

Article

A Multi-Scalar Approach for Assessing Costs and Benefits of Risk Reduction Alternatives for the People and the City: Cases of Three Resettlements in Visakhapatnam, India

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Abstract: Resettlement undertaken with the objective of reducing disaster risk often narrowly focuses only on reducing hazard exposure. However, when resettlements are analyzed from the perspective of holistic development outcomes, including livelihood conditions, health implications, social cohesion and employment opportunities, they are often found to be lacking. Apart from this contrast between considerations of disaster risk and everyday socio-economic risks at the household or settlement level, resettlement programs also lack a clear focus on achieving wider regional development goals including poverty reduction, economic growth and environmental protection. This relates to the sectorization of attitudes to disaster risk and the lack of integration with development concerns across multiple actors involved. This paper offers an approach: (1) to systematize costs and benefits; and using these (2) to assess policy alternatives that could maximize the beneficial outcomes for the resettlement intervention as well as improve overall sustainability for the urban areas they are set in. This paper first situates “risks” within a larger context of structural risks, and then uses the framework of asset accumulation to recognize the changes experienced by the people as costs or benefits. For this, it goes beyond the resettlement site to a broader regional perspective of the city and reflects on the long-term historical trends as well as future risks created by the intervention in the context of urbanization processes and increasing climate variability. To illustrate the use of this approach in assessing intervention alternatives, the paper analyzes three empirical case studies representing in-situ, voluntary and involuntary resettlements from urban Andhra Pradesh in India.

Keywords: resettlement; disaster risk reduction; decision-making; cost-benefit analysis

1. Introduction

Despite its significant financial and economic implications, resettlement has been widely adopted by governments as a chosen means for disaster risk reduction (DRR) and recovery [1,2]. However, studies have shown that resettling people has led to frequent and large losses and rarely spur people’s resilience [1,3–5]. Housing, being among the most tangible and visible forms of vulnerability (or loss post-disaster), attracts most attention from the state agencies as it is a means to showcase responsiveness [6]. The decision-making process does not evaluate the respective costs and benefits of both: the form of housing improvements possible (e.g., in-situ housing, resettlement or relocation (p. 11 [7])) and alternate approaches for risk reduction (e.g., livelihood improvements and infrastructure upgrading).

There is a global consensus that a comprehensive assessment of economic, social and environmental costs and benefits is needed before making any decision concerning resettlement and relocation [8–10]. A cost–benefit analysis (CBA) could be a very useful tool for decision-making, especially in comparing

the available alternatives and identifying the most appropriate and least damaging option in the context of its potential impacts [11,12]. However, CBAs are often limited to economic effectiveness and efficiency [11,13–15] and do not consider intangible yet important outcomes of well-being and livability [16]. They tend to include compensation and resettlement costs such as loss of land, loss of housing, damage to crops or work-related assets, loss of employment and investment to start a new business and costs related to public assets such as community-level infrastructure, but do not include non-marketable assets such as social cohesion, cultural assets, environmental features and physiological stability, critical for a well-being [17]. In a post-resettlement context, it is necessary to assess the nature of risks owing to inadequate provision of services, lack of institutional support mechanisms, and the state's non-recognition of informality. These various hidden costs, which have a very high incidence among vulnerable populations, are under-represented.

Traditional CBAs are also often complex and dependent on quantitative data [18] not often available, making them difficult to undertake by policy-makers. They are often limited to a particular site of intervention [13] and do not consider the impacts beyond its geographical bounds. They are also limited in a specific temporal period and do not account for future risks created. Meanwhile, the decisions made, especially in the post-disaster context, face the challenge of urgency and therefore lack rigorous assessments [4,6]. This establishes the case for making CBA qualitative, which would be useful for decision-making during emergencies, and appropriate for conducting pre-emptively to arrive at the most reasonable, effective and sustainable risk reduction solution relevant for not just the neighborhood but the city at large.

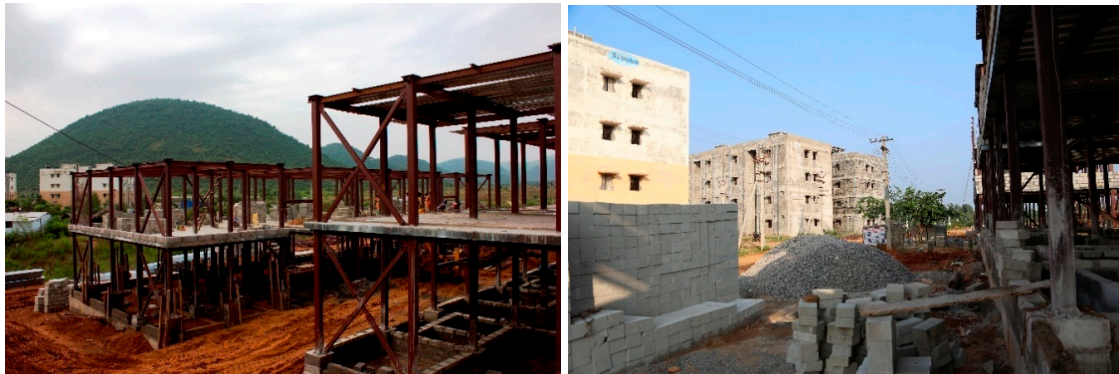
There are many approaches to DRR. Disaster risk may be reduced through post-disaster responses, pre-emptive measures by avoiding hazard exposure through planning [19–21], residual risk reduction through compensatory mechanisms [22] such as insurance [23] or through household level coping and adaptation [24]. Availability and penetration of insurance instruments against losses from disasters is limited, especially in developing countries [25], and a household's ability to adapt is often constrained by their lack of asset ownership, income and other social conditions, and worsened after experiencing shocks [26]. Essentially, it leaves pre-emptive or post-disaster DRR approaches for the state to take, often taken in the form of resettlements.

Pre-emptive resettlements fall under the jurisdiction of development agencies such as city planning authorities or housing development boards, and treated much the same way as development-related resettlements such as moving people due to road widening exercises, whereas post-disaster resettlements usually fall under the purview of disaster management authorities, such as disaster response and rehabilitation agencies. Institutional arrangements for these approaches see development and disaster risk reduction in isolation, and their priorities are limited to either the provision of shelter or moving people out of harm's way [3,6]. They are seldom undertaken with a view of holistic sustainable and resilient outcomes irrespective to what triggered the decision of resettlement development or DRR (see Box 1 for an illustration).

In many instances, resettlement projects are unsuccessful [28,29] because of inadequacies at the new sites, such as distance from livelihoods and social networks, being socio-culturally inappropriate or lack of community participation [30,31]. It is often recommended that resettlement process designs must be adequately financed, such that they incorporate employment generation, assured access to food, improved access to public services and transport facilities, restoration of common properties and support for community and economic development [32]. However, housing is largely seen through its function as a shelter (p. 36 [33]) and not its multi-scalar economic, environmental and social functions, such as asset-based welfare at the household-level [34,35] and community building at the neighborhood level [36]. Large scale housing developments could have significant outcomes for climate mitigation, apart from enabling movement of labor giving a boost to the economy at the urban or regional level [37].

Box 1. Prefabricated “disaster-resilient” housing built at Survey No. 119 for the cyclone-affected fishers adjacent to business-as-usual affordable housing for the poor (source: the authors).

Post Cyclone Hud-Hud in 2014, many high-net-worth individuals and private donors gave financial aid to the Andhra Pradesh state government to support cyclone-affected families, particularly those living in the coastal areas. The state government immediately announced that they would match those funds, and started building 10,000 housing units in the Madhurvada region—an area burgeoning with affordable housing schemes which are lying vacant several years after completion. It is 20 km north of the Visakhapatnam city center and several kilometers from the coastline. Fishers from Pedajalaripeta, which is in the city center, were among the identified beneficiaries for this disaster-resilient housing [27], although they resisted the move owing to the new settlement’s distance from the coast.



The first image shows the high-cost construction of pre-fabricated ‘disaster-resilient’ housing, although located far from the city in a context where there is no social-infrastructure in the vicinity. The second image is of the same housing construction site, adjacent to an existing but unoccupied JNNURM (Jawaharlal Nehru National Urban Renewal Mission) housing which was allocated to beneficiaries from the Visakhapatnam city center, four years ago (as documented in 2015).

Investments such as these raise important questions. Is the adjacent business-as-usual JNNURM housing construction not resilient to hazards, and if it is, then how does the additional cost undertaken in the pre-fabricated version justified? At the same time, if the existing housing is not in demand, on what assumption is additional housing being built? In effect, it alludes that disasters are being used as opportunities to build future housing stock for the city, in line with its overall growth plans, but not necessarily to benefit disaster-affected people or the poor for who’s housing the aid or funds were directed.

There are several existing structural issues beyond the immediate site, especially in developing countries, with regard to increasing slum population, inequitable access to services, poor social infrastructure and high disease incidence. Not responding to these underlying structural issues despite making large investments in resettlement processes purely to reduce hazard risk correspond to limited overall developmental gains, perpetuating risks for the resettled people [2,38], and hindering sustainability outcomes for the regions they are a part of.

This paper uses three cases of resettlement—a voluntary resettlement, an involuntary resettlement (without participation) and an in-situ redevelopment—to evaluate the socio-cultural, economic and environmental implications of these approaches. In doing so, it seeks to assess the structural and non-structural drivers of risk while interrogating the experiences of living in the original and resettled contexts. The three cases are located in the same urban context of Visakhapatnam, a city in the state of Andhra Pradesh in India, bordering the coast of Bay of Bengal that is prone to several climatic hazards including cyclones. The resettlement interventions are from a similar time period, to help identify characteristics that explain their varied outcomes. The objective of this paper is to systematize costs and benefits and lessons learned, and thereby offer an approach to assess policy alternatives that maximize the beneficial outcomes for the resettlement intervention as well as improve overall sustainability for the urban areas they are set in.

2. Research Framework and Methodology

2.1. Framing Our Approach: Defining “Risk”, Asset Accumulation as a Means for Risk Reduction and Multi-Scalar Outlook

It is well accepted that disaster risk is a composite of external hazards—tectonic or climatic or man-made hazards such as unsustainable resource management, unsafe water supply and sanitation practices—as well as intrinsic vulnerabilities of elements (i.e., people: poverty and marginalization; buildings: poor construction; and systems: access to public transport) that affect their propensity to risk [20,39]. The underlying reasons for these vulnerabilities may arise out of socio-economic processes, which may be otherwise unrelated to the hazard event, and it is due to these vulnerabilities that the impacts felt by some people may be more severe than others. Often, there are deeper socio-political reasons that force certain groups of people to live in areas that expose them to hazards and greater risks [40]. This lack of choice exacerbates their vulnerabilities, exposure and often also their ability to respond, and in the face of an event they are left even more vulnerable than before. This cause and effect model [41,42] of vulnerability perpetuates and accumulates risks for the few over time [43]. The risk of severe loss at multiple scales due to climate change-related hazards is particularly high in large urban areas [44]. These risks are not limited to sudden ruinous events, but accumulate over time in the form of recurring conditions of moderate intensities. It is this composite perspective of external and intrinsic factors, coupled with spatial-temporal accumulation over time that we refer to as “risk” throughout the discussion. With this approach, where disasters can be seen as both a cause and an outcome of poor development [42], addressing developmental issues and risk exposure simultaneously becomes pertinent to break this vicious cycle, and possibly realize the inherent opportunity [45] of using investments for DRR and development to achieve overall sustainable outcomes.

This concept of risk is embedded within a larger narrative of urban poverty and regional development dynamics, and risk assessment warrants an approach that acknowledges these complexities and structural risks. Further, there is a need for a variant of temporal assessment that captures the prospect of future reduction/non-reduction of costs/benefits. Using a pure economics frame, this analysis can be completed in a traditional cost–benefit as net present value frame. With a qualitative approach to temporality, our research assessment framework captures risk at the neighborhood and city level, as well as in a historically evolutionary context, which allows us to assess the potential of the regional development framework in addressing the structural drivers of risk. As such, we approach this analysis at two levels:

(1) The perspective of the individual, households and neighborhood: Households tend to follow a strategy of accumulating assets, to improve their wellbeing and life chances for the future [46–48]. This could be by accumulating housing options, access to livelihoods or aid in the time of disasters. Asset accumulation thus becomes part of their coping strategy and people are likely to make some trade-offs based on this strategy while living in areas exposed to hazards. Asset accumulation has resulted in remarkable successes in the context of addressing poverty and inequality challenges [49,50]. It is considered to be a key element in contemporary development policy, particularly in the context of building adaptive capacities of communities and households.

We propose examining the change in the nature of these assets and their accumulation to understand household-level risks. Potential assets could be: (i) socio-cultural (health, education, social safety nets, networks, family extensions, community structures and cultural practices); (ii) physical (buildings, systems, land, public spaces, trees and natural capital, productive and non-productive assets and food); (iii) economic (livelihood options, access to financial services, investments and risk transfer and sharing mechanisms); (iv) environmental (quality and quantity of water, air, green cover and biodiversity); (v) political (agency and voice); and (vi) overall quality of life determined by their levels of access to various assets.

Any existing risks and opportunities, thus, need to be understood in the context of their assets and associated accumulation strategies. For any intervention, a comparison between these costs and benefits borne by people can offer insights into the advantages and disadvantages of any potential intervention.

Since the household is our unit of inquiry, we have focused our data collection at the household level and agglomerating the experiences at the settlement or neighborhood level. Recognizing the distributional challenges within aggregated cost and benefit analysis [11], particular cases of the most vulnerable individuals and households have been singled out to elaborate their needs and safety net requirements.

(2) The perspective of the city: The city is a socio-ecological system [51], and it has a relationship both with the people living in it and other ongoing processes of urbanization. Institutions and social policies play an important role in asset building by enabling or limiting households to accumulate assets. Asset-based social policies provide a structural backdrop against which opportunities are created that allow low-income families to first accumulate assets and then build assets on their own. Moser's asset accumulation framework proposes that access to opportunities helps individuals to earn some marketable assets [52,53]. In a way, this goes beyond the mere concept of savings. Any intervention, therefore, must also be based on an overall vision for the city's development trajectory and informed by its history. There are several systems of indicators available to assess urban sustainability [54,55] within decision support systems [9]. These may be adopted to undertake a CBA of the intervention at the urban level. For the purposes of this paper, we analyze the risks at the city/regional level by examining the level of risk that people and systems are exposed to by placing the interventions in a historical and spatial context of urban development.

In the case of Visakhapatnam, we show that city development processes, when faced with challenges of supporting a large population with limited resources and capacities, are unable to respond effectively in the context of risk management. Asset accumulation, therefore, cannot be looked at in isolation as the ability of individuals to do so, unless city development processes address the gaps through risk-focused development strategies.

2.2. Methodology: Defining Costs and Benefits at the Two Scales

Primary data were collected by a team of researchers from the same institution as the authors, in the period 2015–2017 from 18 sites across Andhra Pradesh and Odisha [56]. For the purposes of this paper, three sites in the Greater Visakhapatnam Municipal Corporation (Visakhapatnam from here on) are used to illustrate the approach described: (1) to limit the scope within a particular regional context; and (2) to provide sufficient diversity of interventions.

A combination of methods was used to collect the information. This study drew from the interviews conducted ($n = 27$) including with government officials, project coordinators, NGOs, community leaders and select disadvantaged individuals ($n = 13$), focus group discussions ($n = 4$) and household-level surveys ($n = 63$). In addition, mapping and field observations were used to substantiate the physical attributes at the resettlement site. Geo-spatial analysis and secondary review of programs and policies were also conducted to assess the costs and benefits at the regional scale.

First, we analyzed costs and benefits borne out of an intervention at the settlement level by using a variety of sources of information listed in Appendix A [57]. The level of risk was assessed based on the changes in assets before and after the intervention. The final assessment sheets were shared with the appointed community members for confirmation of researcher's representations. This research used five outcome clusters: socio-cultural (22 indicators), economic (18 indicators), physical (31 indicators), environmental (7 indicators) and quality of life (6 indicators). These are detailed in Appendix A. Alternate indicators relevant to assess livability may be developed based on participatory processes or particular development context [16].

First, the conditions as experienced in the original locations were documented in absolute terms. The changes in the status quo were then documented and measured based on clear responses received from people during household surveys, focus group discussions, interviews and other secondary

sources of information, as relevant and indicated in Appendix A. This was followed by documentation of various changes, whether they were positive outcomes (risks reduced or avoided) or negative (risks created or continuing). For the sake of simplicity, the original conditions were documented as “good”/“bad”, and each impact as “improved”/“same as before”/“worsened” was documented as response (between 0 and 1 for benefits and between 0 and −1 for costs) in this study as described below:

- With each indicator, any *improvements* in the level of risk to a certain asset was considered a “benefit”. For example, if in the original site, open defecation persisted, but in the new sites people have usable individual toilets improving their conditions for dignity, safety, hygiene, etc. This is seen as a risk reduced and therefore scored 1.
- If it was not a risk to begin with and no risk was created in the course of the intervention, it amounted to a “benefit” in the form of a *risk avoided*. For example, by not moving people too far from their original locations, they could continue to access their workplaces same as before, thereby avoiding a potential risk from being created and scoring 1.
- If a risk continued to exist for their asset even after the intervention, and no action was taken towards improving their status, it was a *lost opportunity* and therefore a “cost”. For example, school access was not good in the previous location, but remains poor, despite the resettlement intervention. It was seen as a lost opportunity to improve their overall development outcomes, and therefore scored −1.
- Any *new risks* created in the course of an intervention were also considered a “cost”. For example, if out of pocket health expenditure in the original site was manageable (therefore risk was low), but, following the resettlement, these costs increased with the new skin diseases hospital being further away, and fewer options of healthcare other than private clinics. This, therefore, was scored −1 as a new risk created.

Aggregation of these scores was done within an outcome cluster, but not across (i.e., a social cost was not countered directly by an environmental benefit, but one social cost was set off by another social benefit). The number of indicators vary across outcome clusters but remain constant across all the settlements (or, in the case of multiple policy alternatives, they must remain the same across those options). Therefore, the total impact can be compared across sites for a particular cluster but not outcomes of the same or different settlements across clusters. To compare results across settlements and their overall outcomes, a three-by-three matrix was used for each of the outcome clusters, with costs represented on the x-axis and benefits represented on the y-axis. These matrices can be adapted to compare different alternatives of interventions (in this case, shown by three different sites for voluntary and involuntary resettlement and in-situ development).

For each site, primary data were organized per outcome cluster as a database. This was done by aggregating responses at the site level. The household level and individual survey results were averaged to arrive at the settlement scores for each attribute. These were substantiated, wherever valid, with focus groups discussions conducted at the site-level, to minimize the influence of extreme experiences. This yielded: (i) clear trajectories of neighborhood-level development over space and time; (ii) critical disjoints; (iii) a lived understanding of the implications of resettlement and relocation; and (iv) macro and micro development narratives.

Outcomes were then compared across sites, by visualizing the overall costs (new risks and continuing risks) and benefits (risks reduced and avoided) that people experienced. These numbers are indicative, and the use of high, medium and low ranges makes them intuitive to understand. The top left corner cell indicates the highest number of benefits and lowest costs, and therefore the most desirable outcome; the bottom right corner indicates the lowest benefits with the highest costs, a condition to be avoided by all means. This is illustrated in Figure 1.

Benefit v Cost >	Low	Medium	High
High	Most desirable		
Medium			
Low			Least desirable

Figure 1. Indicative matrix used to analyze costs vs. benefits.

Secondly, at the city level, the following can be understood as costs and benefits:

- People tend to have a give-and-take relationship with their environs in terms of flow of resources, livelihood extensions and other social and political *dependencies*. Any alterations to these must also be understood as “costs”, both to the city as well as households (those being resettled and those dependent on them socio-economically), unless these dependencies can be restored/recreated after the intervention.
- The city’s overall *opportunity cost* of land, resource pressures on infrastructure provisions and environment must also be understood as “costs” to the city.
- For any potential intervention, *avoided future risks* need to be understood as “benefits”. Specifically, if a risk reduction initiative is undertaken (such as resettlement, relocation, in-situ upgrading, infrastructure improvement or land management), a series of costs may be avoided (e.g., future disaster losses avoided, response and recovery costs not incurred) and some may even be monetized as “benefits” (e.g., ecosystem services).

For the purposes of this paper, the city level risk is discussed qualitatively to offer an alternate approach, although a parallel matrix as that illustrated for the neighborhood level may be generated by following a similar methodology and using urban sustainability indicators offered widely in literature [9,55].

2.3. Case Study: Visakhapatnam

Visakhapatnam is the largest and most populous city in India’s Andhra Pradesh state. It was one of the 20 cities selected for development under the central government’s Smart Cities Mission [58]. It is an important industrial town located midway between Chennai and Kolkata on the east coast, with two major seaports—the Gangavaram Port and the Visakhapatnam Port—as well as an international airport. It has been rapidly growing and sprawling in the last decade. Being a coastal city along the Bay of Bengal, the city has also experienced extreme climatic events such as Cyclone Hud-Hud in 2014.

The official city boundary of Visakhapatnam, the Greater Visakhapatnam Municipal Corporation (GVMC), has nearly 400,000 households [59], and there are nearly 2500 industries in the city of Visakhapatnam [60] as of 2011. Since none of the nearby districts, other than Kakinada in East Godavari districts, have any major economic centers, Visakhapatnam attracts a lot of migrant workers, quickly changing the demographics of the city as well as increasing the infrastructure demands. Forty-four percent of the city’s population [61] lives in more than 741 slums in the city, and their access to water, sanitation and other civic amenities is in poor conditions.

To respond to the growing housing needs, the city has been undertaking many affordable housing development projects, many funded by centrally sponsored schemes, and others sponsored by the state. Many of these are located far from the city (high value city land is not considered for building affordable housing), and people living in city slums, although expected to move to these housing schemes, tend to resist such movement. Consequently, much of the housing remains unoccupied for many years (see Box 1 for an example). As per a national housing policy, state governments in India identify many of these slums as “untenable” [62] on the grounds that they are located in hazardous areas (e.g., on floodplains, next to drains, high-tension wires, railway lines, etc.) and therefore given notices to move. Visakhapatnam has used similar approaches to move people on the pretext of reducing their hazard risk exposure.

For the purposes of the study, three such resettlement sites were selected in Visakhapatnam to understand the nature and form of decision-making and outcomes [56]. All the people resettled previously lived in slums in the city, which were identified as “untenable” [62]. Although these resettlements were done pre-emptively (on the grounds of hazard risk reduction), this region was impacted by the Cyclone Hud-Hud in 2014, and each neighborhood had distinct experiences of it. Of the three sites, the first, Paradesipalem, is a resettlement site around 25 km from the city and built under the centrally-sponsored Jawaharlal Nehru National Urban Renewal Mission (JNURRM) scheme in 2012. The second, Sevanagar, is a resettlement site located in the same neighborhood as Paradesipalem, and also built under JNURRM in 2011, but the people were moved forcibly by the city authorities from land owned by the Indian Railways. The third, Sonia Gandhi Nagar, was an in-situ project built under the Valmiki Ambedkar Awas Yojna (VAMBAY) housing scheme in 2008, and the people who were allocated these houses were neighbors of those who were relocated to Sevanagar, but lived on land that was state owned.

Supplementary Materials are provided with this article containing more details on the case studies, survey instrument, primary data collected, process of aggregation and analysis.

3. Findings

3.1. Risk at the Household and Neighborhood Level

3.1.1. Case 1: Paradesipalem

Paradesipalem is a housing settlement in Madhurwada, a suburb of Visakhapatnam, where 920 housing units were built in 2012 under JNURRM. The residents, predominantly migrants from other districts of Andhra Pradesh, were living in informal settlements on rent in the city center, about 25 km away from this site. Many of them were employed as autorickshaw drivers and were part of a union. Some of them had previously applied for state housing in the 1990s to get a secure tenancy. They were finally allotted houses in 2014, based on criteria such as their income level being below the poverty line and prior housing conditions. They were given an option to choose from among three housing sites, and, since most of them were moving in groups, they moved to the same site. As the secretary of a Paradesipalem women’s collective explained:

“Most people here cannot afford to build a house [in the city], they decided to move to the new settlement. These people have lived through challenging conditions like floods during the rainy season and migrants have had to struggle every day to earn enough to sustain themselves and their families. There was a need to own a house with a legal claim on it and without the fear of eviction.” General Secretary, Ujwala Bharati Mahila Samaikya (UBMS) Paradesipalem, Interview (November 2015).

At the time of the study in 2015, around 250 units (50 per cent) of the lot were occupied, with nearly half yet to be allotted. However, despite several families already having moved here, most services were not completed, and many households received basic services such as water supply only a few years after occupying the houses. The quality of the units too was already deteriorating with poor maintenance and issues such as leakage.

Most residents were engaged in some form of self-employment, such as autorickshaw drivers, daily wage labor, repair work and domestic work. After the resettlement, livelihood options were affected for many people, who had to travel long distances. The expense and time had a severe effect on their savings and profit margins, because of which everyday challenges associated with earning and self-management of resources were not alleviated after resettlement. Many had stopped working regularly—as one resident who earned his living by selling dry fish explained, his customers had now been taken over by competitors, as he travels only on alternate days because the daily commute had become too expensive. His sons have not even moved despite being allocated houses, and he says that the only benefit he has had is that he is no longer threatened by a landlord to pay rent.

“My elder son sells breakfast and snacks, and the younger son uses a rented space to repair watches. They will lose their clients and networks to competitors if they shift. Also, my grandchildren are studying in a government school; here there are no schools nearby and no proper transport facilities. But the biggest problem for them is the distance from their workplace, and they can’t afford to spend on travel every day.” Resident of Paradesipalem, Interview (November 2015).

Women, in particular, have had to compromise on employment for safety (travelling long distances in the city are not considered safe for women), besides losing their past job networks. Most of them used to supplement family income by working as domestic workers, cleaning staff in schools or colleges, cooks or vegetable vendors. While some of them are now trying new home-based income generation activities, several who had diverse skill sets are not able to get appropriate jobs near the new site. These factors can be seen as new risk created for these women and their households.

Few people own marketable assets that are productive, such as autorickshaws, cooking equipment or watch-repair tools. However, the houses they occupy remain non-marketable, because they are “non-alienable”, which implies they cannot be sold in the open market. They can only be inherited and passed on to the next generation. Overall, there is also no change in the access to marketable assets, which remains a continuing risk, since this is a lost opportunity.

While the houses allocated to them are not freely marketable, a sense of ownership has allowed productive use of the space in some cases where people have started using their homes as workspaces or storage of goods. This can be seen as enhancing labor power with the trade-off of asset ownership.

Since their major concern is that they cannot afford a house in the city at the available market prices, residents had expected to save the money they used to spend on rent. After resettlement, however, the change in their monthly expenditure pattern seems to have adversely impacted their savings. Residents lack access to any form of insurance, which is yet another continuing risk, as they are not in a position to recover from damage to their life and property due to climatic or other external hazards.

Children and youth are adversely affected as there is only a private school nearby; the closest government school is around 20 km away in the city. The increase in fees, distance and travel expenses have affected dropout rates of both boys and girls in the settlement. This—either seen as an opportunity cost of spending resources in resettlement as against investing in social infrastructure or through education asset accumulation loss—is a new risk created that has aggravated the risks they were living with previously, and perpetuating it for a longer-term.

Lack of access to health is another pressing issue that also translates into a continuing risk and a lost opportunity for development alternative. The nearest hospital, a private one, is around 5 km away. Even during medical emergencies, they have to either rely on neighbors for travel support or they have to walk.

When it comes to physical outcomes, some risks have been avoided since households now have a concrete house, with individual household toilets. These houses were reportedly not affected much during the Cyclone Hud-Hud, and, other than the overhead water tanks, there was no structural damage.

However, other existing risks prevail. Since the houses are small, some face space constraints, especially people whose children got married subsequent to the house allotment. Access to basic services is still an issue as in the previous slums. Although overhead water tanks were provided, households reported using bottled water or public taps, as the tank water was of poor-quality owing to poor maintenance. Waste management was also reported as an issue as there were no services or spaces for solid-waste disposal, which creates an unhealthy environment with many reporting skin infections.

In terms of socio-cultural outcomes, the positive aspect of Paradesipalem was that it was mostly a voluntary move by a community, most of whom had lived and worked together before. This community cohesion, as a result, has acted as a sort of social safety net. Women have formed small groups to provide microcredit facilities to residents – a unique feature not often seen in resettlement sites. These collectives also raise awareness about entitlements and help people to access credit channels, thus enabling them to solve their own issues.

Residents report intervention from some NGOs who provide support by communicating their community-level issues with local authorities and enhancing participation, which has led to the formation of women and resident committees to solve their problems at the community level, indicating a sense of ownership. These committees take decisions and maintain the neighborhood through measures, including solid waste management and clearing large grasses to avoid snakes (a general problem in the area).

3.1.2. Case 2: Sevanagar

The new neighborhood of Sevanagar in the Madhurwada region of Visakhapatnam was named after the site from where people were relocated in 2011, but has little else in common with the original site. With 960 housing units built in four-story buildings, the site is starkly different from the old Sevanagar around 25 km away, near the Visakhapatnam Railway Station. The families had lived there for several decades, and there was an ongoing legal case about the land occupancy since the railway authority claimed ownership.

In December 2011, the railways authority with the help of the municipal council forcefully evicted the families living here to two different sites as part of the JNNURM project, citing “untenability” [62] owing to their hazardous location and potential flood risk as the reasons for preventative resettlement. Residents reported that they were not given any compensation or notice except to move their household goods, and that they did not even know where they were being moved to until they reached the new site.

The old site was considered to have a high level of risk exposure, with an open drain nearby that used to overflow during the monsoon season causing floods. The houses were also affected by high winds during cyclones. Eventually, however, a sports stadium and a club were built on the vacated land by the railway authority. According to one resident and secretary of the Sevanagar Scheduled Caste Seva Sangam:

“The slum used to get flooded very frequently, but it didn’t affect us much. Water logging used to recede in a few hours and everything would be normal again.” Secretary, Sevanagar Scheduled Caste Seva Sangam, Interview (November 2015).

Before the move, most residents of the region worked as some sort of daily wage laborers (construction workers or cleaners), petty shop owners, vegetable vendors and ironsmiths, among others. Women worked as domestic workers, sold vegetables or ran small shops in the neighborhood.

After the move, livelihoods were significantly hit posing economic risks, as the new site was poorly connected by public transport with only one bus running every few hours, forcing people to depend on private transport. Many residents reported that unemployment increased, particularly for women as there were insufficient work opportunities nearby. Those who could not afford to travel to the city became unemployed.

Some have taken up home-based skill training activities, and many have also opened bank accounts to access formal saving channels. However, they reported that they are unable to save owing to an increase in monthly expenditure. The lack of access and ownership of marketable assets has reduced, as many people lost their household assets during the eviction. Few people have started their own small-scale businesses within the site, which has allowed them to own some marketable assets.

Poor transport and distance from the city have also impacted education and healthcare, with a reported increase in school drop-outs and higher medical expenses, and also reduced access to social safety nets and social networks. For instance, one family who worked as ironsmiths used to make and sell their products near their house in the previous location and get orders for making products. However, after the resettlement, they lost the trust of money lenders and material suppliers because of their distance from the city. Combined with the lack of space to work in the new site, their income is now severely affected.

The involuntary nature of this resettlement has evidently led to several negative psychological outcomes, and many people had still not come out of post-resettlement shock leading to other social issues. Owing to increased unemployment and school drop-out rates, alcoholism as well as cases of suicides had reportedly increased in the new site. One resident stated that the reputation of the place had gone down so badly that many were denied jobs once they revealed that they live in Sevanagar. Once, police raids took place at the site and they checked all houses because of complaints of thefts, and, when this news spread, many residents lost their jobs as domestic workers or daily wage laborers because of suspicion. According to one resident:

“We were busy in our own work back in old Sevanagar, and if we were not busy with work, we had other forms of entertainment like movie theatres nearby. Here, we have four liquor shops near our homes. Kids don’t go to school and are influenced by the elders who are addicted to alcohol.” Secretary, Sevanagar Scheduled Caste Seva Sangam, Interview (November 2015).

Many of them are still fighting a legal battle with the railways and the city government, to get back to their previous location, presenting an additional financial toll on their resources.

When it comes to the physical outcomes, certain risks have been avoided. Houses now have individual household toilets preventing open defecation, people have access to electricity and better roads. They have also shifted from temporary structures to concrete houses. However, several issues remain unaddressed—houses already have leaks and cracks, water is available only for two hours a day and sanitary facilities were reported to be poor with blocked septic tanks and lack of waste management, leading to extremely unhealthy living conditions. Resistance to live in this new location has also prevented setting up of any community-driven management systems, in contrast to the case of Paradesipalem.

Moreover, despite resettlement, people were not given ownership documents rather only occupancy certificates, to ensure that they do not sell these units for profit. People therefore continue to live in fear of being evicted again. The new houses are also a different typology from the row houses that people were used to, which necessitated adapting their modes of functioning since they are no longer able to extend activities to the outside (e.g., cooking with firewood or any livelihood activities). Older people also reported difficulty in climbing the stairs.

Poor quality of drinking water has increased the incidence of waterborne diseases, as a result of which many deaths were reported in the span of three years. Transformations in family support structures have also been observed; most of the families are now nuclear, with more female-headed households.

When the cyclone hit, the housing units at the new relocated site suffered no physical damage. Some water tanks were damaged, and a few people reported leaking roofs. Residents also complained about not being able to work or access ration and supplies for several days after the storm. They did not receive any relief or compensation for these losses, which they would have if they had been in their previous location in the city. There are also no cyclone shelters in the vicinity and no early warning systems at the new site, and many complained of not finding out about the storm in advance, which they were used to at the previous site.

Thus, while some hazard risks were reduced, several more appear to have been created along with continuing risks, such as poor water quality, improper waste disposal and groundwater contamination. Residents echo a high level of dissatisfaction in the community and a feeling that they were better off before.

“Take these houses back and let us live in our old site. We can earn some money by working in the railway station or work for a daily wage in the city. That is the best solution” Secretary, Sevanagar Scheduled Caste Seva Sangam, Interview (November 2015).

3.1.3. Case 3: Sonia Gandhi Nagar

The residents of Sonia Gandhi Nagar (SGN) are some of the last inner-city residents who were allocated new houses in the same location, i.e., in-situ redevelopment. Located near the Visakhapatnam Railway Station, they were next-door neighbors of Sevanagar residents at their previous location. The SGN residents include nearly 150 families who had migrated from different parts of the state and have been living on the site for over 50 years, without formal ownership documents.

In 2008, under VAMBAY housing program, new housing was built on the same site and allotted to the residents. The project was started in 2002, and took six years to complete. Some families were given a site across the highway as transit shelters for that period. According to a resident:

"I was informed that we will be allotted a G + 1 house structure and that all our colony people will be accommodated in one place. All my neighbors agreed. I was happy and agreed on the basis that I would get a pucca house - with a patta [land title] in the same place. I believed this house would be safe from high winds and cyclones, as this city is prone to these natural calamities." Resident of SGN, Interview (November 2015).

However, not everyone received transit housing. During the time it took to complete the project, some people had to move out and find housing on their own. This proved to be quite expensive for people, as much of their savings and income were insufficient to meet the costs incurred by the temporary housing as well as modifications to the allotted houses (e.g., adding a water tank with pipe and pump). This forced many to rely on informal credit sources. In the transit phase, people were also cut off from basic services such as power supply, toilet facilities and streetlights. According to one resident:

"I stayed in a temporary kutcha house in this site. It took me a week to construct the house. For that, I spent around Rs 40,000- Rs 50,000, and I did not receive any support or aid from the government. I borrowed money at 5 percent interest from a moneylender, and am still repaying the debt after 7 years." Resident of SGN, Interview (November 2015).

In return for a basic contribution, all beneficiaries were allotted non-alienable *patta* of the new housing units. A *patta* is an official record of ownership of the land or the dwelling unit, and a non-alienable *patta* means that it can only be passed on to the next generation and not sold. However, according to some people, three blocks were not officially allotted to anyone, and families occupying these units were not allotted *patta*.

In the neighborhood, the predominant forms of occupation include daily wage workers and construction workers. Some have more regular wage jobs such as tailoring, running eateries and tea stalls, working in supermarkets or as domestic workers. Many women are trained in skills such as construction work and tailoring, and they also expressed interest in learning more skills and being a part of women's collectives. However, most families depend on a single working member, and the population here relies on informal credit sources for emergencies and investments.

Because they were resettled at the same site, there have not been significant changes to livelihood and economic outcomes, averting the creation of new risks. Most men and women continue to earn as previously, and some with premises on the ground floor started small shops in front of their homes for additional income.

However, many residents claimed that there are not enough job opportunities for those who are educated. Because of financial needs, graduates are unable to remain unemployed for long and as a result, get involved in regular unskilled daily wage work. However, since they live in the city, they were able to supplement their daily wage work with other skills that allowed them to start small businesses.

Since people did not have to invest much on repair of old houses over the last few years, they managed to save money and use it to get marketable and non-marketable assets such as autorickshaws, sewing machines, refrigerators, televisions and cell phones. The house too is an asset that they possess legal rights for after having paid a contribution. Households also have access to bank accounts, but

none have access to insurance—either life or non-life—which could have been promoted through this intervention, but is now a continuing risk.

Many socio-cultural risks have been averted as the residents' social networks and informal support systems were not affected. Their daily pattern of life, however, has undergone some changes in the transition from a row-house form to apartment blocks, where they now have less social interaction with neighbors. As in most resettlement sites, one issue that came up was the small size of the new houses—sometimes a family of five or six had to adjust in a small apartment, or a joint family was split into two houses where married adults moved out separately. Older members felt this arrangement compelled them to go to work, as it led to higher monthly expenditures for the family unit. Others who could not afford to split household expenses explained their difficult living situation:

“After my son’s marriage we could not adjust in one room. I have to stay outside during their private time. How can two families adjust in one house? We cannot even stretch straight to sleep. My son cannot afford to pay rent and stay separately. Sometimes whatever he earns is barely sufficient for survival.” Resident of SGN, Interview (November 2015).

Other challenges and continuing risks remained. Most have piped water connections, but actual water supply to each household is yet to be provided by the government. Some residents have placed water tanks on the ground floor and use pumps to draw water up to the higher floors. While allotment of ground floor houses was done with preference for people above the age of 60, many households living on upper floors have to continue to walk up and down to fetch water. The settlement also lacked a solid waste management system.

This site is located in an urban area close to a highway. While this has several locational advantages, it also means poorer air quality and less open space and access to play areas for children. Although people's access to public transport remains unaffected, health and education remains a risk, as there is only a private school across the highway from the site and the highway is dangerous for children to cross.

As in the other cases, physical risks have been averted, as residents reported feeling safer in concrete houses in the event of cyclones and floods. During Cyclone Hud-Hud, the new structures suffered little damage, and households even managed to provide shelter to families in the neighborhood (including Sevanagar residents) whose houses were damaged. Livelihoods were affected as people were unable to work for two weeks and they also faced water and power supply issues. According to one resident:

“Earlier, it used to be worse. When I stayed in a kuccha [temporary] house, every year disasters used to cause damage to the house. We always used to worry about what will happen. Now, this house is safe for us. Although this house is not of good quality, and the walls get damp during heavy rains” Resident of Sonia Gandhi Nagar, Interview (November 2015).

3.1.4. Outcomes in Comparison

Using 23 indicators for socio-cultural outcomes, 31 for physical, 19 for economic, 7 for environmental and 6 for quality of life, the overall costs and benefit outcomes for the three settlements post the interventions were assessed and compared (see Figure 2). Even a cursory look at these visualizations and analyses show that those who have been provided in-situ housing, such as Sonia Gandhi Nagar (SGN), face the least costs and fewer new risks. While some of their previous challenges persist, going forward, they could be resolved with other policy measures. On the other hand, in Sevanagar (SEV), where residents were moved by force, the well-being of residents worsened, and no amount of resources can bring back lost lives and reduce the trauma caused. The results could have been more beneficial and costs could have been avoided if people had been able to sustain their previous ways of living despite resettlement. This could have been possible by relocating them closer and not 25 kms away.

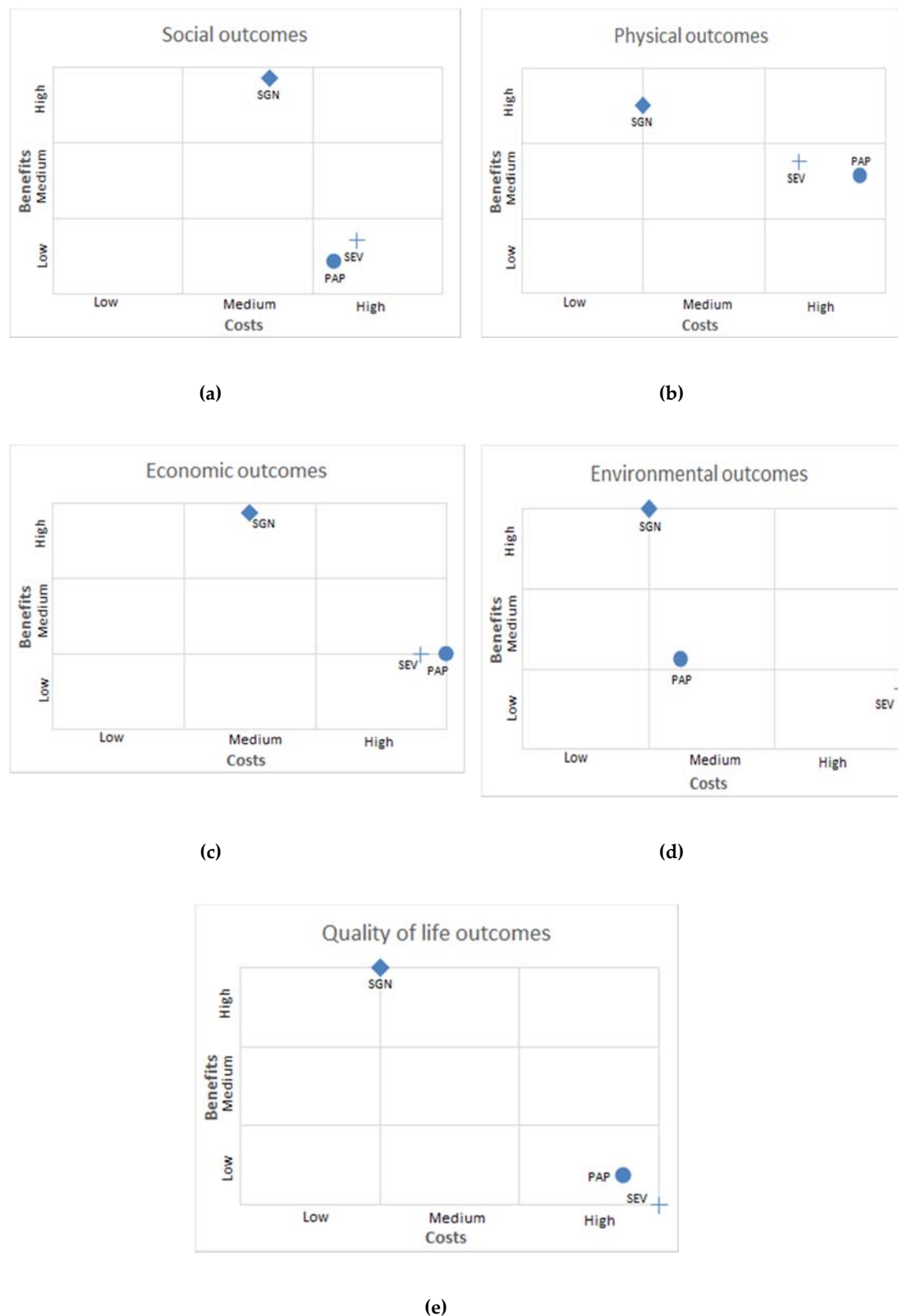


Figure 2. Comparison of the five outcome clusters across three sites: Paradesipalem (PAP), Sevanagar (SEV) and Sonia Gandhi Nagar (SGN). (a) Social outcomes; (b) Physical outcomes; (c) Economic outcomes; (d) Environmental outcomes; (e) Quality of life outcomes.

The risks, costs and benefits for Paradesipalem, Sevanagar, and SGN based on outcome groups have been summarized and analyzed in Table 1 and Figure 2.

Table 1. Summary of outcomes, costs and benefits for each site.

Cost/Benefit	Socio-Cultural	Physical	Economic	Environmental	Quality of Life
Paradesipalem					
Risks Reduced/Avoided (Benefits)	Community moved as a whole; toilet access for women; improved perception of safety from cyclones. Women feel more empowered and have formed committees and self-help groups	Strong house structure, availability of piped water supply, toilets and septic tanks, electricity connections; access to roads	Access to bank accounts; house ownership documents; access to informal networks	None	None
Continuing Risks (Opportunity Costs)	Lack of skill training; high school and college dropout rates and low female literacy	Lack of safe play areas and solid waste management; no solar options for water and electricity; limited social and critical infrastructure; no gas connections	Informal economic activities; lack of insurance; loss of income and reduced savings due to increased expenditure on travel	Less access to trees/green cover; high dependence on groundwater	None
Risks Created (Costs)	Increase in health expenditure; high incidence of disease; reduced safety for women; limited access to education	Lack of streetlighting and access roads; limited size of the house/space; lack of early warning systems	Shift from multiple earners to single earners for households; women lost livelihoods.	Poor water quality which impacts residents' health; poorly maintained septic tanks	Public transport required to access workplaces, education; lack of public spaces; lack of PDS and health facilities
Sevanagar					
Risks Reduced/Avoided (Benefits)	Community moved as a whole; toilet access for women; improved perception of safety from cyclones	Strong house structure; availability of piped water supply, toilets and septic tanks, electricity connections, gas connections, access to roads	Access to bank accounts; house ownership documents,	None	None
Continuing Risks (Opportunity Costs)	Lack of skill training; low female illiteracy	Lack of safe play areas, solid waste management systems; no solar options for water and electricity; lack of social and critical infrastructure	Informal economic activities, lack of insurance, loss of income due to loss of networks	Lack of access to trees/green cover; high dependence on groundwater	None
Risks Created (Costs)	Increase in health expenditure; high incidence of disease; informal safety nets and networks impacted; reduced safety for women; limited access to education; increased school and college dropouts, increased alcoholism and other psychological issues as well as rise in suicides	Limited size of the house/space; lack of early warning systems	Shift from multiple earners to single earners per household; reduced access to informal safety nets and networks; reduced savings	Poor water quality which impacts residents' health; persistent foul smell from poorly-maintained drains and septic tanks; settlement more exposed to snakes, pigs, etc.	Public transport required to access workplaces, education; lack of public spaces; lack of PDS and health facilities
Sonia Gandhi Nagar					
Risks Reduced/Avoided (Benefits)	Access to informal safety nets and networks; neighborhood relations and cultural practices retained; psychological safety; toilet access for women, presence of anganwadis	Strong house structure; access to toilets and septic tanks, electricity connections, gas connections, roads and transport networks; availability of early warning systems, social and critical infrastructure	Multiple earners per household and no change in access to work; access to skill development in the city; access to bank accounts; increase in marketable and non-marketable assets; house ownership documents; access to informal networks	No change in water quality and impact on health	No change in access to public transport, public spaces, entitlements such as PDS
Continuing Risks (Opportunity Costs)	Lack of skill training; low female literacy; high school and college dropouts	Lack of piped water supply; no safe play areas; and no solid waste management measures and solar options for water and electricity	Informal economic activities continue, no savings and insurance	Location next to the highway contributes to air pollution; high dependence on ground water	Limited access to education and quality health care
Risks Created (Costs)	Separation of families and elders having to work; no support in terms of transit housing	Reduced size of the house/space	None	None	None

3.2. Risk at the City Level

Visakhapatnam is similar to many other cities in a developing context: there are entrenched socio-economic vulnerabilities, as well as existing hazard exposure increasing with changing climate. According to the Census of India, 2011 [61], close to 56 percent of Visakhapatnam's district population was not employed. The percentage of main workers in 2011 has decreased as compared to 2001. Female workers' participation has decreased from 70.1 percent in the 2001 Census to 66 percent in the 2011 Census. Of those working, three percent were involved in a home-based industry. Thirty-three percent of the population was recorded as illiterate. There were 627 doctors in government healthcare facilities, for a population of 2,035,922 in urban areas of the district in 2010. Overall, 37.5 percent of the city's population [61] lives with poor access to water, sanitation and other civic amenities. In essence, the outcomes experienced in the case studies described earlier, are exemplars of these urban-level development indicators at the micro-level.

According to Indian Meteorological Department (IMD) data, there is an increasing trend of maximum and minimum temperatures, and annual precipitation in Vishakhapatnam district. Following Cyclone Hud-Hud, much of the city's green cover was lost, and nearly 185 people died in 2015 in Vishakhapatnam due to the heat wave (Figure 3) [63]. The city experienced severe heat wave conditions compared to the rest of the district that year [64]. The increase in built-up and paved surfaces in the city is another major contributor to increasing local temperatures. Despite this, planning visions or propositions (such as the recent Smart City Plan [58]) meant to chart ways forward, do not recognize the implications of increasing urban sprawl on temperatures.

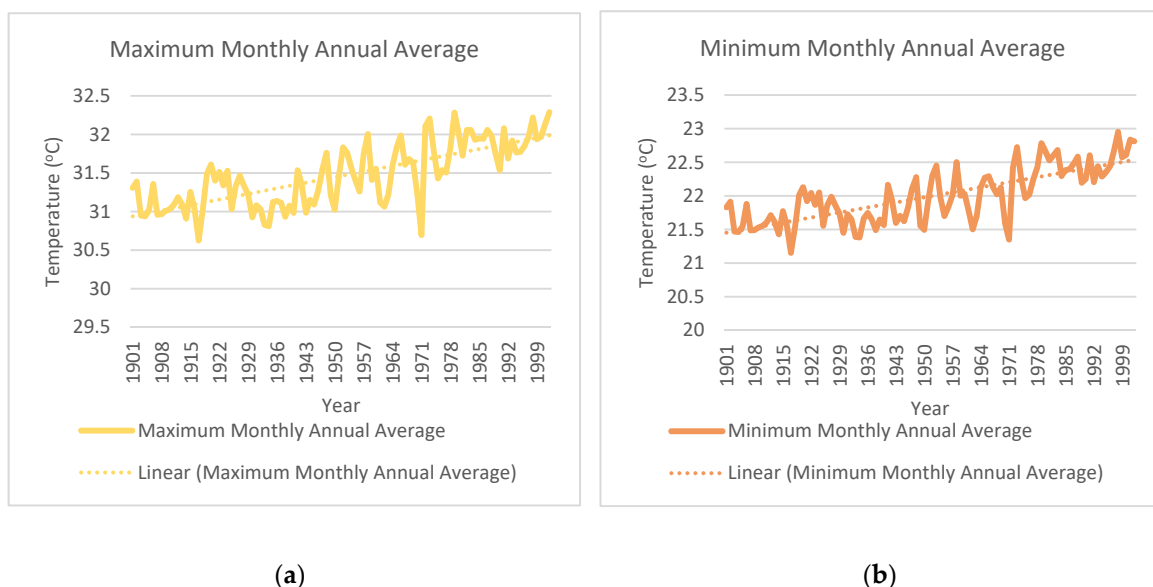


Figure 3. Changing temperature trends in Visakhapatnam district over the last 100 years. Source: Authors based on Indian Meteorological Department data. (a) Maximum monthly annual average; (b) Minimum monthly annual average.

Wind speeds during Cyclone Hud-Hud in 2014 peaked at 260 km/h, affecting its communication systems and transport networks including the international airport. There was also severe damage to the Vishakhapatnam port and the fishing harbor, thus disrupting economic activity and affecting the livelihoods of many. People living in all parts of the city were affected, particularly the ones surviving on daily wages. This included those who were recently relocated to the outskirts of the city, as their connections to the city were broken for a much longer period.

According to a study done by TERI (2014), 25 out of 72 wards in the city located in the low-lying areas are prone to floods, storm surge and sea-level rise [65]. The increasing rainfall trend indicates high potential risk to the city from floods as well as vector-borne diseases. There is also the risk of rockslides

and landslides triggered by heavy precipitation. Human activities such as housing construction on the slopes and an alteration of the local terrain due to road-widening are increasing the risk of landslides in the city [64]. Mapping done by Anil et al. [66] shows an increase of construction activity on the city's hillsides between 1998 and 2010, which has reduced slope stability, increased environmental degradation and altered natural drainage patterns.

More than 23,000 dwelling units were built in the city as part of the Basic Services to the Urban Poor (BSUP) project under JNNURM between 2006 and 2012 [67]. The city has an estimated 741 slums [58] and according to the Census of India, 2011, 44 percent of its total population lives in these slums scattered all across the city [59]. To address the issues of slums, the city proposed a slum-free housing scheme in 2015 [68]. Figure 4 indicates the proposed and new affordable housing locations under the scheme in the outskirts of the city.

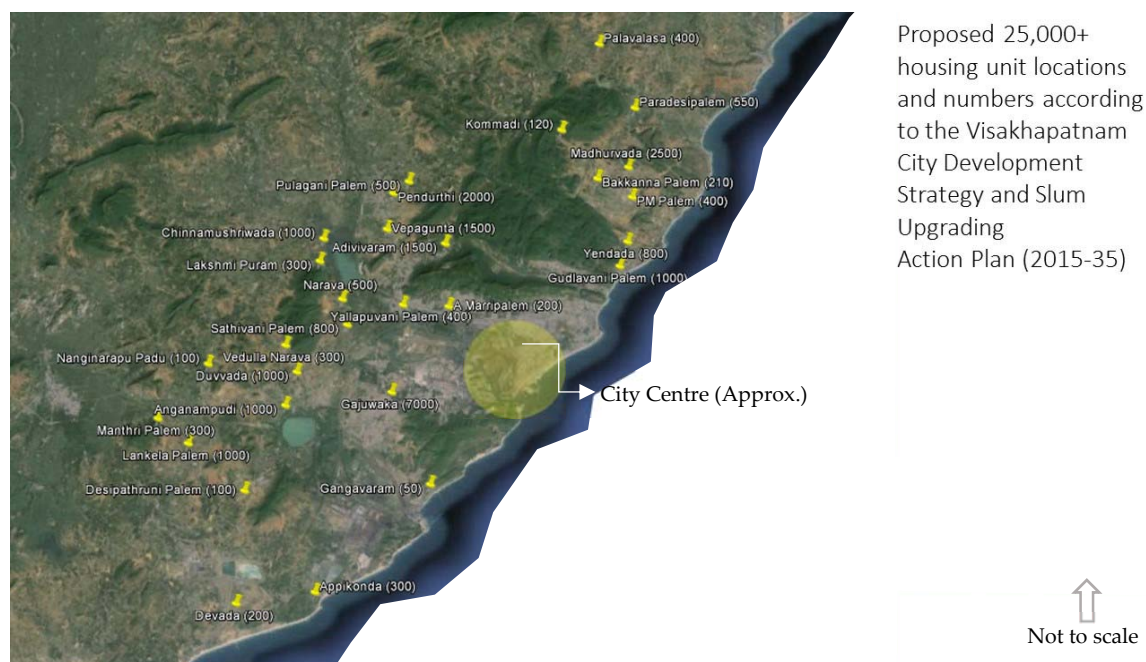


Figure 4. Locations of the proposed and completed housing projects (along with the number of housing units in each location) indicating more outward-growing sprawl. Source: Authors based on data from Visakhapatnam City Development Strategy and Slum Upgrading Action Plan (2015–2035).

Despite the context of frequent hazard exposure in the present and the future, newest affordable housing projects are located in the outskirts of the city to save the more expensive land in the center for the land markets. However, this is promoting sprawl, in addition to increasing the burden on economically-weaker sections of society, who will need to commute to the city for work and other services. This could be seen as a systematic perpetuation of inequity at the city scale, while also increasing the city's footprint and undermining the “compact-city” argument. A larger footprint may even correlate to increased hazard incidence and therefore exposure. Figure 5 indicates how the city has been growing over the last decade.

Cities such as Visakhapatnam have existing structural issues with regards to housing conditions, increasing population of slum dwellers and their limited access to essential services and high rates of disease incidence. In addition to these factors, the burden of natural hazard-induced risks has a detrimental effect on the developmental gains made, despite large investments in physical infrastructure at the city level.

While these underlying issues regarding housing and access to services must be addressed without adversely impacting hazard exposure, the resettlement cases illustrated above indicate that, in the

process of reducing hazard risk through resettlement, the overall socio-economic and environmental burden has increased on the people, and cumulatively on the city.

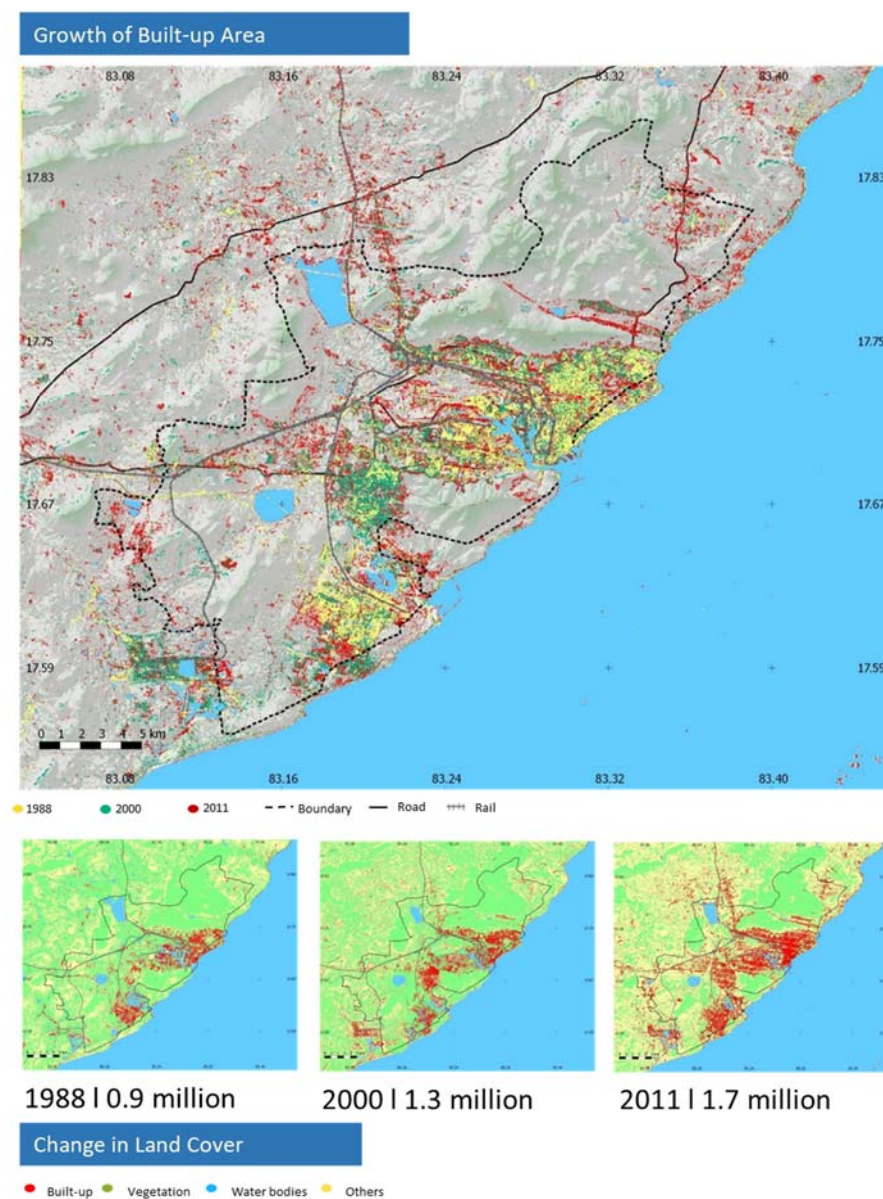


Figure 5. Maps showing Visakhapatnam city's increasing sprawl. Source: Geospatial Lab, Indian Institute for Human Settlements.

4. Discussion

The overall physical outcomes of these resettlement interventions may be relatively better than other outcomes as the new houses were structurally stronger and able to provide protection in the event of cyclonic storms. However, residents were still unable to access basic needs and services (good quality and reliable drinking water sources, solid waste management, reliable public transport and early warning systems) adequately, leading to poor quality of life outcomes. It is essential to recognize that lack of infrastructure services creates its own cycle of informal infrastructure provisioning, which eats into the economic and asset base of households. This vicious cycle creates an endemic and endogenous poverty trap, which gets exacerbated through the larger, highly inequitable development trajectories at the city scale.

The lack of social infrastructure, mainly health and education, was a critical impediment to building adaptive capacities of households. Similarly, lack of access to employment opportunities within affordable distance and the disruption of economic activities were key common problems experienced across settlements, except in the case of in-situ resettlement. These inappropriate structural arrangements threaten the economic security of affected people and their livelihoods, resulting in a reduced capacity of households to accumulate assets or to adopt other accumulation strategies to manage risk. This problem is endemic to urban contexts, again underscoring the deep-rooted, multi-layered nature of poverty.

Since resettlement is inextricably linked with livelihood changes, offering skill building as a bundled product with resettlement decisions can help diversify livelihood opportunities for affected people, as they improve chances of asset and related accumulation strategies through alternative income. They also strengthen adaptive capacities by offering a much wider possibility of negotiating rights and opportunities, enhancing the political agency of the individual/household. In our research, we observed that people's ability to accumulate assets and use a diversified asset accumulation strategy, such as innovative livelihood practices, provided a social and economic buffer to resettled or relocated households. The interventions could consider strengthening people's abilities to diversify their economic resources and avenues.

In these case studies, there was clear evidence that collective action arrangements (informal safety net collectives, women's groups enabling the exercise of rights and local development committees) have a profound impact in terms of reducing risks. Factors that enabled the formation of such innovative collectives and groups play a positive role by acting as a buffer against residual risk, most significantly in terms of negotiating the impact of economic or environmental shocks, and could be promoted as an integral part of these intervention designs.

Environmental outcomes have no particular pattern, but they need to be understood within the context of the site, including exposure to hazards and dependence of people on available natural resources. People who lived in locations that were deemed "untenable" for more than five years, tend to develop adaptation strategies to deal with those risks. The resettlement of such neighborhoods should be avoided since it tends to hamper their abilities to adapt, alongside an increased socio-economic burden. At present, the role of climate change in increasing future risks is barely acknowledged in resettlement or housing policies. Suitable models and simulations must be devised to inform design and policy actions towards overall and long-term risk reduction.

Understandably, the most beneficial and least costly outcomes were experienced when many key aspects of original life were replaced or recreated on a one-to-one basis, most evident in the case of in-situ resettlement (although there is a need to include proper temporary housing options or rental support in in-situ plans). These cases also show that resettlement must only be undertaken when other alternatives of risk reduction such as in-situ upgradation are not yielding as much or more benefits. Conversely, resettlement needs to be of a form (e.g., moving to a close-by location) that maintains continuity of life services, even if the provision of new services is not planned/possible.

In addition to the size of the settlement, the level of homogeneity must determine the design of a rehabilitation and resettlement projects. Heterogeneity, even in small sites, needs to be dealt with on a case-by-case basis, or it can lead to the rise of unforeseen problems when different communities are moved without a choice. In the case of large homogenous resettlement projects, where people who have moved together as a group have already lived together, the results can be more positive as long as their essential needs (of access to water, social services, etc.) are taken care of. However, such homogeneity in urban contexts is usually rare.

When it comes to the official discourse around regional development processes, it was clear that there was a lack of imagination with respect to understanding the experience of risk in a regional context which manifests as unbalanced regional development. Investments, such as these resettlement interventions, are unable to address structural challenges of reducing poverty and generating livelihoods while supporting a large population base.

There was also a strong correlation (in simple analogous terms) between effective official institutional frameworks (such as an efficient public food distribution system, accessible financial institutions and dedicated skill training programs) and better economic, socio-cultural, political and environmental outcomes for affected households/settlements. It is therefore evident that existing institutional arrangements need to be re-designed to focus on the eradication of urban poverty as their central mission (both structurally and non-structurally) and continuously re-invent them with the changing dynamics of regional development processes.

5. Limitations

While the proposed approach has the potential to assess the risk outcomes more broadly, it is also limited by the modalities in which it is conducted. In this case, case studies are used to illustrate the approach, and the generalizability of the set of indicators to other contexts may be limited. However, the authors encourage the adoption of context-specific indicators developed such that they correspond to the local sustainability vision of the city and region [16].

Ideally, these costs and benefits cannot be directly equated. The impact of each benefit may not necessarily negate the negative impact of some other costs. Similarly, the weightage of each of the impacts cannot be similar and they must be represented on different scales. Further, use of equal weightages for all indicators assumes equal importance of all indicators for the people, although participatory processes can be used to arrive at certain weightages based on their actual priorities.

This method would still require some primary level data gathering and consultations with the people concerned to garner a clear understanding of what the existing conditions of the people are and what ideal developmental outcomes they envision in the short to medium term (1–9 years). The gap between these is what would indicate the gap between risk reduction objectives and sustainable outcomes for the people and the region.

In addition, the research was done at the select sites after the interventions were completed, but the surveys and interviews included questions about the conditions “before the intervention” as were experienced on the original sites. The data rely on people’s recollections of their situation from that time, and they may have discrepancies [57]. Please refer to the survey instrument supplied as Supplementary Materials with the article.

This approach employed prospectively would involve assuming the potential outcomes, and therefore similar limitations would persist. This could be minimized by incorporating participatory processes with the community. Moreover, the use of this systematic approach could help widen the intervention design and overall approach to risk reduction, in a way that addresses developmental challenges that are otherwise left out from such interventions.

6. Conclusions

The very reason most people live in hazardous conditions relates to their underdevelopment, exclusion or marginalization. They are more likely to be at risk due to lack of access to safe land, housing and building practices. Thus, if resettlement is seen primarily as a means of getting people out of unsafe environmental conditions without transforming their developmental conditions, their asset accumulation and overall capabilities and capacities, resettlement is likely to only be a means of trading risk reduction of one type (disaster risk) with another type (chronic or everyday risk). Only through integral planning methods where overall holistic risk is considered can resettlement hope to achieve sustainable goals.

Through this qualitative evaluation of the contexts of individual cases, we get a glimpse of the experience of social, economic and environmental implications of different forms of resettlement. By doing so, we highlight the multiple dimensions of costs (new and existing risks) and benefits (risks avoided or addressed). This cost–benefit analysis can be seen as a synonym for traditional risk-assessments, which conducted prospectively could suggest pathways for action towards more positive developmental outcomes.

Assessing the structural and non-structural drivers of risk while drawing from the lived experiences of inhabitants in their original and resettled contexts, it is our contention that the state is unable to

eliminate the structural drivers of the experience of risk (poverty, informal jobs and settlements) and its instrumentality, such as political agency and individual/household capabilities.

The examples from our empirical work support our argument that, unless the state addresses the structural drivers of poverty, unemployment and informality, resettling and relocating people merely transfers the risk rather than eliminating it, and in many cases creates new risks. Systematizing costs and benefits, as well as lessons learned, and examining the advantages and disadvantages with regard to the reduction of future economic, social and environmental costs will be necessary to arrive at the best policies for maximizing beneficial outcomes.

The city-framework shows that there are serious deficiencies in individual and system capabilities to address shocks or endemic stresses (e.g., poverty). With this lack of convergence between regional development objectives and project-level interventions, the imbalances in cities will continue to be in a state of flux, with the creation of new risks as people migrate to the city in search of livelihoods, and the challenge of providing them with a decent quality of life.

Methodologically, even though the cases used here to illustrate the proposed risk outcome approach are post-intervention, this approach of conducting cost–benefit analysis could potentially pre-emptively help make better policy and programmatic decisions between alternatives for risk reduction, including different forms of resettlement. This may be seen a non-static assessment to be used and updated over multiple periods over the course of the intervention (pre and post). Using the systematized costs and benefits, investments can be directed to specific aspects to avoid or reduce costs and increase benefits for all including differentiated groups. It offers the opportunity to get used as a tool for long-term developmental gains towards a more sustainable outcome.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/12/15/5958/s1>, Table S1: Cluster-level outcomes for each case study site, Survey S1: Household level survey instrument, Document S1: Primary data (also available on <https://doi.org/10.24943/cirf3.2016>), Document S2: Transcripts and interviews (also available on <https://doi.org/10.24943/cirf4.2016>), Document S3: Detailed case studies (also available on <https://doi.org/10.24943/cirf3.2016>).

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Appendix A

This table offers a set of indicators used for the outcome clusters in this study. These can be adapted based on the context, as long as the set of indicators used across all the policy alternatives being assessed remain the same. These indicators, at present, are relevant at the settlement level. A similar framework may be developed for the city-level analysis using relevant urban sustainability indicators.

Table A1. Illustrative Outcome Cluster Indicators used for the Study.

Potential Assets	Indicators of Measurement	Sources of Information Applied	Conditions Prior to Intervention (Base)	Risks Reduced/Risks Avoided (Benefits)	Continuing Risks (Opportunity Costs for the Project/Residual Costs for the People)	Risks Created (Short- and Long-Term, Macro/Micro Narratives of Development)
		A. HH Survey, B. Mapping, C. Select Individual Interviews, D. Group Discussions, E. Observations	Notes	(0 to 1)	(−1 to 0)	(−1 to 0)
Social						
1	Health	Out of pocket health expenditure	A			
2		Incidence of illness, types of diseases	A, D			
3		Working in hazardous conditions	A, C			
4		Distance from the closest health center	D			
5	Education	Skill training	C, D			
6		Quality of education	A, C, D			
7		Learning ecosystems	D			
8		Dropouts rates	A			
9	Social Safety Nets	Level of Female Education	A			
10		FORMAL: Knowledge of entitlements and channels	A, D			
11		INFORMAL: Structure and channels	A, D			
12	Networks	Neighborhood relations	A, D			
13		Collective activities (social benefits/economic benefits/religious benefits)	D			
14		Stories of reliance/Dependence	A, C, D			
15	Family structure	One or multiple households/joint family	A			
16	Family Extensions	Women	Household structure/Head of family	A		
17		Older People	Family support structure	A		
18		Levels of compensations in project	A, C			
19		Children	Support by Anganwadis	D		
20	Physically disabled	Access to entitlements	A, C			
21		Levels of compensations in project	A, C			
22	Community Structure	Collective assets	D, E			

Table A1. Cont.

Potential Assets		Indicators of Measurement	Sources of Information Applied	Conditions Prior to Intervention (Base)	Risks Reduced/Risks Avoided (Benefits)	Continuing Risks (Opportunity Costs for the Project/Residual Costs for the People)	Risks Created (Short- and Long-Term, Macro/Micro Narratives of Development)
			A. HH Survey, B. Mapping, C. Select Individual Interviews, D. Group Discussions, E. Observations	Notes	(0 to 1)	(−1 to 0)	(−1 to 0)
23	Psychological Risks (Privacy, Dignity, Safety Against Crime and Conflict)	Memory, manifestation of shock, insecurity (stress) [Stratified sampling]	C				
24		Safety	A, B, C, D				
25		Space creation	A, B, D, E				
26		Number of incidences and their dimensions	D				
27		Toilets for women—use, location and number	A, B, D, E				
28		Transit housing quality and standards, Project considerations for cultural sensitivities	A, B, D, E				
29	Cultural Practices	Rituals and festivals	D				
		Physical					
1	Buildings	Before and after resettlement	Type of roof/type of walls/plinth	A, B, E			
2			Housing typology/form	A, B, E			
3		Household level – built-up area	Modifications on provided/modifications allowed	A, E			
4		Household level	Size of the plot and covered area	E			
5	Public Systems	Water	Quality/frequency/service provider	A, D			
6			Type of supply	A, D			
7			Sources and usage—drinking and non-drinking	A, D			
8			Type of storage	A, D, E			
9		Sanitation	Type of disposal (before and after)	A, D, E			
10			Type of toilet/location	A, D, E			
11			Planning priorities and design	A, D, E			
12		Solid waste	Collection system/disposal system	A, D, E			
13			Reuse (approaches at local level)	A, D			
14		Electricity	Source/type of usage	A, D			
15			Reliability/resilience (opportunity/risk)	A, D			
16		Energy	Consumption pattern (positive or negative)	A			
17		Transport	Type of roads	D, E			
18			Availability of public transport	D, E			
19		Communication/ICT	Early warning systems	A, D			

Table A1. Cont.

Potential Assets		Indicators of Measurement	Sources of Information Applied	Conditions Prior to Intervention (Base)	Risks Reduced/Risks Avoided (Benefits)	Continuing Risks (Opportunity Costs for the Project/Residual Costs for the People)	Risks Created (Short- and Long-Term, Macro/Micro Narratives of Development)	
			A. HH Survey, B. Mapping, C. Select Individual Interviews, D. Group Discussions, E. Observations	Notes	(0 to 1)	(−1 to 0)	(−1 to 0)	
20	O&M	Social infrastructure	Health/education/information center/temple	B, E				
21		Critical infrastructure	Resilience	B, E				
22		Operations	Costs to community/individual/government/private	D				
23		Reliability	Resources available (e.g., staff)	D				
24		Community level	Issues if any/ways of resolution	D				
25		Community level	Awareness about channels (e.g., approaching officials)	D				
26	Land	Productivity/tenure/inundation/expenditure		A				
27		Site location/quality of soil/hazard exposure/distance from previous site		B, D				
28	Public Spaces	Types of public spaces		B, D				
29		Play area availability and access		B, D				
30		Available/usage		B, D				
31		Proximity		B, D				
32	Trees and Natural Capital	Kind of ownership/type		A, D				
33		Utility—(ecological balance/livelihood/quality of life)		A, D				
34	No. of Assets	Productive/life line assets		A				
35		Kind of ownership/usage		A				
36	Food	Staples/kind of food		A				
37		Consumption pattern (quantity and expenditure)		A				
38		Availability		A				
Economic								
1	Livelihoods—Nature and Composition	Type	Formal/informal	A, D				
2			Self-employed/daily wage labor	A				
3		Household level	Diversity of income	A, D				
4			Sole/multiple earners	A				
5		Labor	Gender perspective		A, C, D			
6			Skill and education status		A			
7	Pattern of Consumption (Expenditure)	Productive and non-productive assets		A				
8		Type and quantum of savings		A				
9		Food and nonfood (NSSO consumption structure)		A				

Table A1. Cont.

Potential Assets			Indicators of Measurement	Sources of Information Applied	Conditions Prior to Intervention (Base)	Risks Reduced/Risks Avoided (Benefits)	Continuing Risks (Opportunity Costs for the Project/Residual Costs for the People)	Risks Created (Short- and Long-Term, Macro/Micro Narratives of Development)
				A. HH Survey, B. Mapping, C. Select Individual Interviews, D. Group Discussions, E. Observations	Notes	(0 to 1)	(−1 to 0)	(−1 to 0)
10	Marketable and Non-Marketable Assets	Usage and type (e.g., refrigerator, car)	A					
11		Economic asset ownership patterns	A					
12		House ownership	A					
13	Access to Financial Services	Type (formal, informal)	A, C, D					
14		How they access	A, C, D					
15		Means to access	A, C, D					
16		Reasons for using and not using	A, C, D					
17		Current status	A, C, D					
18	Financial/Capital Investments	Mutual funds/bonds/savings—all channels but liquid	C					
19		House/land/other assets	C					
20	Risk Transfer and Sharing	Formal and informal (SHG, local chit funds, other channels)	A, D					
21		Insurance—micro/business	A, D					
22		Insurance—life (health, accident)/non-life (endowment, child, building, crop, vehicle, fire, catastrophic, weather)	A, D					
23		Insurance—asset/output based	A, D					
24		Cooperative/individual arrangements	A, D					
Environmental								
1	Quality and Quantity of Water	Scenario	Before and after	D				
2		State of environment	Primary and secondary impacts on individuals	A, C, D				
3		Source	Surface water/ground water	D				
4	Quality of Air	Secondary level impacts on individuals (e.g., health, respiratory problems)	C, D					
5	Green Cover	Type of vegetation	D					
6		Proportion of green cover	D					
7	Biodiversity	Secondary-level impacts on individuals (narrative)	D					
Institutional, governance, and regulatory								
1	Status	Types of existing institutions (Formal/informal)	D					
2		Norms and governance systems (informal institutions/reasons for creating norms)	D					

Table A1. Cont.

	Potential Assets	Indicators of Measurement	Sources of Information Applied	Conditions Prior to Intervention (Base)	Risks Reduced/Risks Avoided (Benefits)	Continuing Risks (Opportunity Costs for the Project/Residual Costs for the People)	Risks Created (Short- and Long-Term, Macro/Micro Narratives of Development)
			A. HH Survey, B. Mapping, C. Select Individual Interviews, D. Group Discussions, E. Observations	Notes	(0 to 1)	(−1 to 0)	(−1 to 0)
3	Risk Created by (I/G/R)	National/state/district level	D				
4		Differential impacts on other groups (community based, old aged/marginalized populations)	C, D				
5	Risk to (I/G/R)	Decision leading to risks	D				
	Quality of Life and Political agency						
1	Access to Assets	Access to public transportation	D				
2		Access to primary, secondary and tertiary education	D				
3		Access to public spaces	D				
4		Access to public distribution system/any other sources	A				
5		Access to adequate health facilities	D				
6		Access to entitlements	A, C				

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