uma Oya project. Most families continue to engage in farming, but the overall area of farmland and the scale of agricultural activities have decreased because of the project. Livestock rearing is less common, particularly in Dyarabba, where many households have had to reduce or abandon these activities due to the loss of land. These findings highlight the tangible impact of the project on local livelihoods, showing how families have had to adjust their traditional farming(helmalu) and livestock practices in response to changes in land.

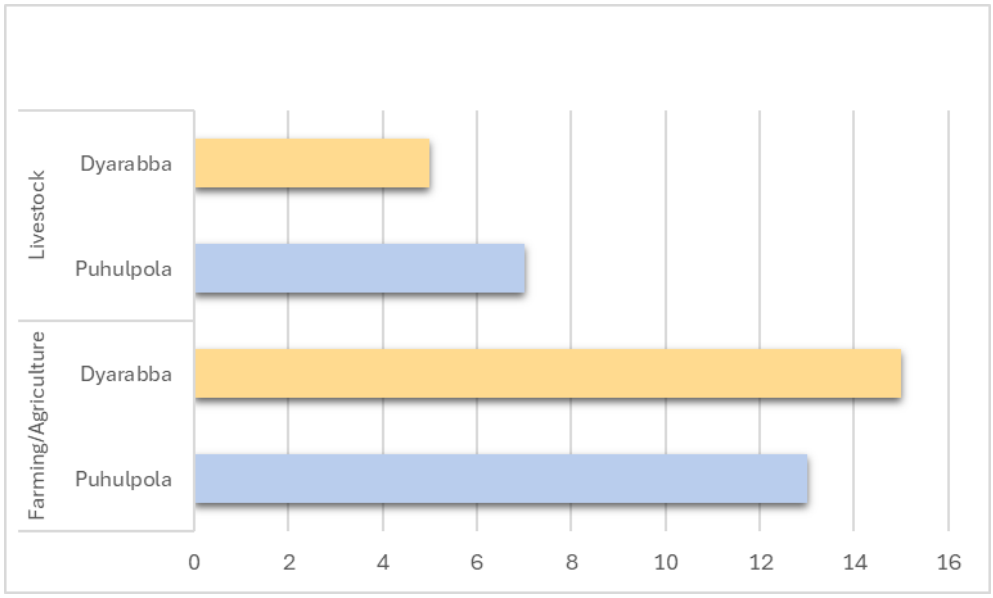


Figure 11: Impact of the Uma Oya project on farming and livestock activities
(Source: compiled by the author)

Changes in household income after the Uma oya project

Figure 12 represents changes in household income among participants in Puhulpola and Dyarabba following the Uma Oya project. Most households in both villages reported a decrease in income, primarily due to the disturbances of traditional livelihoods such as vegetable farming and livestock rearing. Only a small number of households experienced an increase in income. These findings highlight the economic challenges faced by affected families, showing that the project has significantly reduced their ability to maintain stable and sufficient household earnings. The decline emphasizes the economic vulnerability induced by displacement and reduced access to productive land (Cernea, 2000; Tilt et al., 2009). These findings highlight the need for compensation and livelihood restoration measures that consider both immediate losses and long-term sustainability.

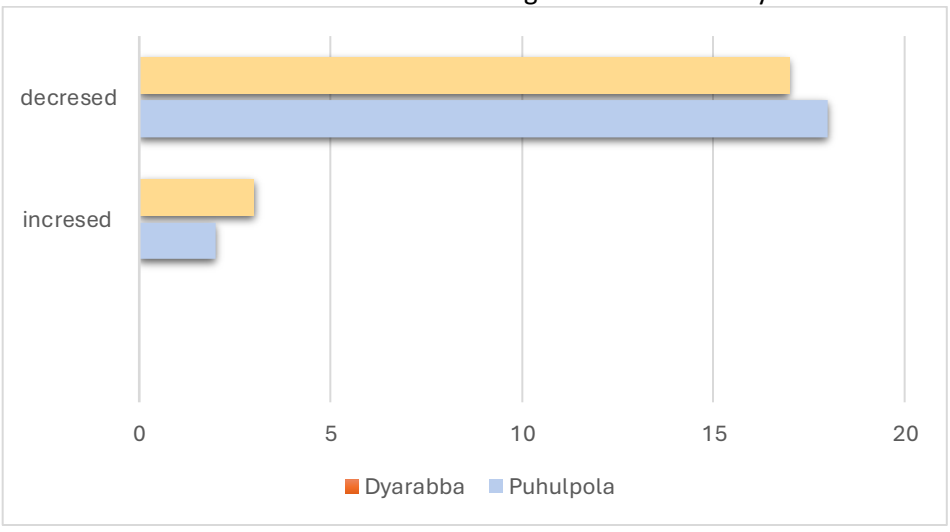


Figure 12 : Changes in household income after the Uma Oya project
(Source: compiled by the author)

Physical Satisfaction

5.3.1 Access to Agricultural lands before and after the Uma oya project

Figure 13 shows changes in access to agricultural lands among participants in Puhulpola and Dyarabba before and after the Uma Oya project. Before the project, most families enjoyed full access to their farmland, enabling them to sustain their farming activities. Following the project, however, the number of households with full access has noticeably decreased, while a growing number now have no access to their lands. A small portion continues to have partial access, but the overall trend indicates a significant reduction in the ability of families to use their agricultural lands. These findings reflect the direct impact of the project on local livelihoods, and the challenges households face in continuing traditional farming practices.

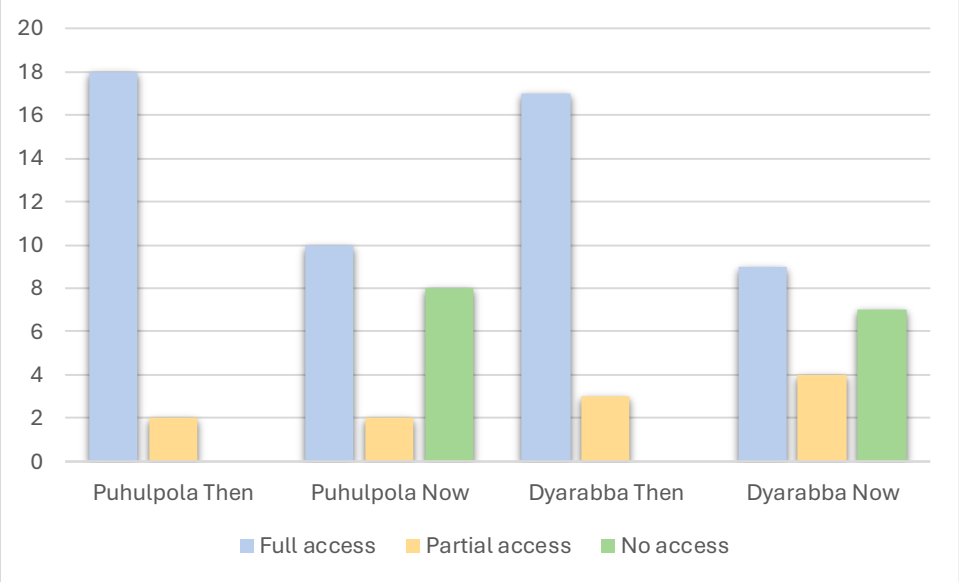


Figure 13: Changes in household income after the Uma Oya project
(Source: compiled by the author)

Sense of safety in the environment after the Uma oya project

Figure 14 presents participants' perceptions of safety in their environment in Puhulpola and Dyarabba following the Uma Oya project. The data indicates that majority of residents feel only moderately or slightly safe, while some even consider their surroundings not safe at all. Fewer participants reported feeling most or completely safe after the project. These findings suggest that the project has affected the community's sense of security, possibly due to changes in land use, displacement, or environmental alterations, highlighting the need to address safety concerns in the affected areas. This trend aligns with global studies showing that restricted land access contributes to livelihood insecurity (Scudder, 2005; Bocarejo & Oviedo, 2012).

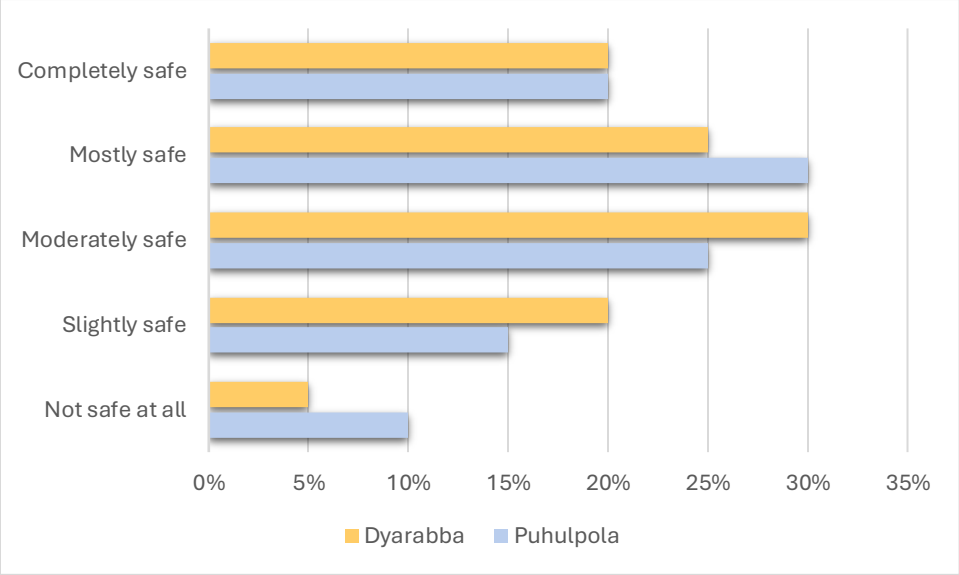


Figure 14: Sense of safety in the environment after the Uma Oya project
(Source: compiled by the author)

Social Dimensions

5.4.1. Impact on integration of communities

Figure 15 shows changes in participants' sense of pride and belonging in their communities in Puhulpola and Dyaraaba before and after the Uma Oya project. The data shows a significant decline in both measures across both villages. Prior to the project, most residents reported feeling a strong sense of pride and connection to their community. After the project, however, these feelings have decreased considerably, reflecting the social and emotional impact of land loss, livelihood disruptions, and environmental changes. These findings highlight how large scale development projects can erode community cohesion and residents' attachment to their local environment.

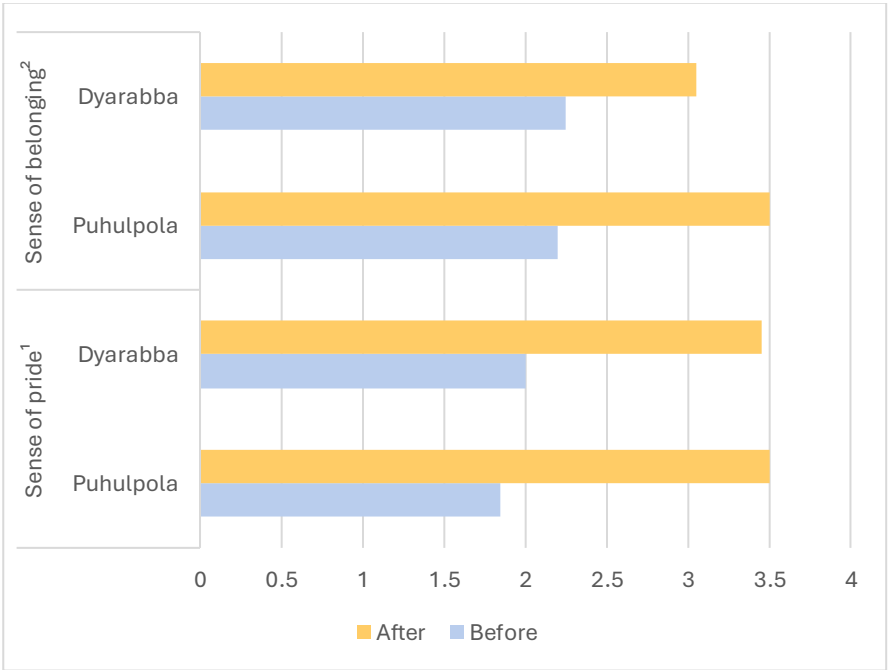


Figure 15: Changes in sense of pride and belonging before and after the Uma Oya project
(Source: compiled by the author)

changes in community friendliness and knowing one another before and after the Uma Oya project

Figure 16 presents participants' perceptions of friendliness and social connections within their communities in Puhulpola and Dyarabba before and after the Uma Oya project. The data shows a marked decline in both aspects. Before the project, most residents reported strong feelings of friendliness and familiarity with their neighbors. Following the project, these feelings have decreased substantially, indicating that the social fabric of the communities has been disrupted. The decline reflects how displacement, loss of land, and changes in local livelihoods can weaken interpersonal relationships and reduce opportunities for community interaction. This decrease indicates a disruption of the social fabric, where relocation, land loss, and changes in livelihoods weaken interpersonal relationships and limit opportunities for community engagement.

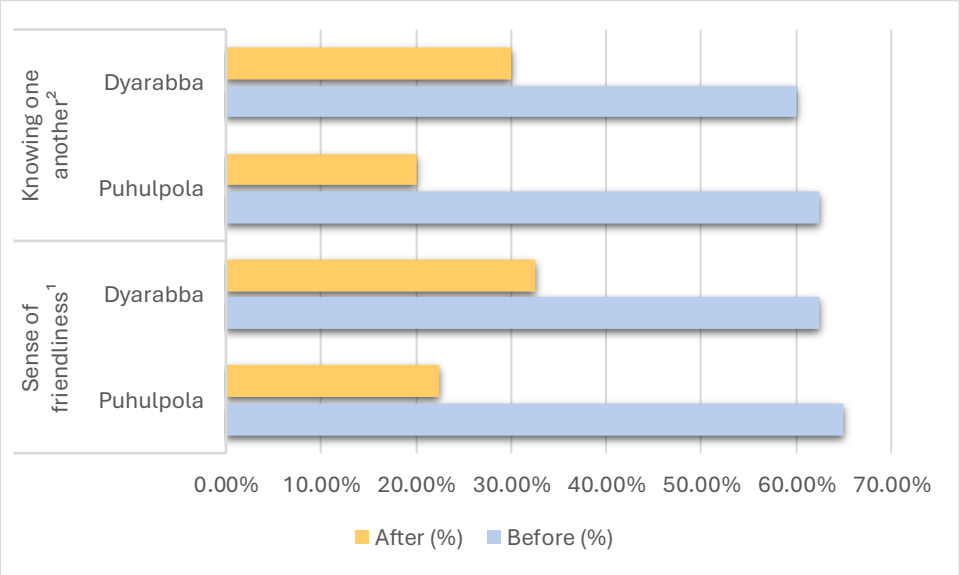


Figure 16: Changes in community friendliness and knowing one another before and after the Uma oya project

(Source: compiled by the author)

Overall Satisfaction

Figure 17 presents participants' assessments of their overall life satisfaction and satisfaction with agricultural livelihoods in Puhulpola and Dyarabba, using a modified Cantril Ladder scale ranging from 1 (very dissatisfied) to 10 (very satisfied).Before the water-based development, participants in both villages reported relatively high overall life satisfaction, indicating stable livelihoods and a sense of well-being rooted in agricultural activities and secure land access. Satisfaction with agricultural livelihoods mirrored this pattern, reflecting the central role of farming in daily life and household income.Following the project, both overall life satisfaction and satisfaction with agricultural livelihoods declined substantially. The reduction reflects the direct impact of the project on land ownership, access to farmland, and farming activities, which disrupted traditional sources of income and household stability. Participants rated their current satisfaction closer to the midpoint of the scale, highlighting the challenges and uncertainties they now face.

Looking five years ahead, Participants showed a favorable expectation for recovery. Both overall life satisfaction and agricultural livelihood satisfaction are expected to rise above pre-project levels. This forward-looking optimism suggests that households predict the restoration of consistency through adaptation, restoration of agricultural opportunities, or alternative livelihood strategies.

Overall, the data captures a structured progression a high level of satisfaction before the project, a significant drop immediately after, and a hopeful recovery projected over the next five years. This

pattern shows both the social and economic disruption caused by the project and the resilience and expectations of affected communities.

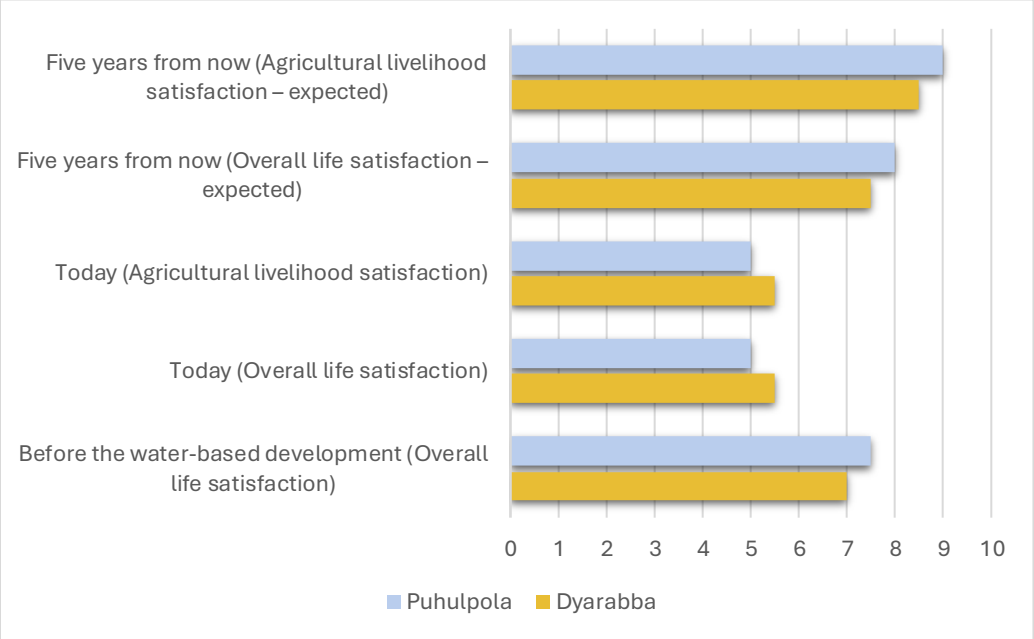


Figure 17: Overall Satisfaction
(Source: compiled by the author)

Conclusion

The findings suggest the complex social impacts of large-scale water-based development on affected communities in the hill country of Sri Lanka. The analysis of satisfaction levels before and after displacement reveals a clear decline in overall life satisfaction and livelihood security, particularly in relation to agriculture, livestock, and household income. The Modified Cantril Ladder results further indicate that, although communities hold expectations for improved living conditions in the future, their present realities are marked by dissatisfaction and uncertainty. The application of Cernea's Impoverishment Risks and Reconstruction (IRR) model and related theories highlights how the Uma Oya project has reproduced many of the risks identified in global displacement studies, including loss of land, reduced income sources, and disruption. Hence, despite compensation and relocation efforts, gaps remain in ensuring housing adequacy, livelihood restoration, and livelihood satisfaction of affected households. These findings highlight the urgent need for more holistic and community centered planning in future water-based/hydropower development projects to mitigate long term impoverishment risks and safeguard the quality of life of affected populations. To address the challenges identified in Puhulpola and Dyaraaba, it is recommended that future interventions focus on restoring livelihoods by providing affected households with access to farmland and livestock support, ensuring adequate housing and infrastructure in resettlement sites, and strengthening community networks to rebuild social cohesion disrupted by the project.

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