

Understanding social engineering and disaster resilience of the rural roads sector for sustainable development

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Abstract

With the rising number and increasing severity of natural disasters globally, there is a growing need to engineer solutions to facilitate climate change adaptation and systemic disaster resilience. This is especially for the rural roads sector: when road embankments, culverts and bridges are affected by changing rainfall intensity and patterns, marginalised and poor vulnerable communities in rural areas lose access to basic infrastructure services such as roads connectivity thereby suffering the most from inundations and induced damages to their lives, livestock and livelihoods. Through the analysis of various innovative case studies, the authors highlight poverty alleviation centric approaches, materials and technology for building disaster resilient infrastructure in the rural roads sector.

Keywords: Disaster Risk Reduction; technology choice; infrastructure resilience; community contracting; nature-based solutions; innovative local resource-based approaches; rural roads asset management

1 Introduction

It is commonly understood that a ‘*new normal*’ of living with extreme events has emerged whereby globally there is an increase in patterns reflecting higher frequency, severity and uncertainty of natural disasters. This leads to loss of lives, negative impacts on local economies, livelihoods and unprecedented damage to physical infrastructure. As per the recent findings of the IPCC report [1], the effects of climate change are ‘*here to stay*’ as natural hazards including floods and cyclones disproportionately intensify. These trends are irreversible. At the same time, as the Global Assessment Report on Disaster Risk Reduction 2022, many targets from the Sendai Framework may not be achievable by 2030 at the current rate of progress [2]. With such rising uncertainty for communities and decision makers,

there is an urgent need to explore risk-informed innovative strategies, adaptive pathways and solutions at all governance levels to adapt to varying climate change induced shocks for resilient sustainable development. One starting point can be to devise social engineering solutions for resilient infrastructure contributing to physical, economic and community resilience.

2 Rural infrastructure resilience for sustainable development

To achieve a growing, thriving, resilient and responsive economy and civil society, it is necessary to build and maintain resilient infrastructure that can act as a “buffer” to internal and external shocks. When deriving and ideating solutions for infrastructure resilience, it is necessary to view the latter from a systemic