

RAHAT: ADVANCING ANTICIPATORY ACTION THROUGH BLOCKCHAIN-BASED SOLUTIONS

EXECUTIVE SUMMARY

Anticipatory Action (AA) is a forward-looking strategy in disaster response, designed to mitigate the effects of predictable hazards by initiating actions before a crisis fully materializes. This approach leverages early warnings, pre-agreed actions, and pre-arranged financing to safeguard lives, protect livelihoods, and preserve human dignity. The effective execution of AA necessitates robust systems for data integration, prompt communication, transparent fund disbursement, and continuous monitoring and evaluation.

Rahat, an open-source, transparent, and decentralized financial access platform built on blockchain technology, is specifically engineered to bolster the resilience of vulnerable communities against various shocks, including climate-related events. Derived from the Nepali word for "relief," Rahat streamlines the anticipatory action process by leveraging blockchain's inherent qualities of immutability, transparency, and efficiency. This white paper details how Rahat integrates with and enhances the core components of anticipatory action, offering a more effective, accountable, and inclusive framework for humanitarian aid.

1. INTRODUCTION TO ANTICIPATORY ACTION (AA)

Anticipatory Action involves taking measures ahead of a crisis, utilizing lead time provided by climate and weather forecasts to act as risks emerge, rather than waiting for needs to escalate post-event. This proactive stance is distinct from traditional reactive disaster responses. AA aims to reduce acute humanitarian impacts before they fully unfold, promoting dignified and cost-effective interventions that protect development gains.

Key terminology associated with Anticipatory Action includes:

Preparedness: The knowledge and capacities to effectively anticipate, respond to, and recover from disaster impacts, based on risk analysis and early warning systems.

Response: Actions taken directly before, during, or immediately after a disaster to save lives, reduce negative impacts, ensure public safety, and meet basic needs.

Recovery: Restoring and improving livelihoods, health, and economic, physical, social, cultural, and environmental assets after a disaster, aligning with sustainable development and "build back better" principles.

Resilience: The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt, transform, and recover from hazard effects in a timely and efficient manner.

Disaster Risk Reduction (DRR): Policies and strategies aimed at preventing new, reducing existing, and managing residual disaster risk to strengthen resilience and achieve sustainable development.

Disaster Risk Management (DRM): The application of DRR policies and strategies to prevent new, reduce existing, and manage residual disaster risk.

Prevention: Activities and measures to avoid existing and new disaster risks.

Threshold: The critical point at which a decision or action must be taken to prevent a negative outcome or crisis from escalating.

Forecast: Predicting future events or trends based on current data and analysis.

Impact-Based Forecast: Predictive models and data analysis used to anticipate potential hazards and their impacts on people, infrastructure, and the environment, providing early warnings and guidance for mitigation.

Lead Time: The amount of time needed to prepare for and respond to a potential future event to minimize its impact.

Triggers: Specific events or indicators that signal the need for a predetermined anticipatory action or response.

Effective AA frameworks are underpinned by three core elements: pre-agreed triggers, pre-agreed activities (Early Actions), and pre-arranged financing. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) actively facilitates and supports these frameworks, integrating a learning component for continuous improvement and evidence generation regarding the positive impact of early assistance on people's well-being.

2. INTRODUCING RAHAT: A BLOCKCHAIN-POWERED PLATFORM FOR AID DISTRIBUTION

Rahat is a transparent and decentralized financial access platform built on open-source blockchain technology, with the primary goal of enhancing the resilience of vulnerable communities against climate shocks. Meaning "relief" in Nepali, Rahat serves as a digital Cash and Voucher Assistance (CVA) management system. It was

selected as a grantee of the GSMA Innovation Fund for Anticipatory Humanitarian Action in 2024, receiving funding from the UK Foreign, Commonwealth & Development Office.

Developed by Rumsan Associates Pvt. Ltd., Rahat's mission is to make humanitarian aid distribution simple, efficient, and transparent. The platform functions as a comprehensive project management tool for anticipatory action, enabling the tracking of activities before, during, and after a crisis.

Rahat leverages blockchain technology, an incorruptible digital ledger that ensures secure and transparent transactions. The key benefits of blockchain in humanitarian aid, as recognized and utilized by Rahat, include:

Immutability: Information, once recorded on the ledger, cannot be altered.

Irreversibility: Accepted information in the ledger cannot be reversed.

Transparency: The blockchain ledger is visible to all participants, ensuring records are publicly accessible.

Low-cost: By reducing the need for intermediaries, blockchain can lower transaction fees.

Decentralized Security: Strong cryptography and a large network of participants make transactions fraud-proof.

Rahat has been successfully piloted in Nepal, demonstrating its potential to revolutionize traditional aid models by fostering financial inclusion and driving positive impact in vulnerable communities.

3. RAHAT'S FRAMEWORK FOR ANTICIPATORY ACTION

Rahat integrates blockchain technology across critical phases of anticipatory action, providing a streamlined, transparent, and accountable process from early warning to aid disbursement and monitoring.

3.1. FORECAST INTEGRATION AND TRIGGER SYSTEMS

Effective anticipatory action is predicated on accurate and timely forecasts that initiate pre-defined actions. Rahat addresses this by:

Managing Forecast Sources: The Rahat system provides access to hydro-meteorological data from various sources, including the Global Flood Awareness System (GLOFAS) and the Department of Hydrology and Meteorology (DHM) Nepal, for station-level analysis [10, 20, 15 (SN 45, 46), 590]. This integration offers real-

time and future insights, supporting informed decision-making for flood preparedness and activation. Users can also input manual forecast sources for daily monitoring when API data is unavailable [15 (SN 47)].

Establishing Trigger Modules: Rahat allows users to set up predefined indicators to initiate timely responses to potential hazards. These triggers can be automated, directly linked to forecasting data with predefined thresholds (e.g., specific rainfall levels), or manual, incorporating human-validated observation statements as fallback mechanisms. Triggers are designed to align with the "threshold" concept in AA, representing the critical moment for intervention.

Multi-signature Trigger Mechanism: Rahat implements a multi-signature trigger mechanism, a blockchain security feature that requires approval from multiple parties before any action is taken. This enhances accountability and trust, ensuring that anticipatory action funds are released only when appropriate triggers are activated by both forecast data and human validation. Once configured, these triggers are securely stored on the Stellar blockchain, ensuring immutability and transparent auditing.

Trigger Phases and Activities: Rahat supports different phases for triggers, such as Readiness and Activation, allowing for automated and manual trigger statements [15 (SN 50, 51), 591]. When phases are triggered, related automated activities are also initiated [15 (SN 55), 595]. A revert option is available for triggered statements, which are showcased in the history for transparency [15 (SN 56)].

3.2. COMMUNICATION FOR EARLY WARNING

Timely and clear communication is paramount for effective early action, enabling communities to prepare proactively. Rahat facilitates seamless interaction and information sharing through its communication management features:

Multi-channel Communication: Rahat provides services such as Short Message Service (SMS), Interactive Voice Response (IVR), and Automated Voice Calls (AVC) [9, 8, 19, 15 (SN 36), 58, 622, 624, 649, 595]. This multi-channel approach ensures broad reach, even for individuals with feature phones, or in areas with varying connectivity. It utilizes third-party services like Prabhu SMS and Sparrow SMS for message dissemination.

Automated Alerts: Upon trigger activation, the system can automatically send early warning messages to beneficiaries and stakeholders. A pilot in Nepal demonstrated that households received early warning alerts within 49 minutes of trigger activation, achieving a 55% success rate. Stakeholder success rate for receiving alerts was 90%.

Effectiveness and Inclusivity: 98.3% of beneficiaries in a pilot found early warning communications helpful for proactive decision-making. IVR was found to be more effective than SMS in reaching populations with low literacy. Localized and multilingual communication (e.g., Nepali and Tharu, Maithili) is critical for inclusivity.

Pre-drafted Communications: Rahat supports the use of pre-drafted communications, which are critical for rapid dissemination.

3.3. CASH AND VOUCHER ASSISTANCE (CVA)

Providing immediate financial assistance is a core component of anticipatory action, empowering beneficiaries with flexibility and dignity. Rahat's blockchain-based CVA module is central to its utility:

Transparent Fund Management and Disbursement: Rahat introduces a CVA module to enhance the management and distribution of aid, streamlining beneficiary identification, eligibility assessment, and the delivery of cash or in-kind assistance [9, 15 (SN 57, 58)]. This includes a fund allocation system that assigns resources to selected beneficiary groups.

Digital Tokens and Redemption: Funds are disbursed as blockchain-based digital tokens. Beneficiaries can redeem these tokens for cash or goods from designated local vendors using SMS (for feature phones) or QR code cards. This process offers flexibility and supports local economies by involving community vendors. Rahat has been successfully piloted in Nepal, providing digital cash assistance to banked and unbanked beneficiaries.

Financial Inclusion: Rahat actively contributes to the financial inclusion of vulnerable community members, facilitating seamless cash transfers through local vendors and reaching populations irrespective of their banking status. In a UNICEF Nepal pilot, 95% of bank transfer recipients appreciated the timeliness of the process. Cash assistance through platforms like Namaste Pay (mobile money) was found largely effective, with 80% finding it reduced delays.

Direct Payout Module: Transactions can be initiated directly through the Rahat dashboard, reducing reliance on third-party Financial Service Providers (FSPs) for core transfers [9, 13 (Fund Flow Management diagram), 599]. While FSP services like NCHL and eSewa can be integrated for payout functions and reporting, Rahat's direct payout enhances control [13 (Technology Stack diagram), 599].

Pilot Results: In one pilot, 774 households received NPR 15,000 within 5 hours 23 minutes of activation. Overall, 95% of cash recipients expressed satisfaction with the timeliness of fund distribution.

Offline CVA: The offline vendor app allows beneficiaries to provide an OTP and amount to a vendor, who then validates it to release cash, ensuring aid delivery even in areas with limited connectivity.

3.4. ACTIVITY MANAGEMENT

Rahat functions as a project management tool that helps in tracking activities before, during, and after a crisis. It enables the efficient planning, organization, and tracking of AA project activities.

Phased Approach: Activities are categorized under three main phases: Preparedness, Readiness, and Activation [15 (SN 32), 66, 72, 77, 79, 86, 594]. These phases align with standard anticipatory action frameworks.

Automated and Manual Activities: Rahat allows for the creation and management of activities, with some being automated to trigger automatically once a phase is activated [15 (SN 35, 55), 595]. Other activities can be managed manually, with options to update their status and link them to specific trigger statements [15 (SN 38), 594, 596].

Field Staff Empowerment: The system empowers field staff with offline functionality, allowing them to manage activities and update their status even in low-connectivity environments [9, 12, 60, 585, 54 (Milestone 3, Activity 1)]. This ensures continuous operation and data integrity.

3.5. MONITORING, EVALUATION, AND LEARNING (MEAL)

Continuous monitoring and evaluation are essential for the iterative improvement of AA programs and for demonstrating accountability. Rahat provides comprehensive MEAL capabilities:

Real-time Monitoring Dashboard: Aid agencies and stakeholders can monitor all transactional information, cash flow, projects, beneficiaries, merchants, and their status in real-time through the Rahat dashboard. This significantly reduces reporting time from weeks to less than 24 hours, enhancing accountability and efficiency. The dashboard displays information such as the number of beneficiaries who received cash and the total amount distributed.

Reporting Capabilities: The system generates detailed reports based on beneficiary data, area of coverage, and activity completion charts. These reports can be filtered by date ranges and exported in Excel files according to client requirements. Rahat also provides specific reporting for communication campaigns, showing summaries for SMS and voice messages [15 (SN 44), 597].

Offline Functionality: To ensure operations in remote, low-connectivity areas, the mobile version of the Rahat application allows field staff to manage activities, configure triggers, and update forecast sources even when offline. Offline updates automatically sync with the central system once an internet connection is restored, ensuring data integrity. This feature is vital for enhancing accessibility and scalability in challenging environments.

Learning Component: Rahat's design is iterative, focusing on building evidence of impact and incorporating learnings for scale and adoption. This aligns with OCHA's commitment to independent evaluations, including quantitative assessments of impact on household welfare, qualitative assessments of beneficiary experience, and forecast/trigger evaluations.

3.6. BENEFICIARY MANAGEMENT

Effective targeting and management of beneficiaries are critical for humanitarian aid. Rahat facilitates this through:

Non-PII Data Management: The tool facilitates the management of non-Personally Identifiable Information (non-PII) beneficiary information within the system. This includes tools for capturing demographic data and conducting needs assessments [11, 21, 15 (SN 16)].

Targeting and Grouping: Users can filter and target beneficiaries based on various indicators categorized into physical, geographical, social, and economic dimensions. This allows for precise segmentation and analysis of beneficiary data, and targeted beneficiaries can be grouped based on real-time requirements [22, 15 (SN 17, 19, 20)].

Tracking Assistance: The system tracks the assistance provided to individual beneficiaries, ensuring resources are allocated effectively and equitably [11, 21, 15 (SN 22)].

3.7. TRANSPARENCY AND ACCOUNTABILITY

Blockchain's inherent properties provide a robust foundation for transparency and accountability in humanitarian aid. Rahat leverages these properties to enhance project oversight:

Immutable and Transparent Records: All financial transactions, contracts, and procurement processes related to AA projects can be recorded on the blockchain, creating an immutable and transparent audit trail. This minimizes the risk of fraud and ensures that fund flow is visible to all authorized participants.

Real-time Reporting: Rahat's real-time monitoring and reporting capabilities provide stakeholders with immediate oversight of project operations, expenditures, and outcomes. This transparency promotes accountability to donors and affected populations.

Multi-signature Trigger Mechanism: By requiring approval from multiple parties for trigger activation and fund release, the multi-signature feature on the blockchain enhances accountability and trust in the decision-making process for anticipatory action.

Reduced Manual Interventions: While some manual interventions existed, the multi-signature trigger mechanism and real-time dashboards significantly improved transparency and trust, allowing stakeholders to track cash flow and engagement effectively.

4. BENEFITS AND IMPACT OF RAHAT IN ANTICIPATORY ACTION

Rahat offers several key benefits that enhance the effectiveness and efficiency of anticipatory action, grounded in its blockchain architecture and user-centric design:

Increased Speed and Efficiency: By automating early warning alerts and aid disbursement through blockchain, Rahat significantly reduces the time and cost associated with transactions and traditional aid distribution processes. For example, 774 households received cash within 5 hours 23 minutes of activation. Communication of early warnings can be delivered within 1-2 hours of trigger activation.

Enhanced Transparency and Accountability: The immutable nature of blockchain ensures that all transactions are securely recorded and visible to all stakeholders, minimizing leakages and fraud. This builds trust among donors, agencies, and beneficiaries. Reporting time is cut from weeks to less than 24 hours.

Improved Financial Inclusion: Rahat caters to both banked and unbanked populations through flexible token redemption via SMS or QR cards, expanding access to financial services for the most vulnerable. 95% of cash recipients expressed satisfaction with the timeliness of fund distribution.

Data-Driven Decision Making: Real-time monitoring and reporting capabilities provide granular insights into project operations, enabling continuous learning and adaptive management.

Resilience Building: By facilitating timely aid before a crisis, Rahat helps communities protect their assets and livelihoods, preventing negative coping strategies and strengthening their capacity to recover from challenges. 98% of

beneficiaries who received early warning communications from Rahat reported taking proactive steps to prepare for floods.

Offline Functionality: The availability of an offline application for field staff is crucial for operations in remote or low-connectivity areas, ensuring that updates can be sent without relying on a constant internet connection.

Inclusivity in Communication: Rahat supports multi-channel communication, including IVR, which is particularly effective in reaching populations with low literacy, enhancing the reach of early warnings.

5. CONCLUSION

Rahat represents a significant leap forward in applying frontier technologies to humanitarian aid, especially within Anticipatory Action. By providing a transparent, efficient, and inclusive platform for managing early warnings, triggers, communications, and cash-based interventions, Rahat empowers aid agencies and communities to act decisively and effectively before a disaster strikes. Its blockchain foundation ensures unprecedented levels of accountability and trust, while features like offline functionality and multi-channel communication address critical operational and accessibility challenges in diverse environments.

As the world faces increasing climate-related hazards and complex humanitarian crises, Rahat offers a scalable and adaptable solution that can enhance the speed, dignity, and effectiveness of humanitarian response. Its proven impact in pilot projects in Nepal underscores its potential to protect lives and livelihoods and build long-term resilience for vulnerable populations globally, contributing to the broader goal of a Digital Nepal by demonstrating how emerging tech can deliver public services in remote areas.