SNAPSHOT
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BIO-DYKES: WORKING WITH NATURE TO REDUCE FLOOD LOSSES

The Terai plains in Nepal are inhabited by indigenous communities farming soils enriched by annual floods. Climate change is making these floods more destructive. The combination of increasing intensity of monsoon rains and glacial retreat in the Himalayas increases the risk of more frequent and catastrophic floods impacting these communities.

KEY FACTS

- Annual and summer monsoon precipitation is predicted to increase during the 21st century, with increased incidence of catastrophic flood events.
- Regular monsoon driven flooding leads to significant loss of life, property, and livelihoods. In 2017, 80% of the Terrai region and surrounding districts suffered severe inundation, resulting in at least 140 people losing their lives, and $584.7mil in economic losses.
- Despite comprising only 23% of the land area of Nepal, the Terai is home to over 50% of the population. The region is cut across by numerous rivers and is considered an agriculture hub of the nation.
- Bio-dykes use local skills and resources that combine traditional grey infrastructure with natural elements to create cheaper, sustainable, and locally-appropriate solutions to increasing threat of floods, generating social and environmental benefits.

Riverine flood plains are attractive areas for productive agriculture with fertile soils and an accessible water supply for irrigation. However, productivity varies as some fields offer better returns than less fertile or waterlogged areas. The lowest lying fields next to the river face the greatest flood risk and are often the least desirable. They tend to be farmed by the poorest members of the community, those with the most to lose when a flood strikes.

As a consequence of climate change, the monsoon is changing with more frequent and intense rainfall events, resulting in more catastrophic flooding.

Many communities in these highly productive areas are facing increasing losses. They are forced to spend their savings to compensate for losses incurred rather than investing in building their livelihoods.

This is gradually eroding their capital, forcing them to sell assets and give up on farming to migrate to urban areas in search for employment and a more reliable future.

To protect these productive agricultural lands and to strengthen food security and rural livelihoods, these communities should be able to thrive on these lands despite the flood risk.

We need the combination of two approaches to provide the communities with the knowledge and capacities they need to turn this situation around. The first is flood risk knowledge and the important catalyst that Early Warning Systems (EWS) provide. The second is the implementation of risk mitigation measures which requires flood risk knowledge.

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The lower Karnali basin is an area served by an effective community-centred EWS. The introduction of this system in 2010 has enabled the communities in the area to switch from a flight response when the flood arrives to a measured evacuation response after the warning. Having a couple of hours to move to higher ground gives them time to learn about how the flood unfolds, improving their understanding of flood risk. We cannot stop the flood from happening, but we can help the community mitigate the risk, so that the flood does not result in a disaster every time. This is where the bio-dyke comes in.

Bio-dykes are a combination of traditional infrastructure with natural components. Bio-dykes can take different forms to reduce bank erosion, flood levels, and the velocity of the flood pulse. They can thus be adapted to meet local needs to protect critical assets. The cost of the construction and maintenance of a bio-dyke is significantly cheaper than the construction of concrete measures, making bio-dykes more suitable for remote locations. The construction does not require technical expertise but traditional knowledge and skills, and can be built by local people.

Bio-dykes are also more sustainable than concrete measures as they do not significantly disturb natural processes along the river bank. Bio-dykes deliver both economic and biodiversity benefits to communities over time.

CASE STUDY: BANGALIPUR

"The river used to erode 4-5 metres of land every year. Two people from each household worked for 25 days to build this bio-dyke. This year there has been no soil erosion at all." -Phularam Chaudhary, Community disaster management committee chair.

The people of Bangalipur village in the Bardiya district of Nepal have lived and farmed on the land next to the Aurahi River, a tributary of the Karnali river, for generations. In 2008, 2009, and again in 2014, the community was hit by damaging floods that washed away crops, destroyed houses and removed top soil, depositing in its place gravel, stones, and debris covering the fields.

The residents asked the local government for a dyke to protect their community from floods. However, this village is relatively isolated and hence not a top priority for the Karnali River training project, a nationally funded programme to protect vulnerable communities in the province.

After hearing about Practical Action's work in a nearby community where a bio-dyke had been constructed, Bangalipur village reached out to Practical Action.

Several villagers visited the nearby bio-dyke and developed plans in consultation with our staff to construct a bio-dyke to protect their village. The construction involved people from every household working collectively over 25 days to build the 220-meter-long living barrier.

Since its constuction, erosion has been halted and community members feel safer. The bio-dyke has not stopped the floods altogether, but greatly reduced their impact.

About Practical Action

Practical Action is an international development organisation that puts ingenious ideas to work so people in poverty can change their world.

Big change starts small.

References and Further Reading

Bio-dyke: An Environment-Friendly Solution to Protect River Banks. Rakesh Khadka, Practical Action (2018).

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