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NATIONAL COMMUNICATIONS ACADEMY - FINANCE

NCA-F

CENTRE FOR POLICY STUDIES & RESEARCH

NCA-F

CPSR

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About National Communications Academy- Finance

The National Communications Academy–Finance (NCA-F), formerly known as NICF, is a premier Central Training Institute (CTI) under the Department of Telecommunications (DoT), Ministry of Communications (MoC). Recently, NCA-F was awarded the prestigious Sarvotkrisht (5-Star) accreditation by the Capacity Building Commission under the NSCSTI 2.0 framework, recognizing it as a centre of excellence in training, governance, infrastructure, and digital pedagogy, and highlighting its excellence in delivering exemplary capacity building for civil servants. Located on a 53-acre campus in Delhi NCR, it offers modern infrastructure, including a 220-room hostel, sports facilities, computer labs, and a well-stocked library. NCA-F trained 12130 officers last year, generating 30279 training man-days, and has already trained 6934 officers this year with 31862 man-days, reflecting its continued commitment to large-scale, high-quality capacity building. Under Mission Karmayogi, it has published 99 courses on the iGOT platform, attracting over 912205 learners, with 798628 course completions.

As the designated cadre training institute for the Indian Posts and Telecommunications Accounts and Finance Service (IP&TAFS), NCA-F provides training to civil servants of the MoC. Its 2-year Induction Training for IP&TAFS Group 'A' probationers blends classroom sessions, on-the-job learning, and field visits. The Academy also conducts Mid-Career and Induction Training for AAOs and JAs, addressing the training needs of around 4,000 Group B and C personnel across DoT, DoP, and MoC.

NCA-F also conducts the Special Foundation Course (SFC) for officer trainees of various Central Civil Services, in collaboration with LBSNAA Mussorie, aligning with national standards of civil service capacity building and inter-service learning.

NCA-F collaborates with global and national institutions, including ITU, NLSIU, IIMs, IITs, IISc, NSIC, and Capacity Building Commission (CBC), for joint research and training in Telecom Manufacturing, IPR Policy, Spectrum Economics, and 6G Standards. It actively integrates Indian Knowledge Systems (IKS) into its training curricula through specialized modules and initiatives. NCA-F also organizes workshops, seminars, and webinars, and delivers demand-based training on Corporate and Project Finance for MDOs and PSUs.

About Centre for Policy Studies and Research (CPSR)

The Centre for Policy Studies & Research (CPSR), established by the National Communications Academy–Finance (NCA-F), aims to enhance expertise in communications policy through joint research and capacity-building initiatives. CPSR envisions evolving into a leading think tank addressing key challenges in the telecommunications and postal sectors, including communications finance, spectrum management, telecom regulation, and digital inclusion. It also explores policy dimensions of emerging technologies such as AI, cloud computing, and satellite broadband.

CPSR's objectives include generating high-quality, evidence-based research to inform policymaking, grounded in ethical values of equity and inclusivity. The Centre works with government bodies, think tanks, and academic institutions to deliver actionable insights for both public and private stakeholders.

In addition to publishing this journal to disseminate research on timely policy issues, CPSR has contributed feasibility reports and case studies for various government schemes. To deepen its impact, CPSR organizes its work into focused research units tackling core areas such as the evolving telecom licensing framework, Digital Bharat initiatives, and spectrum allocation methodologies. Recent CPSR studies have examined the impact of data consumption on India's economy, explored innovative infrastructure investment tools in the telecom sector such as Infrastructure Investment Trusts (InvITs), and analysed the implications of tariff hikes on the Indian telecom industry, including their effects on market dynamics and consumer behaviour.

Through its Centre for Policy Studies & Research (CPSR), NCA-F aspires to be a leading think tank and Centre of Excellence in Communications Policy, Licensing, and Regulation.

About Journal of Communications Finance

The *Journal of Communications Finance* is an initiative by the Centre for Policy Studies and Research (CPSR) under the National Communications Academy-Finance (NCA-F), which operates under the Ministry of Communications. Two volumes of this journal have already been published, one in December 2024 and another in July 2025, reflecting the Institute's commitment to advancing research and knowledge in communications finance and policy.

The journal seeks to publish high-quality research papers and articles that contribute to the evolving landscape of postal, telecommunications, and other sectors. It serves as a platform for academicians, policymakers, and industry practitioners to analyse contemporary issues and emerging opportunities across areas such as communication policy, spectrum economics, telecom licensing, postal finance, public and corporate finance, and the broader regulatory and legal frameworks governing these domains.

In addition to its core focus areas, this journal also includes research across broader developmental and governance themes. These include financial inclusion, fintech innovations, community-based financial models, climate resilience, sustainable development, behavioural sciences, cultural contexts, digital governance, artificial intelligence, welfare architectures, and digital public infrastructure.

With a focus on relevant and actionable insights, the journal addresses emerging areas and challenges in the postal and telecommunications sectors. It also includes research on other relevant topics such as artificial intelligence and digital literacy. These contributions aim to shape future policies and inform decisions in both the public and private sectors, ensuring the journal plays a significant role in the development of Communication finance.

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Editorial Board

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Message from the Chief Editor's Desk

It is with deep pride and a sense of meaningful purpose that we present this ***Special Edition (Volume III, Issue I)*** of the ***Journal of Communications–Finance***, showcasing the scholarly reflections of the ***Officer Trainees of the Special Foundation Course – 2025***. This edition is more than a compilation of articles—it is an affirmation of the intellectual awakening, analytical discipline, and public-spirited commitment that these young professionals bring to India's governance landscape. As they stand at the threshold of public service, their writings reflect not only an understanding of contemporary challenges but also a conviction that informed thinking and ethical governance can meaningfully shape the nation's future.

The themes explored in this edition speak to the breadth and depth of India's developmental journey. Beginning with transforming finance, the Officer Trainees probe the evolving architecture of financial inclusion, the promise of fintech, and the emergence of community-driven models that hold potential to democratize growth. Their insights into climate resilience and sustainable development underline the urgency of imagining financial, technological, and institutional ecosystems that can fortify a climate-secure, self-reliant Bharat. In the domain of public administration and policy design, their reflections draw from behavioural sciences, cultural contexts, digital governance, artificial intelligence, and welfare architectures—offering finely nuanced perspectives on how governance can become more humane, data-informed, and future-ready. The case studies included in this edition illuminate the transformative power of digital public infrastructure and innovative welfare mechanisms, demonstrating how policy intent and technological design can converge to strengthen public systems in profound ways.

Collectively, these contributions reveal a maturing consciousness—one that recognizes the complexities of governance, yet remains anchored in optimism, empathy, and responsibility. They reflect a generation of Officer Trainees who are not only prepared to engage with the demands of administration but are also inspired to imagine possibilities beyond the present.

I extend my deepest appreciation to the Faculty Members, Mentors, and last but not the least to the Editorial Team especially, Associate Editor, Mr. Shashank Shekhar Agarwal, Managing Editors Ms. Yukti Chaudhari, Dr. Nitika Gaba and Ms. Japneet Kaur who

nurtured this endeavour in such short span, and I also commend the Officer Trainees for their thoughtful, well-researched, and compelling contributions. It is my belief that this Special Edition will not only inform and inspire but also spark meaningful dialogue on how India can continue to build governance systems that are resilient, inclusive, and visionary.

Happy Reading!

Ms. Madhavi Das
Director General
National Communications Academy–Finance

Transforming Finance: Inclusion, Technology and New Models

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2.1 Group Lending and Joint Liability Based on Peer-To-Peer Lending: A New Model for Financial Inclusion in Rural India

Sh. Srajit Kumar

Abstract

In developing countries, formal and informal credit markets coexist. The formal credit market is mainly dominated by banks and Non-Banking Financial Companies (NBFCs). The present article proposes a new method of lending, where other participants, including individuals, pension funds etc. can participate in the rural credit markets and thus may contribute in reducing the share of informal credit in the markets. The article proposes a new central platform (which can be a Digital Public Infrastructure (DPI)), which would not only onboard both the creditors and debtors, but also give space to moneylenders to enter the formal credit markets.

Keywords

Financial Inclusion, Group Lending, Joint Liability, Rural Credit Markets, Peer-to-Peer (P2P) Lending Models

Introduction

Financial inclusion means making sure people can use the financial products and services they need—such as savings accounts, payment systems, credit, and insurance. These services should be both affordable and genuinely helpful for the communities they're meant to support. The World Bank considers financial inclusion as an important factor not only in reducing poverty and improving overall well-being, but it also addresses to the struggle faced by such a population with limited access to these financial resources.

This lack of access to financial services has had significant negative effects on both their lives, and also the overall economy. It results into many characteristic features as:

- **Lack of Financial Services:** The world's poor population have no reliable means of receiving and making daily payments. This inability restricts their upward mobility due to less and insecure liquid money.

- **Lack of Financial Products:** Limited access to credit. The informal sector employs the majority of the world's poor. This includes small and marginal farmers, artisans, small scale vendors etc. Despite their ability to make small investments in their enterprise, lack of formal credit restricts their ability to do so.

- **Lack of Savings:** Poor population are unable to develop assets and collaterals which could help build financial resources needed for investing in enterprise, or improving life in general. Saving also protect people from disastrous effects faced during uncertain times.

Literature Review

Financial inclusion is a burning issue in rural India, which needs to be addressed with positive outcomes. There are very few sources of credit for rural people which are formal, for example:

- **Co-operative Credit Societies**: Co-operatives were meant to serve as the most affordable source of credit for rural communities in India. However, they haven't been able to fully meet farmers' financial needs, allowing moneylenders to maintain their hold on the market. In practice, it's the large farmers who have benefited the most from these societies, while the small farmers—who were the original focus of the cooperative movement may still struggle to get all the credit they require from these institutions.

- **Commercial Banks**: Commercial banks have been unable to provide cheap credit to farmers because of following reasons

  i. Farmers often can't offer adequate security or collateral.

  ii. Lenders face challenges when trying to recover loans.

  iii. Agricultural records are often unclear or outdated.

  iv. The loans provided are usually too small, in numbers leading to higher overall transaction costs for the commercial banks

- **Regional Rural Banks**: They were set up by the Government to extend credit to farmers, artisans, landless workers and rural people in general. However, the loan extended by them yet needs to cover the credit needs of larger population

  Due to the various shortcomings in the formal sectors, the people now have to turn towards informal sectors of credit like *sahukaars*. Often these moneylenders exploit people and charge a high rate of interest from rural people.

Problems with Current Models

As per studies conducted by various scholars, a common feature of rural credit markets in the developing countries is the coexistence of formal and informal credit markets (Hoff & Stiglitz, 1990; Besley & Coate, 1995; Kochar, 1997; Bell et al., 1997; Mohieldin & Wright, 2000; Anderson & Malchow-Moller, 2006; Boucher & Guirkinger, 2007; Barslund & Tapp, 2008).

This statement is supported by two different arguments:

1. One line of argument is that Government rules imposed on formal lenders can actually help create or strengthen the informal credit market (Bell, 1990; Bell et al.; 1997; Kochar, 1997; Anderson & Malchow-Møller, 2006). In many low-income countries, policymakers have capped the interest rates that formal institutions are allowed to charge, hoping to encourage borrowing from formal sources and curb what they view as exploitative informal lending. However, these ceilings often restrict formal lenders as they find the loan provisions to be riskier and therefore unprofitable at the regulated rates. Several studies (Bell, 1990; Hoff & Stiglitz, 1990) show that such regulations generally failed to deliver the intended results. As a result, informal lenders continue to dominate rural credit markets. As a result, their interest rates may actually rise because of these policies. This has led researchers to question how effective government interventions in the formal credit sector really are (Hoff & Stiglitz 1993).

2. A second explanation centers on credit rationing that arises from information gaps between lenders and borrowers. Since adverse selection and moral hazard are common in lending, formal institutions tend to restrict credit to applicants who can put up acceptable collateral. Informal lenders, by contrast, are often willing to extend loans to people without substantial assets. Being community insiders, they usually know their borrowers better and can rely on alternative arrangements—such as interlinked contracts (Bell, 1988; Bardhan & Udry, 1999)—to reduce the risk of default (S. Tang & S. Guo, 2010)

Proposed New Model

The present article proposes a new model based on Group Lending and Joint Liability approach. The suggested model consists of following sequential six steps:

Step 1: Formation of the Group and Decision on Volume of Loan:

All the credit seekers would make a group of 4-5 people who they can trust, as the loan would be given collectively to the group. If one of the people is not able to pay

back the loan then the group would have to suffer and a penalty will be imposed on the group depending upon the scale of default. People can also choose to change groups once all the credit is repaid to the central organization. Each village would be assigned an official or a member of the village who can operate computers well.

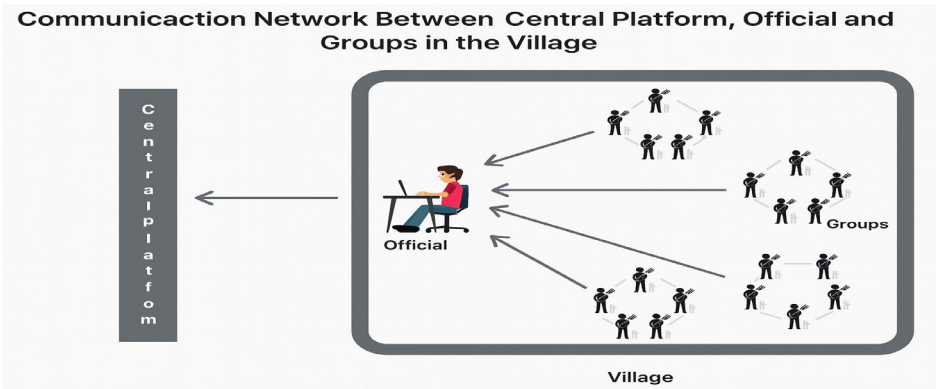


Figure 1: Communication Network between Central Platform, Official and Groups in the Village

The model is based on a fundamental observation that a group always tend to exclude outliers. Even if a member of the group tries to take more credit than required by using the fraudulent data, the overall credit provided to the group would increase. This would increase the liability of the entire group because they would have to pay more money as interest. Further, on the occasion of default, the entire group has to suffer. So, the members of the group would discourage the behaviour of taking more loan than required.

Step 2: Data Collection and Peer Verification

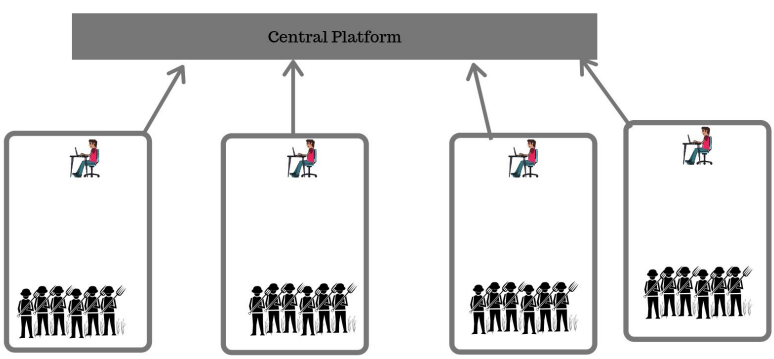
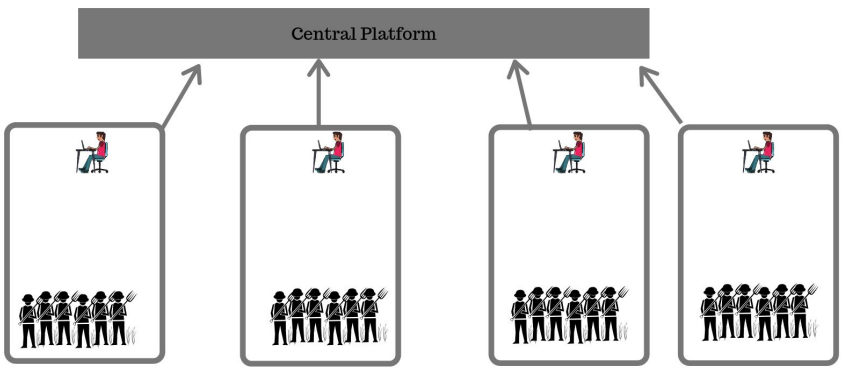


Figure 2: Data Collection by the Concerned Official

The whole group will reach out to the concerned official; who would fill in all the details of the members of the group *i.e.* land ownership, sources of incomes, other liabilities, family size and other required fields. Each member of the group will cross check the data of all their group members.

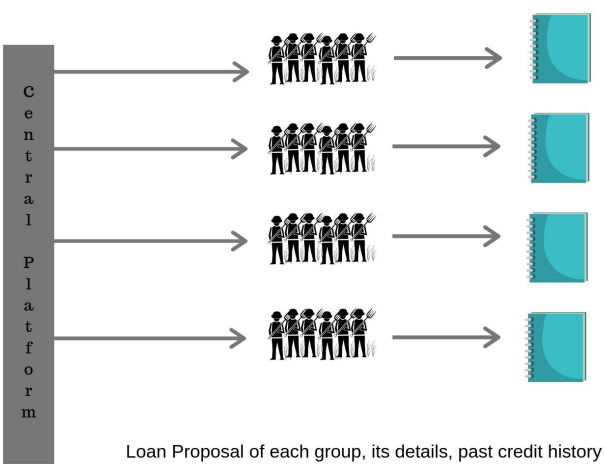
Step 3: Applying for Loan

Once the group decides that it needs a loan, it would approach the official concerned and would give him the proposal of the loan. The proposal would include the amount of credit they are seeking including detailed calculations of expenses under various heads e.g. cost of seeds and fertilizer, cost of raw materials, electricity for handicrafts and so on. The members would again verify if any member of the group is claiming more money than he requires.



Each farmer group would add the would add the details for which loan is needed i.e. crop type, seed price, and so on. The other farmers would again cross check. If a farmer tries to take more loan then the group would have to pay more interest and so the group would dicourage this.

Figure 3: Loan Application by the Group



Loan Proposal of each group, its details, past credit history and the amount that is to be loaned to the group as decided by the central platform would be made public

Figure 4: Details Published in Dashboard

Step 4: Publishing Loan Demand

A central platform may exist in Government for coordinating and placing the loan demand on their dashboard. This information will be available to the public, along with the other data like credit history, land holdings etc of the groups seeking loans. This would attract potential investors like people from urban areas, other big farmers and sahukars/moneylenders, investors etc. The central platform shall announce the percent of assured interest to investors to gain potential investment.

Step 5: Provisioning of Loan by Lenders

The officials of the central platform would give priority to the moneylender(s) of that village and he would have to buy at least 20% of the loan. Once the moneylender buys x% of the loan and the platform owns (100-x)%, out of which the other investors can also buy shares in the loan from the central platform. The moneylenders will still get the interest on a loan that he used to get earlier, if it is less than 20%. The central platform however, would charge in less interest so that the groups still get the loan at an affordable rate.

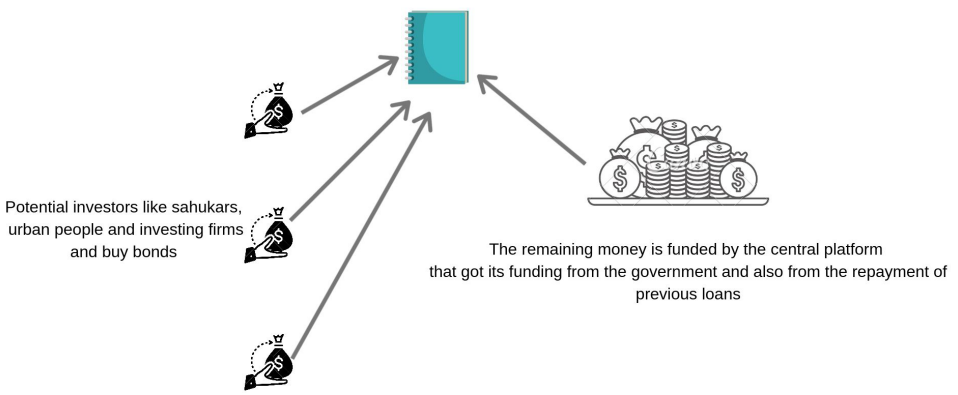


Figure 5: Financing Provision

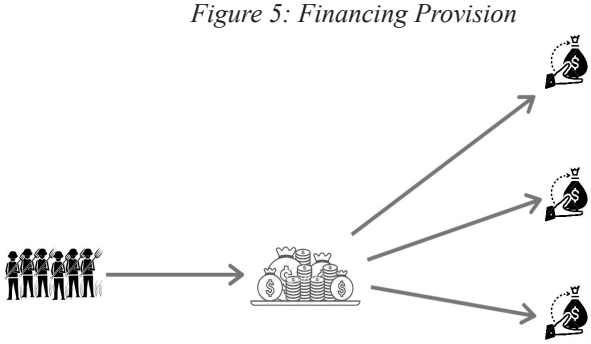


Figure 6: Repayment Mechanisms of Loan

Step 6: Repayment of Loan and its Distribution

After the prescribed gestation period, the regular repayment of the loans starts from the farmers, artisans etc. to the central platform who in turn transfers the funds to the investors according to their shareholdings.

Various Perspectives of the Suggested Model

The Need of Joint Liability and Group Lending and its Benefits:

Group Lending and Joint Liability are necessary in this model as the farmers lack the collateral against the requisite amount of loan. The farmers and the people in rural areas don't have collateral for the security of the credit, hence the concept of social collateral is taken into picture here. This model was tested and implemented in various parts of the world like Grameen Bank in Bangladesh, Bandhan Bank in West Bengal etc.

Studies have shown that there can be both advantages and disadvantages of introducing group lending. The positive effects may be seen, where loan partners can repay some part of the loan of members to improve group's perception and reduce credit rate for next time. The negative effect arises when the entire group defaults, as compared to when at least one of the group members would have not defaulted in the first case. (Besley & Coate, 1995).

The key idea is that lending institutions can tap into "social collateral." In a group-lending setup, the groups are drawn from communities with strong social ties, this added pressure acts a powerful incentive to repay and can offset some of the downsides associated with group lending. More broadly, the notion of using the sanctioning power of certain individuals to improve outcomes has important implications for how contracts are designed when formal market institutions interact with informal, community-based ones (Besley & Coate, 1995).

In this model, villagers are allowed to form their own groups, which effectively lets local knowledge guide the screening process. As Ghatak (1999) shows, borrowers with safer projects tend to team up with others like themselves, while those with riskier profiles end up grouped together. Because of this sorting, high-risk borrowers face higher interest charges and closer monitoring from both the lender and the platform, whereas safer borrowers receive more favorable terms. Although risky borrowers shoulder heavier expected joint-liability payments—since their partners are more likely to fail—the reduction in overall interest rates that comes from attracting safe borrowers back into the market can raise the welfare of everyone involved. By drawing on local information embedded in social networks, joint-liability group lending can therefore help overcome credit market failures.

Need of Moneylenders as Stakeholders and Their Role Play

It has been known that the moneylenders have been working from a few centuries in India. Although they play a usurious role in most of the developing nations, they still have been able to maintain their monopoly in the field of informal lending. The money lenders have a significant edge over the traditional banking systems because they have the access to local information of the borrowers, which the banks lack. This allows them to screen the loans that are riskier and over the years they develop a group of trustworthy people, only to whom they extend credit. Another reason is that they also know the methods to enforce repayment of the loan.

Keeping moneylenders under a central platform helps in avoiding debt trap conditions for farmers as well regulation on their own selfish interests. One method of regulation is by licensing them and thus keeping a tab on their usurious roles.

Requirement of Fund and Entry of Peer-to-Peer (P2P) Platform

This model suggests that in the initial phase, Government/ Central Platform has invested more funds to increase the confidence of farmers/artisans and to displace conventional moneylenders from monopolistic portion. Once the model is successfully implemented for 2-3 years, then it may could be open for other lenders, as because this would train the various models for the calculation of interest rates, probability of default etc. and so on based on the historical values.

Another challenge could be that the moneylender, in case of a bad loan can focus on only getting his share back. This could be tackled by having a rating system for moneylenders. Each moneylender gets a rating based on what percentage of previous loans he was able to retrieve. If the credit overall fails, but the moneylender gets selfish in retrieving his share, the rating of the moneylender would reduce. This could even lead to exclusion of moneylender from the platform itself.

Variable Interest Rates and Its Need

In Akerlof's (1970) lemons framework, if there are enough high-risk borrowers in the market, the equilibrium interest rate can rise to a level that pushes safe borrowers out altogether. Ghatak (1999) shows that the joint-liability feature of group lending changes this outcome by encouraging borrowers with similar risk profiles to form groups. Once the borrowers sort themselves, the effective cost of borrowing differs between safe and risky clients. On completion of the project, a risky borrower would have paid more interest, to cover for their group members, who are likely to have defaulted. Since safer borrowers get better effective interest rates under this arrangement, they are drawn back into the credit market. As a

result, the market interest rate falls, the borrower pool becomes safer on average, and overall repayment improves.

Regular Repayment: A Habit-Forming Schedule

There are various advantages of a regular repayment schedule. They help in screening out the undisciplined borrowers early-on (De Aghion, Morduch, 1999). This also helps the group members and moneylenders to increase the supervision of defaulting members. Another advantage of schedule payment is to force the households to seek for additional regular sources of income, instead of relying on a risky and very seasonal source of income i.e. farming. The members of the group can jointly also try to start an additional source of income. It also encourages the habit of saving in rural households. This eventually helped them to build funds and thus reducing dependency on microfinance firms in future leading to self-sustainability.

Requirement of Fund and Entry of P2P Platform

This model suggests that in the initial phase, the Government via the central platform has to invest more funds to increase the confidence of farmers/artisans and to displace moneylenders from monopolistic positions. Once other investors begin to observe the rate of returns on the loans, they may themselves begin participating in the process, reducing the dependence on government funds for newer loans.

Different P2P Models for Adoption

There are various P2P models existing in the world. The type P2P adopted may depend on various parameters like location, product, economy etc. Some of the existing models are discussed below.

In U.K., there are 2 main P2P lending platforms *i.e.* Zopa and Funding Circle. Both the platforms can be used to take loans for different things from buying a car to the expenses of a wedding to consolidating a more expensive loan. Zopa doesn't take any collateral so their procedure for preventing default is checking their credit history, current income and variables. They also spread the money of lenders in a diverse portfolio automatically. In case of default, the loan is sold to a collection agency and then they pursue the defaulter. In the case of a funding circle, there are 2 types of loans, first that are backed by an asset, which on default leads to confiscation of the asset. The second type of loan is with a monthly repayment schedule. Again, in case of default, the loan is again sold to the collection agency.

In the USA, the main P2P lending platform is prospering marketplace. They also lend for a variety of purposes as Zopa. They prevent default by screening the

applicants of loans using a set of eligibility criteria for the borrowers. The criteria include annual debt to income ratio below 50% and no bankruptcy filed in the last 24 months among many others. Use of collection agencies is not explicitly mentioned in their default prevention policy.

In Australia, Society-One is the P2P lending platform. They also lend for many purposes, like consolidation of loan, wedding, livestock loans etc. They screen loans using criteria as the individual should be a permanent citizen of Australia, income at least $30,000 p.a etc.. In case of default, the loan is again passed through a collection agency. In New Zealand, Harmoney is present. They also screen loans using the criteria, and then sort the loans in different grades. The lenders can then lend the loan on the basis of the various information that is made public by Harmoney, where collection agencies are used in case of default.

In India, the P2P lending platforms are not autonomous but are regulated by the RBI. PaisaDukan, Rupee-Circle, Microgram are the main ones in India. All the platforms work similarly, i.e. first screen the loans that satisfy the eligibility criteria. Once the loans are screened, then they are sorted into different grades. It is the responsibility of the lender to check the loans and invest on the basis of their risk appetite. Rupee-Circle also uses collection agencies and other legal procedures. But all the fees of such processes are cut from the lender themselves, before they are paid back.

Latvia has **Mintos** working as P2P in their country. They have originators working for them, who verify the loans and check the details of the loans. They are required to invest a minimum of 10% into the loans. In case of default, the entire responsibility is of the originators. If the originator fails to recover the loan, the entire investment of the lenders is lost.

In Ireland, there is Linked-Finance. They lend mostly for business purposes unlike Zopa and Funding Circle, who loan mostly for personal reasons. They have the same models of verifying and then classifying the loans. The loans are again passed through the collection agencies in case of default.

Hence in most of the current models, except Mintos of Latvia, the bad loan is passed through collection agencies. In current model too, the bad loans are finally passed to moneylenders themselves.

Possible Challenges and Suggested Solutions

There could be various challenges arising in this model, and possible solutions to them are listed below:

- **Breakdown of Joint Liability Due to Weak Social Capital**

  Group lending relies heavily on social collateral: borrowers discipline each other because default imposes a cost on the group.

  However, in many Indian villages, the social ties may be weak, fragmented, or divided by caste and politics. Furthermore, the borrowers may collude to collectively default (Besley & Coate, 1995).

  Result: This may lead to failure of joint liability, leading to strategic default or inability to enforce peer pressure.

  Solution: A stricter penalty can be imposed on wilful defaulters, where they could be excluded from other government benefit programs, to create a deterrence.

- **High Information Verification Burden and Risk of Misreporting**

  The model assumes villagers truthfully verify each other's income, landholdings, liabilities, and credit needs.

  In practice however, misreporting can be mutual, or group members may collude to inflate loan amounts. Even the local officials may be bribed or influenced, who may put wrong data in the platform, creating an information asymmetry. Cross-checking of the data for any such malice would become costly in time and resources.

  Result: the platform may inherit the same information asymmetry and adverse selection problems that plague banks.

  Solution: increasing transparency, capturing the information from reliable sources, with checks and social audits

- **Dependence on Moneylenders May Reinforce, and not Reduce their Power**

  The model requires moneylenders to purchase at least 20% of each loan.

  Risks include that the moneylenders could dominate bidding and influence loan terms, allowing risky borrowers to be portrayed as safe ones. Their local power and coercive enforcement ability may persist within the "formal" platform. They may also strategically buy shares in loans only when they expect high returns, cherry-picking better groups.

  Result: Instead of reducing informal-sector dominance, the platform might formalize it.

Possible Solution: Incentivise moneylenders to purchase riskier loans more by allowing them to charge a higher interest rate. This interest rate would be higher than "safer" borrowers, but lower for the group had they gone directly to the moneylender in the informal credit market.

- **Limited Digital and Administrative Capacity at the Village Level**

  The model depends on accurate data entry, digital literacy, and smooth operation of a central platform.

  However, various observations in villages can be a hindrance. Village-level officials may lack training or resources, which may make the entry and scrutiny of data of borrowers erroneous. Further power outages, connectivity issues, and low digital awareness may hinder participation. Operational errors can further lead to misclassification, delays, or disputes.

  Result: Implementation bottlenecks may undermine trust in the system.

  Possible Solution: Use of schemes like *BharatNet, PM Kaushal Vikas Yojana, PM Digital Saksharta Abhiyaan* to build local workforce, and empower debtors to give right information, avoiding errors.

- **Investor Reluctance and Risk Perception in an Open P2P Rural Credit Market**

  P2P lenders—urban individuals, pension funds, or institutions—may hesitate to fund risky rural borrowers because rural incomes are volatile and seasonal. Joint liability also does not eliminate systemic risk (monsoon failure, market shocks). Further, limited repayment history and weak enforceability may increase perceived default probability.

  Result: The platform may struggle to attract enough diversified capital, especially in early years.

  Possible Solution: The government will have to start the investment and funding process, along with the moneylenders as a pilot project and proof of concept. Once it is observed that sufficient returns are being generated, more investors can take the lead role.

Conclusion

Rural credit markets in India are still characterised by lack of financial inclusion, information gaps and presence of unofficial lenders. This is despite continuous efforts of the government and banks. The above Model suggests use of local information

networks, digital infrastructure and moneylenders, reducing the structural flaws. It combines group lending, joint liability and a central P2P platform.

Moneylenders in the model are not sidelined or bypassed, but are regulated. This would help in cohesion of informal markets with formal ones. Moneylenders bring in their informational advantages, and coercion methods, which prevents groups from defaulting. However, the effectiveness of the model will rely on factors like strength of social ties, accuracy of borrowers' data, and willingness of outside investors to interact with rural credit markets.

Despite these obstacles, this model provides a logical way to increase capital in rural credit market, and reduces reliance on informal lending. The model reduces competition between formal and informal markets and actors, increasing collaboration between them. The model has the potential to improve rural financial systems, while making contributions to general development objectives. This model thus relies on community-based monitoring, utilizing the traditional actors of credit markets with new digital platform, and bringing in capital from a variety of sources.

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During his time at IIT Kanpur, he worked under the mentorship of Prof. B. V. Phani and Dr. Ramswarup Bhaskar on projects related to financial inclusion in rural India, contributing to analytical and technology-driven approaches in development-focused research. Following graduation, he joined Oracle in Bangalore, where he gained hands-on experience in cloud computing, network systems, and file management architectures, further strengthening his technical foundation for public-sector digital transformation.

Beyond academics and professional pursuits, he enjoys playing the guitar, dancing, and engaging in board games, reflecting a balanced blend of creativity, teamwork, and personal expression.

Climate Resilience and Sustainable Development

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3.1 The Reds in the Greens: Challenges to Green Finance

Sh. Vaibhav Singh

Abstract

As the spectre of climate change induced extreme weather events, associated disasters and a long-term alteration of the familiar environment looms large, the need to transition to greener and more sustainable development pathways has never been more urgent. In this scenario, the need for timely availability of finance that is affordable and willing to sustain through the length of a green project becomes pertinent. However, the recent trends in the market point to a declining appetite for 'greeniums' that reflect the premium that investors are ready to accept while investing in such instruments. This is in the form of lower yields of financial instruments that the investors accept in lieu of the fact that money raised is being used to fund green transition.

Keywords

Cyber-attacks, Network Infrastructure, Vulnerabilities, Network Infrastructure Security

The Challenges in the Sovereign Green Bonds Market in India

The cancellation of the 30-year green bond auction in June 2025 by the Reserve Bank of India (RBI) is a case in point. Bids worth ₹10,943 Crore were received against a ₹5,000 Crore target. However, the bids for yields were in likelihood higher than the RBI's tolerance level (ET Bureau, 2025). Although, the prevailing Middle-Eastern geopolitical tensions at that time are also to blame for the increased yield demand, it is significant to note that previously in May 2024, a 10-year green bond issue was also cancelled, indicating a fundamental mismatch between the Central Bank's expectations and market demand (Trivedi, 2025). The greenium provides a buffer for issuers to raise cheaper finance by reducing the yields. However, globally as geopolitical uncertainties reduce investor appetite, the increased yields by 20-50bps eat into the 7-17bps historical greenium buffer (Trivedi, 2025). In this scenario, India's historically low greenium, 2-3bps reflects an inherent challenge of a yet to fully mature market (Trivedi, 2025).

This challenge for raising green finance through Sovereign Green Bonds (SGB) has been plaguing India since their launch in 2022-23. In this scenario, the

Government's target for FY26 of mobilizing ₹25,342 crore through SGBs seems to be a herculean task. For FY25, SGBs had risen from ₹20,785.60 crore in FY24 to ₹25,297.89 crore in FY25 but were short of the target of ₹32,060.86 crore (Kundu, 2025). For FY26, SGBs were intended to fund schemes like *KUSUM,* the Green Hydrogen Mission, *PM Surya Ghar Muft Bijli Yojana,* etc. among other projects like metro constructions, energy efficient locomotives, etc.

In this scenario, while the Government might be able to raise funds through conventional bonds or other alternatives, it becomes however, pertinent to confront the challenges of raising finance for a green transition. Importantly, though these challenges pertain to the Government only, the scenario is equally difficult for corporate issuers as well. Though, that is a matter of discussion for some other day.

Tiding Over the Challenge: Innovating for a Better Finance Landscape

The world needs investments of upto $3-6 trillion annually until 2050 to meet the 1.5 °c Paris Agreement target and here green bonds are one of the key instruments (Policy Circle Bureau , 2025). Thus, resolving issues of investors is important to bridge the finance deficit while also integrating innovative financial instruments to further the cause. In this scenario, it becomes important to integrate bonds with traditional financial institution-based credit to fund green projects as also pointed out by Dr. Ajay Mathur, former Director General of the International Solar Alliance (Mathur, 2024). Developing on an illustration of a power plant, he draws an interesting parallel in the finances of a 100 MW coal and an equivalent solar+wind+storage plant. He argues a role for financial institutions in providing the initial capital for projects in terms of credit while reducing its tenor. As a comparison he argues that a viable 100 MW coal plant would need ~₹900 Crore while the equivalent renewable energy plant would need ~₹1900 Crore. In this, the gap of ₹1000 Crore can be bridged by reducing the tenor of the credit as the coal plant would take 4 years to start producing electricity while the renewable plant would be up and running by the second year. Afterwards, a viable plant can then raise a bond from the market to repay the loan and therefore, free the bank's book to ensure that the availability of capital by recirculating the same limited capital into the market. Thus, integrating bonds as a next step in the finance cycle can aid institutional capital achieve scales while mobilizing markets to pitch in to fill the gaps.

At the same time, it is pertinent to build markets for SGBs by making it compulsory for pension funds and other social security funds to invest a part of the corpus in them. Additionally, green bonds raised at the level of local governance institutions like ULBs and District Panchayats with tangible delivery timelines on the ground

can be furthered to democratize the climate finance landscape. Herein, corporates can be encouraged to invest while local prominent cooperatives can be engaged for the purposes of ensuring due diligence in proper utilization of available financial resources. When we are celebrating the International Year of Cooperatives, it is important to recognize their potential in furthering climate goals. Amul, for example, with its vast membership of dairy farmers can help induce climate friendly practices in the sector while also encouraging better outcomes for its members. In this respect, therefore, mobilization of green finance right at the grassroots level can enhance its efficiency.

Green Finance for a Greener and a More Stable Grid

While overall market sentiments affect the allocation of resources across sectors, it is important to ensure that overall certainty remains aligned in favour of green sector's growth potential. To ensure that, strict vigil over 'greenwashing' practices and ensuring their non-proliferation is important to retain investor confidence. Along with that, a better prioritization of renewable energy infrastructure projects is needed to build a sustainable energy generation model which is self-contained. It has been observed that grid-level planning remains an afterthought while installing renewable energy plants. The case in point is the rapid expansion of renewable energy infrastructure in the past decade in India without corresponding increase in either energy storage or other alternatives like nuclear energy to replace the thermal power that remains the only baseload generation source. Temporal and seasonal variations in the renewable energy sources production is a cause of concern when, for example, the evenings in summers see a dip in solar generation while energy demand rises for cooling applications. Currently, India has around 212 GW renewable capacity, including large hydro. At the same time, coal-based thermal capacity stands at 220 GW with just 7% growth post FY20 (Walia & Sasi, 2025). At a time when plant load factor is already high, ramping up thermal power generation to bridge shortfalls becomes difficult, leading to energy shortfalls in peak usage hours.

From an energy sector perspective, such structural issues challenge investor confidence in funding instruments devised to finance such renewable energy projects that might face viability challenges due to grid-level uncertainties. This is reflective of a siloed project planning. Hence, devising an integrated grid-level master plan and then allowing SPVs and local level governance bodies to raise climate finance can help overcome some of the challenges.

Future Oriented Funding: Finance for R&D

Climate finance for green energy transition however, is just one of the many

facets of the sector. Funding for research and development which remains dismal, especially in India where whole R&D spend across sectors hovers around 0.6% to 0.7% is a cause of concern as well. Innovative technologies and solutions require stable capital that is willing to incubate an idea and also willing to bear the risk of failure. Mobilizing public and private resources here is important wherein government has undertaken the Anusandhan National Research Foundation with an outlay of ₹50,000 crore during 2023-28, of which ₹14,000 crore would be from the Central Government and remaining mobilized through donations from private sector and public enterprises (PIB, 2024). Here, initiating special InvITs-like funds with a prospect of benefiting their investors by means of breakthrough research can be one of the ways complimenting the broader idea while going forward.

Thus, challenges in green finance that appear as 'reds' in the 'greens' need to be recognized and addressed. This can partly be done by means of creating greater markets for instruments like Sovereign Green Bonds by including them into pension and other social security investment funds' allocations as has been discussed above. Furthermore, generating awareness about these instruments by emphasizing over their long-term stability as an investment instrument while adopting higher and better disclosure standards can help generate greater interest (Gupta, n.d). Making use of instruments like InvITs to fund green infrastructure projects is another possibility. Furthermore, the integrated development of projects aligned with climate friendly goals across sectors can help boost synergy that enhances investor confidence. As discussed above, undertaking projects with a 'whole-of' approach rather than in siloes while anticipating the future linkages ahead of the curve can help make projects financially viable at the earliest, allowing faster recirculation of limited resources. The investors should be able to see the vision of a solved jig-saw puzzle before they are expected to bet on individual pieces to fit in and solve the issues at hand. Thus, conceptualization in itself should be the most robust stage of a project in order to attract finance. Furthering alternative investment models while reducing project turn-around times is important to boost the availability of capital in the market. However, in all this, it is important that countries that have been historically significant polluters and emitters pay their fair share of the dues and also share clean technologies with all other countries, especially the emerging and developing economies to facilitate a smoother transition towards a more climate-friendly world order. Till then, it should be our endeavor to ensure the greening of all the 'reds' in the way of our green future.

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He has a keen interest in policy matters, particularly those focused on building a future-ready, sustainable, and resilient society. His engagement with contemporary governance issues reflects a forward-looking perspective anchored in evidence-based thinking and institutional accountability.

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3.2 Synergizing Disaster Risk Reduction with Efforts to Build Climate Resilient Viksit Bharat 2047

Sh. Kenneth Chakma

Abstract

As planet earth braces up for a world impacted by climate induced disaster ranging from Californian wildfire, Glacial Lake Outburst Flooding (GLOF) in Sikkim to growing intensity of heatwaves in north India, developing climate resilience becomes imperative to achieve the targets of Sustainable Development Goals (SDGs) 2030 and the long-term goal of Viksit Bharat by 2047. The integration of both Disaster risk reduction and climate change adaption at various stages of governance is key to break the administrative silos for an effective, efficient, and sustainable future. This paper addresses the gap in our present developmental processes and underscores the importance of inter-departmental coordination, decentralised governance, and grassroot initiatives to create climate resilience frameworks in our policy planning.

Keywords

Disaster Risk Reduction, Landslides, Flooding, Heatwaves, Policy framework, Risk Assessment, Nature-Based Strategy, Glacial Lake Outburst Flooding (GLOFs), Payment of Ecosystem Services, Ecotourism

Introduction

India's unique geographic diversity subject itself to varied nature of disaster-landslides in Himalayan states of India, frequent flooding of Assam floodplains and heatwaves in northern states of India. To tackle such challenges, the Disaster Management Act, 2005, brought a paradigm shift to move from post disaster to proactive, multi hazard and preparedness model of governance. However, weak integration of climate change projections and vulnerability in developmental planning has led to facing major challenges in forms like prolonged drought cycles in regions of Maharashtra and Karnataka's adverse impact on agriculture productivity, heat stress set to reduce labour productivity, post flood impact on health sector in the form of water borne diseases like malaria and dengue, urban flooding due to poor planning of drainage system, and rapid intensification of cyclones like *Fani* or *Tauktae*, which caught existing preparedness off-guard, increasing human toll. This demands a need to fully analyse disaster risk reduction planning through a climate lens to reduce cost and create a unique roadmap of

Viksit Bharat which is more people-centric, rooted to Indian traditions and scientific understanding. Climate resilience is key for achieving the Sustainable Development Goals (SDGs), particularly SDG 11, that is, Sustainable Cities and Communities, SDG 13, that is, Climate Action, followed by SDG 15, that is, Life on Land.

Challenges of Disaster Risk

India faces multi-dimensional climate induced risks, particularly flooding, landslides, and heatwaves, which increasingly demand looking into the gap areas in the present hazard management**.** In the present state of affairs, flooding mitigation is mostly an embankment-centric approach, which creates a false sense of security as it encourages human settlement along floodplains. The problem is further impacted by weak implementation of floodplain zoning where wetlands and natural riverbeds are protected. Moreover, in some cities like Mumbai, Chennai, and Gurugram, infrastructural development without due consideration of micro drainage system profiling has caused urban flooding havoc, where severe waterlogging issues are visible even after short duration of intense rainfall. Lastly, accelerated glacial melting combined with limited inventories and monitoring of glacial lake has increased the risk of Glacial Lake Outburst Floods (GLOFs) across the Himalayan states of Sikkim, Uttarakhand, and Himachal Pradesh.

The threat is further exacerbated by increasing incidence of landslides. While the Geological Survey of India (GSI), the nodal agency of landslide is responsible for mandatory landslide susceptibility mapping, the need for more granular data is key for planning of local governance disaster mitigation planning. Moreover, poor building code enforcement followed by lack of slope modification policy in various states have led to improper land use alteration, and indiscriminate quarrying creating challenges of anthropogenic induced landslides in parts of Himalayan states and particularly the Western Ghats. Lastly, operational and technical deficiencies like fragmentation of landslide coordination due to overlapping functions of GSI, Border Roads Organization (BRO), and State Disaster Management Authorities (SDMAs) has led to delay in sharing of critical data and timely slope stabilisation work.

Concurrently, heatwaves have emerged as a major climate related hazard too. According to World Health Organization (WHO) report, heatwave is a key variable as it has an important bearing upon occupational health hazard and the environment. It is a key cause of weather-related deaths which includes mental health, heart related diseases, asthma, diabetes and can also result in increased transmission of other infectious disease. Heatstroke is a medical emergency with a high-case fatality rate. In India, the frequency and intensity of these compound

extremes are expected to increase as global temperatures continue to rise. This will pose a complex and escalating challenge for the country. It is also estimated that around 3.5 Crore full-time jobs and reduction of labour productivity of 4.5 percent by 2030 will be attributed to heat stress only (Kjellström et al., 2019). At this juncture, India should rapidly scale up its heat resilience through data-driven understanding of the heat risk faced by every district to improve granularity of data set.

Key Interventions for a Climate Resilient Viksit Bharat

A coordinated effort by bridging the gaps of Climate Change and Disaster Risk Reduction (DRR) is key to address the systemic risk and enhance resilience across various sectors and scales. These approaches are key for long-term adaptive planning which is aligned with the targets of Sustainable Development goals and Sendai Framework for Disaster Risk Reduction.

Nature-Based Strategy (NBS)

Nature-Based Strategy (NBS) provides dual role in risk mitigation and ecosystem enhancement. For instance, in Indian cities, integrating urban forestry within the Heatwave Action Plan is key to reduce the impact of urban heat islands. Moreover, to promote sustainable agricultural practices, promotion of zero tillage, crop rotation, crop residue retention, and crop diversification will play key role to improve carbon sequestration and lower N_2O emission. From the policy perspective, exploring new financial mechanisms like green carbon credits through coordinated implementation of PES schemes will allow private players' participation in NBS initiatives. Lessons from programmes like "Room for the River" of Netherland model, can be applied in India as pilot projects that restore riparian zones, reduce flood risk, enhance water security, support sustainable fisheries, and provide recreational benefits, provided there is strong enforcement of environmental regulations.

Ecosystem-Based Strategy (EBS)

EBS harnesses ecosystem services for adaptation, particularly benefiting indigenous and rural communities. In states like Meghalaya, since more than 90 percent of the forest is owned by community, a unique model of payment of ecosystem services under GREEN Meghalaya provide financial incentives for conservation activities which is key for biodiversity conservation, carbon sequestration, and carbon financing projects in sectors like agriculture and livelihood mission plans. Similarly, regular quantification of the ecosystem services through estimation of payment for ecosystem services (PES) will have a key role to provide comprehensive economic

value to depleting natural resources. The recent study of IIT Bombay on Sanjay Gandhi National Park's PES is valued to be around 15 lakh crores, which includes morbidity costs due to respiratory ailments that the city saves is around Rs 514 crores per annum alongside providing 128 million litres of drinking water per day.

Therefore, the trilogy of ecosystem health, local governance empowerment, and people participation is imperative for formulating a national PES policy with a coordinating agency to oversee PES schemes and guidelines are implemented across all states to ensure conservation activities translate into visible green growth.

Community-Based Solutions (CBS)

CBS emphasizes localized planning, co-production of knowledge, and participatory methodology which is evident in states like Sikkim where community-based early warning systems for landslide has been developed by the GSI. Thus, in Himalayan states, the community-based societal attributes can be tapped through CBS projects which can focus on climate resilient agriculture and inclusive microfinancing to achieve food security and household resilience. For instance, the Biodiversity Management Committee, formed under the Biodiversity Act 2002, has played a positive role in Chamoli and Pauri district of Uttarakhand, where documentation of local species and micro-management of the forest areas have led to maintaining watershed health, curbing soil erosion, and protecting the native medicinal species of plants. This has created conducive environment for tapping the ecotourism potential of the region.

Unified Risk Governance

Unified Risk Governance seeks to integrate climate change adoption into the budgetary framework across the various line departments. For instance, the *Ahmedabad Heat Action Plan* model incorporates early warning systems, vulnerable group focus, health preparedness, access to water, community education outreach, and urban planning, cutting across varied departmental mandates. Moreover, a unified risk data platform which can integrate the data of Indian Meteorological Department, Geological Survey of India, and climate projections which is accessible to all stakeholders will be key game changer for risk screening before formulating any projects in the future. Lastly, by tapping the private players through green credit schemes, it can help achieve models like the German "Resilient City" which is based on using blue green infrastructure (permeable surface to absorb excess rainwater, green roofing, etc.) through multi hazard approach which is disaster proofed with stable financing, varied stakeholder participation, and vertical coordination. This is key for achievement of SDG 11, that is, Sustainable Cities and Communities for India, too.

Cross-Sectoral Collaboration

Collaborative approaches ensure the holistic integration of health, water, land use changes, and food security. Thus, joint monitoring is key to break the administrative silos which can be driven by AI-supported decision models integrating IOT, 5G, blockchain technology for transparency in data management and real time monitoring of hazards at local level planning. Embedding these technologies enable early detection, quick response coordination, and accurate climate risk projection. To operationalise this, institutional linkages between the scientific and technical institutions like Indian Institute of Remote Sensing, ICMR, ICAR, IITs, ISRO, and NIDM ensure the latest data of climate change is revised as per the requirements. However, without capacity building at the local level (district, municipal, panchayat), the technical outputs may remain underutilised.

Conclusion

Thus, true synergy requires mandatory integration of future climate projections in various facets of development planning-from urban infrastructure to rural livelihood. This ensures that every investment for developed India is hedged against the future climatic shocks. Decentralised empowerment at the level of panchayat raj, Fifth schedule, and Sixth schedule areas need to be funded with technical support by Centre. Policy support must prioritise Nature-based Strategies (NBS), where it can restore our degraded forest, wetlands, and promote afforestation for landslide prevention followed by conserving our mangroves for coastal protection. Thus, building resilience which is region-centric, into our DNA of development will ensure that the Viksit Bharat is not only developed but also local, secured, sustainable, and adaptive in the face of 21st century's greatest challenge. Lastly, it's key to recall our Hon'ble Prime Minister's call for "Building Local Resilience in a Changing Climate" which is inherent in Indian tradition. This is key for ensuring local participation for driving local climate resilient initiatives.

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With expertise in geochemical mapping, landslide susceptibility analysis, river geomorphology, and systematic geological mapping, he is known for his rigorous fieldwork and scientific clarity. He continues to bring this technical proficiency to the North-Eastern Region, one of India's most geologically dynamic zones.

3.3 *Surya* – The Jolt that Electrifies Bharat's *Atmanirbharta* and *Vikas*

Sh. Kanishak Aggarwal

Abstract

The role of the Sun in shaping India's civilizational, scientific, and technological progress has been profound. From ancient *Suryavanshi* dynasties such as the *Ikshvakus* and the *Cholas,* who drew strength and legitimacy from solar symbolism, to the astronomical text *Surya Siddhanta* authored by *Aryabhata,* the Sun guided India's early advancements in mathematics and physics. Today, this legacy inspires India's leadership in solar energy innovation as the nation seeks to become *Viksit* and *Atmanirbhar*. Solar power supports strategic autonomy by reducing dependence on fossil fuels and stimulates economic growth through expanding manufacturing capacity, especially in solar photovoltaics, semiconductors, and critical minerals processing. It also drives inclusive development through rural solarization, rooftop systems, agricultural solar pumps, and solar powered public infrastructure. Emerging technologies such as concentrated solar power strengthen reliability and efficiency, addressing energy storage and grid stability challenges. *Surya* therefore symbolizes a transformative pathway empowering India's rise as a global clean energy leader.

Keywords

Solar Energy Innovation, Surya Siddhanta, India's Clean Energy Transition, Suryavanshi Polity and Civilization, Solar Photovoltaics and Manufacturing Ecosystem

Introduction

History is replete with references to India's path to power, where the Sun served as the fuel for the ignition of Indian polity. Some of the well-known dynasties include the *Ikshvakus*, who claimed themselves to be descendants of the Sun God (Smith, 2008). This dynasty was adorned by kings like *Lord Rama,* whose reign was governed by the principles of *Dhamma*, which translated into *Ram Rajya*. The core of this polity was reflective of the Sun's unwavering luminescence. Another instance is the *Chola* dynasty, the *Suryavanshams,* who were able to establish India as a naval superpower (Subbarayalu, 2012).

Surya Siddhanta, authored by *Aryabhata,* is the epitome of the Sun's supremacy guiding India's path to scientific power (Pingree, 1970). In order to track the Sun's

position, the development of principles of trigonometry such as sine and cosine took place, a knowledge which later travelled to Europe and formed the foundation of modern-day physics and mathematics.

The calculation of the solar year as 365.258756 days is astonishingly close to real day calculations, an achievement possible because of India's scientific intelligentsia. Today, the same scientific ethos is steering India toward innovation in solar technology.

Solar power is not a novel idea when thought of from the lens of science, mathematics, and philosophy. The manufacture of the light bulb, a system that transforms electrical energy into light energy, serves as a model to build solar panels. Solar panels are the inverse of this technology, converting light energy into electrical energy.

Harnessing Surya's Power: Metamorphising Light to Energy

The Sun's energy can be harnessed in multidimensional ways not limited to electricity alone. It can be used in solar heating applications, solar disinfection, solar lights, solar furnaces, and solar pumps.

For the purpose of solar photovoltaics, if harnessed proportionally, it can activate the manufacturing cycle for the Indian economy. India's growing energy demands, as part of its path to becoming *Viksit*, require fuel, and this requirement can be fulfilled significantly by solar energy systems, for the Sun offers an infinite source of energy. In the paradigm of a clean energy world, where western notions dominate and industrial giants resist leap frogging, India can take the lead in solar Photo-Voltacs (PV) development. There is multiplier benefits associated with solar photovoltaic development.

Benefits of Surya's Halo

First and foremost is the reduction of dependence on fossil fuels, which has historically created *Nirbharta* on oil producing countries. This dependence is complicated by brewing geopolitical tensions, and solar energy helps in navigating them, helping India maintain strategic autonomy.

Second, is the development of industries that manufacture solar cells and modules, where India's manufacturing capacity stood at 7.6 GW as of June 2024, and the country's cumulative solar module manufacturing capacity reached 77.2 GW in the same period (Ministry of New and Renewable Energy [MNRE], 2024). Although the numbers are still modest, in comparison, in 2014 India had only 2 GW of solar module production capacity, highlighting India's decisiveness to become *Atmanirbhar*. This clearly highlights India's growing export demand to countries like the United States of America (USA), even when tariffs seem unfavourable.

This helps India capitalize on demand shifting away from China due to strained China-USA relations. These industries help absorb India's demographic dividend. The developments in the industry can be leveraged to develop semi-conductor fabs, the most sought after industry in the present technological paradigm, where the development of Graphics Processing Units (GPUs) is of central importance. These GPUs form the basis of high-performance computing and are crucial for running artificial intelligence (AI) systems, functioning as their central nervous system.

Third, is the development of critical-mineral refining industries required in the solar ecosystem. This involves the development of lithium battery packs, a prerequisite for energy storage in electric vehicles. Development of critical minerals refining is *sine qua non* for the modern electronics sector and will enhance India's stature as an export-oriented unit in the world's industrial landscape.

A case in point for solar power utilisation is the development of solar pumps used in agriculture. This development has inclusivised the growth. The *PM KUSUM* scheme is a revolutionary initiative transforming India's agricultural landscape, fulfilling irrigation needs and removing the negative externalities arising from electricity driven pumps (MNRE, 2020). Solarized pumps have helped farmers irrigate their fields, activating India's primary sector and energizing India's path to power.

Solar energy offers an independent and rural centric model for electricity supply, echoing Gandhian philosophy. This development has democratized the growth. Rooftop solar electricity generation is decentralized, making every individual the owner of their energy. This gives people liberty to utilize electricity even in previously untouched areas suffering from energy shortages.

Solar street lights have transformed the safety landscape for women, making public spaces more usable and productive. This has enabled the Indian economy to run on both wheels of the chariot, which earlier functioned on one.

The Solar Fresnel dish is a novel idea that can be used in schools to provide hot meals for students. The system continuously tracks the Sun to maximize radiation capture. The sunlight collected is redirected to a focal point to heat the substrate, enabling large scale cooking, especially beneficial in villages where the availability of Liquified Petroleum Gas (LPG) is limited or irregular.

Another promising domain for India is the development of Concentrated Solar Power (CSP). India should increase its focus on solar thermal energy systems. This is because the maximum efficiency for a single junction PV cell is nearly one-third, popularly known as the Shockley- Queisser limit (Shockley & Queisser, 1961), whereas solar thermal systems provide efficiency up to 45%. This significant

difference is reflected in land use requirements, crucial in a country where land burden is intense.

One of the advantages of solar thermal systems over photovoltaics is their prolonged energy generation capability. The molten salts used as a heating substrate remain hot for extended periods, similar to the principle used in solar ponds. This prolonged energy supply helps maintain the base load, which is essential for round the clock electricity and reduces the need for battery storage.

Challenges

There are challenges too while harnessing the solar energy; more procedural than technological. It is often seen that while new tenders are issued, a buzzword in the media, actual energy generation remains minimal due to multiple factors like lack of Power Purchase Agreements (PPAs) between the solar power generator (seller) and the distribution company or DISCOM (buyer). There is understandable hesitation on the part of DISCOMs due to fears that the price of solar energy may fall rapidly as technology advances. To overcome this, mandatory enforcement of strict regulatory timelines after bidding should be adopted.

Another hindrance is the evacuation of solar electricity from solar parks. Often, these parks are located in remote regions. Transmission infrastructure requires significantly more time to build than solar plants, thereby delaying energy evacuation. There may also be Right of Way issues. To overcome this, Green Energy Corridors need to be prioritized.

Policy unpredictability also creates uncertainty in investor sentiment. A unit standard deviation in policy may reduce investments by 11% (Singh, 2023). Changes in customs duty and the Approved List of Models and Manufacturers (ALMM) are such examples (MNRE, 2021).

A crucial problem is grid intermittency arising due to fluctuations in solar insolation throughout the day. This affects grid stability. Another challenge is that Direct Current (DC) power generated by solar panels which requires inverters to convert it to Alternating Current (AC) for transmission, increasing the losses. To address this, round the clock tenders must be prioritized and hybrid storage systems need to be developed.

Surya, thus, becomes more than a source of light; it becomes the electric field which powers the India's *sui generis* growth story.

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New Directions in Public Administration and Policy Design

4.1 Contours and Webs of Digital Arrest Pandemic

Sh. Aditya Hriday Upadhyay

Abstract

Digital Arrest has grown to be one of the most pressing law & order issues facing the country in the last couple of years. Execution of these crimes involves a very elaborate system whose contours stretch beyond borders and domains. Also, certain vulnerabilities of both victims and our legal enforcement system are accentuating this crime. This article analyses both sides: the contours of the system executing these arrests and our inner webs exposing us to their illicit actions. Lastly, based on recent policy responses, the article further explores potential approaches and preventive frameworks aimed at mitigating this rapidly expanding phenomenon.

Keywords

Digitization, Dark Web, Three Line System, Authority Bias, Salience Bias, Critical Thinking, Caller Name Presentation (CNAP), Cyber Forensics

Introduction

Recently, the Supreme Court of India, in a *suo moto* writ petition *titled "In Re: Victims of Digital Arrest related To Forged Documents"* expressed disbelief over the revelation that individuals across the country have collectively suffered losses amounting to nearly ₹3000 Crore due to the digital arrests scam. The occurrence of digital arrests is rising at a rate comparable to that of a pandemic. According to the Home Ministry, the cases reported on the National Cybercrime Reporting Portal have tripled between 2022 to 2024. Additionally, the total amount defrauded has surged by an astonishing 21 times during the same duration. This situation necessitates immediate action to mitigate the financial, psychological, and social damages caused by this issue. To develop and implement effective measures, we must first comprehend the contours of this crime and the inner complex webs that hinder our ability to combat this escalating threat.

Expanding Contours

The contours of this crime extend beyond borders and are quickly changing over time. A large network of scam operations is established in conflict-prone areas and special economic zones throughout Southeast Asia, particularly in Myanmar and Thailand, where government oversight is limited. Victims are enticed through

deceptive job postings that promise attractive salaries and benefits, often involving travel through Bangkok, taking advantage of visa-free entry policies. These facilities serve as places where trafficked individuals are forced to engage in sophisticated scams. According to I4C, between January 2022 and March 2025, Indian authorities rescued 2,471 citizens from scam operations in Southeast Asia, where they had been deceived by false job offers and coerced into engaging in cybercrime.

Evolving *Modus Operandi*

Focusing on the methods used by offenders, these are also becoming increasingly complex and difficult to identify. The majority of scam calls utilize Voice over Internet Protocol (VoIP) technology through applications like WhatsApp and Skype. This complicates the ability to trace calls, especially when the servers are located outside of India. Fraudsters use artificial intelligence to replicate voices or generate fake video calls, convincingly impersonating officials. Recently, there has also been a notable rise in the utilization of the dark web for perpetrating these crimes. The dark web acts as a marketplace for stolen personal data, malware tools, and other illicit activities. Additionally, scammers demand payment through digital transactions such as UPI, cryptocurrency, or prepaid gift cards. The stolen funds are frequently divided into smaller amounts, funneled through numerous accounts, and ultimately transferred to offshore accounts for illegal purposes. This creates a method of easy layering, allowing them to evade law enforcement.

These Digital Arrest Scams usually have "three lines". In the first line, a fraudster posing as an official like a bank representative contacts customers, informing them of discrepancy. The caller advises the customers to file a police complaint and offers to connect them to a higher official via WhatsApp or Skype. The fake police officials, dressed in a proper khaki uniform represent the second line. They speak in an intimidating manner and inform customers about a scam or crime committed by them. Then comes the third line involving senior level officials who inform customers of "Digital Arrest" and carry out further proceedings. Training given to the victims is based on this three-line system and performance-based incentives are also provided. With time, fraudsters are refining these methods and expanding to new domains.

Webs Impeding at Individual Level

Having seen the contours of the supply side, it is now essential to understand our inner webs which increase our vulnerability to these crimes. First, let us analyse our vulnerability at the individual citizen level. As we saw, a common aspect of these digital arrest scams is the almost constant appeal to authority: police and security

forces; the judicial system and international organizations. It is this appeal to our inherent respect for authority (Authority Bias) that enhances the effectiveness of these scams. The repeated use of well-known public figures in various digital arrest scams highlights the exploitation of another cognitive bias, Salience. Victims tend to focus on a familiar name without questioning the likelihood of such a situation occurring.

Socio-economic factors also affect how vulnerable a person is to cybercrime. Individuals from disadvantaged economic backgrounds frequently do not have access to cybersecurity training and resources. This absence of cybersecurity education makes these communities more susceptible to exploitation by cybercriminals. Age is also a vulnerability that accentuates exposure to these scams. Senior citizens, especially those with minimal technological skills, are at a greater risk of falling prey to cybercrime. This demographic is frequently targeted by scams and phishing schemes because of their inadequate familiarity with technology and their increased tendency to trust online interactions.

In line with the Law of Unintended Consequences, the resounding success of Digitization in India has also given wings to these scams in various ways. In recent years, focus on digitization and consequent success has convinced a fair share of the population, especially elderly, that everything can be done electronically. Digitization especially in the Criminal Justice system has lent perceptual legitimacy to these digital arrests.

Webs Impairing the State Machinery

At the level of State, several loopholes leave us vulnerable to digital arrest. India's criminal justice system has multiple weaknesses that allow scammers to infiltrate. Currently, "digital arrest" is not a crime specifically defined under the Bharatiya Nyaya Sanhita, 2023 or the Information Technology Act, 2000. While several provisions in existing laws are used to pursue prosecutions in these cases, there isn't a specific law addressing digital arrests. This absence of specialized legislation hampers conviction rates. Additionally, most local police departments lack state of art technological tools and expertise required to investigate intricate cyber frauds. Some metropolitan authorities do possess required capacity and infrastructure but small district-level enforcement agencies are mostly poorly equipped. Even after identifying the suspects, the prosecution process is mostly delayed by complex procedural requirements, such as synchronization between states, forensic vetting, and the authentication of digital evidence. Thus, these webs at both collective and individual levels, are restricting our ability to act while empowering this rapidly growing threat.

Framework to Counter the Digital Arrest Pandemic

Having understood the contours of the perpetrators and the webs impeding the victims, we can proceed for developing strategies to combat this digital arrest issue.

- **Tackling the Individual Vulnerability**

  To begin with, it is vital to tackle psychological vulnerabilities at the individual citizen level. Initiatives to raise awareness and educate the public should be expanded through SMS, social media campaigns, the Cyber Dost initiative, the *Sanchar Sathi* portal and app, and digital displays in public areas such as metro stations and airports, emphasizing cyber safety and security. Additionally, systems should be put in place to bolster individuals' critical thinking skills when faced with potential digital arrest situations. For instance, India's telecom regulator could mandate that all communication services include a warning that appears during extended calls regarding digital arrests. From a behavioral standpoint, citizens need to overcome their natural bias toward authority and cultivate a more open mindset regarding the actions of law enforcement agencies, ensuring they verify any orders before placing their trust in them.

- **Legal and Policy Reforms**

  At the level of state, first we need to reform our legal and criminal justice architecture. The proposed Digital India Act should have elaborate provisions to tackle various intricacies of Digital Arrest Crime. Dedicated cybercrime units should be established in each district, staffed with skilled digital forensics professionals. Ongoing training and certification for law enforcement officials handling cyber-related incidents should be made compulsory. India's banking regulatory authority could implement best practices like Singapore to prevent fraudulent transactions. In Singapore, payment service providers are mandated to prevent users from attempting to withdraw over 50 percent of a customer's account balance within a 24-hour timeframe.

- **International Cooperation**

  We saw how the scope of these crimes extends beyond borders, as many scammers operate from foreign locations using infrastructure diffused across countries. Therefore, any single national effort is inadequate. Strengthening international collaboration through Interpol, partnerships with CERT, and Mutual Legal Assistance Treaties (MLATs) is essential for tracking, extraditing, and prosecuting cybercriminals operating overseas. To address the issue of international Voice over Internet Protocol (VoIP), a caller identification

verification system, such as the "Caller Name Presentation (CNAP)" suggested by TRAI, is necessary to assist users in recognizing legitimate calls.

- **Technological Solutions**

  Finally, as we emphasize the need to "fight fire with fire," the solution to the digital arrest epidemic partially lies within technology itself. It is essential to create and deploy AI-powered tools like MuleHunter.AI that can monitor and detect fraudulent activities in real-time, allowing for quick responses to new dangers. We must regularly utilize and update antivirus software and firewalls to identify and eliminate threats. On a governmental level, better-equipped cyber forensic labs can enhance law enforcement's capacity to analyze digital evidence.

Conclusion

To put it together, digital arrest has transformed from a specialized crime targeting particular individuals and using niche mediums into a widespread issue that is rapidly changing and evolving at an unprecedented pace. Our shared vulnerabilities are increasingly exposing us to criminal activity. We need to recognize these challenges and take immediate action based on the aforementioned policy measures. Only coordinated efforts across all levels can halt the proliferation of this crisis and protect both the interests of innocent individuals and the governance structure of the nation as a whole.

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4.2 Interplay of Culture and Data in Targeted Policy Making

Ms. Ayushi Thakur

Abstract

This article begins with delineating the rise of data-based policy making, particularly in India. It highlights the limitations of relying exclusively on quantitative, aggregated data-especially the neglect of cultural factors that shape behaviour, social norms and policy outcomes. The paper argues for integrating cultural context into evidence-based policymaking and analyses the complex and reciprocal relationship between culture and data. Through illustrative examples from India, it demonstrates how similar datasets can mask divergent cultural realities and how culturally sensitive approaches can strengthen policy efficacy. Using a qualitative and interpretive methodological approach, the study combines (a) a conceptual analysis of culture and data within governance frameworks, (b) a comparative case examination of alcohol prohibition outcomes in Gujarat and Bihar, and (c) interpretive analysis of demographic datasets such as Census 2011 to highlight how similar data patterns can mask divergent cultural realities. It further draws on documented field experiences and secondary literature to enumerate the reciprocal relationship between culture and data. The article concludes by advocating for localised, mixed-method policy design that combines quantitative and qualitative insights for more inclusive governance.

Keywords

Evidence-Based Policy Making, Data-Driven Governance, Cultural Analytics, Public Administration, Localised Interventions, Inclusive Governance, Behavioural Insights

Introduction: The Upsurge of Data-Centric Governance

The 21st century brought with it the ever-widening data revolution. Its divergent connotations are still evolving. The large corpus of empirical data and available tools for data collection and analysis is changing the ways knowledge is produced. (Weinberg, 2013; Meter and Schroeder, 2015). This has a profound impact on governance structures worldwide. Such a shift is particularly visible in a country like India which is making huge strides in its journey of digital revolution and transformation, through its robust digital public infrastructure.

Built upon this architecture, administration is increasingly moving towards data-driven service delivery. Examples include the upcoming Census, various reports and indices published by NITI Ayog, e-Shram database etc. This is touted as an essential step towards increasing transparency, administrative efficiency and accountability, effectively leading to good governance towards a Viksit Bharat.

The utility of such evidence-based policy making is unquestionable. However, such broad-based data collection overlooks the nuances hiding beneath them. One such aspect is that of 'culture'.

Culture: The Missing Layer in Data Analysis

Culture is the 'complex whole of shared beliefs, customs, arts, and social behaviours that characterize a particular group or society. It encompasses both tangible aspects like material possessions and intangible ones like knowledge, values, and traditions. Culture is learned and passed down through generations, shaping how people live, think, and interact with one another.'

In a highly diverse society like India cultural underpinning of data becomes all the more important. This is so, because macro-data analysis doesn't account for the causal behavioural trends. Even if sometimes it does, it doesn't account for the differences and diversity of such trends. This leads to uniform policies divorced from cultural realities, thereby limiting its overall impact.

The Utility of Cultural Context: A Comparative Analyses

An appropriate example of the same would be the contrast in the results of a similar policy effort aiming at alcohol prohibition, in Gujarat and Bihar. While in Gujarat, prohibition efforts were largely successful due to historical reasons and aversive behavioural tendencies of the people towards alcohol, reinforcing policy actions. On the other hand, the evidential data of Gujarat's success led Bihar to adopt the same policy, whilst accounting for its own social realities. Such an adoption couldn't replicate the same success as the cultural base was missing, leading to policy failure. Data from one context cannot be transplanted into another without cultural analysis. This explains the significance of accounting cultural factors in evidence-based policy making.

Interpreting Data Through a Cultural Lens

Apart from the shortcomings of culture-data divorce, there's also a lot of merit in their interplay. Culture in India's context signifies diversity in terms of practices. This in turn highlights diversity in data sets collected and the need for differential analysis.

Take for instance, the 2011 Census Data which shows that some tribal areas have higher or balanced gender ratio resembling the ratio in some non-tribal areas. The data is similar, but reasons differ. Among the tribal groups, reasons can vary from lower son meta preference, greater gender equity in inheritance roles, lower access to sex selective technology etc. However, in non- tribal districts the balanced female ratio could be due to skewed migration patterns, better enforcement of sex selective laws etc. Without cultural understanding one might interpret that both societies are gender progressive which might be far removed from social reality.

Therefore, identical quantitative patterns may signify divergent social realities. The interplay of culture and data is essential. Because mere data collection may not provide the whole picture unless seen through a cultural lens.

Culture and Data: The Interrelationships

The interplay of culture and data has greater connotations. It has a role in:

- Selection/omission of data
- In defining our tools and methodologies for data collection
- Interpretation of that data

This is the very reason why some societies categorise identity while collecting data on the basis of clan or tribe while some on the basis of religion or caste. In fact, in some tribal societies land ownership records are based on the community and not individuals. Such an intricate relationship is bound to have culturally determined impacts on the policy made through such data collection.

The relation between data and culture is mutualistic. As much as culture should corroborate data, even data can be used for cultural documentation and preservation, both having profound impact on policy making. A term widely recognised as ‘cultural analytics’ (Lev Manovich 2017). The policy of targeted cultural preservation can have data led efforts. It is the very basis of the *Gyan Bharatam Mission,* trying to preserve cultural identity through the use of evolving technology for institutionalising cultural data.

Culturally Sensitive Policymaking: Evidence from Practise

The benefits of integrating cultural insights into policymaking became evident during the COVID vaccination campaigns in India. Initially vaccine hesitancy was visible in certain regions of Haryana. As a result, the administration appointed local vaccine ambassadors drawn from among the socially prestigious people of the society leading to more than 10% increase in vaccine adoption. This shows the

success of culturally aligned policy making corroborated by numerical outcomes.

However, one needs to be cautious. Data can have a 'cultural bias' specially algorithmically enabled data which is slowly gaining traction in an AI driven world. This is particularly evident in technologies like facial recognition which can have biases against particular race, region, gender etc. Therefore holistically inclusive data sets which are culturally sensitive can be a solution for such policy incentives. AI can in turn be used for furthering such action as well. Building AI models on local and diverse data sets instead of westernised uniform models can be an apt example of the same. For furthering such a goal, AI can be used for translating, interpreting and analysing data from various languages in a linguistically diverse region like India to have a broad data set on which Large Language Models can be built for various policy interventions. *IndiaAI Mission* can integrate such an aspect.

Toward Localized and Mixed-Method Policy Design- a Way Forward

Data remains indispensable, but it should be as inclusive as possible and must cater to the cultural sensitivities of the populace to counter such a bias. Broad trends based on data are important, but for more targeted policy making, we need localised data and localised interventions. Qualitative and quantitative policy making should go hand in hand.

It is for this very reason that administrators must not lose touch with the general public. Interaction with the people or the *'Janapada'* as *Kautilya* puts it in his *Arthashatra* is of utmost importance for an administrator. In Chapter XXXV, *Kautilya* gives a detailed description of how revenue collectors and spies have an indispensable role in getting to understand the real problem of the people based on ground reality. The same lessons we must apply today.

Administrators must increase their understanding of local problems, culturally embedded practices and localised solutions as much as possible. This is a true form of sustainable development. They must delve into cultural study of the various regions wherever the policy is targeted. They must also keep an open mind towards cultural insights in the form of traditional indigenous knowledge for inclusive governance.

Conclusion

The interplay between culture and data is fundamental to designing targeted and effective public policies. Data provides scale, measurability, and structure, while culture offers essential context for interpretation and implementation. Policies rooted in both dimensions—qualitative and quantitative—are more likely to achieve meaningful outcomes. An integrated approach embodies the principles of

a *Bhartiya* model of inclusive development and strengthens the foundations of culturally informed governance.

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She was awarded the 'Best Intern' under the Government of India's Swachh Bharat Summer Internship programme, a recognition of her initiative, leadership, and commitment to community-oriented work. Her interests lie in governance and public policy, with a particular focus on integrating ground realities and societal nuances into institutional decision-making.

A keen observer with a creative bent of mind, she seeks to blend policy thinking with grassroots understanding. Her article reflects this vision—emphasizing holistic, people-centric administration and the importance of aligning public policy with lived social experiences.

Case Study

5.1 Programmable Welfare: Using the Digital Rupee Within PFMS for Smarter DBT and Treasury Operations

Sh. Abhijay Pagare

Abstract

This article looks at how India's Digital Rupee (e₹) could work together with the Public Financial Management System (PFMS) to build next generation Direct Benefit Transfers (DBT). PFMS has already improved the way welfare funds are tracked and delivered, but issues such as payment delays, reconciliation problems, unused scheme balances, and benefits being spent on unrelated and unwanted expenses persists. The programmability built into Central Bank Digital Rupee (e₹) introduces a way to guide funds toward their intended purpose and support just-in-time payments, while giving the government clearer visibility into how money moves through the system. Central Bank Digital Currency (CBDC) helps to create person and purpose specific delivery of DBT. At the same time, the article raises important constraints especially around digital access, privacy, and the complexity of linking large financial and administrative networks. Early pilots like *PM Vidyashree* suggest that gradual adoption is both feasible and useful. Overall, the article argues that combining PFMS with the Digital Rupee could be a meaningful step toward a SMART DBT 2.0 which is a real-time based self-intelligent system built on efficiency and equity.

Keywords

Central Bank Digital Currency, Direct Benefit Transfers, Public Financial Management System, Digital Welfare Delivery, Financial Inclusion, Digital Public Infrastructure

The Next Generation of DBT (2.0)

Figure 1. Digital Rupee + PFMS
(Source: Author)

Institutional Architecture: Understanding CBDC Design and PFMS Capabilities

The Digital Rupee (e₹) is India's Central Bank Digital Currency (CBDC), a sovereign, RBI-issued digital form of the rupee that has the same legal tender status as physical cash (RBI, 2025). A distinctive aspect of CBDC design in India is the exploration of *programmability to create rupee for specific purpose* allowing funds in CBDC wallets to be earmarked for specific purposes, time windows or merchant categories, with Direct Benefit Transfers (DBT) use cases as well.

On the other hand, the Public Financial Management System (PFMS) is a centralized, web-based financial management platform. The main motive is digitalisation of financial rules which tracks the flow of funds under central schemes and provide real-time reporting of expenditure across all levels of programme implementation (Controller General of Accounts, Ministry of Finance, n.d.). Over time, it has evolved into a financial management tool with "single window" through which the Union Government executes and monitors most of its electronic payments, including DBT, giving stakeholders real-time, reliable MIS and decision-support.

Persistent Frictions in Current Welfare Delivery: Exclusion, Delays and Inefficiencies

Over the last decade, DBT has clearly cleaned up a lot of the old leakage in welfare schemes. Money now moves straight into beneficiaries' bank accounts instead of getting stuck with layers of intermediaries. But anyone who has worked with DBT systems knows the story is more complicated. Aadhaar seeding errors, frozen or mismatched bank accounts and incomplete documentation still keep many eligible people out of the net. Even when the money does go through, it usually travels over traditional banking rails and batch processes, which means delays in credit, messy reconciliation across multiple accounts and large amounts of scheme money lying idle as float. And DBT, by design, focuses on who receives the cash, not how it is used; subsidies meant for LPG, fertiliser or nutrition can easily be diverted to other spending, weakening the link between public spending and the outcomes the scheme was created for.

Programmable Transfers as a Tool for Smart DBT 2.0

If we put CBDC and PFMS together, we are basically moving from the first generation of DBT, which was mainly about *getting the money to the right person* to a smarter version that also cares about *how the money flows through the system and what it finally achieves.* On the treasury side, a link between PFMS and the Digital Rupee (e₹) would mean that scheme funds don't have to sit scattered across dozens of intermediary bank accounts. Instead, they can be held as a more centralised CBDC balance, with PFMS triggering *just-in-time* transfers whenever

a payment is actually due. Any unspent money at intermediate levels can be pulled back automatically. In plain terms, the government would be paying out only when it really needs to, *not "just in case"*, which reduces idle float, lowers the implicit interest cost on parked funds and gives the Centre a much clearer, real-time picture of its cash position.

On the beneficiary side, the retail digital rupee can simply plug into the existing PFMS–DBT set-up. After the usual checks on eligibility and sanction, PFMS could push the benefit straight into a CBDC wallet instead of only sending it to a bank account. Because settlement in e₹ is instant, the money shows up for the beneficiary almost immediately, and the government's books get updated at the same time, so reconciliation and refunds become easier to handle.

The real change, though, is what you can do with programmability. Transfers made in digital rupee for a specific scheme can be tagged for certain uses, say, redeemable only at fertiliser outlets, PDS shops or health facilities, or valid only for a limited period. The beneficiary still feels like they are receiving cash, but the system quietly nudges the subsidy towards its intended purpose. In that sense, PFMS sets the rules and CBDC becomes the smarter form of money that follows those rules.

Technological, Operational, and Social Barriers to DBT 2.0

On paper, the idea is very clean: PFMS connects to the digital rupee, money becomes programmable, and leakages come down. On the ground, it is more complicated. A large share of DBT beneficiaries still struggle with smartphones, apps and even basic network coverage. If we shift too quickly to CBDC wallets, we risk creating a new kind of exclusion for exactly the people the system is meant to protect. There is also a genuine worry about privacy. A programmable, fully traceable rupee can easily be seen as the State "sitting inside your wallet" unless there are very clear legal and technical limits on who can see what.

The other set of challenges is more operational. PFMS, RBI, banks, state governments and fintechs will all have to plug into a new rail and keep it running reliably at national scale. One serious outage, security incident or badly designed pilot in a big scheme can shake trust for years. And finally, programmability itself raises design questions: how tightly should the government lock money to a specific use, what happens in genuine emergencies when a family needs flexibility? Those are the real trade-offs that policy and technology will have to resolve.

Start Small: Why Pilots Matter

A sensible way to move towards smart DBT is to take a piecemeal approach instead of forcing a big overhaul. The easiest place to start is with a few small

pilots where the stakes are low and the benefits are easy to measure things like student scholarships or equipment support. At the same time, people should have more than one way to use the digital rupee. Those who have smartphones can use an app, but others should be able to rely on basic phones, cards or even help from a local CSC centre or post office. Privacy also has to be taken seriously from day one. People need to know that their day-to-day spending isn't being watched. And programmability, while useful, should be kept simple and explained clearly.

On the government side, PFMS and the CBDC system can be connected gradually, starting with optional digital-rupee payouts while keeping the bank-transfer route open. If all of this is done patiently with real user support on the ground, smart DBT can grow naturally without confusing people or cutting anyone out.

What the First Pilots are Teaching Us

In this sense, the idea of integrating CBDC with PFMS is no longer only a conceptual discussion. In schemes such as *PM Vidyashree* (Press Information Bureau, 2024), where pilots are experimenting with new ways of transferring support to students, we can already see the contours of a more "intelligent" DBT framework emerging. PFMS continues to manage the core public finance functions like sanction, approval, routing of funds and audit trails while the digital rupee has the potential to provide a more precise, transparent and responsive payment layer on top of it.

If these pilots are scaled thoughtfully, *PM Vidyashree* can serve as a credible proof of concept for the next phase of welfare delivery in India. The shift would be from simply transferring money to designing transfers that are better timed, better targeted and easier to monitor, without undermining the dignity or autonomy of beneficiaries. For those of us who have seen PFMS from the inside, the sense is that the institutional and technological foundations are largely in place; the real question now is how quickly policymakers and technology practitioners are willing to move in order to realise this "Smart DBT" trajectory.

A Gradual Rollout: Starting With Pilots and Keeping Both Systems Running

For the first time, the State can send not just rupees, but intent. When PFMS decides the destination and CBDC decides the path, welfare finally reaches where it should.

It is the shift from money sent to money traced with purpose. PFMS handles the "who and how much" of payments, while CBDC handles the "how it can be used". Together, they create a closed-loop system generation next gen DBT (Smart DBT).

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Author's Profile

Mr. Abhijay Pagare is an officer trainee of the Indian Revenue Service (Income Tax) and a technology-driven professional with multidisciplinary experience spanning global finance, public financial management, and digital governance. His career reflects a distinctive integration of advanced software engineering with institutional public finance, built upon over five years as a Senior Software Developer at J.P. Morgan Chase and 1.5 years of service in the Indian Civil Accounts Service (ICAS).

During his tenure at J.P. Morgan Chase, he worked extensively on fixed-income securities and equities, contributing to the development and maintenance of high-availability financial platforms and distributed microservices supporting global portfolios valued between USD 40–50 million. His responsibilities encompassed performance-critical backend engineering, system optimization, and close coordination with cross-functional teams across Product, Compliance, and Quantitative Research, ensuring secure and dependable financial operations.

Following his selection in the UPSC Civil Services Examination 2022, he served in ICAS, where he contributed to key modernization initiatives of the Public Financial Management System (PFMS). His work focused on strengthening digital payments architecture, enhancing fund-flow efficiency, and examining integration pathways between PFMS and emerging digital platforms such as the Central Bank Digital Currency (CBDC).

His professional journey demonstrates a consistent commitment to leveraging technology, data-driven governance, and systems thinking to improve financial transparency, institutional efficiency, and digital transformation within the public sector.

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