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Post Disaster Review of Recovery Efforts 2005 Earthquake in Red Zones Region of Balakot, Pakistan

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ABSTRACT

The town of Balakot and the surrounding area were almost entirely destroyed by Earthquake-2005. The authorities declared the area uninhabitable and classified it as a red zones region. However, the government provided assistance right after the disaster on a short-term and initial recovery basis. The rebuilding and rehabilitation were mostly done through community efforts with very little assistance from the government departments. This renewal was not recognized in the public domain by the state and was not mainly undertook by the people at the local level. It occurred as a combination of government programs, institutional actions, the local economy, and community efforts. This paper will assess each recovery phase with analysis of the influences of the different roles throughout the recovery process. All data collections are standardized and generalized with testing through regression analysis. This paper will universalize the complicated process of recovery to decrease the likelihood of disasters.

Key Words: *Earthquake-2005, Red Zone Region, Disaster Recovery, Restoration, Rehabilitation, Reconstruction*

INTRODUCTION

In the 21st century, there are more and more catastrophic disasters. Earthquake risk due to its sudden-onset disaster behavior provides very little time for early warning and evacuations leading to greater damage of the built environment, fatalities, and injuries than other hazards. But, on the other side, it offers potential for redevelopment, especially of the built environment (Moatty et al. 2017). The process of recovery would be laying the initial groundwork for long-term earthquake risk reduction and ultimately sustainable development. In the DRR field, the strategy with the most complex and challenging issue is resettlement. Resettlement as DRR strategy has an unfortunate history of failure. It always includes the legal aspects, but the phenomena are often more complex and multifaceted and legal aspects. Land or asset ownership will often be part of these strategies and it is simple to understand property ownership issues, but often social and economic issues have the more complex. Recent studies indicate that

understanding of human-environment relationship and adaptive recovery approaches was beneficial in addressing complexity (Berke et al. 1993, Smith & Wenger 2007)

On October 8, 2005, the catastrophic Earthquake-2005 has virtually obliterated Balakot town and its surroundings. The records indicate that more than 200,000 of the tehsil population were adversely affected by this earthquake. Nearly 90 percent of the physical infrastructure of this area lay in ruins. The ruin of physical infrastructure disrupted the provision of shelter, economic activities, and caused social dislocation (Durrani et al. 2005, Kaleem et al. 2016). After Earthquake-2005, the Government carried out micro-seismic risk assessment. The studies concluded that the active faults in the region have a very high certainty of future earthquakes. As such, the Government declared Balakot and its surroundings to be red zones unfit for habitation. This region was termed Red Zones of Balakot. The Red Zones Region (RZR) of Balakot included the geographical areas of Balakot, Garlat, Ghoonal, Sathbani and Kewai union councils (UCs). In the RZR of Balakot, three UCs created nearly 99% by land area and population. These three UCs were Balakot, Garlat, and Ghoonal (Government of Pakistan GOP. 2006, 2007).

The RZR of Balakot straddles two important fault lines which form a wedge. This area has natural beauty of river Kunhar which is part of Lesser Himalaya. It is a heritage and tourist area. Balakot is the tehsil administered center and served the entire Kunhar valley. Balakot is the converging point of River Kunhar valley and is tourism center for the whole zone. The residents of RZR of Balakot, enjoyed prosperous economic condition and social status in area (GOP 2000, 2006).

After Earthquake-2005, the relief and rehabilitation phases of recovery, were carried out on the same places in this area. In the rehabilitation phase of any disaster recovery, majority of work was carried out by the Non-Governmental Organizations (NGOs) and community self-reliance based action. The commercial and tehsil routines were reinstated in the RZR of Balakot. Going forward in time the restoration of Earthquake-2005 is uncertain. It is now more than a decade time and the locals are still awaiting allocation in the new Balakot town. People have adapted to the modified environment.

The reconstruction of businesses and residences has begun on community self-reliance model. The Earthquake-2005 management agency of the Earthquake Reconstruction and Rehabilitation Authority (ERRA) in Pakistan has undertaken the reconstruction programmes with a "build back better" vision which is recognized internationally. However, the reconstruction of the RZR of Balakot town is far from the all the benchmarks of the ERRA's reconstruction strategy. Relocation from disaster risks is certainly one of the most difficult strategies regarding earthquake DRR. This present study will provide new understandings of all those strategies and outcomes, which will help raise understanding towards the awareness of the disaster recovery phase (Ali 2013, Shafique & Warren 2015).

Conceptual Framework

Post-disaster recovery commences when the emergency response is over. The emergency response consists of, but is not limited to: searching for survivors, providing medical treatment, managing to sustain order, running hospitals, and a whole lot more. The recovery has a number of stages which are inter-related. Relief, restoration, rehabilitation, reconstruction, and disaster preparedness. The ultimate goal of these related stages is to simply restore the functions and features of the community.

Relief and Restoration Focus on Giving People Basic Needs Like Food, Shelter, Utilities, and Safety.

Relief usually happens in temporary places, while restoration aims for more lasting solutions. In this study, living standards are used to measure how well relief and restoration efforts are working. We check this by looking at the quality of homes and inside features, access to healthcare and schools, and how well utilities and transportation services are working.

During the Rehabilitation Stage, The Focus Changes to Helping the Local Economy Recover.

In Balakot, the economy depends a lot on trade, and agriculture is a big part of that. Reconstruction means rebuilding important structures like utilities, roads, and public buildings. In the Balakot Red Zone, this phase got very little help from government agencies or donors because of land use rules. Disaster preparedness, the last stage, is about creating a strong system to manage emergencies and reduce the chances of future disasters (United Nations 2009; Mayner & Arbon 2015). This study looks at all these stages by comparing the situation before and after the 2005 earthquake in the RZR of Balakot.

Relief and Restoration

Relief camps were established on the hazard-prone sites shortly after the emergency response. The approaching winter and the absence of clear policy led officials to initiate restoration efforts within the same high-risk zone. This decision encouraged both donor agencies to launch their initiatives and local residents to reopen businesses. Prefabricated shelters were widely adopted for housing, government offices, businesses, and public services. Basic civic amenities were quickly reintroduced. In 1998, the populations of Balakot and Garlat stood at 11,351 and 11,956, with average household sizes of 7.0 and 7.2, respectively. Post-disaster, the 2017 census recorded population growth to 14,681 and 19,513, while household sizes reduced to 5.59 and 5.58. The annual growth rates of 1.35% and 2.58% exceeded the tehsil average of 1.27%, despite the lack of infrastructure. Due to economic hardships and the risks of rebuilding in a red zone, most people avoided constructing permanent homes, continuing instead to reside in prefab shelters nearly 90% of residents lived in such units, consisting of a kitchen, two rooms, and two bathrooms. These were widely considered inadequate for family life, and similar dissatisfaction was voiced by shopkeepers operating in temporary structures.

Before 2005, the RZR enjoyed a reliable supply of services such as water, electricity, telecommunications, liquid petroleum gas (LPG), wood fuel, sanitation, waste disposal, and road maintenance. These were significantly damaged during the earthquake. Though initially restored, the temporary infrastructure has since deteriorated, primarily due to a lack of maintenance and the limitations of makeshift shelters. Residents were more critical of the utility services than were commercial operators. Governmental services such as healthcare, education, transportation, and policing were resumed promptly, often operating from temporary facilities. In many cases, these services improved post-disaster due to focused interventions. However, feedback on these services remained mixed, with notable satisfaction only in recreation and security, which remained relatively unchanged before and after the earthquake.

Relief Services and their Immediate Post-Disaster Status in RZR Of Balakot

Service Area	Pre-Disaster Status	Post-Disaster (Relief Phase)	Challenges/Remarks
Housing	Permanent structures	90% in prefab shelters	Prefabs seen as temporary and inadequate for long-term living
Medical Services	Regular hospitals and clinics	Temporary medical facilities	Rapid response, but lacked full capacity and privacy
Education	Functional schools	Reopened in temporary structures	Interrupted learning cycle; NGOs helped restore basic operations
Water Supply	Stable municipal supply	Initially disrupted, later restored	Service restored quickly but lacked long-term maintenance
Electricity	Consistent electricity	Limited and unstable power access	Widespread complaints about frequent outages

Sanitation	Basic municipal systems	Temporary and poor	Lacked hygiene; raised health risks
Waste Disposal	Routine collection services	Irregular and under-resourced	Contributed to unhygienic camp environments
Commerce/Markets	Formal shops and bazaars	Makeshift markets, open stalls	Many businesses resumed in prefab or temporary spaces
Government Services	Operating from proper buildings	Shifted to prefab units	Operational but faced space, privacy, and staff shortages
Security/Police	Full presence	Continuity maintained	Security structure remained largely unaffected

Pre- and Post-Earthquake Comparison of Key Indicators In RZR of Balakot

Indicator	Pre-Earthquake (Before 2005)	Post-Earthquake (2017)	Comment
Population (Balakot)	11,351	14,681	Increased despite being in red zone
Population (Garlat)	11,956	19,513	Higher-than-average tehsil growth
Average Household Size (Balakot)	7.0	5.59	Decreased, possibly due to migration or housing constraints
Type of Housing	Permanent structures	90% prefab shelters	Prefab shelters seen as inadequate by residents
Access to Utilities	Reliable pre-2005	Temporary & deteriorating post-2005	Basic services restored but not maintained well
Commercial Infrastructure	Fully functional	Temporary markets, slow rebuilding	Shah Alam and Madina Market became trade centers post-disaster

Rehabilitation

Reconstruction is the hardest stage of recovery when the local economy has to resume operation. The local economy infrastructure was completely destroyed by Earthquake-2005. The recovery in the Balakot town is unique; it started immediately during the recovery due to the commercial importance or role of the Balakot town. The recovery started by a self-reliance-based mechanism of the local people, and was enabled with the immediate need of their core role and central position of Balakot town in the Kunhar River valley. The commercial accommodation and tourism are slowly and gradually being rehabilitated in the area. The support of the Government sectoral departments for the civic physical infrastructure is very limited in the RZR of Balakot, which also limited the business in the area. The municipal infrastructure is almost knocked down. However, the main highway and over-structure and containment along the riverbank are completed.The RZR of Balakot consists of rural and urban areas. The UCs of Garlat and Ghanool were agriculture areas, and agriculture is predominantly the makings of their basic livelihood.

The UC of Balakot was urbanized area and the residents' livelihoods involved business-related tasks. The livelihoods could be categorized into farming, business-related tasks, and services with very few production-related tasks. There was more farming (50%) than business-related tasks (40%), and the rest of the sectors were collectively about 10% (GOP 2006, 2007). The Balakot town and surrounding area were of utmost importance to the whole valley of the river Kunhar, as was shown in responses from

consumers and travelers. The core location of the area not only attracted consumers and travelers, but assisted the local economy through business in the marketplace of Balakot town. The nature of these businesses and their assistance to the development of area, particularly of Balakot, was assessed by the analysis of the proportion of core and non-core economic tasks. For business there were only core economic tasks for the local economy. The nature and role of business as core or non-core was assessed from consumer and population, to see if most business operated as mixed modes. Most businesses operated in mixed mode but the quantity of core economic tasks were considerably greater than non-core economic tasks.

Reconstruction

One phase of healing that directly supports the restoration and rehabilitation phases is reconstruction. However, red zone restrictions prevented restoration in Balakot's RZR. In the temporary shelters, the necessary municipal services' infrastructure was operationalised. The reconstruction phase was not started at the Balakot RZR. As the situation deteriorated, local residents began to demonstrate. A budget of Rs. 229 million was allotted by the government in 2010 to improve municipal infrastructure services. The infrastructure for homes and businesses is built by the local populace using self-reliance and, more recently, individual initiative. The general quality of life, as well as the municipal facilities and services, deteriorates over time. Feedback from the business community and residents regarding the quality of life, municipal amenities, and services makes this complaint very clear. Without a doubt, it is the entrepreneurial opportunities that support the rehabilitation of each of their residential and commercial areas. The residents of the Balakot RZR were well aware of the high risk of earthquakes in the area and were also well-informed about the government's relocation and/or payment program. Commerce and the lack of a decent alternative source of income were the only reasons people chose to reside here. The temporary shelters served as the starting point for the trade operations. Shah Alam and Madina Market, two famous buildings that survived the 2005 earthquake, served as the hub of all commercial activity. Over a period of more than 10 years, the private sector has been progressively and methodically rebuilding homes and businesses with full might. The majority of the residents, along with government agencies and their support systems, continue to use the makeshift shelters.

Disaster Preparedness

The RZR of Balakot lacked crisis services and preparedness for disasters prior to Earthquake 2005. The Earthquake of 2005 changed people's knowledge, comprehension, and behaviour around disasters. Through workshops, sensitisation campaigns, the provision of instruments and trained staff, and other measures, disaster readiness was enhanced in the aftermath of the tragedy. The Tehsil Municipal Officer (TMO) office in Balakot is where the catastrophe emergency response and help centre was established. This center's limited capabilities, such as Rescue 1122 facilities, are sufficient for RZR of Balakot. Earthquake 2005 changed people's awareness, comprehension, behaviour, and actions, which increased their ability to be prepared for disasters. Both at the community and academic levels, rescue and emergency sensitisation programs, trainings, and simulations were carried out. Following Earthquake 2005, sectoral departments' and communities' institutional capability was raised to the required level.

Generalization of the Recovery

Four main stages, each with sub-stages, and 27 criteria are used to categorise the catastrophe restoration process. The methodological section already discusses the significance of each restoration stage and its substages. As a result, each criterion has a unique importance value that is determined by multiplying the importance value of the main and sub-stages by the number of criteria in the restoration sub-stage. The

pertinent section of the research explains the various methods used to collect the data pertaining to each criterion. Every source of information is transformed into a standardised data range, with a focus on how it relates to the first step of restoration. Every criterion's score, significance, and standardised mean values are computed in the criteria-based table. Reaction, rehabilitation, rebuilding, and readiness have respective efficiency ratings of 4.62, 6.38, 2.88, and 8.30. According to a summary of the contributions made by sectoral departments, NGOs, and self-reliance-based systems, sectoral departments and NGOs only support the reaction and readiness stages. While the reconstruction stage had little attention from all players, the local community was involved in the rehabilitation stage through a self-reliance-based method. The data and their explanation in the pertinent parts are exactly in line with this condensed post-disaster scenario.

The pre-disaster state of the selected criteria serves as the foundation for the post-disaster scenario. The best indicator of pre-disaster conditions is the middle and mean value of standardised values. Regression analysis is therefore crucial to the post-disaster scenario portrayal. The pre-disaster state affects the mean values of the post-disaster criteria. Multiple R and R Square values of 0.78 and 0.61, respectively, show a good correlation between the pre- and post-disaster criteria. Regression analysis, however, reveals that all criteria are clearly related to one another, as evidenced by the post-disaster criterion intercept values, which have a -0.0066 of 1.0339 value. The thorough residual analysis of every criterion reveals that readiness and rebuilding are only loosely related, whereas response and rehabilitation are highly dependent on one another. The scattered graph method, which displays the same values in the linear regression equation, is used to further validate the results.

Summary of Post-Disaster Recovery in the Red Zones of Balakot (2005 Earthquake)

Recovery Stage	Key Activities	Stakeholder Involvement	Efficiency Score	Comments
Reaction/Relief	Emergency services, temporary shelters, food, water, medical aid	Government, NGOs	4.62	Most effectively implemented; fast response and active external aid
Restoration	Reintroduction of civic services, temporary infrastructure, prefab shelters	Government, NGOs, Community	6.38	Successfully provided basic services but infrastructure remained temporary
Rehabilitation	Economic revival, trade, agriculture resumption	Mainly Community (Self-reliance)	2.88	Minimal government role; local economy recovered due to commercial self-interest
Reconstruction	Permanent buildings, infrastructure, relocation plans	Community (limited), Government (very low)	**Lowest** (score not initiated)	Largely missing; major gaps due to red zone restrictions and lack of state support
Disaster Preparedness	Community trainings, Rescue 1122, simulations	Government & Local Institutions	8.30	Most improved area post-disaster; effective awareness and response capacity built

Stakeholder Contribution By Recovery Stage

Recovery Stage	Government Departments	NGOs	Community (Self-Reliance)	Comment
Reaction/Relief	✓ Strong presence	✓ Strong presence	━ Limited but responsive	Immediate support was coordinated, efficient, and well-received.
Restoration	✓ Present (temporary services)	✓ Active (prefab shelters)	✓ Active in reopening businesses	Civic services resumed; prefab use dominated housing & shops.
Rehabilitation	━ Minimal support	━ Low engagement	✓ Major role in economic revival	Trade, farming, and business reemerged primarily due to community effort.
Reconstruction	✗ Negligible	✗ Negligible	✓ Gradual private rebuilding	Official projects stalled due to red zone limits; private efforts grew.
Disaster Preparedness	✓ Training & resources	✓ Workshops, tools	✓ Participation in simulations	Collaborative effort; marked improvement in preparedness levels.

CONCLUSION

With 27 measures that cover every aspect of the restoration, the disaster restoration process is methodically divided into stages and sub-stages. The research's conceptual underpinnings provide a basis for the significance of each metric and demonstrate its importance. Due to the diverse nature of the measures, the research must employ a range of methods for collecting and interpreting data. According to the research, RZR of Balakot has two important characteristics: it is unfit for habitation and offers unmatched circumstances for trade. These two opposing characteristics appeal to the local populace because of trade and the fact that sectoral departments have placed little emphasis on building physical amenities because of red zone regulations. The reaction stage and all of its metrics so exhibit impressive development and expansion. Because of their business interests, the local community directly supports the rehabilitation, while sectoral departments indirectly assist. Disaster preparedness is a brand-new community capacity building effort that has a significant positive impact on Earthquake 2005 recovery. At every participant level, the rebuilding stage has the worst conditions. The "Built Back Better" ERRA vision runs counter to this repair.

The restoration process is very universal for evaluating different disaster restoration techniques that are in the spotlight since it is divided into stages, sub-stages, and measures. It is clear that every restoration process will follow the same evaluation trajectory. The systematic framework for determining the significance of each measure and how it is calculated is the most notable aspect of this generalisation. There are several ways to assess each measure's effectiveness in the context of stakeholder roles. The measurements show the sub-stage that complements the main restoration stage and, eventually, the entire restoration process. The within-stage variability can be captured by this generalisation technique. On the one hand, it might show how RZR of Balakot has been completely restored, while on the other hand, it shows differences at various restoration levels. Balakot's RZR restoration received a score of 5, reflecting mixed post-Earthquake 2005 conditions that are more similar to pre-earthquake levels. Progress is

completely uneven across the many stages of catastrophe repair, according to the regression framework and individual scores of the key stages. It also identifies the areas that require future attention in order to advance and change the potential for catastrophe recovery into resilience.

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